Animal Health Manual









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Animal Health Manual

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We cannot forget all farmers who have received many of us for questions related to animal health problems there are facing, but also allowing us to take photos from their villages/animals for finalizing this book. Thanks to all of them!

Thank you very much for making this first “Animal Health Manual” happen in Cambodia!

PREFACE

It is with a great pleasure that we present the first “Animal Health Manual in Cambodia” and we take this opportunity to thank all the people who contribute to the redaction of the manual.
This manual was written for people from different levels/departments (animal health officers, universities, farmers, private sector, NGOs, …) that are dealing with animal health issues in the country. Its purpose is to provide simple, adaptable and readable words that can be understood by any user. To avoid overlapping with the existing training manuals for Village Animal Health Workers (VAHWs), it was agreed to have this book compiling the main animal diseases in the country, not targeting only farmer trainings but also is not intended to be a dictionary of all animal diseases.
In another hand to make this manual as widely accessible as possible, we tried to avoid highly technical terms in both versions English and Khmer.
Similarly this manual can become a reference animal health document with updates from time to time by adding any emerging and/or re-emerging diseases.
We hope this huge work will contribute to better understand and tackle the common animal diseases in Cambodia and consequently improve food security and livelihoods!

Phnom Penh, April 2013

Dr. Kao Phal	**Dr. Sorn San**	**Dr. Lotfi Allal**
DAHP Director	AHICPEP Director	FAO Cambodia
Cambodian CVO	NaVRI Director	ECATD Team Leader

Content

I Introduction to the anatomy of domestic animals

Poultry 3
1. Description of different external parts of the body 3
2. Description of internal part of the body 4

Swine 11
1. Description of different external parts of the body 11
2. Description of internal parts of the body 12

Cattles 18
1. Description of different external parts of the body 18
2. Description of internal parts of the body 19

II Fundamentals of physiology in domestic animals

Poultry 27
1. Digestion 27
2. Breathing 30
3. Reproduction 32

Swine 36
1. Digestive system 36
2. Respiratory system 38
3. Reproductive system 40

Cattle 46
1. Digestive system 46
2. Respiratory system 49
3. Reproduction 49

III Understanding of diseases

- Definition of Health and Diseases 57

1. Infectious agents 57
2. Parasites 62
3. Feeding 65
4. Welfare 67

- Spread of diseases 70

1. How Infectious Agents are spread? 70
2. Fundamentals of Bio-Security 72
3. Disinfection 75

IV Managing health and welfare

- Housing animals 79

Poultry 79
Swine 81
Cattle 85

- Feeding animals 86

Poultry 86
Swine 89
Cattle 94

V Handling and examination of domestic animals

Poultry 103
Swine 105
Cattle 109

VI Practical procedures, emergency assistance and castration

Chickens 117
Swine 122
Cattle 131

VII Immunity and vaccination of the domestic animals
- How animals respond to infection 141

Poultry 153
Swine 153
Cattle 153

VIII Medicinal treatment of diseases
- Vitamins and Minerals 157
- Antibiotics 164
- Anti-inflammatory medicines 171
- Anti-parasites medicines 177
- Hormones 181
- Vaccines 182
- Disinfectants 184
- Antidote 185

IX Parasites
Cycles of parasites 197
1. Direct cycle 197
2. Indirect cycle 198

External parasites 199
1. Specific impact of external parasites 199
2. Control of common external parasites 202

Internal parasites 205
1. Specific impact of Internal Parasites 205
2. Control of common Internal Parasites 209

X Poultry diseases in small flocks
Diseases with respiratory symptoms 217
1. Newcastle disease 217
2. Infectious Bronchitis (IB) 218
3. HPAI 219
4. Fowl Cholera 221
5. Infectious Laryngo-Tracheitis (ILT) 222

Diseases with digestive symptoms 225
1. Coccidiosis 225
2. Salmonella 225

XI Swine diseases
1. CSF 241
2. FMD 244
3. PRRS 246
4. Respiratory disesaes 248
5. Enteric disease 250
6. Lameness 254
7. Skin diseases 257
8. Reproductive diseases 260
9. Nervous diseases 267

XII Cattle diseases
1. Anthrax 273
2. Black leg 274
3. FMD 276
4. Respiratory diseases 277
5. Enteritic diseases 279
6. Skin disorder 283
7. Lameness 286
8. Disastrous body condition 288
9. Reproductive diseases 289





I. Introduction to the anatomy of domestic animals

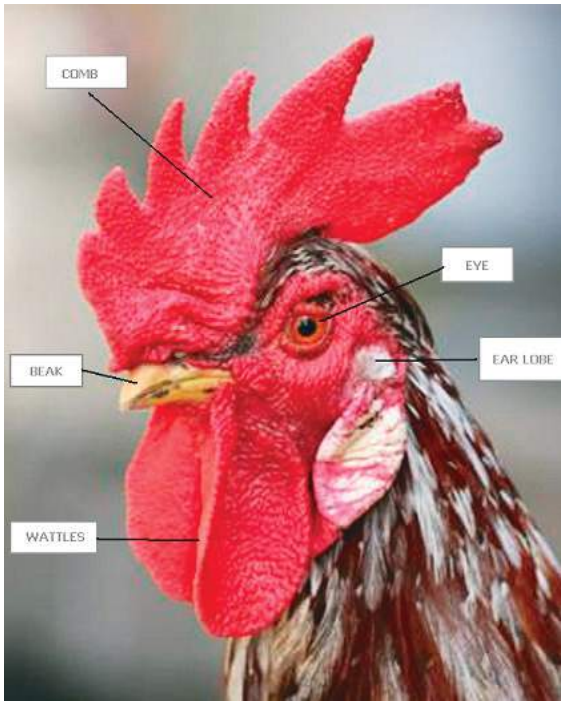




Poultry

1. Description of different external parts of the body

External examination of chicken shows:



- Comb – The comb is a red fleshy appendage on the top of the chicken's head.
- Eyes -Chicken have two eyes, one on each side of their head and the eyes should be dark and prominent
- Ear Lobes – Chicken have two ear lobes, one on each side of their head
- Beak – Chicken have an upper and lower beak. The beak is usually a yellowy color
- Wattles – Chicken have two wattles which hang below the beak. Wattles are fleshy skin and are generally red in color

- Breast – The breast is at the front of the bird and should be broad and plump



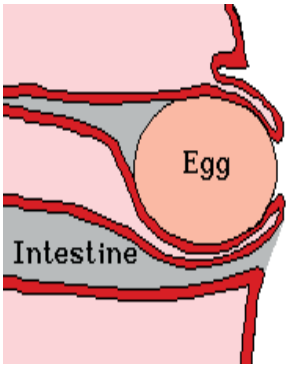
- Wings – Chicken have a set of wing feathers on either side of the body which allows them to fly.



- Tail Feathers – The tail feathers are the same color as the other feathers and point upwards.



- Vent – This is the opening which allows the birds to excrete and for the females to lay their eggs..





- Toes – Chicken have four toes on each foot. Three of their toes point forward and one faces back for balance. **specific variation: chicken/duck feet**
- Each foot has three claw-like toes and in between each is a stretch of web which is flexible. The webbed feet help the duck swim more smoothly and faster because it acts like a paddle.



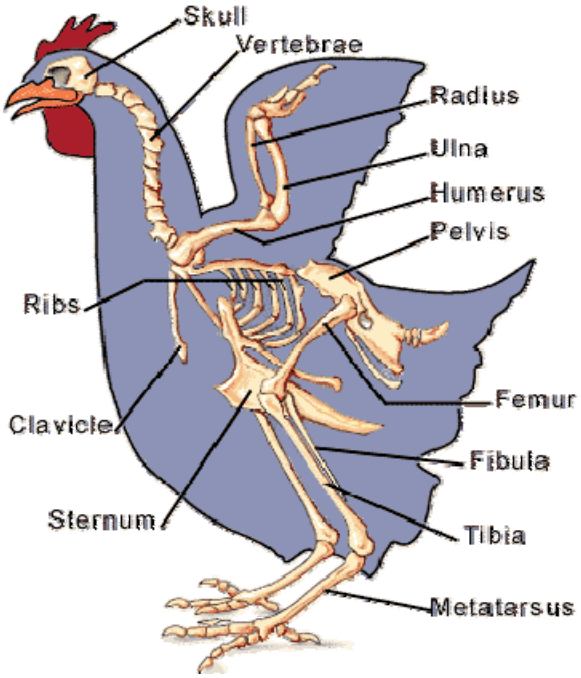
2. Description of internal part of the body

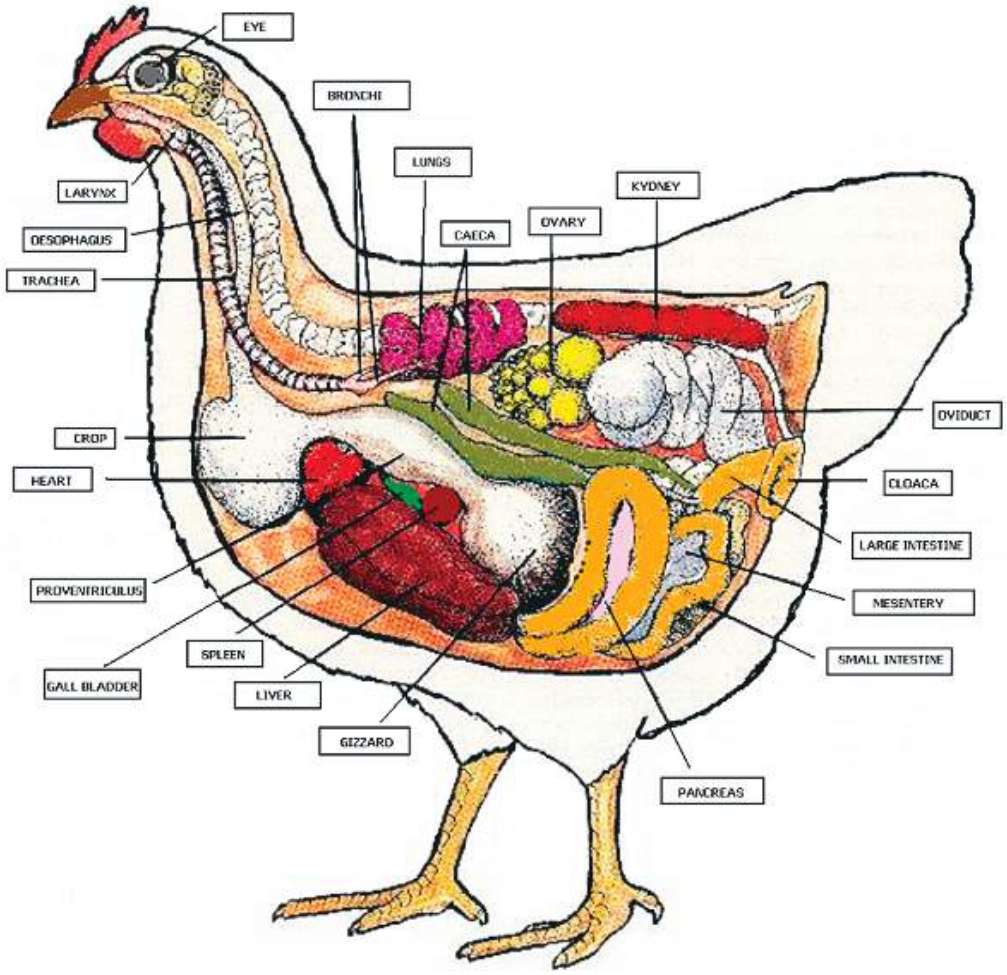
2.1 skeleton

The skeleton allows chicken to stand up and to protect internal organs and tissues.
The skeletal system of a chicken is compact and lightweight, yet strong.
The tail and neck vertebrae are movable, but not the body vertebrae, to give the body sufficient strength to support the wings.
There are two special types of bones:

The **pneumatic bones** are important to the chicken for respiration. They are empty bones which are connected to the chicken's air sacs and are important for the chicken to be able to breath. Examples of pneumatic bones are the skull, humerus, clavicle, sternum, some vertebrae.

The **medullary bones** are an important source of calcium for the laying hen. Examples of medullary bones are the tibia, femur, ribs, ulna, toes and scapula.





- Digestive tract: from beak to cloaca

Beak / Mouth:

Chicken Food is picked up by the beak enters the mouth; chickens do not have teeth so they are not able to chew their food. The chicken's **tongue** is then used to push the feed to the back of the mouth so that it can be swallowed





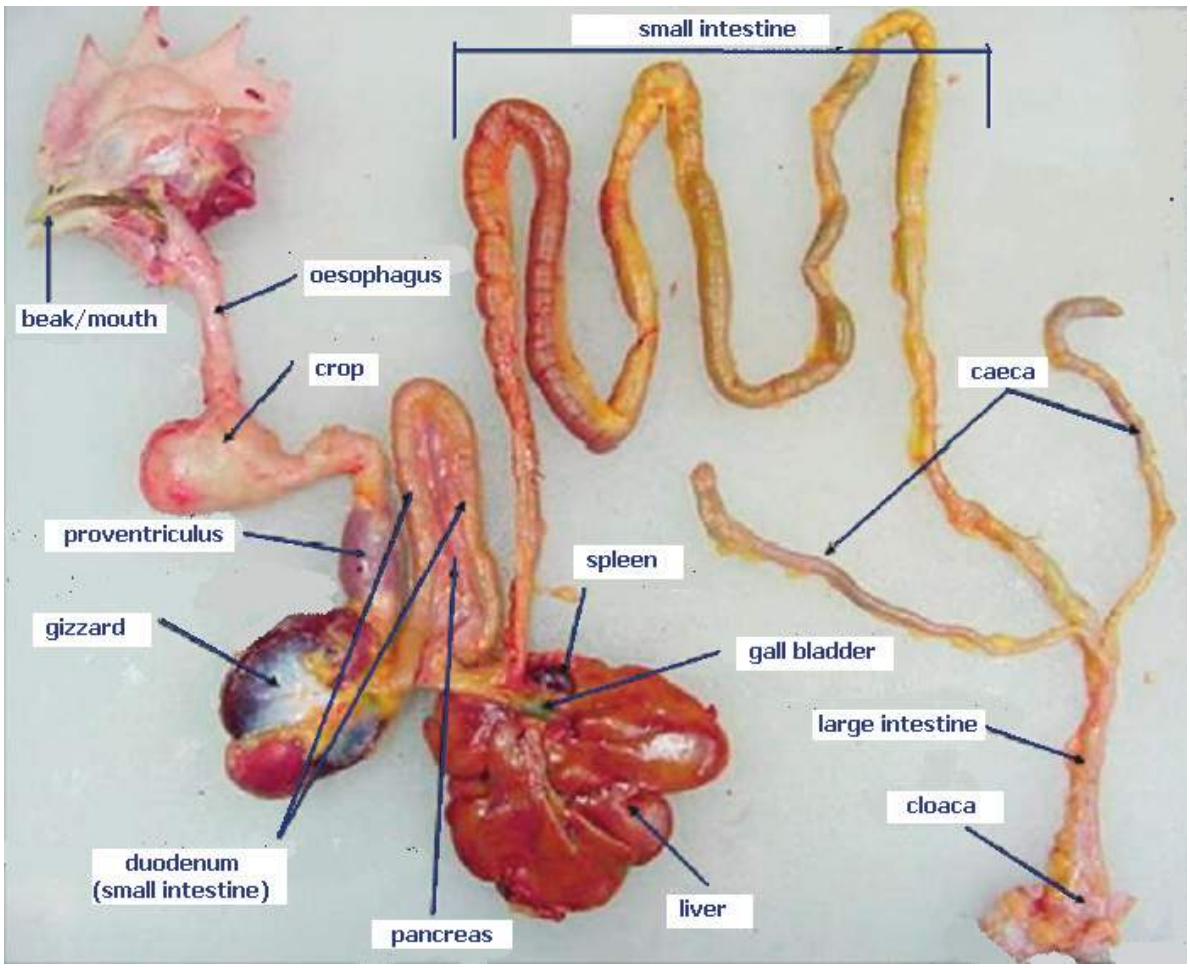
Duck: Beak is designed for scooping up water and search around for insects and other tasty morsels in the ground. The nostrils are located near the head end of their bill allowing them to find food in water without having to hold their breath



Digestive tube

The digestive continue with following parts:

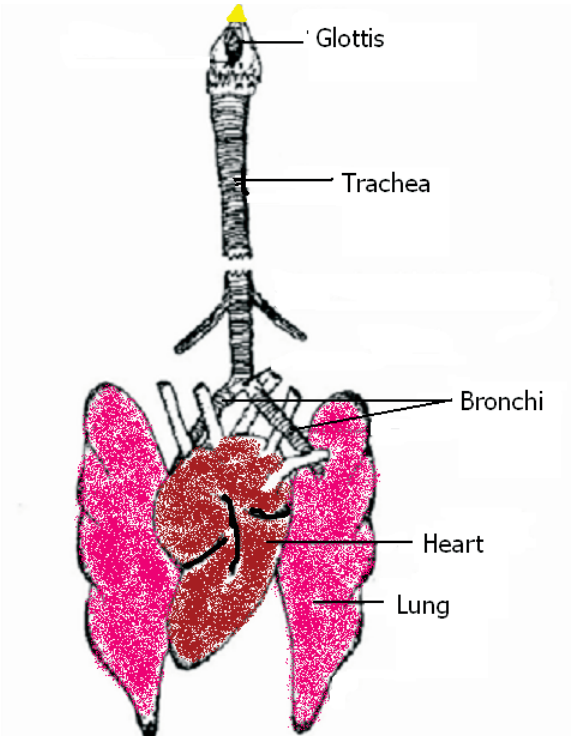
- Esophagus; the mouth connects with esophagus that is a flexible tube; it carries the food to the crop and proventriculus
- Crop: it is an "out-pocketing" of the esophagus to store feed
- Proventriculus: it is the "true" stomach of chickens
- Gizzard: it is the "mechanical stomach" made of strong muscle; can contain small pebbles that grind the grains
- Small intestine: the first part is called duodenum and receive secretion of pancreas and liver through the gall bladder
- Ceca are two blind pouches located where the small and large intestines join.
- Large intestine is shorter that small intestine
- Cloaca: where digestive wastes are mixed with urinary wastes before exit



- Respiratory tract

One part of respiratory tract is very similar with other animals:

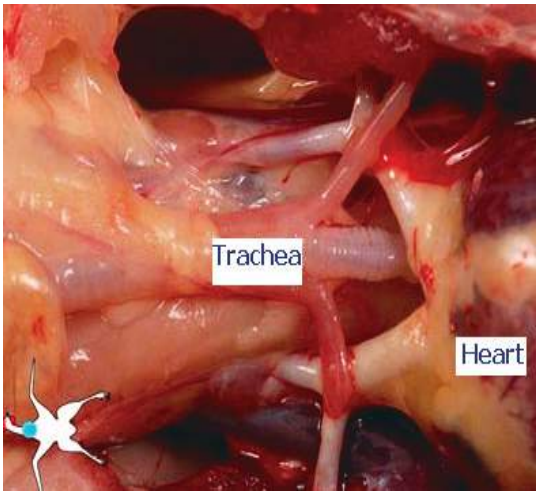
The **glottis** is the start of the respiratory tract. It closes when feed is passing down the throat so that the feed does not enter the lungs





The **trachea** is made up of cartilaginous rings

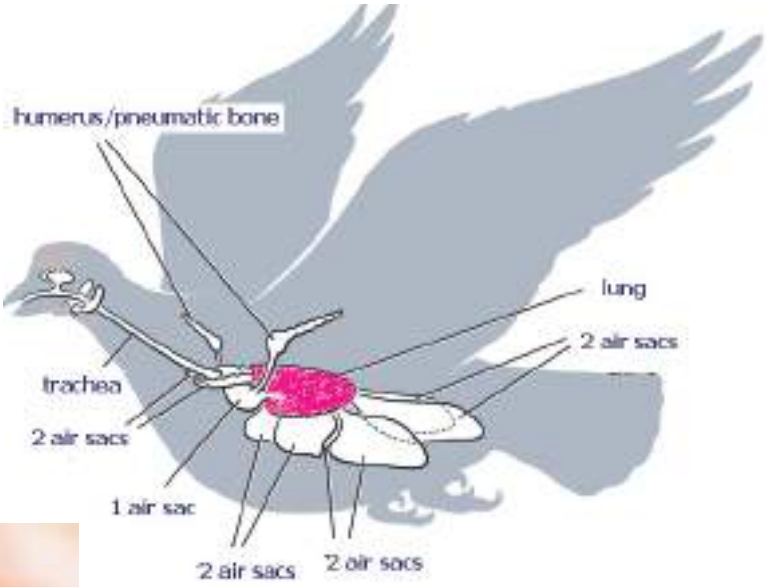
The trachea divides into two smaller tubes called **bronchi**

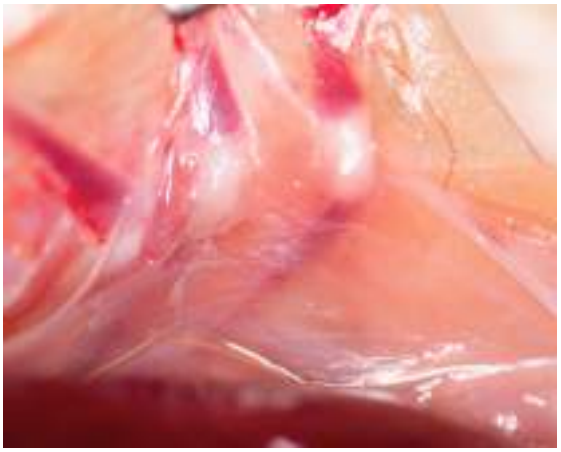




- **Lungs** are relatively small and do not expand.
- They are firmly attached to the ribs

One part of the respiratory tract is very specific: birds pass air through the lungs by means of **9 air sacs**. The air sacs are balloon-like structures made with thin and transparent membrane at the 'ends' of the airway system.
The air sacs finish in the **pneumatic bones** like humerus





- Reproductive tract

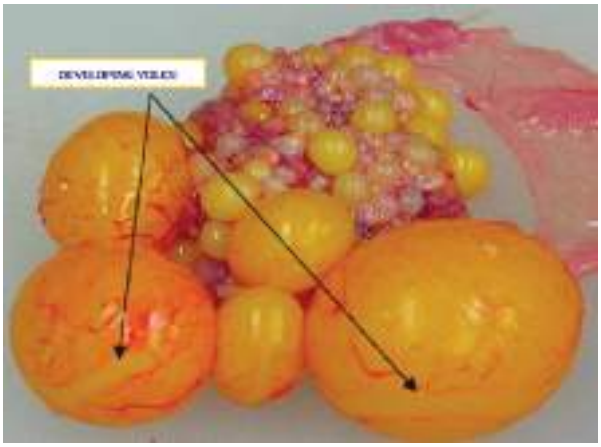
Layer

Observation of reproductive organs when opening the carcass of the layer



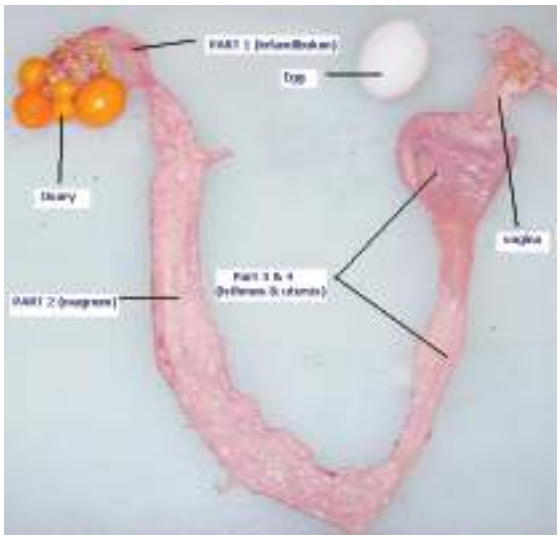
If we take out the reproductive tract, it is possible to identify:

- ovary: only the left ovary and oviduct is functional; the ovary is a cluster of developing yolk



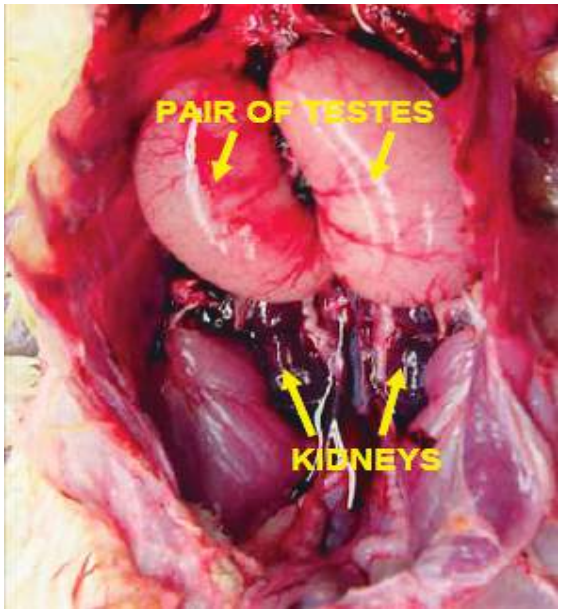
- oviduct; it is divided in 4 parts. The first part (infundibulum) where yolk is released, second part (magnum) where the white is added and the third and fourth part (uterus) where shell is produced

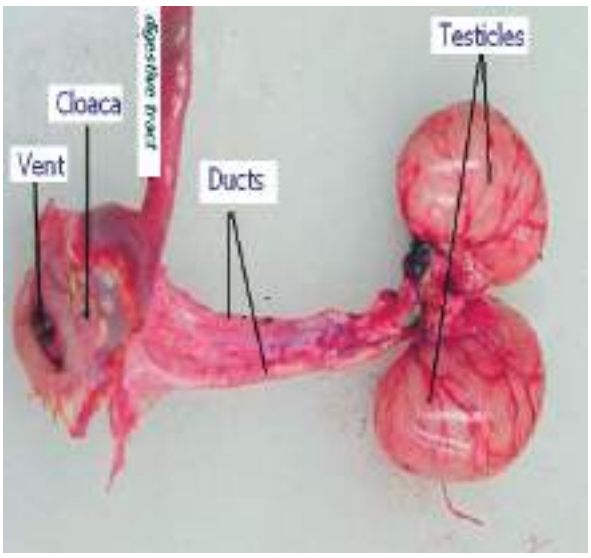
- vagina: The vagina is made of muscle which helps push the egg out



Cock

Observation of reproductive organs on the carcass of the cock





- Two testicles situated near the kidneys ; in cock testicles have size of cashew

- Ducts that transport the sperm and open into a small papilla in the cloaca

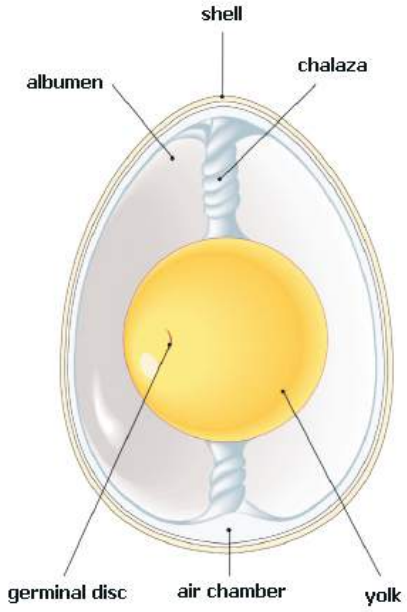
- Papilla serves as mating organs. In duck there is a real penis



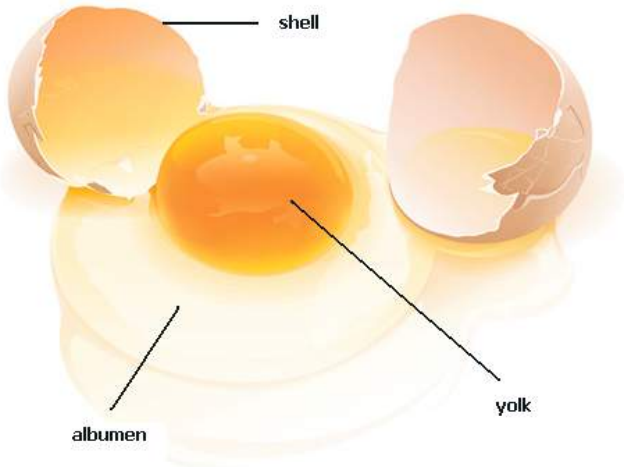
- The egg

Composition of the egg is:

- The yolk: 32 to 35% of the total egg and is made mainly of lipids and proteins



- The albumen: 52 to 58% of the total egg is made mainly of protein and a lot of water
- Chalaza: fibers are twisted and form a spiral rope that maintain the yolk in the middle of the albumen
- Air chamber: empty space located at the large end of the egg



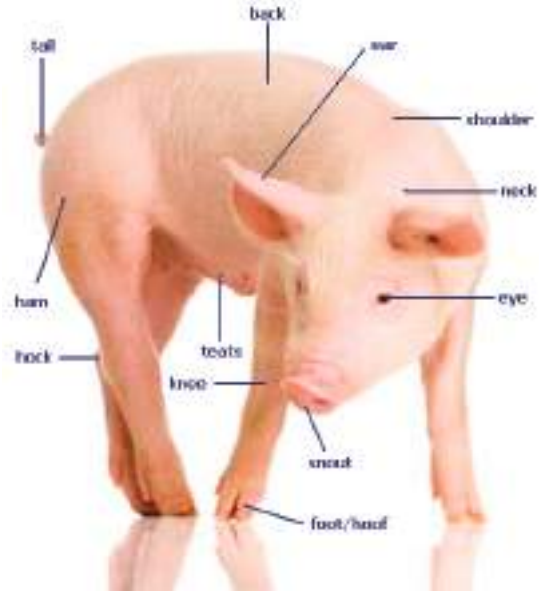
- The shell only 9 to 14% of the total egg is made mainly of calcium

Swine

1. Description of different external parts of the body

The body of pigs is similar to other mammalian with some specific characteristics:

- the neck is not very well delimited



- Snout is characteristic of pig; it is strengthened by a bone and cartilage to dig into the soil



- Canine in the male grow continuously



- Swine have four hoofed toes



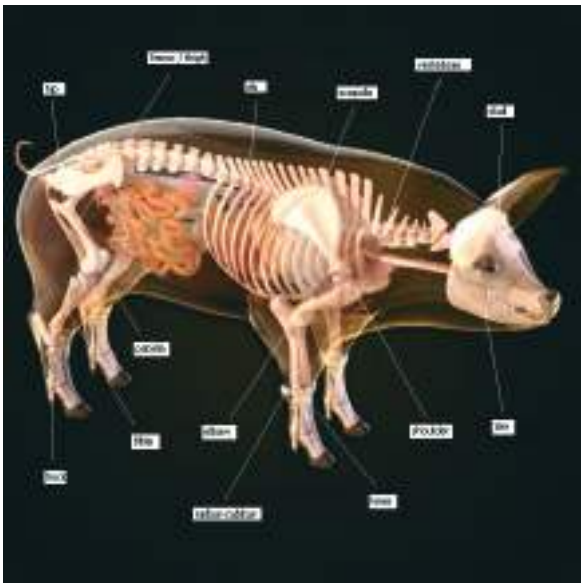
- Color of skin vary with the breed





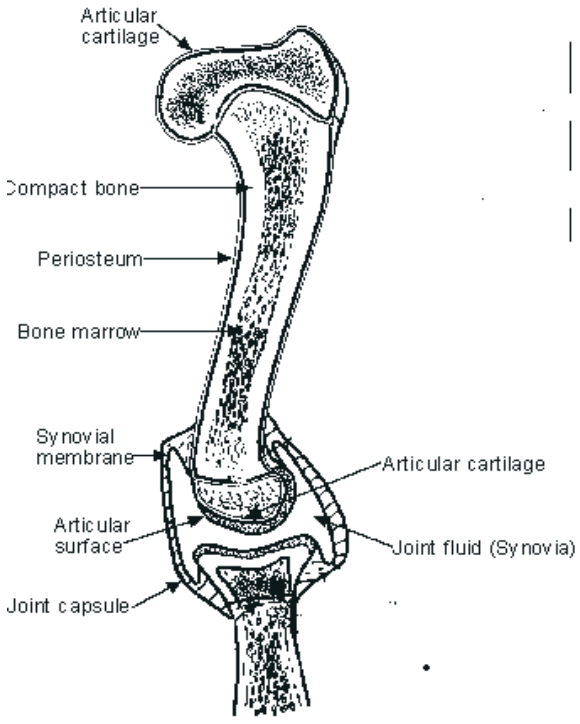
2. Description of internal parts of the body

1.1 Skeleton



- The compact bone are coated by a strong membrane and the center is composed of a spongy mass (producing cells of the blood)
- The skeleton is made of bones and joints.

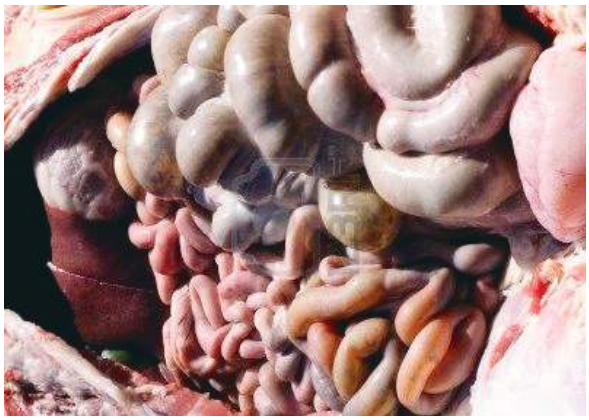
A joint consist of the ends of two bones surrounded by a strong capsule. The ends of bones are covered by smooth cartilages which form the articular surface.



1.2 Organs

- Digestive tract

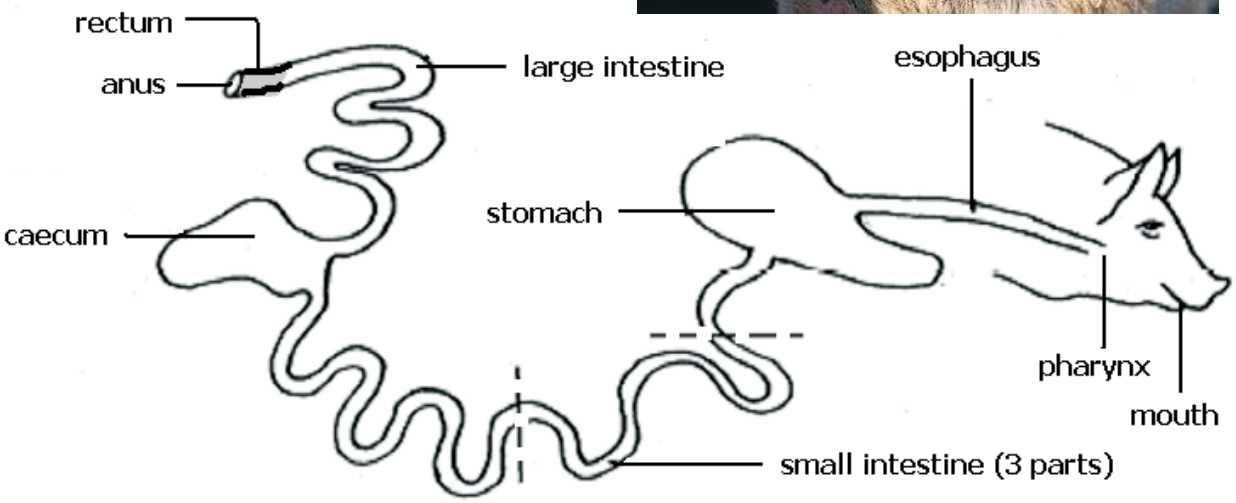
The digestive system can be considered as a tube that starts at the mouth and finishes at the rectum.



Description of digestive tract:



- the mouth (36 teeth) opens into the pharynx which is the common area for the passage of feed and air.



- esophagus: muscular tube move the feed that have been swallowed to the stomach
- stomach : only one compartment (pig are monogastric) of about 7.5 liters; the spleen is attached on the stomach



- small intestine: can reach 18m
- Cecum: between small and large intestine
- large intestine: near 5m long
- rectum
- anus

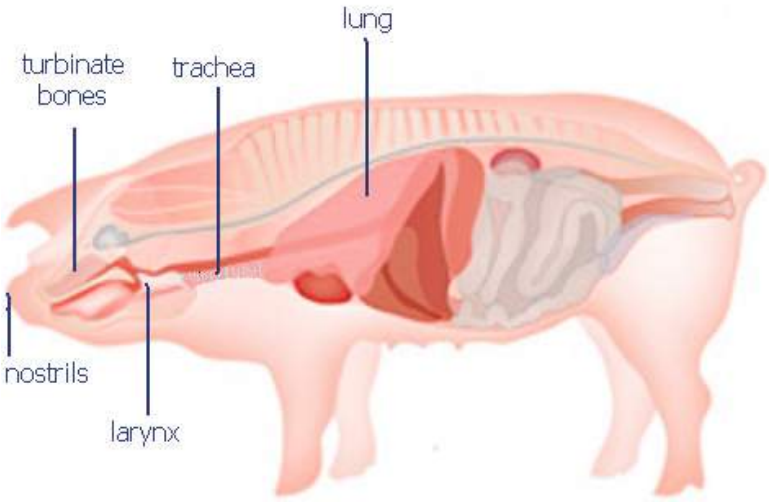
- liver has 5 lobes and one gall bladder; the liver must be firm and soft with homogeneous dark brown-red color



- The ducts of liver and pancreas arrive in small intestine

Respiratory tract

- structure



- nostrils: entry of the air going to the nasal passage

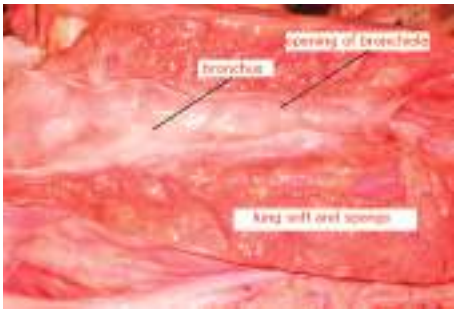


- turbinate bones: it is four thin and curling bones in the nose of the pig



- larynx and tonsil: in the back of the mouth

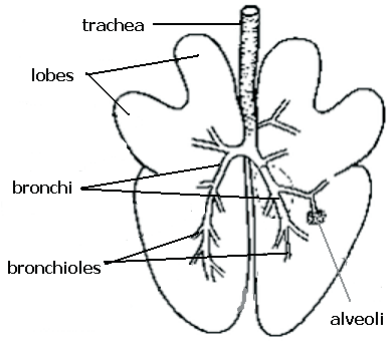
- trachea in the neck which passes down into the chest where it divides into



- two bronchi in the lungs

- lungs (7 lobes): spongy and soft texture

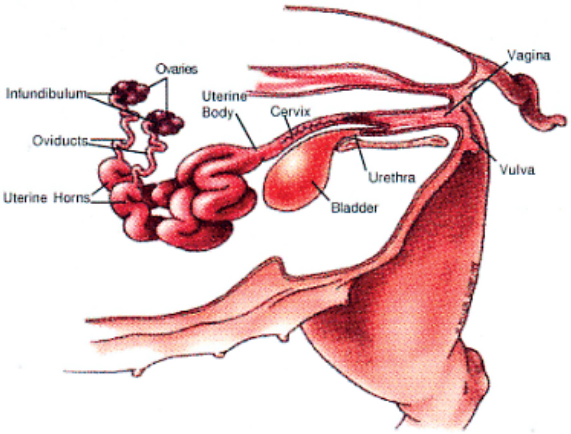
- The bronchi branch into smaller bronchi and continue to branch gradually reducing in size to become bronchioles which terminate in very tiny air sacs called alveoli.



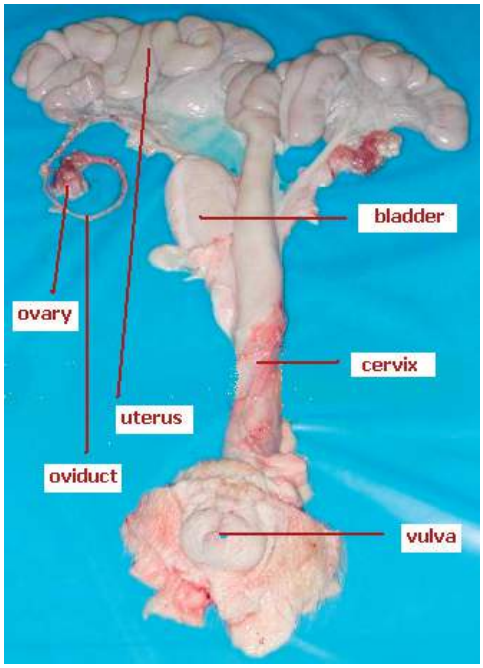
The respiratory tract is lined by a smooth membrane called a mucous membrane because it is bathed in sticky mucus

Reproductive tract

- description of reproductive tract of the sow



- ovary: small glands that produce the ovules (eggs) ; each ovary is surrounded by a thin membrane called the infandibulum
- infandibulum collect ovules and divert them to the oviduct
- oviducts are 15 to 25 cm and act as site of fertilization
- uterus: Consists of two horns up to 1.5m in length when contain the fetuses.
- cervix: The muscular neck and entrance to the womb; can be open or closed
- vagina: The passageway from the exterior to the cervix. The bladder duct come out in vagina
- vulva: The vagina opens to the exterior through the fleshy lips of the vulva.



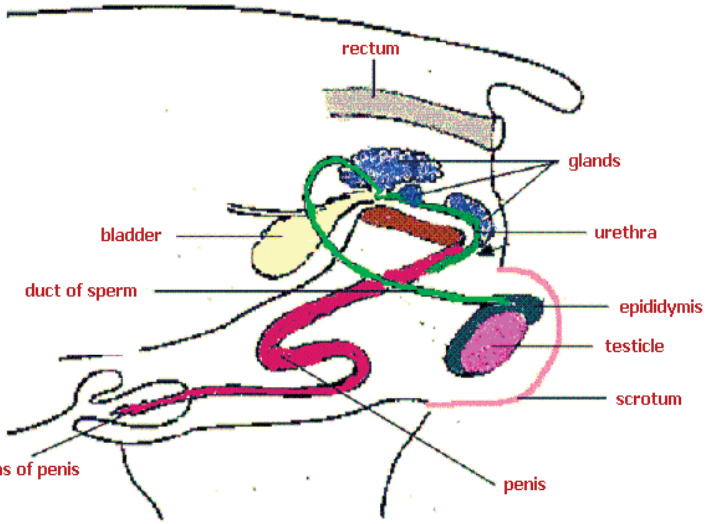




- description of reproductive tract of the male



- scrotum is the skin protecting testicles
- testicles: 2 testicles that produce sperm must be large and even

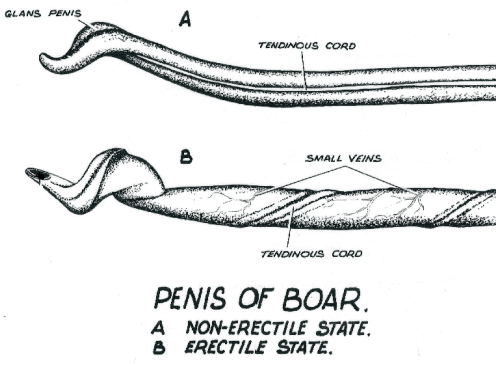


- epididymis is attached and connected to testicles; inside there is a long canal where the sperm get final maturation
- deferens duct extend from epididymis. This small canal transport the sperm to the urethra
- urethra is the joint excretory canal for sperm and urine from bladder to glans penis



- penis: the penis is the organ of copulation; it has a sigmoid flexure that extend during erection.

- glans penis is like a cork-screw



PENIS OF BOAR.
A NON-ERECTILE STATE.
B ERECTILE STATE.

- description of udder

In general sows have

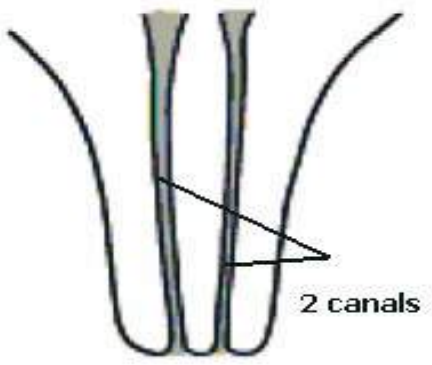
- thoracic teats,
- 8abdominal teats
- and 2 inguinal teats



- udder develop a lot few days before farrowing

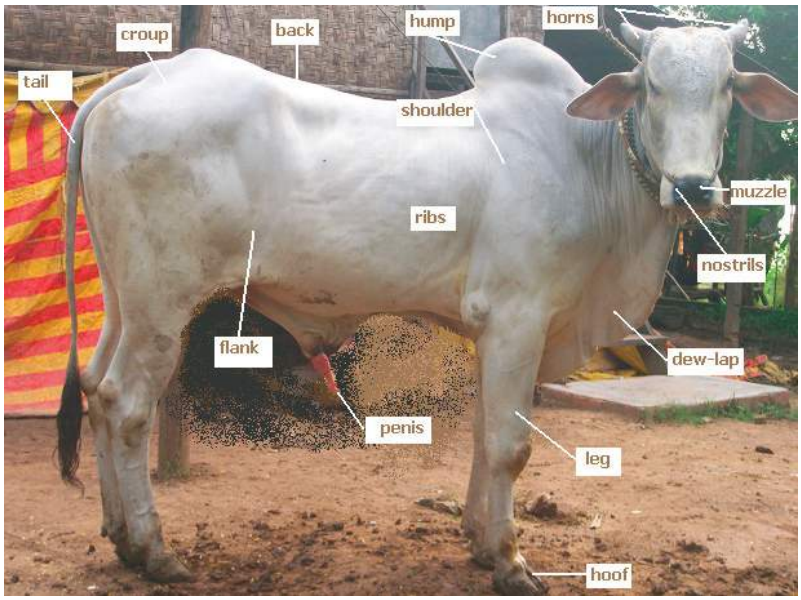


- Teats have 2 canals



Cattles

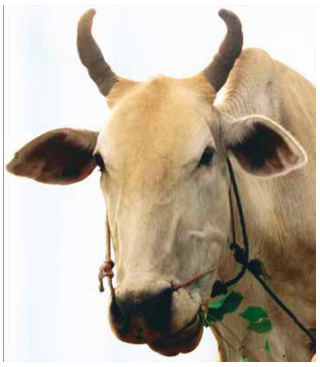
1. Description of different external parts of the body



Some specific difference can be seen between cow and buffalo

- horn are black and more developed in Buffaloes





- skin : buffaloes are almost hairless and the skin is dark grey to black





- hoof: buffalo has splayed hooves

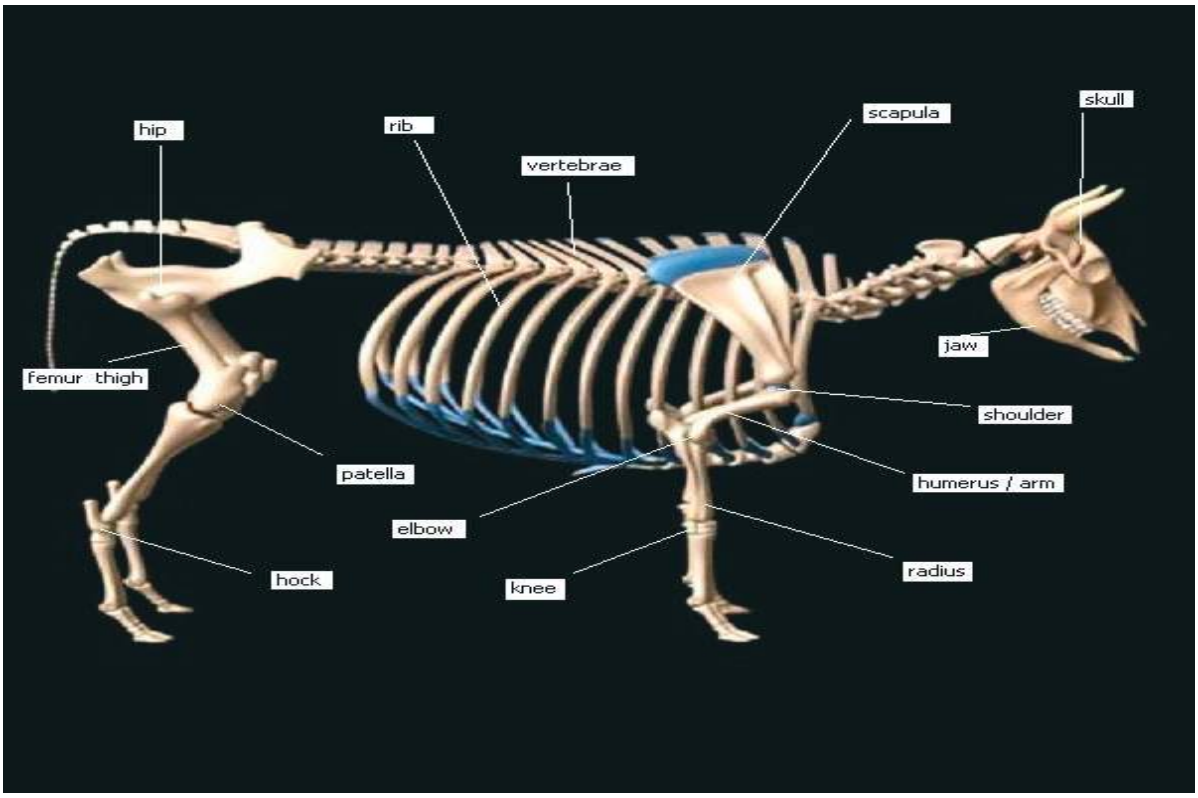




2. Description of internal parts of the body

2.1Skeleton

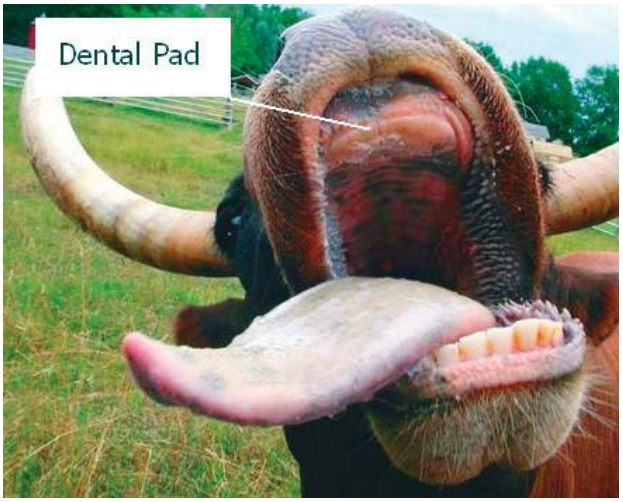
Cattle skeleton have the same structure that other mammalian.

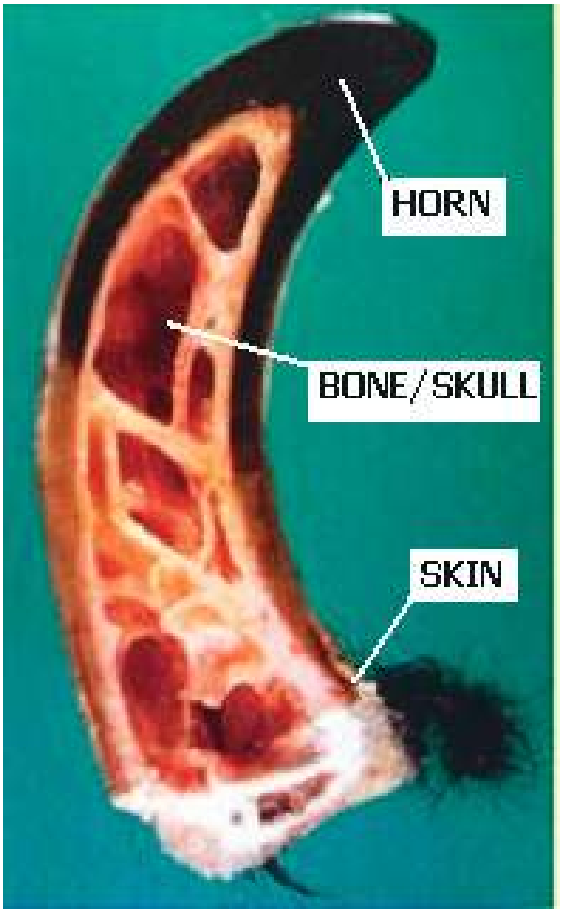


Some distinctive features can be noticed:

- Cattle have 8 incisors on the bottom jaw but no teeth on the top jaw that is called the dental pad; this characteristic allow to better cut the grass

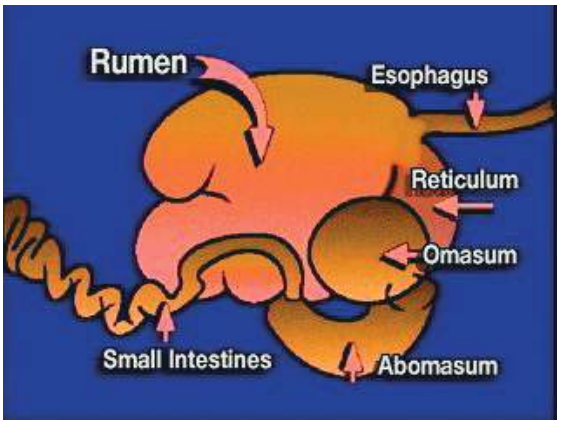
- cattle have horns and the structure of horn must be known especially when farmer want to cut horns





2.2 Organs

- Digestive tract



The stomach of the cow is very specific and has four compartments; each compartment of cattle stomach is made of different tissue structure well adapted to the function

Rumen is on the left side of the body; the volume is about 160 liters



The reticulum with a volume of 9.5 liters ; the spleen is applied on the reticulum (and partially on the rumen)



The omasum which volume is about 15 liters



the abomasum is called the true stomach with the same functioning than in pigs; it contains about 20 liters

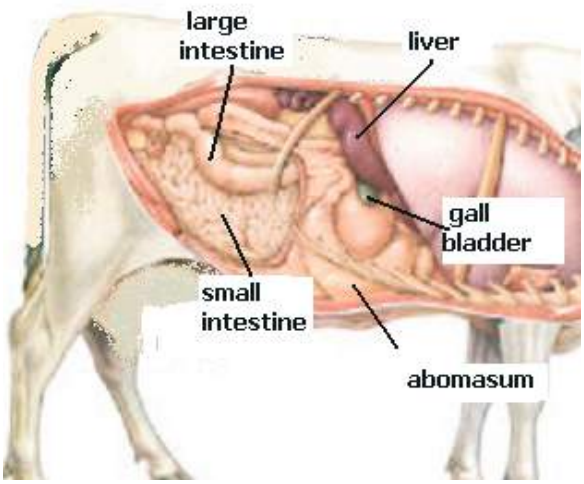


After 4 stomachs the digestive tract continue with intestines

- small intestine from abomasum to large intestine; it is about 40 meters long
- large intestine continue intestines until rectum; it is about 10 meters long

Some glands are connected to the digestive tract:

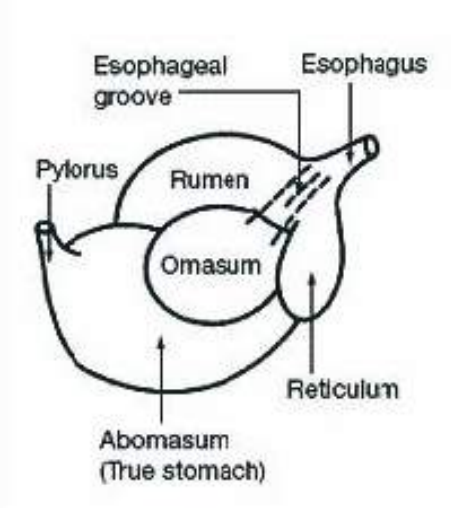
- liver 4 to 10 kg and not clearly split in lobes. The canal of the liver and gale bladder join and open in small intestine
- pancreas



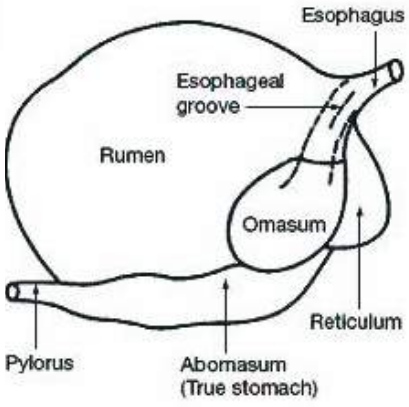
- digestive tract of the calf

The 4 stomachs are not completely developed before 2-3 months in the calf.

The milk shunt directly to omasum and abomasum by-passing under-developed rumen and reticulum



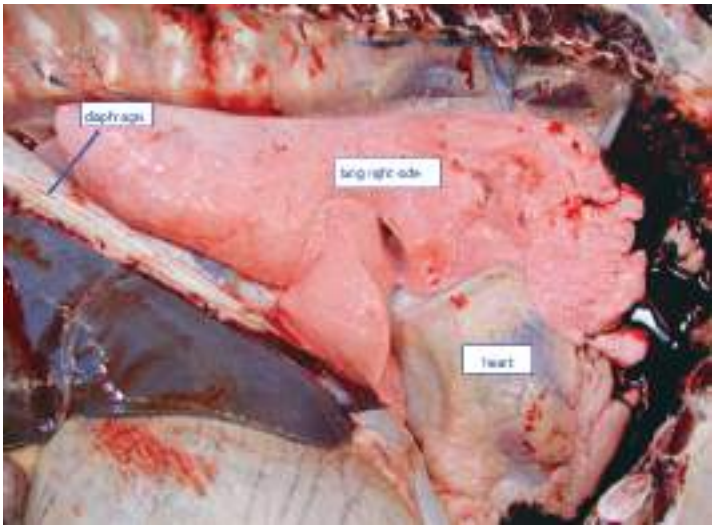
calf stomach



adult stomach

- Respiratory tract

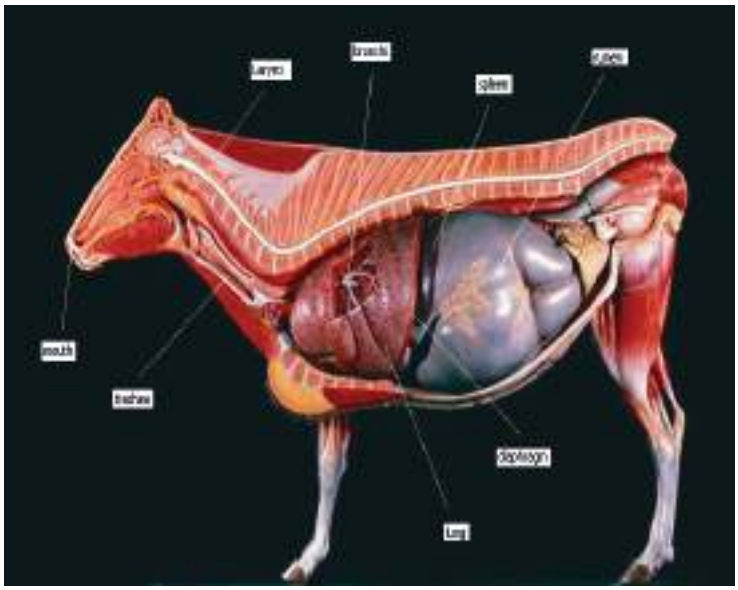
Cattle have small lungs, relative to the animals' size, and the lungs are set deep in the chest.



Different parts of respiratory tract in cow are:

- muzzle and nostrils

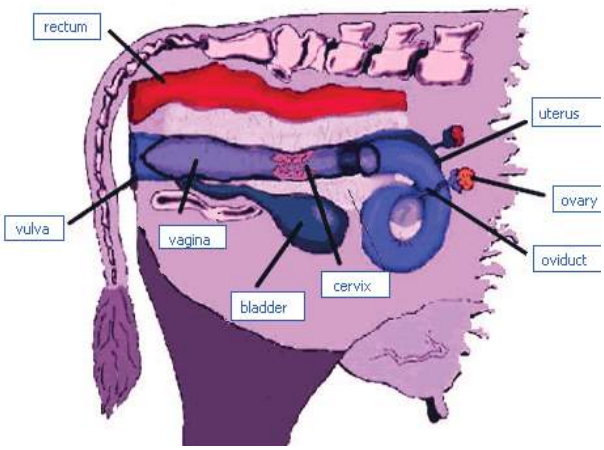




- larynx
- windpipe
- lungs

The larynx in the back of the mouth opens into the trachea which passes down into the chest where it divides into two bronchi. The bronchi branch into smaller bronchi. The respiratory tract is lined by a smooth membrane called a mucous membrane because it is bathed in sticky mucus

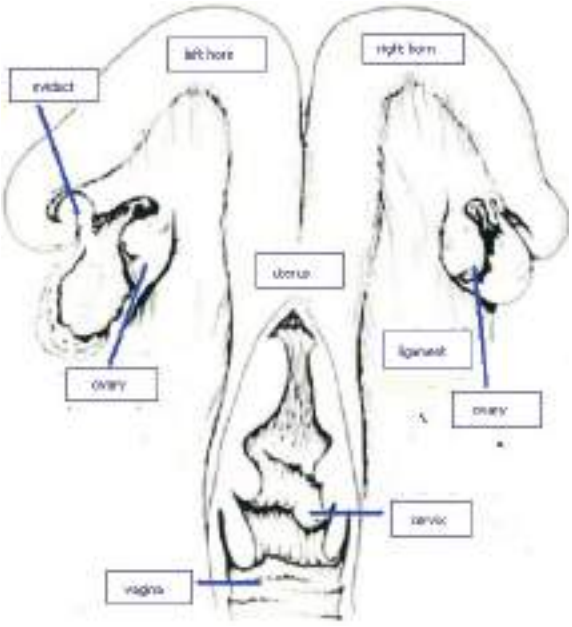
- Reproduction tract of the cow



The different parts of the genital tract of the female are:

- ovaries: two ovaries, one on the right side and one on the left side suspended by a ligament
- oviduct: it is a small canal from ovaries to uterus; 25 cm long and diameter <1cm; uterus: has 2 horns
- cervix: it is the “door” to access uterus, can be open or closed
- vagina: duct of the bladder open on the bottom of vagina
- vulva : external part of the reproductive tract





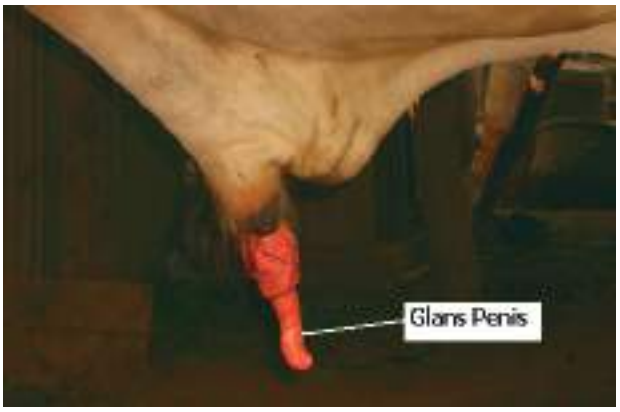
Of the bull

Observable organs are two testicles protected by supple and thick skin called the scrotum and the sheath of the penis



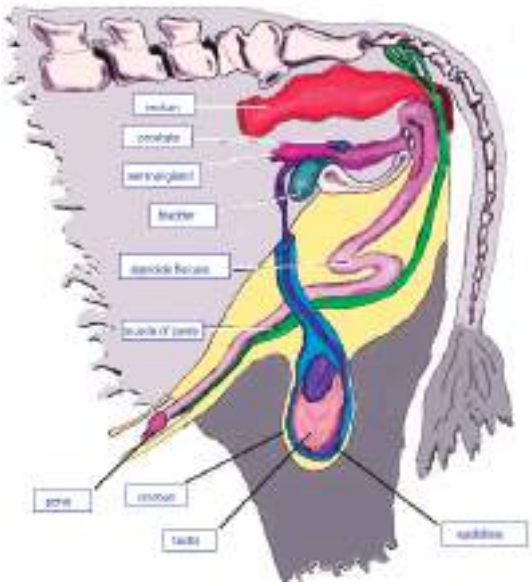


During mating glans penis and penis are visible



- Internal structure show testicles and epididymis attached to the testicle for storage of semen, the urethra which is a duct inside the penis serving to eject sperm and urine

- Prostate and seminal vesicles are glands that work for protect spermatozoids



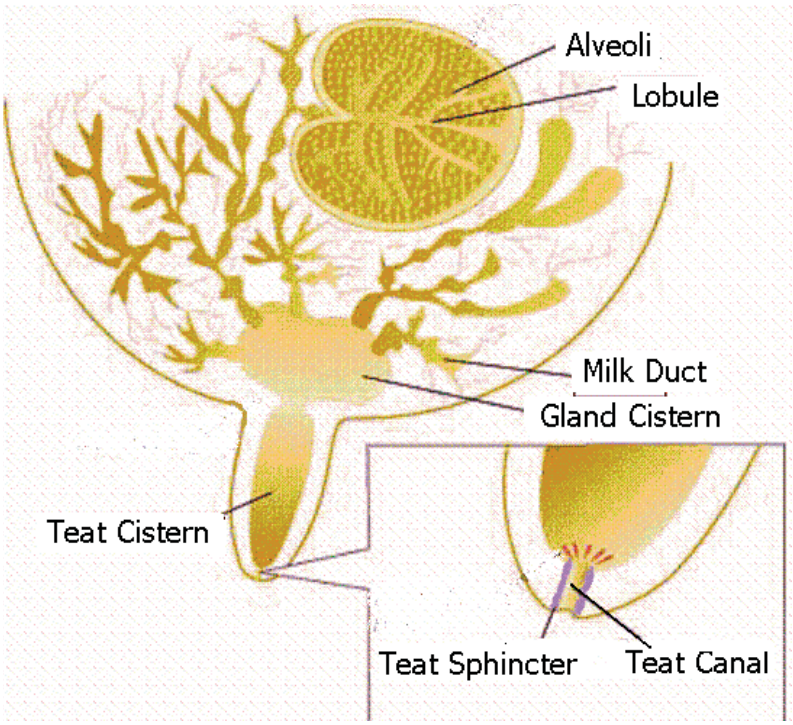
- Udder

The cow udder consists in four separate quarters that contain a separate mammary gland which is composed of:

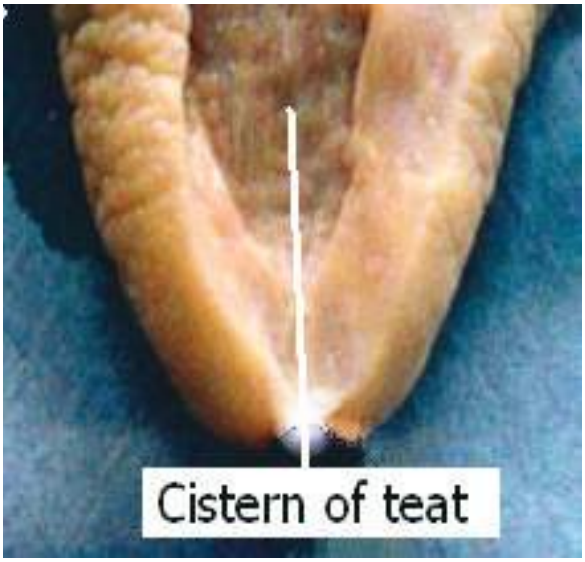


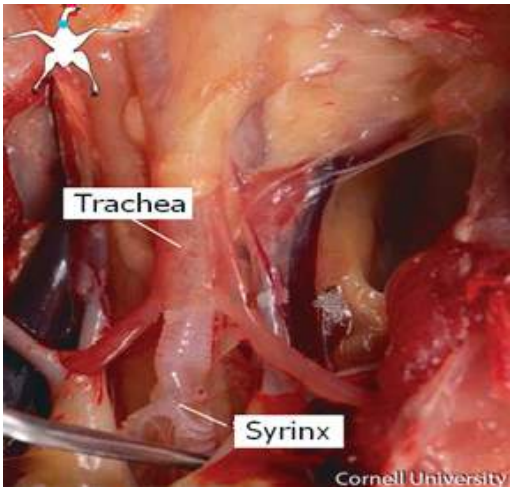


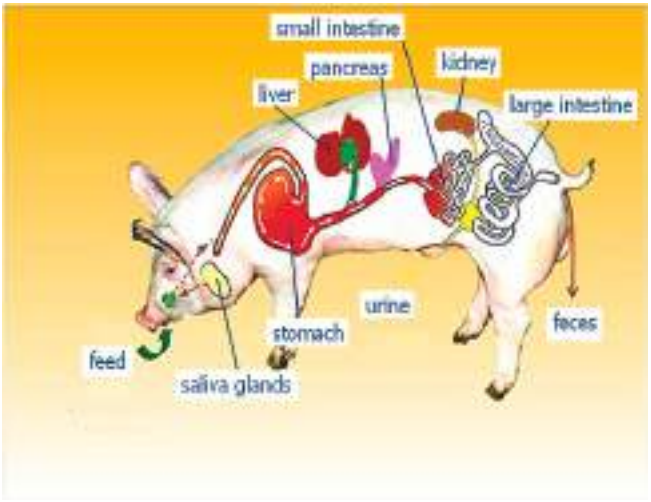
- secretory tissue (alveoli)
- a duct system to collect milk from alveoli to the cistern
- two cisterns (storage area) : one in the mammary gland that contain 250 to 500 ml of milk and one in the teat that contain 20 to 40 ml of milk



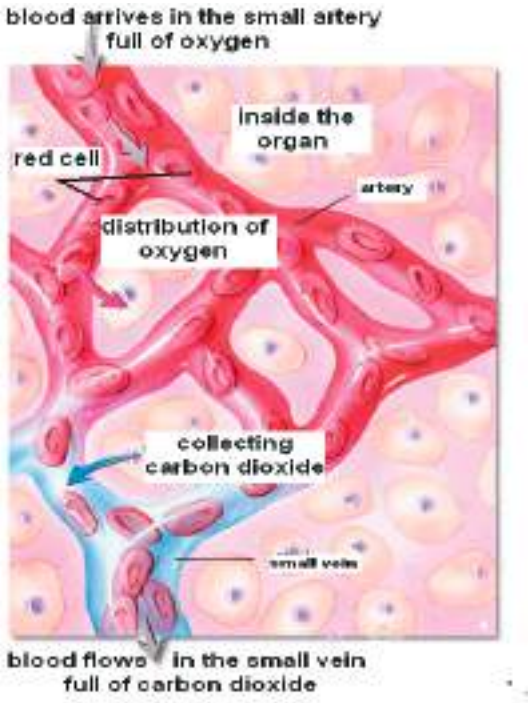
- a teat that contain a cistern and is kept closed by a circular muscle (sphincter) near the tip

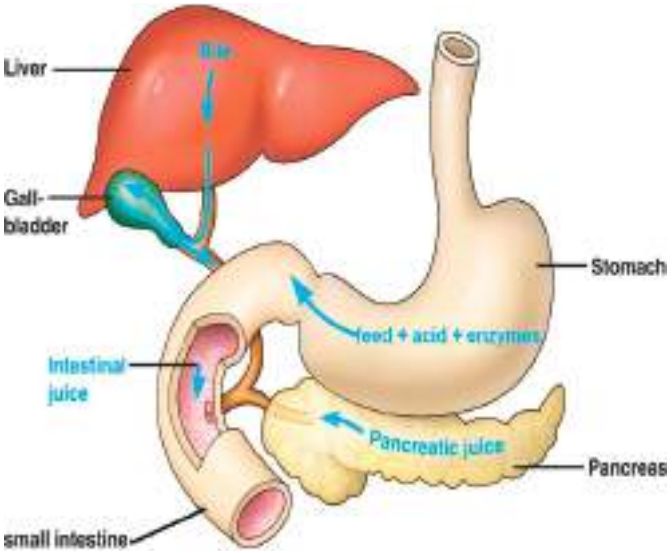






II. Fundamentals of physiology in domestic animals





Poultry

1. Digestion

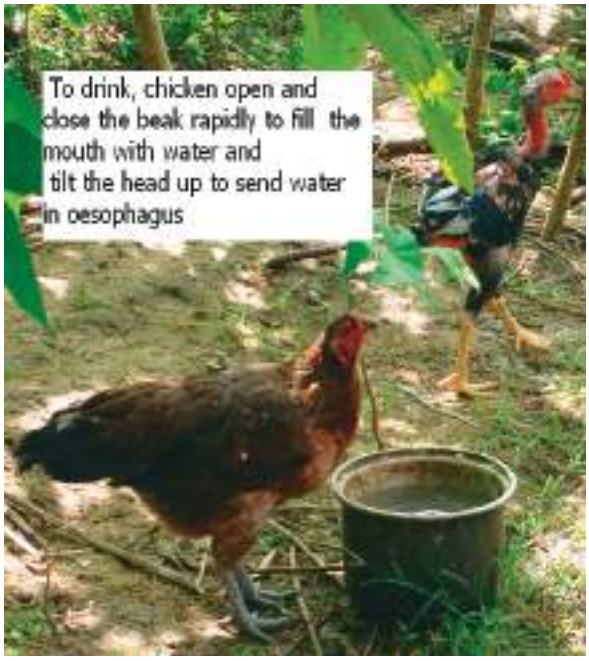
- role of digestive system

The digestive tract of any animal, including chickens, is important in converting the food the animal eats into the nutrients their body needs for maintenance, growth, and production (such as eggs). Once food is eaten, it must be broken down into its basic components: protein, fat, sugar, energy, vitamins...

- functioning of digestive system

Chickens, obtain feed with the use of their **beak**. Food picked up by the beak enters the mouth. Chickens do not have teeth and use the **tongue** to push the feed to the back of the mouth so that it can be swallowed.



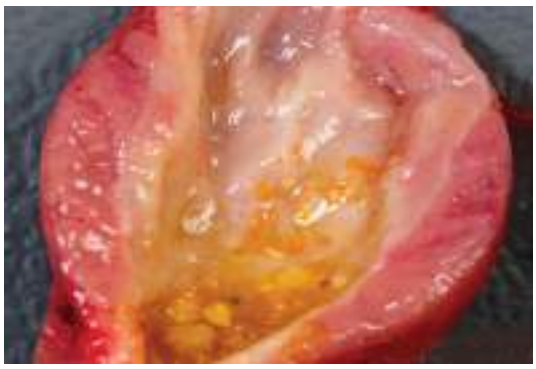


- **Esophagus**: The esophagus is a flexible tube that carries food from the mouth to the crop and from the crop to the proventriculus.

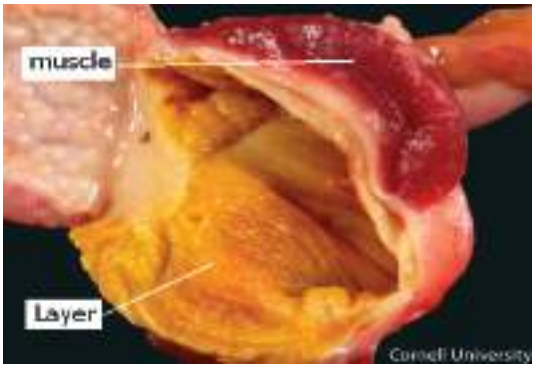
- Any swallowed feed and water is stored in the **crop** until it is time to pass it on to the rest of the digestive tract. Crop impaction can occur when the chickens eat a long piece of string



- The **proventriculus** produces acid and enzymes that are mixed with the feed; the digestion starts
  In the proventriculus, the feed is mixed with secretion of glands (acid and enzymes) and look mucoid and creamy with small pieces of feed



- The **gizzard** is a part of the digestive tract unique to birds. It is made up of two sets of strong muscles which will grind the feed; they are protected by a strong layer. Backyard chickens eat small stones that remain in the gizzard and help grinding grains. When a chicken eats a small, sharp object, it is likely to get stuck in the gizzard. Chickens with damaged gizzards will grow thin and eventually die



- The small intestine receives digestive enzymes from the **pancreas** and bile from the **liver** via the **gall bladder**. Enzymes are necessary for protein digestion (broken in amino-acids) and bile is important for fat digestion.



- The **ceca** are located where the small and large intestines join. One important function of the ceca is fermentation which produces the eight vitamins B. The ceca empty their contents two or three times a day, droppings typically have mustard to dark brown in color and are smelly.



- The **large intestine** is where the last of the water re-absorption occurs.

- In the **cloaca**, digestive wastes mix with urinary wastes. It is why droppings are coated with white pasty material: it is uric acid, the avian form of urine.



The small and large intestines are populated by bacteria, called **microflora**. This population of microflora aid in digestion. Intestinal disease can occur other microbes upset the balance of normal microflora. The result is **enteritis** producing diarrhea, increased thirst, dehydration, loss of appetite, weakness, and weight loss or slow growth.

- feces: normal to pathology

The color and texture of chicken fecal material is important sign of disease.
"Normal" chicken fecal material shows the dark fecal material with a coating of white uric acid.
But sometimes it is possible to observe changes:

- Droppings with blood is sign of coccidiosis



- Greenish droppings is sign of worms



- worms can be observed directly



Watery green droppings are observed in case of Newcastle disease

Brown watery droppings = *E. coli* infection...



- Urinary system

The chickens do not have a urinary bladder. The ureters carry urinary wastes from two kidneys to the cloaca. The uric acid is discharged into the cloaca and excreted with the feces. The white pasty material in chicken droppings is considered to be the urinary system excretion.

2. Breathing

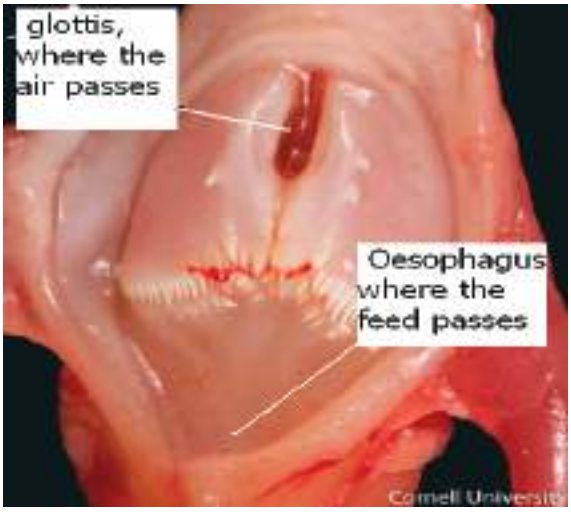
- role of respiratory system

The respiratory system is involved in the absorption of **oxygen** (O_2) from ambient air, release of **carbon dioxide** (CO_2) contained in the blood of the chicken
In chicken respiration is as well involved in temperature regulation by release of heat

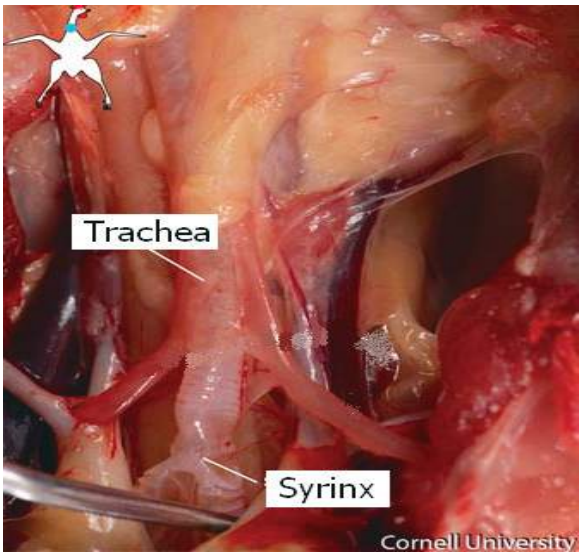
- how do poultry breathe?

Birds don't breathe the same way as mammals do.

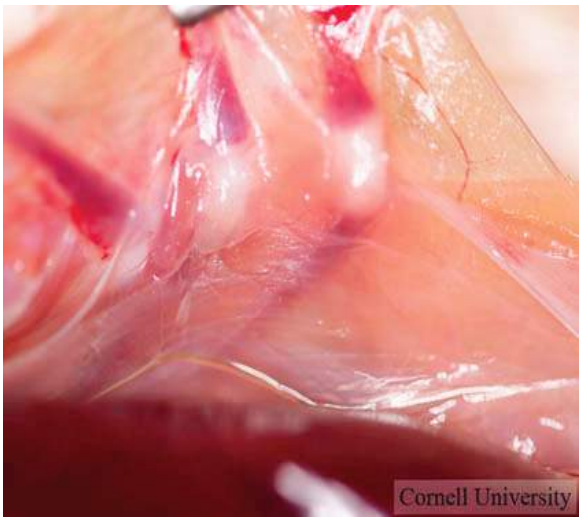
- The avian respiratory tract starts with the **glottis**. The glottis closes when feed is passing down the throat so that the feed does not enter the lungs.



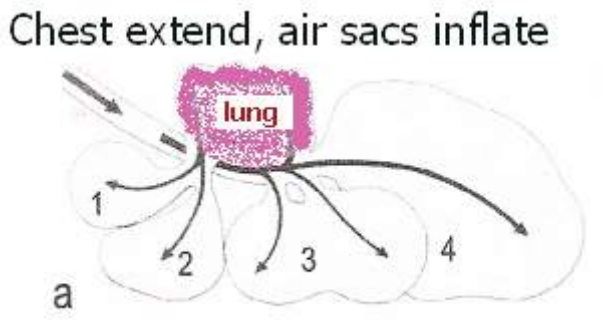
- The air enters through the trachea. When the trachea bifurcates in two branches, there is a voice box called **syrinx**. The rooster can crow. (hens can crow as well, but they don't because they do not have male hormones to encourage them to crow)



- Air passes branches of the trachea and at the terminal portions of the trachea the 9 air sacs bud out. These air sacs are very thin, colorless and when inflated resemble tiny balloons inside the body cavity



- Lungs facilitate oxygen and carbon dioxide exchange but cannot inflate. Distention and compression of air sacs, not the lungs, moves air in and out.



- Then breathing is under control of movement of the sternum and rib cage.



- Holding a bird too tight will restrict movement of the rib cage and suffocate the bird. This often happens when young children hold baby chicks.



- It is a cause of mortality when middlemen overload cage for transportation; chicken cannot extend the breast and then cannot breathe and die.

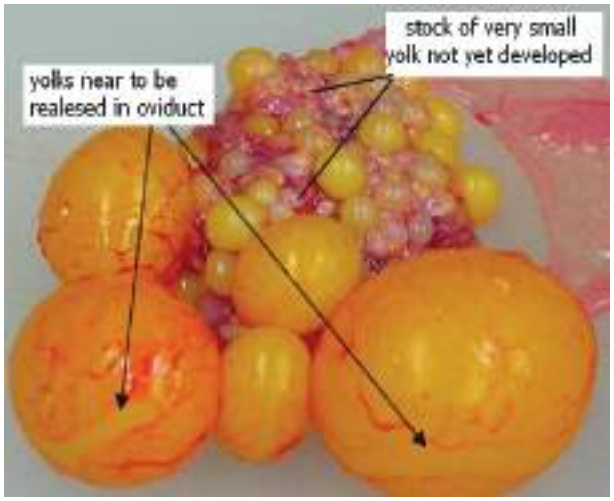


3. Reproduction

- production of the egg

The hen starts to produce fertilizable eggs at 5-6 months of age.

➢ development of yolk:



The **ovary** is a cluster of developing yolks. Pullets have 2,000 to 10,000 potential eggs.
It takes approximately 10 days for a yolk to develop from very small to normal size of a yolk found in eggs.
The yolk will provide nourishment to the developing chick and also provides maternal antibodies to protect the chick against infectious agents.
The color of the yolk depends of the diet. It comes from some pigment especially contained in corn.

Ovulation is the release of the mature yolk from the ovary into the oviduct. It occurs 30-60 minutes after the previous egg has been laid. In hens, ovulation usually occurs in the morning.
The developing egg will start his passage in the oviduct; the oviduct is a long tube containing many blood vessels and glands:

- The first part of oviduct (infandibulum) is the place where the egg can become fertilized if sperm is present
- The egg then passes to the second part (magnum) where the albumen (egg white) is placed around the egg. It takes about 3 ½ hours. The white serves as a shock absorber
- The egg then passes the third part (isthmus) where the shell membranes are placed around the egg. It takes 1 ½ hour
- The egg then moves to the uterus where a hard calcified shell is placed around the developing egg. It takes about 20 hours. The shell will provide protection and a dark, warm, moist sterile environment



➢ Formation of egg

- The egg passes quickly through the vagina just before it is laid. The total time to form a new egg is 25-26 hours.
- Chicken lays eggs in clutches. A **clutch** consists of one or more eggs, followed by a rest period. Clutch size, as well as the numbers of clutches laid in a breeding season, will vary with species. Backyard layers usually lay a clutch of around 10 eggs, 6 times a year.



- Fecundation

➢ copulation

The cockerel is used for breeding at 6 months of age to ensure viable sperm

The cock does not have penis. He will try to put his vent on the vent of the hen

Good ratio is one cock for 15 hens, If too many cocks, the fertility is low because they waste time for fighting



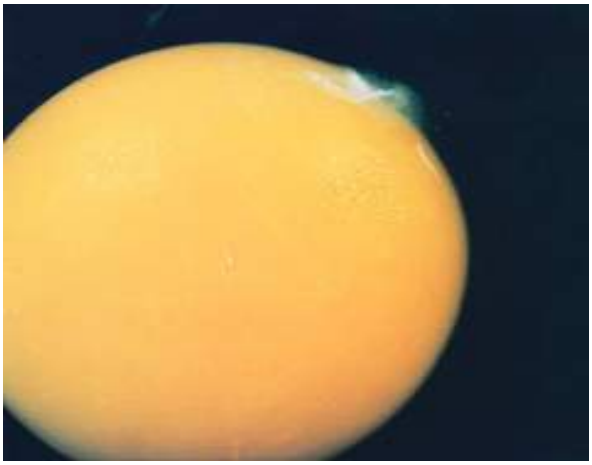
➢ fertilization

The infundibulum also serves as a reservoir for spermatozoa where fertilization can take place.

Near the junction of vagina and uterus, there is a gland which can store sperm for 10 to 15 days. When an egg is laid, some of this sperm can be squeezed out of the gland and migrate to the part 1 of oviduct to fertilize another egg.

This feature is very specific of birds; the sperm remain viable at body temperature.

The germinal disc is a small circular white spot on the surface of the yolk; it is where the sperm enter the egg



- Development of chick

➢ Incubation

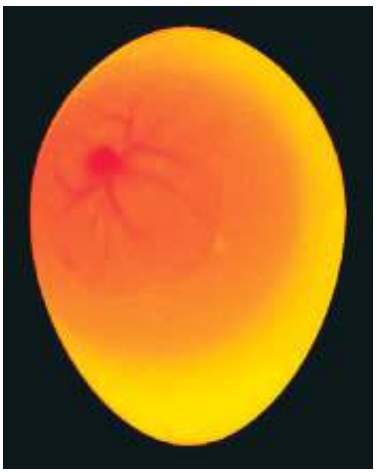
- eggs need the right temperature and humidity for hatching: 38-39C; Incubation temperature and humidity is perfect for bacteria development; do not incubate dirty eggs (washing egg is not a good idea because it destroy natural protection of eggs)
- hen does this by sitting on the clutch of eggs (8 to 13), full time, leaving only for food and water; The hen will leave the nest 15 minutes each day to eat: she will not eat much, she must be in good condition before setting
- The hen turns the eggs on a regular basis by using her beak; it keeps the embryo from sticking to the inside of the shell and provide a small amount of oxygen
- incubation of chickens is 21 days

- Egg candling

The purpose of candling is to shine a light through the egg so you can see what's going on inside it especially to check if the egg is fertilized or not

Use a light coming through an opening smaller than the diameter of egg

After incubating for one week, we can see a webbing of vessels surrounding a dark spot: the embryo is developing correctly.



- Hatching

- The hatching process can last from 4 to 12 hours before the chick breaks free from the shell
- The chick, as it appears upon freeing itself from the shell, is wet and very tired, for the next several hours it will lie still and rest. A few hours later the chick, now dry and fluffy, will become extremely active
- The yolk sac inside their bodies will sustain them for up to 48 hours



1. Molting

Normally, each year chickens molt or lose the older feathers; they start to lose feathers on head, then neck, then body and finally on wings and tail. During this period (about6-7 weeks) generally hens stop to produce eggs.



2. Body thermal control

The temperature of adult chicken vary from 39.8^{o}C to 43.6^{o}C

Birds do not sweat; to regulate temperature during hot weather chicken use a panting mechanism. They breathe with opened beak and lift the wings to feel fresher.



Chicks: newly hatched chicks need supplemental heat especially in the night to maintain body temperature during first two weeks of life. With backyard chicken the body of the mother supply warmth



but when raising chicks in cage, it is necessary to provide warmer in the night time



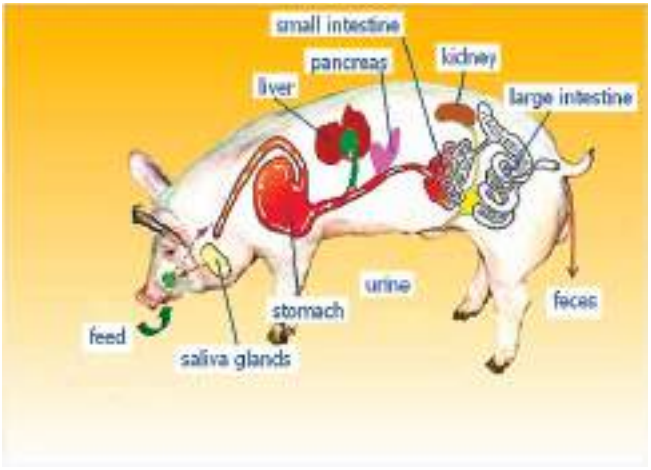
Swine

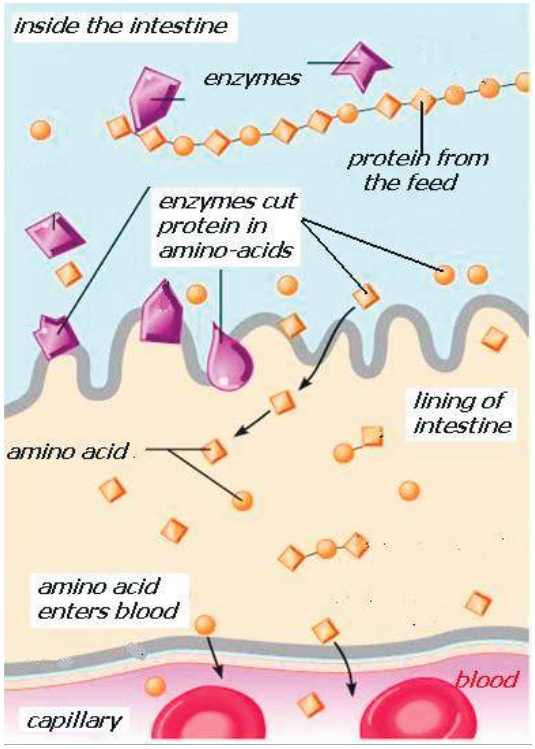
1. Digestive system

Pigs are monogastric like humans, they have only one stomach.

- role of digestive system

The digestive tract is a long tube through which pass the food ; the food is broken down into smaller and smaller units. These small units are absorbed as nutrients and pass in the blood or if not absorbed pass out in the feces or urine.





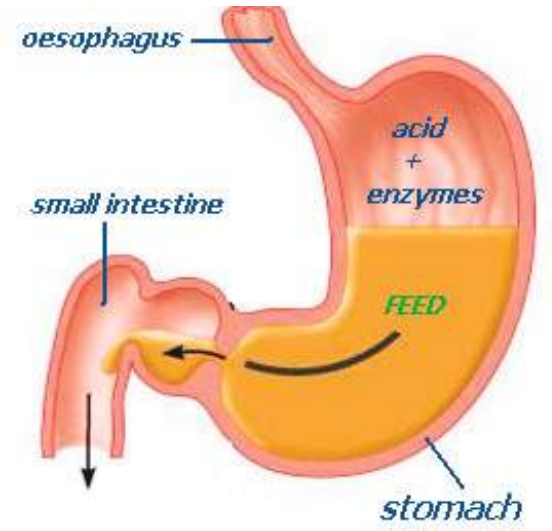
example of proteins: protein inside the feed are broken during the digestion in amino acids which will pass from the lumen of intestine to the blood through the lining of intestine; these amino acids are distributed by the blood to organs

- function of organs

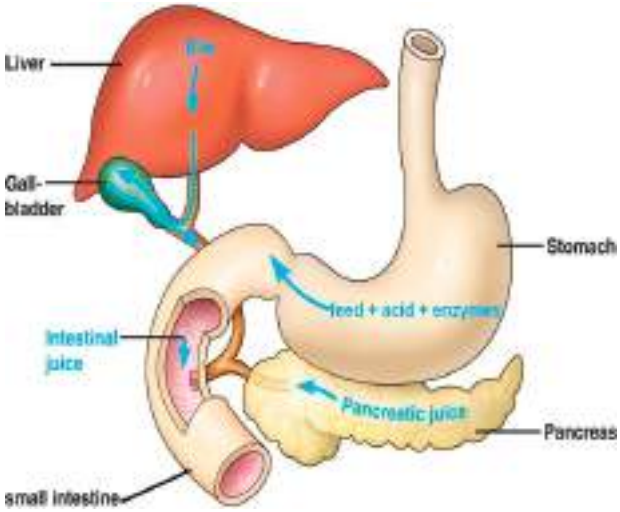
- The mouth is where food enters the digestive tract and where break-down starts. Teeth chew and grind food into smaller pieces, saliva moist the food and the tongue helps by pushing the food toward the oesophagus.
- The esophagus is a tube which carries the food from the mouth to the stomach. A series of muscle contractions push the food toward the stomach.



- The stomach is a chamber where chemicals are added to the food. Certain cells along the stomach wall secrete hydrochloric acid and enzymes. These chemicals help break down food into small particles of carbohydrates (sugar), protein, and fats. Some particles are absorbed from the stomach into the bloodstream. Other particles which the stomach cannot absorb pass on to the small intestine.



- The small intestine is a complex tube; the cells along the wall produce enzymes. At the first section of the small intestine (called the duodenum) secretions from the liver and pancreas are added. Secretions from the liver are stored in the gall bladder. These bile secretions aid in the digestion of fats. Digestive juices from the pancreas pass through a duct into the small intestine. These secretions contain enzymes that are necessary to the digestion of fats, carbohydrates, and proteins.
  Undigested nutrients and secretions pass on to the large intestine



- The main function of large intestine is the absorption of water. The large intestine is a reservoir for waste materials that make up the feces. Some digestion takes place in the large intestine.
- The terminal portion of the large intestine is called the rectum; muscles contractions push feces to the anus. The anus is an opening through which undigested food passes out of the body.



2. Respiratory system

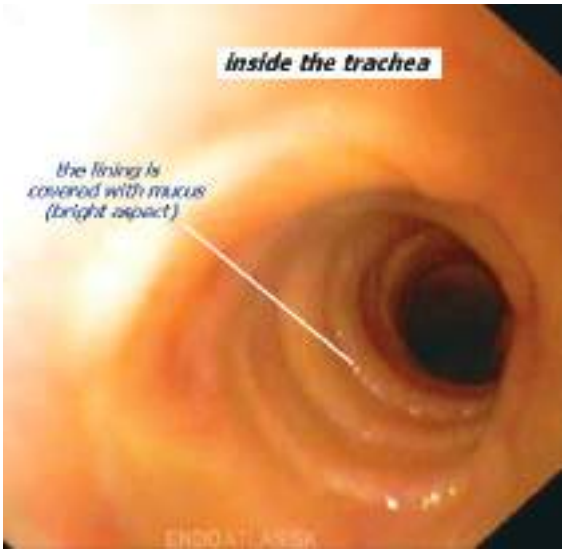
- role of respiratory system

The respiratory system delivers oxygen to the cardiovascular system for the distribution to the body and it removes carbon dioxide.

- physiology of respiratory tract

➢ The turbinate bones in the nasal passage can clean large particles of the air, adjust temperature of the air to temperature of the body and have one zone which is the "center" of smell

➢ Smaller airborne particles are then deposited in the trachea and bronchi. They induce coughing and are expectorated.
The trachea, and bronchi are protected by epithelium and mucous gland; some microbes like Mycoplasma, destroy this defense and other microbes can easily "attack" the lungs.

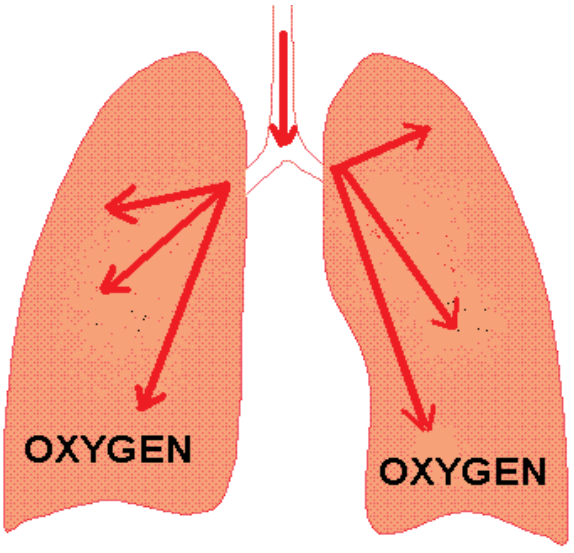


➢ Very small particles (like bacteria, virus...) can reach alveoli. Normally they are destroyed by specific immune cells called Macrophage. Some microbes (example PRRS virus) can destroy these macrophages and the lungs are not more protected against infections like Pasteurella.

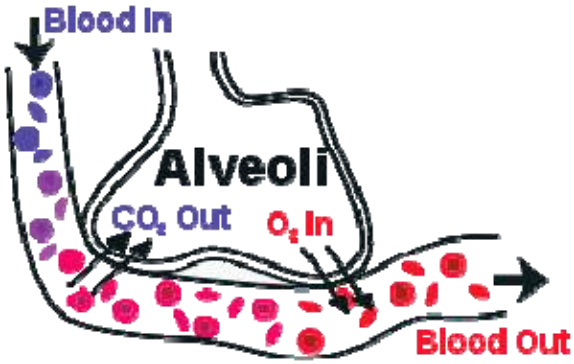
➢ Inspiration and expiration are caused by movements of muscle between ribs, ribs and diaphragm

➢ Gas transfer occurs in the alveoli of the lungs:

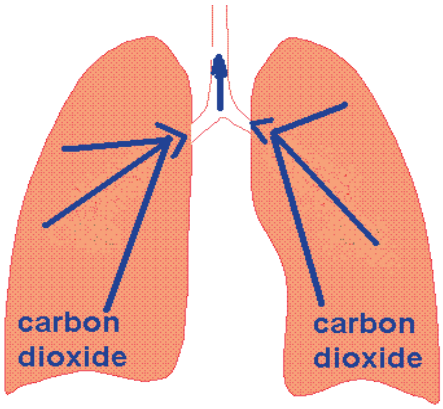
1. During inhalation air is taken into the lungs passing through trachea, bronchi and finally to alveoli. The air inspired in alveoli is rich in oxygen and poor in carbon dioxide

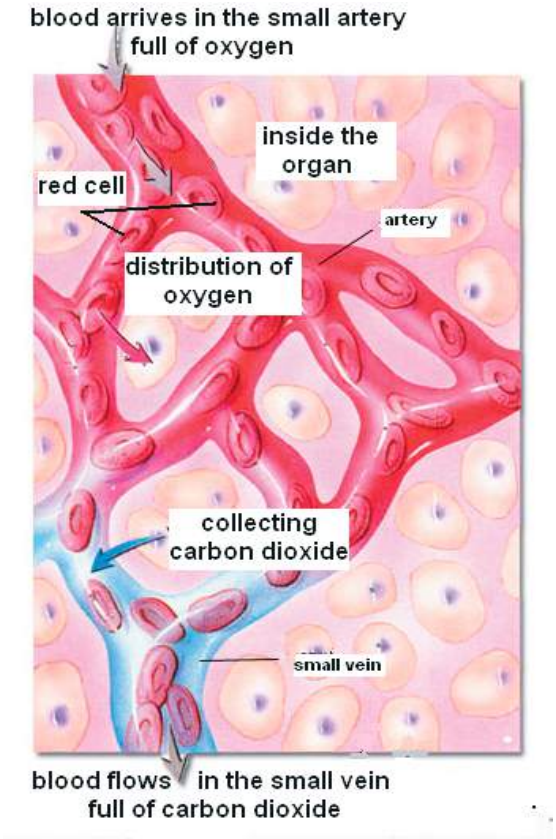


2. Oxygen diffuses from the alveoli into the red blood cells in the capillaries and will reach organs to deliver oxygen
   At the same time, red blood cells in the capillaries release carbon dioxide they collected in the organs. The carbon dioxide diffuses into the alveoli



3. the carbon dioxide is expelled from the body during expiration





➢ Role of blood

The blood transports the oxygen from the lungs to the organs in the red cells:

- the blood transported in arteries is red because is full of oxygen

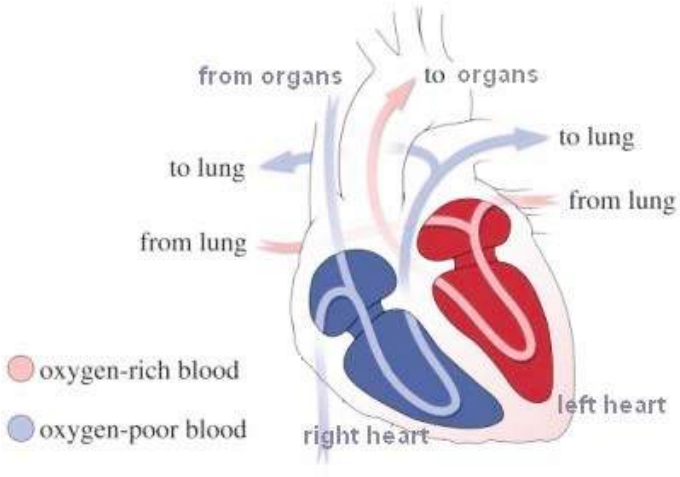
The blood transports the carbon dioxide from the organs to the lungs in the red cells as well:

- the blood transported in veins becomes blue because is poor in oxygen and full of carbon dioxide

➢ Role of the heart

Circulation of blood from lungs to organs and from organs to lungs is the function of the heart
The heart is a pump, and pumps blood; it is made of muscle and is divided in 4 chambers.

- Tubes called arteries come out of the heart and transport oxygen
- Tubes called veins go into the heart and transport carbon dioxide



- terminology specific for lungs

- alveolar macrophage: cell located in alveoli of the lung that destroy bacteria and viruses
- bronchitis: inflammation/irritation of bronchi causing coughing
- pneumonia: inflammation and infection of the lungs
- pleurisy: the shiny membranes that cover the surface of lungs and the inside of the chest are called the pleura. inflammation or infection of the pleura is called pleurisy
- respiratory rate: it is 20 to 40 in piglets and 15 to 20 in fattening pigs and sows. It increases when the lung is damaged.
- rhinitis: inflammation of the mucous lining in the nose. Can be caused by gases, dust or microbes.
- tracheitis: inflammation of the trachea causing strong coughing

3. Reproductive system

- estrus cycle

- Cycle: the first cycle appears in gilt around 6 months of age. For sows the new estrus will come out few days (5 to7 days) after weaning piglets. If sows are very thin, estrus can be delayed for weeks until the sow recover correct condition.
  If the sow (or gilt) is not mated or inseminated a new cycle will appear 21 days later

- Detection of estrus: it is easier to detect estrus if a boar is near the sow. When they have contact nose to nose the sow will pick up the ears and the boar will become active

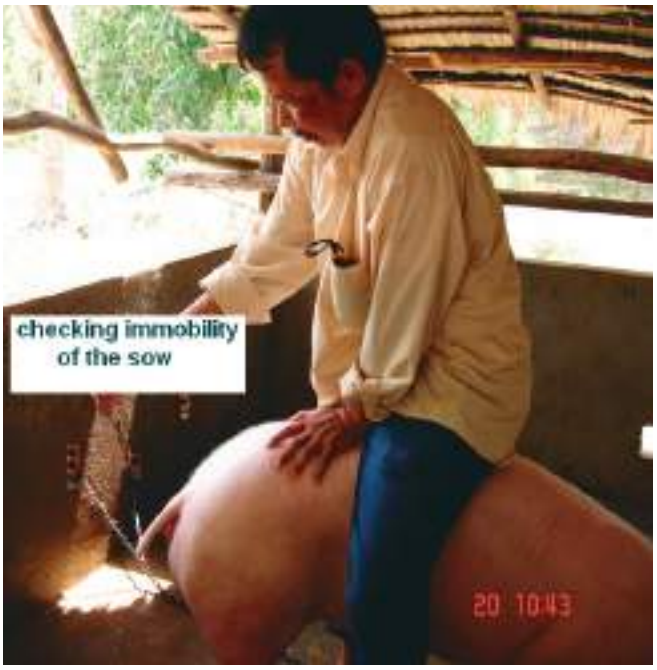


The second sign will be a swollen and redden vulva but sometimes this sign can be very slight





At least the most reliable sign is immobility of the sow. If the farmer seat down on the back of the sow or gilt the animal will not move but stay immobile



It is good time for mating or inseminating within 12 to 24 hours.

- embryonic and fetal development

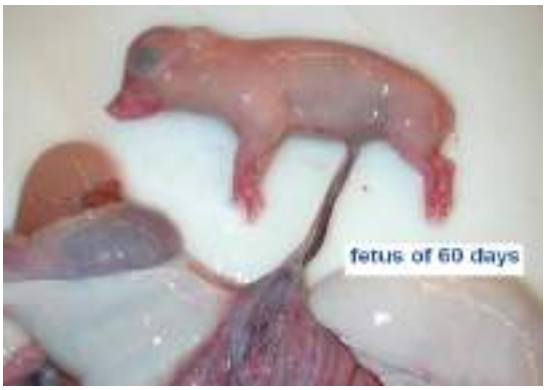
➢ The fertilization occurs the day of mating;

- within 1 hour after mating, the sperm move to the oviducts.
- Day 2, the embryo descends in the uterus.
- Day 3, the embryo size is 0.2 to 0.3 mm.
- Day 4 to day 12, embryos move between the horns.



➢ implantation: the attachment of the embryo to the uterus by establishment of the placenta starting 12 to 14 days post-mating; at this time the embryo size is 5 to 10 mm.

➢ After 1 month, the embryo becomes a fetus which will develop until delivery



- repeat breeding: it means that the sow will show again estrus sign after mating or AI

Repeat breeding can be regular when occurring 18 to 22 days after mating; it is often due to bad quality of sperm or because uterus is in bad condition because of chronic infection. Repeat breeding can be irregular when occurring about 35 days after mating; it is mainly due to infection with specific diseases like, PRRS, CSF, Parvovirus.

- Pregnancy:

- Normal duration is 114 days (3 months, 3 weeks, 3 days).. It is important to calculate the estimated date of delivery to better organize delivery time.
  Sometime, delivery can be late, more than 115 days It is appropriate to induce farrowing by injecting Prostaglandins to increase survival chance for piglets. Delivery will start few hours after injection.
- Before farrowing: it is important to identify signs of imminent farrowing: 10 days before delivery, mammary glands enlarge and become firm and swell the vulva lips swell. 8-12 hours before delivery, the milk arrives when pressing teats. 30 to 90 minutes before delivery, passage of blood tinged, oily fluid and meconium

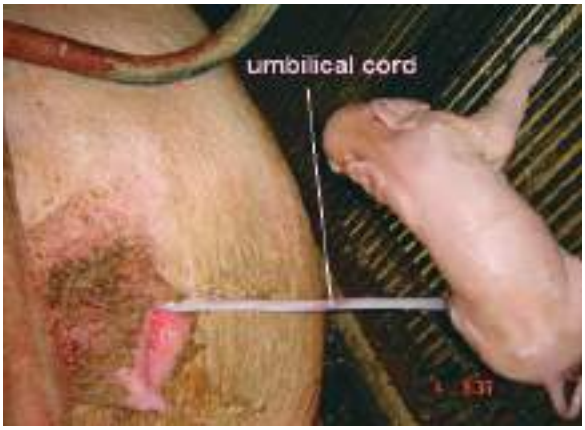


- Farrowing

- Phases of normal farrowing: 30 to 90 minutes after release of meconium, delivery starts, the first piglets appears



- After birth the piglet is still tied to the sow by the umbilical cord; the cord will be cut when walking to the udder



- More piglets are born approximately 15 minutes apart with a maximum of 30 minutes in normal delivery
- Total time of normal delivery usually takes less than 2.5 hours
- The placenta is usually delivered 2-4 hours after the last



- Weaning

The sow will milk piglets 21 to 28days. She remains anestrus during lactation.
The sow will show again estrus sign 5 to 10 days after weaning except if the sow is very thin. The body condition at weaning is very much linked to fast estrus.



- Semen



- Volume of sperm is 200 to 500 ml. The color is creamy white. The ejaculation duration is between 5 to 20 minutes
- Sperm temperature is 37.5°C; it is why testicles are outside of the body to ensure lower temperature.
- It takes 4 weeks in the testicles for spermatozoids development and 2 weeks more for maturation in epididymis
- Sperm remains viable in the sow 30 to 48 hours
- Quality of the sperm depend of concentration of spermatozoid (up to 100 million/ml) and mobility (capacity to move); it is easy to check with a microscope

Rq: Many factors can decrease the quality of the sperm (climate, feed, stress, sickness, …)







- Terminology specific for reproduction

- **Abortion**: delivery of a premature non-viable litter, less than 111 days after mating
- **Agalactia**: shortage of milk or no milk



- **Cryptorchid**: a male pig whose testicles have not descended in the scrotum. The testicle stays in abdomen or in inguinal canal. This testicle cannot produce fertile sperm



- **Embryo**: develop after fecundation. It is called embryo until the 30th day; after it becomes fetus
- **Endometritis**: infection of the uterus
- **Fetus** : in the pregnant sows, piglet from 30 days to delivery
- **Mastitis**: inflammation associated with infection of the mammary gland
- **MMA** (Mastitis Metritis Agalactia) no milk or colostrum at the delivery time. Serious symptoms in the sow, fever, anorexia, painful udder. Usually caused by E.Coli



- **Mummified piglet:** piglets who died in the uterus during pregnancy. Tissues and fluid resorb, remain skin and skeletal
- **Oestrus**: the period during which the sow accept the boar, usually 2-3 days
  - oestrus cycle: the period from one oestrus to another, usually 19 to 22 days

- **Orchitis**: inflammation of the testicle. Usually due to Japanese meningo-encephalitis or Brucellosis



- **Ocytocin**: hormone produced by the sow that causes uterus contractions and release of milk. Can be injected to stimulate these functions
- **Prostaglandins**: hormone which induce opening of the cervix and contraction of the cervix.
- **Repeat breeding**: oestrus appearing after mating or AI when embryo cannot develop properly

- **Stillborn piglet**: piglets which die during the delivery



- **Weaning**: separation of piglets from the sow after the suckling period. Usually at 21 to 28 days.

- Physiologic data

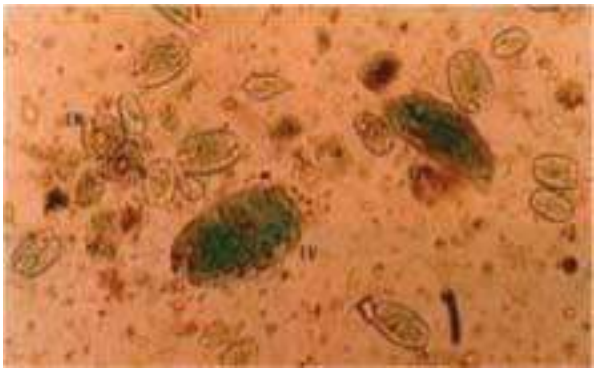
- temperature: 39°C
- breathing rate: 30-40/mn for fattening pigs
- weight and age: expected performances when feeding crossbred pigs with commercial feed
    - age at weaning: 1 month
    - weight at weaning: 8 kg
    - weight after 1st stage weaning (2 weeks special feed): 12 kg
    - age at 25 kg; 2 months 1/2
    - age at 60 kg: 4 months 1/2
    - age at 80 kg: < 6 months
    - Fat thickness: 15 mm
- age of puberty: 6 months
- age at first farrowing: 1 year
- size of litter: 10 t0 12 piglets
- number of teats: 14
- rhythm of mating: boar can only serve once every 24 hours.

Cattle

1. Digestive system

- physiology of digestion

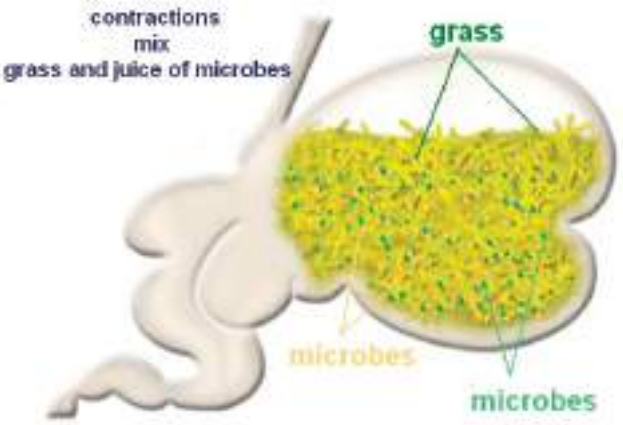
Cattle are ruminant, they have complex digestive tract that allow to produce energy and protein from forages and fiber (like straw)



The rumen is a big pot of fermentation of more than 100 liters and contains a lot of microbes that multiply inside; these microbes are bacteria, protozoa, fungi

1ml of rumen juice contains roughly 10 to 50 billion bacteria and 1 million protozoa

The rumen is always contracting and moving. Healthy cows will have one to two **rumen contractions** per minute. The contractions mix the rumen contents, bring microbes in contact with new feedstuffs and move materials out of the rumen.



These microbes are of different types:

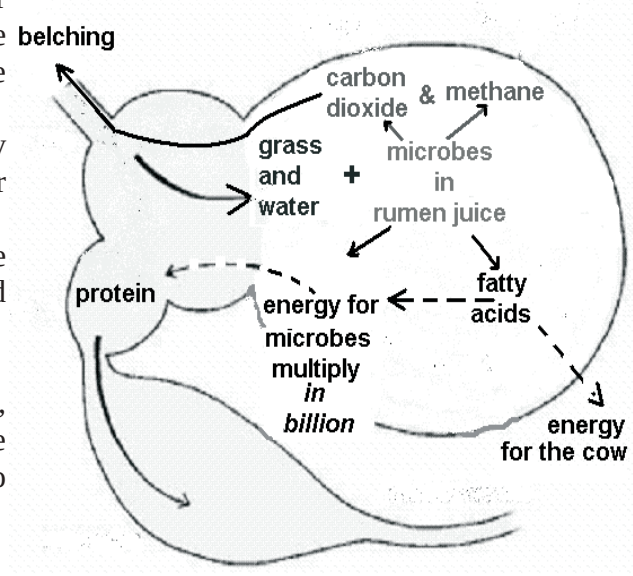
- some can digest fiber
- some can digest starch
- some can digest proteins

➢ Energy

In this "big pot" fiber, starch and sugar contained in the feed fermented to produce acids (fatty acids) and gas (carbon dioxide and methane)

- One part of the fatty acids are absorbed by the animal and used as a source of energy (for moving, producing milk, meat...)
- One part of the energy is used to feed the microbes; they can multiply a lot and be used by the cow as source of proteins

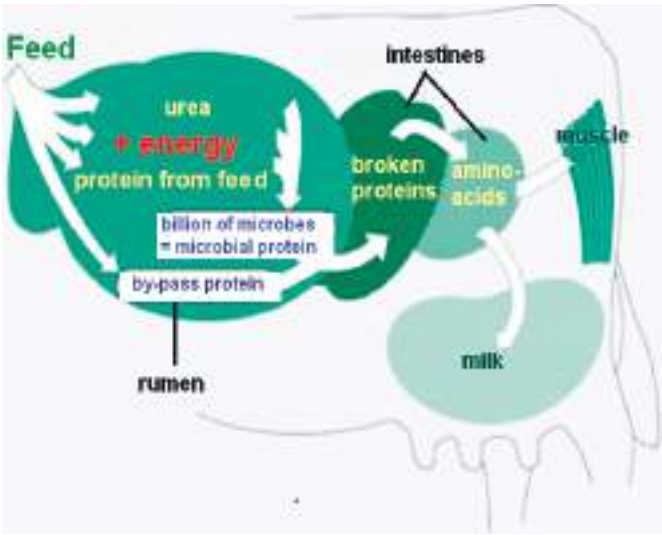
- During this process, large quantities of gas, mostly carbon dioxide and methane, are produced in the rumen. This made the cow to **belch** and eliminate the gas.



- Proteins

Proteins are necessary to produce milk and meat. They are transformed in amino-acid to be absorbed by organs.

- Protein or urea are attacked by microbes in the rumen and transformed in ammonia; this ammonia and energy will be used by micro-organism of the rumen to multiply in billion. This mass of microbes contains 80% of protein and goes in intestine for complete digestion
- Some proteins from leaves are not destroyed by microbes in the rumen and go directly in intestine for complete digestion: it is by-pass proteins



- Microbes requirements
  - It is important that microbes leaving in the rumen can find necessary nutriments to grow well and to multiply: this ensure forage digestibility
  - If necessary conditions, temperature, pH, nutrients are not met in the rumen, microbes cannot develop and cannot transform straw in energy and protein

  Growth of microbes in the rumen requires:
  - a source of cellulose (forage, straw) or starch (corn, cassava root) to provide **energy**
  - a source of **nitrogen** compounds to produce ammonia; these nutrient can be provided by grass, foliages or urea
  - a source of minerals: **P, Ca and Mg**
  - a source of trace elements: **Cu, Zn, Mn, Fe and S**
  - a source of vitamins **ADE**, provided by forages of good quality or by premix; ruminants can produce vitamins of the B group

The reticulum is a pump for rumination



- The reticulum forms boluses with the feed and serves as a "pump" to push back in the esophagus and then to the mouth: it is rumination
- Rumination is important because it breaks down fiber in small pieces, it facilitates fermentation
- While the cow is cud chewing, she is adding a lot of saliva (50 liters/day), that prevent acidity in the rumen and provide a lot of urea
- A cow may spend as much as 35 to 40 percent of each day ruminating



The omasum and the abomasum: the real stomach

- One function of the omasum is to absorb water from the feed in the stomach.
- The abomasum is the true stomach like stomach of pig; content is very acid, microbes cannot survive and digestion is made via breakdown by enzymes.

The intestine: produce the manure

- After the feed and microbial particles pass through the abomasum, it travels to the small intestine where nutrients are absorbed. The small intestine receive juices from the liver through the gall bladder and from the pancreas which help digestion.
- Most of the digestive process is completed in small intestine.
- The unutilized or unabsorbed feed particles pass on to the large intestine; water is absorbed
- The last stage is production of manure: it is full of organic matter and N, P, K and S.
- It is a good fertilizer

Ultimate stage of digestion in cattle



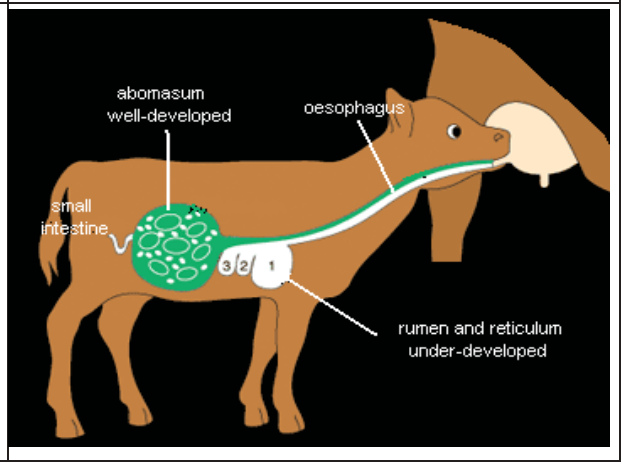


- digestive system of the calf

- At birth and during the first few weeks of life, the rumen, reticulum, and omasum are undeveloped. In the calf, the abomasum is the largest compartment of the stomach. At this stage of life, the rumen is nonfunctional, milk passes directly into the abomasum.



- As long as the calf remains on milk, the rumen remains undeveloped. When calves begin consuming grain and forage, a microbial population becomes established in the rumen and reticulum and they will start to develop.



2. Respiration

- specific weakness of lungs in cattle

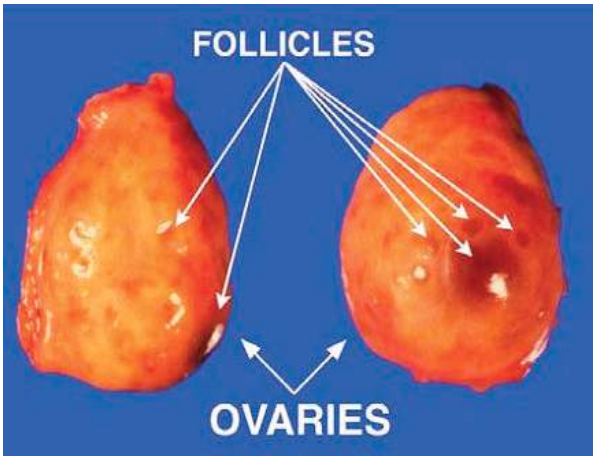
- Cattle have small lungs, relative to the animals' size, and the lungs are set deep in the chest; it is why cattle are prone to respiratory diseases
- Once viruses and bacteria get into the lungs, it's easy for them to stay; they can develop and cause infection.
- Even a small loss of lung capacity from infection can be a serious matter.
- It is clear when we compare lung volume of cattle and horse
- Normal breathing is:
  - rate/ minute is 10-20 movements for adult
  - 15-30 movements for calf

	Cow	Horse
Lung volume	12.4 liters	42 liters



3. Reproduction

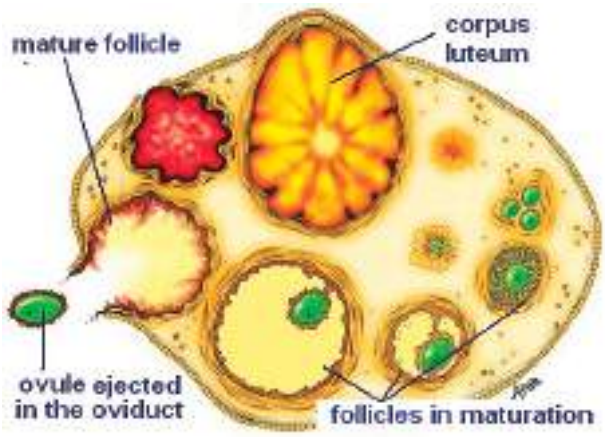
- Normal cycle of reproduction
- **Puberty** is the time of the first oestrus
  - Age of puberty vary between 1,5 and 3 years. The major factors controlling the onset of puberty are body weight and growth rather than age: Poor nutrition can delay puberty.



- **Oestrus** is the time for reproduction

The cow is in oestrus when ovaries are active:

- after oestrus, the ovary rejects an ovule in the oviduct and these ovules can be fertilized with bull semen
- Day 2 to day 4 days, the Corpus Luteum is formed; it secretes Progesterone
- when there is no fecundation: from day 5- to day 17 the Corpus Luteum resorb
- day 21 a new ovule is released from mature follicle, it is a new cycle



- Oestrus will appear regularly if no fecundation: range to be 17 to 24 days in zebu the average is 20-21 days
- The mean duration of oestrus in zebu cattle is only few hours: average of 12 hours. The farmer must be attentive, it is easy to miss signs of oestrus

➢ **Signs of oestrus** are important to detect the best time for mating



- Licking and rubbing each other
- Sniffing the vagina of another cow.
- Mutual chin resting



- Mounting another cow
- Standing to be mounted by another cow

All signs are more obvious in presence of a bull

- Glary vaginal discharge



➢ Sometimes oestrus do not appear after calving it is called anoestrus or estrus come back regularly even though mating, it is called repeat breeding

These disorders cause infertility; cows cannot give birth to a new calf. Main reasons are:

- poor body condition, the cow is to skinny and ovaries “sleep”
- chronic infection of the uterus that impair development of embryo and placenta
- cyst on the ovary which provoke hormonal disorder

- Mating

To increase the chance of fecundation, mating must be operated from 12 to 24 hours after the beginning of oestrus. The best time is 18 hours after manifestation of oestrus

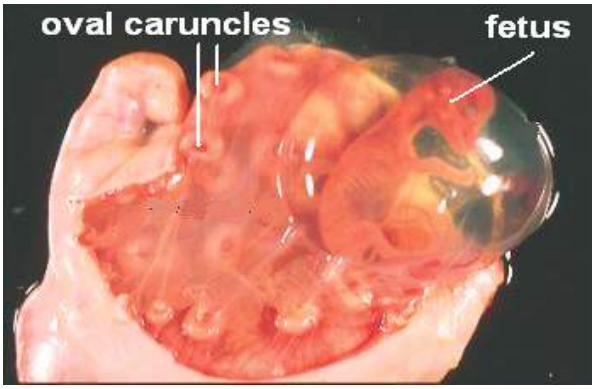


- Pregnancy

- Gestation is the period from conception to parturition; the cow will not show sign of oestrus
- Estimates of the gestation average 285 days
- It is important to be sure that cow is pregnant: detection of return on heat must be done very carefully 3 weeks after mating.
  After 7 months of pregnancy, the evidence of gestation can bee seen on the right side



- Placenta

The placenta is an organ that connects the developing fetus to the uterine wall of the cow: via the blood of the cow, the fetus receives nutrients, eliminate waste and exchange oxygen and carbon dioxide Ruminants have a cotyledonary placenta; about 75 to 125 oval caruncules are like numerous small placentas.	
Normally placenta is delivered within 6 to 12 hours of birth	

- Delivery

The first stage lasts 2-6 hours:



- The cow may show signs of discomfort by kicking at her belly, and becoming restless.
- Uterine contractions begin
- At the end of this stage the water sac appears

The second stage of delivery lasts 1-2 hours



- The cow lies down, contractions will increase and abdominal pushing is obvious (the calf must enter the birth canal in a certain position in order to have a normal delivery)
- The cow have strong abdominal presses while delivering the head and chest of the calf, after which she will usually take a short break before delivering the legs

The third stage starts after the birth

- The mother lick the calf (if not, rub the calf with salt and introduce it to the mother)
- The placenta should be delivered within 6 to 12 hours

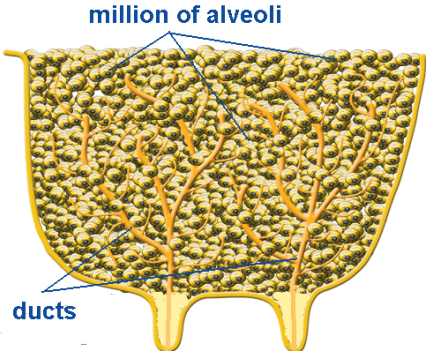


1. Udder and milk production

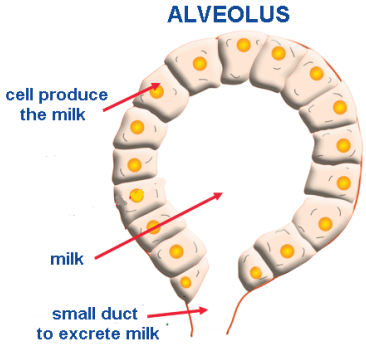
The function of the milk is to nourish the new born calf

- The glandular tissue deep within the udder contains millions of microscopic sacs called alveoli (15 cm3 of udder contain about 1 million alveoli)

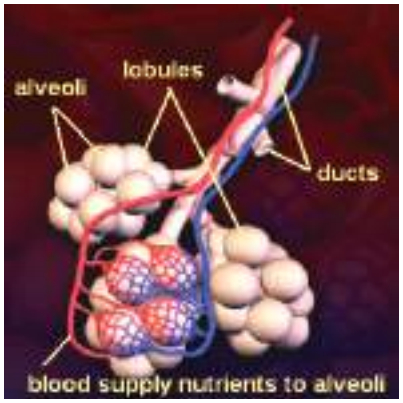




- Each alveolus is lined with milk-producing cell; these cells take nutrients from the blood and produce milk; synthesize lipid, protein, lactose, some milk components (vitamins, minerals) are not synthesized here but are simply filtered out from the blood into the milk.

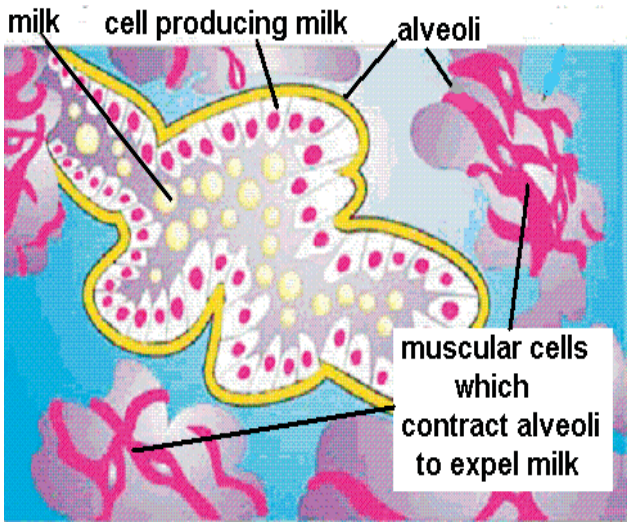


- There is a large blood supply to the udder; in the order of 400 liters of blood pass through it to produce a single liter of milk

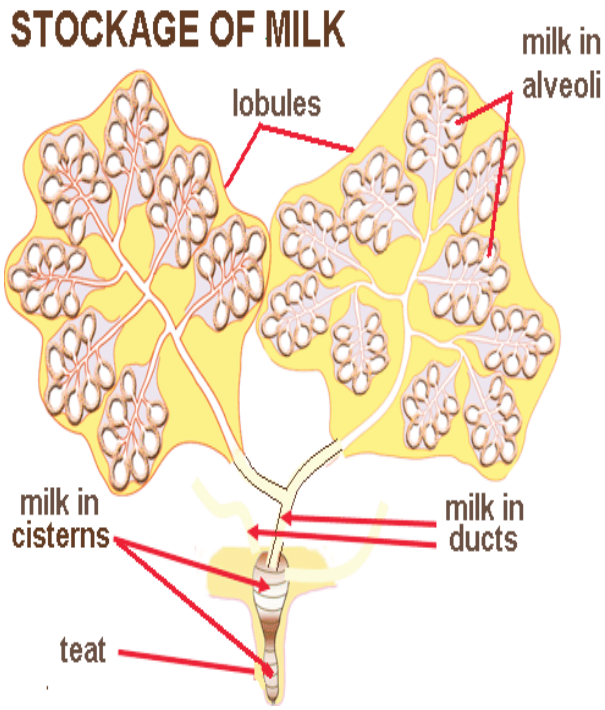


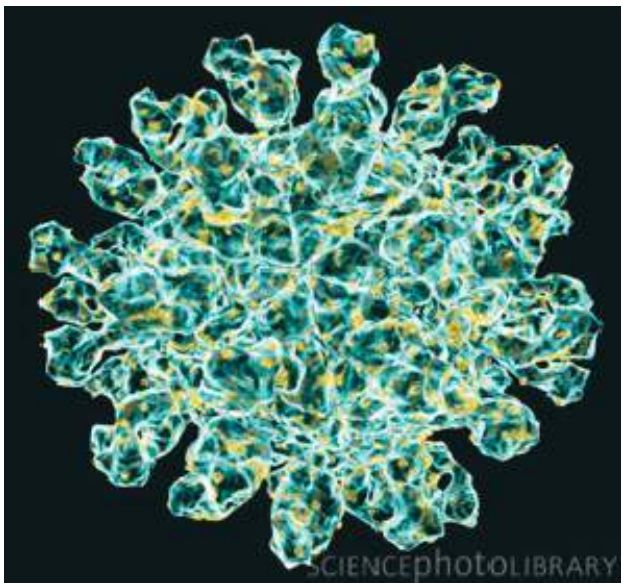
- The alveolus is surrounded by muscle cells that contract, squeezing milk from the alveolus into the milk ducts; when the calf suck the milk it activates milk let-down. The milk ejection lasts for only about 6 minutes

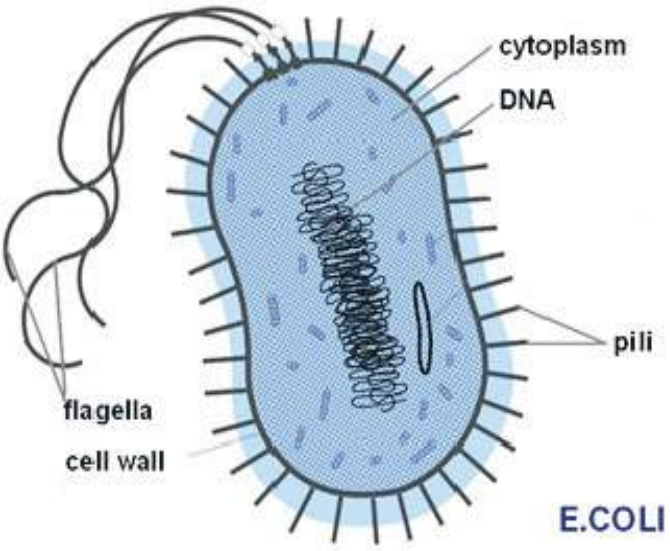




- Between suckling periods, milk accumulates in the alveolar spaces, milk ducts, and cisterns. During milking, this accumulation of milk is removed through the teat ducts.







III.
Understanding of diseases





Definition of Health and Diseases

It is a state of physical and psychological well-beings that allows the animals to express their best potential for production and reproduction.

A. The causes of diseases

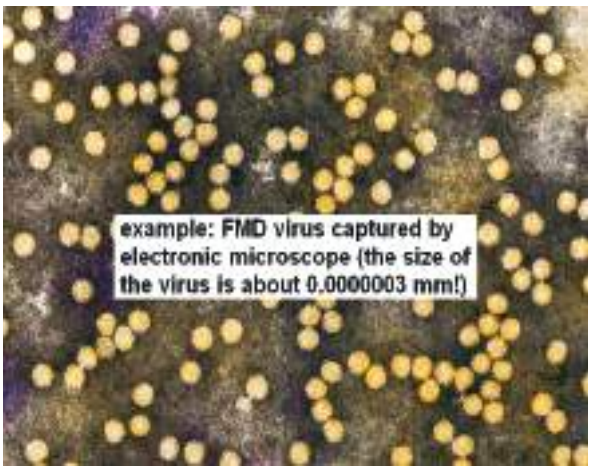


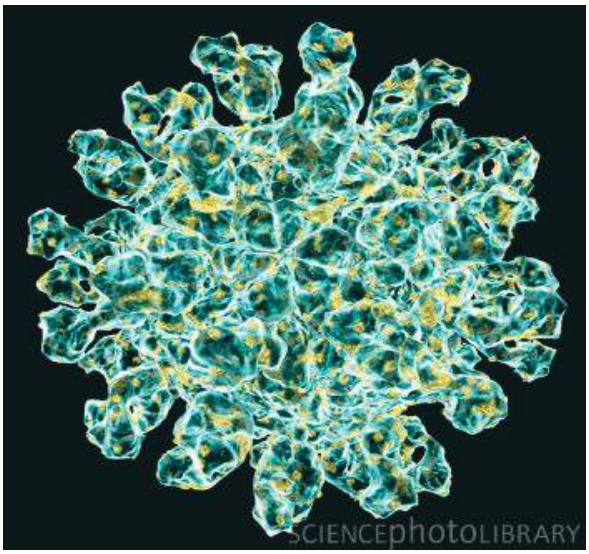
1. ***infectious agents****: virus, bacteria, fungi, protozoa*
2. ***parasites****: external and internal*
3. ***feeding****: deficiencies, unsafe feed*
4. ***welfare****: stress, lack of bio-security*
5. ***distress****: toxic, trauma*

1. Infectious agents

- Virus

➢ Virus are very small micro-organism (they cannot be seen with a normal microscope) which can cause diseases

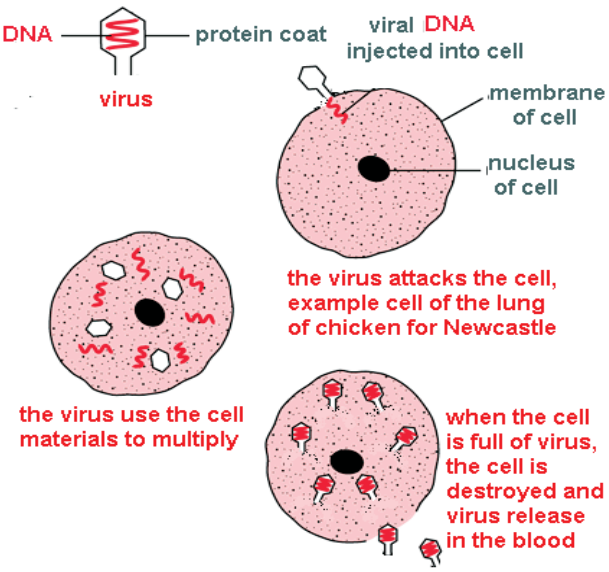




➢ Model of FMD virus can be drawn by computer to show the surface made of complex proteins

- A virus cannot grow or reproduce apart from cells of animals.

- A virus invades living cells and uses their chemical machinery to keep itself alive and to replicate itself; they behave like pirates.
  This activity often damage or destroy the cells which they infect



- Virus may reproduce with fidelity or with some errors; it is called mutation.
  It can explain why vaccination is not systematically effective for some diseases like PRRS

- When viruses are outside of the animal body they cannot replicate, they are inert. But they can survive many month in the environment
  For example NDV can survive for several weeks in a warm and humid environment on birds' feathers, manure, and other materials



- Some viruses can multiply in an animal without symptoms like Bird Flu in ducks. But the virus multiplies and ducks shed a lot of virus. Chicken are very sensitive with the virus and will die when they are contaminated.

  The disease caused by a virus can depend of the species contaminated



- Clinical signs depends of what organ is attacked by the virus: for example in CSF the virus invade and damage the cells of the small blood vessels causing small hemorrhages in the organs or in the skin



Antibiotics are not active against viruses

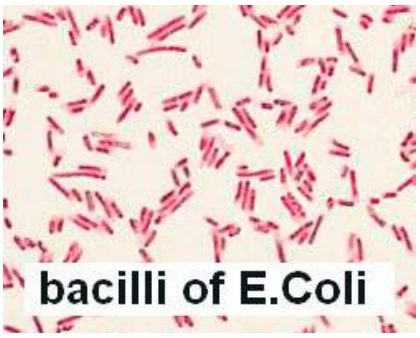
- Bacteria

Bacteria live on or in every material and environment. Bacteria are well-known to cause diseases but only a small number among the thousands of bacteria are pathogenic. For instance the rumen of cattle contains billion of bacteria which are indispensable for the nutrition.



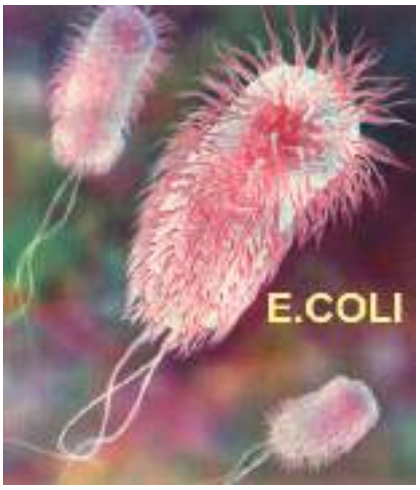
- Bacteria consist of only a **single cell**; the average size is about 0.001 mm (3,000 times bigger than a virus)

  Bacteria can be observed with optical microscope



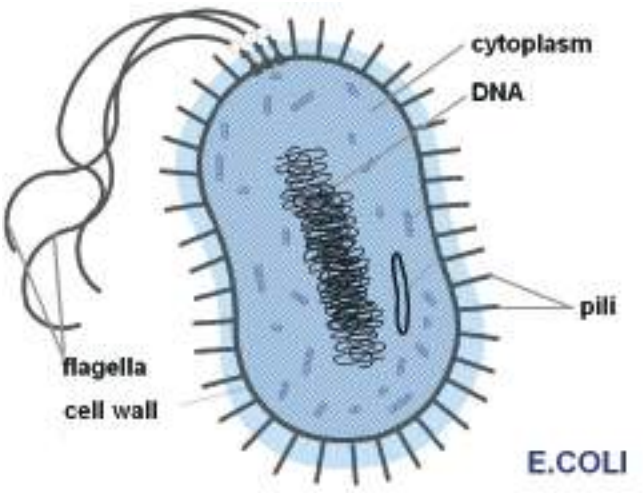
- Bacteria cells come in three main **shapes**: spherical (cocci), rod like (bacilli) and spiral

- Bacteria have the same **basic structure**:



- a **cell wal**l and capsule covering the cell that protects the cell and give the shape
- a **cytoplasm**: a gel-like substance composed mainly of water that contains stock of nutrients for the bacteria
- genetic material (**DNA**) that floats around in the cytoplasm

- a **flagella** like a tail to move in the environment
- **Pili** are sort of hairs to attach the bacteria to organs

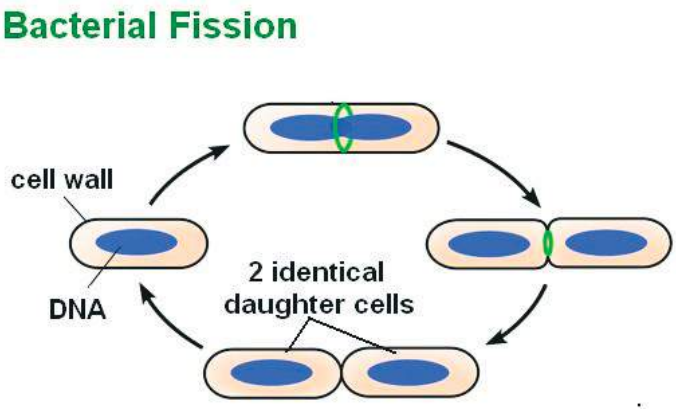


- Bacteria, as other cells have basic **nutritional requirements**; they need a source of energy, of nitrogen, of carbon (organic matter found in litter, in dead animals, rubbish... can provide these nutrients). Water, trace elements and sometimes oxygen are necessary as well.

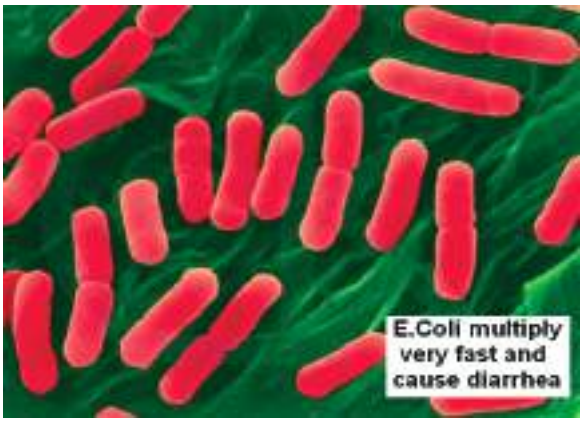


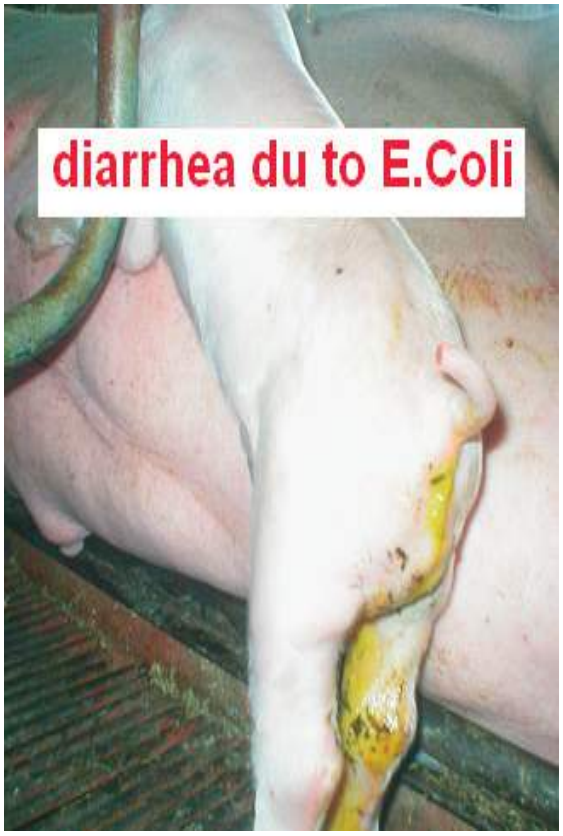
- **Reproduction** of the bacteria is made by fission:
the cell grows and duplicates DNA. When the bacteria reach double of its original size, it split in two identical daughter cells.





- Bacteria can reproduce at tremendous speed. For example E.Coli can divide every 20 minutes: if we have only 10 bacteria E.Coli and environment is good for multiply, after 12 hours of reproduction we obtain more than 600 billion of E.Coli. Fortunately a lot of bacteria will die during the reproduction time because the body of animal will "fight" with bacteria. But it makes clear that treatments must against diarrhea caused by E.Coli, must start as soon as possible!





A limited number of bacteria are responsible of the majority of the diseases. All animals (and humans) are infected by bacteria living on the body surfaces (skin, gut, lungs). They are exposed in permanence to bacteria (through air, water, soil and feed)
Normally due to animal natural defenses most of these bacteria are harmless.
An infection can be seen as a miniature battle between bacteria and animal. When natural defenses of animal are weak (stress, fatigue, parasites, other diseases...), or when the number of bacteria in environment is very important (many sick animals spread huge quantity of bacteria in a group) or when the bacteria is very active (highly pathogen) the infection will start.
Bacterial disease will occur when bacteria can enter in the body, attach on organs, multiply in enormous quantity and reach the bloodstream.

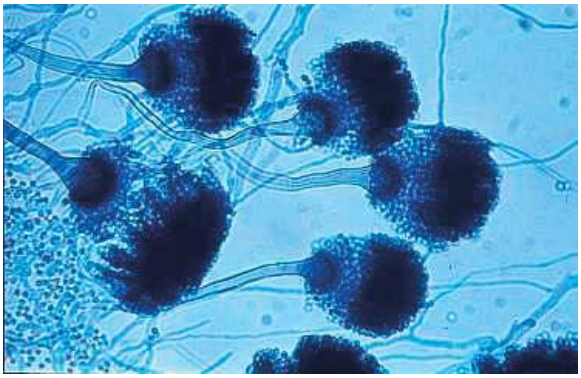
- Fungi

- Fungal species which can cause diseases are multi-cellular

Fungi are composed of microscopic filaments

When they develop on culture media, they are observable





under microscope, about .005 mm = 5 times bigger than bacteria

- In general weakness, other disease or low immunity is necessary to develop a disease caused by fungi; fungi are everywhere and animals are constantly exposed to them and in normal condition they develop protection against fungi

- Fungi, the most famous are called Aspergillus can impact animal health in two major ways





- through production of mycotoxins: aflatoxin is found in mouldy raw materials and especially corn. Regular intake cause liver damage and destroy immunity (capacity to neutralize microbes)

- through localized infections: ringworm in pigs or cattle a infection of the skin by fungi



- or through systemic infection: Aspergillosis of chicks is a general disease after inhalation of fungi



2. Parasites

Parasites are organisms that either live in the body we say Internal parasites, or externally: on the skin or in the skin, we say external parasites.
In general parasites are harmful for animals and it is important to control parasites because they impair animal health

- General impact of parasites

- Despoilment and poor growth

- Internal parasites eat nutrients provided by feed in the intestine

- External parasites suck blood causing anemia and weakness or provoke strong irritation and lesions of the skin that perturb animal



- Cause of diseases

Some internal parasites can damage organs (liver) or function of organs causing diarrhea...



- Transmission of diseases

When external parasites bite, they can transmit infectious diseases



- Cycle of parasites

All parasites have a development cycle from egg to adult (apt for reproduction).
Generally different stages are:

- egg - larva - adult







The cycle can be direct: all the stages of the development from egg to adult occur in one animal; for example Ascaris cycle
The cycle can be indirect when the development of the parasite requires two animals: for example Fasciola cycle

- External parasites

Mange, ticks, lice, flies are common external parasites.
The negative impact of external parasites on Animal Health is due to:

- Lesions of the skin: serious irritation, permanent scratching, will disturb animals that will grow slow and facilitate other infections of the skin

- Blood depletion: the only source of nutrition that **ticks** use is the blood sucked from animals





- Annoyance and stress for animals: It is caused especially by **flies** when they are too many



- Transmission of diseases: external parasites are important vectors of diseases and sometimes can be as well reservoir of diseases:

- Flies make contact with feces and can transport E.Coli, Salmonella, Coccidiosis
- Ticks can transmit blood diseases like Babesia, Anaplasma
- Mosquitoes spread Fowl Pox...

- Internal parasites



Ascaris, Toxocara, Red Worms, Taenia, Coccidiosis are common internal parasites; scavenging animals, free range flock or free grazing cattle are more sensitive to infestation by internal parasites because they can easily ingest eggs and larva released on the ground.
The negative impact on Animal Health is due to:

- Worms absorb essential nutrients and significant infestation lead to bad body condition



- Worms can kill animals like Toxocara in young buffaloes and cattle

- Internal parasites can damage organs, liver, intestine, lungs causing diarrhea and coughing



- Internal parasites can be transmissible to Humans and are concern for Human Health as well; for example Taenia and Trichinella



3. Feeding

Some diseases are due to poor diet, for example piglets which do not receive enough iron develop anemia. But in general all deficiencies decrease the capacity of animals to resist to diseases and always impair growth and reproductive performances.

Major nutrients necessary for a good health are:

- Water

Water provides basis for all of the fluid of the animals' body, bloodstream requires liquid for circulation, digestion requires moisture for breakdown of feed, water is needed to produce milk, urine...

- Insufficient watering decrease appetite, increase the risk of cystitis and the body cannot eliminate properly



- The quality of water is important as well. The water can be polluted by bacteria, pesticides or can transmit diseases like Bird Flu when ducks shed virus in a pond for example



- Energy

The body needs energy to maintain life and activity; the main source of energy is provided by "sugars" (for example cassava root is rich in starch) and by fat (for example rice bran is rich in fat)

- In case of deficiency in energy the animal will draw on its reserves (fat) and will loose weight. For example a sow during lactation needs a lot of energy to milk piglets and if she cannot eat enough, at weaning she is very thin with many problems of health and the next oestrus will be delayed for many weeks
- In contrary if animals receive too much energy, they become fat with problem to stand up and difficult farrowing



- Protein

Proteins are the basis of animal body structures. Proteins are made of amino-acids. Protein supply materials to make body tissues especially muscle. Pigs and poultry require essential amino-acid (for example lysine, methionine must be provided in the feed) but cattle can synthesize all amino-acids.

- For poultry and swine the proteins must be provided in the feed (fishmeal contain more than 50% protein, soybean 40%, rice bran 12%, corn 8%, rice 2%) but for cattle they can produce protein from fiber.

- Protein deficiency provokes poor growth because muscle cannot develop and low milk production, leading to weak piglets or calf.





- Minerals:

Calcium, phosphorus and manganese provide materials for growth of bones, teeth and tissues. Other minerals are in small quantity but are essential for the functioning of the body; for example it is important to inject iron to new-born piglet to prevent anemia.

- Deficiency in calcium is cause of rickets in young animals or thin-shelled eggs in layers.





- Lack of phosphorus give muscular weakness and poor fertility

- Vitamins

Vitamins are an essential component of a well-balanced diet and their major function is the metabolism and utilization of nutrients. Vitamins are needed in small amount; it is called trace-elements but their role is crucial
Aspect of the skin of animals is a good indicator to suspect deficiency in vitamins; bright and smooth hairs, supple skin are sign of good health and sufficient supply in vitamins



4. Welfare

Traumas are a major cause of diseases and have crucial impact on animal health in various manners:



- Injury of the skin and subcutaneous tissues causing local infection

Recovery and cicatrisation can be very long if not treated properly:
Cut hairs around the wound and wash with water and brush to make a dirt free zone
Everyday clean again with water and soap to eliminate all weeping
If the wound is deep, inject antibiotic Long Action



- Introduction of microbes inside the body causing general infections by:

- bites: in Cambodia farmer must be aware of the risk of Rabies when animals are bitten by dogs
- bad technique: sometimes microbes can penetrate in the body and cause infection because of improper procedures: abscess after injection, teeth clipping, tail docking...

- wound: various microbes take opportunity to invade the body through lesion of the skin or of mucous membranes and cause general diseases: streptococcus, tetanus...



- Suffering

Suffering several days decrease feed intake ad water intake, animals become weak in few days and are more sensitive to other diseases

- lameness: painful joint or feet decrease the capacity to move to eat and drink and has severe impact on health
- eyes: lesions of eyes show redness of conjunctiva, eye discharge and can be sign of foreign body or injury or cut to the cornea. It is painful and animals often stay immobile in the shade

It is important to use medicines that decrease pain to support animal health (paracetamol, phenylbutazone, analgine...)



- Function impaired:

- broken leg; in general it results in slaughtering animals
- vulva damaged cause infertility because the male cannot mate the sow or the cow
- teats wounded cannot excrete the milk normally and are cause of insufficient milking of spring



Distress

5.1. Toxic

The risk of poisoning is much higher for free ranging animals; common poisonings are:

- Intoxication by urea

  Cattle find a bag with a rest of urea and lick the product: symptoms are
  - Severe bloat
  - Muscle tremors that progress to incoordination (walk like drunk)
  - Death within 2 hours

  The treatment should be implemented



immediately when the farmer see the cattle licking the bag; the farmer must give to drink 2 to 5 liters of vinegar diluted with water



- Intoxication with pesticides: it is the same cause; the animals find a bag with a rest of chemicals.
  Symptoms are excessive salivation (cannot be confused with FMD because it is very acute), the animal is excited before showing depression and death can occur if the dose ingested is too important. Treatment is injection of Atropine in the muscle

- Some plants are not really poison but can cause allergy; in Cambodia photosensitive allergy is common
  After eating some plants and staying under the sun, cattle show lesion of the skin that can become very severe. When symptoms appear, the farmer must keep cattle under the shade and inject Dexamethasone.



5.2. Trauma

Stress is a condition which occurs in animals when confronted with adverse management and environments.

- Effects of stress are various but essential ones are
- Stress make animals more susceptible to diseases, immunity is weak. For example it is recommended to mix antibiotic in the feed of piglets at weaning because the stress of separation from the sow, change of feeding from milk to pellets, new environment in the cage of weaning and fighting with other piglets induce high sensibility to disease during the first 10 days after weaning. Often piglets face diarrhea, coughing, loss of weight...
- Animals drink and eat less; the diet is deficient and animals become weak.

- Major factors



- Excessive stock density: high density is one factor of improper and uncomfortable housing of animals that cause stress
- Important variations of temperatures: very hot in the day time and cold in the night time: animal become very susceptible to respiratory infections and get stress to adapt to changing environment several times a day

- Movement to a new pen: it causes big stress for animals. For example when farmers move the sow to the farrowing pen, the sow eat very little, is reluctant to stand up and is often constipated.
- Mixing animals and fighting; it is common for pigs at weaning period or beginning of fattening. The farmer wants to make homogenous groups of pigs and mix pigs from different litters. They fight and it causes stress that induce low feed intake and growth



- Inadequate and poor nutrition: feeling hungry, and looking desperately for feed, causes stress



B. Spread of diseases

1. How Infectious Agents are spread?

How the diseases may enter in the farm or in the village? If we know the different ways to spread diseases it will be possible to decrease the risk of contamination of the farm or of the village.

- Sick animals: they spread microbes through
  - Feces
  - Nasal discharge

  It means that during close contact with a sick animal, virus, bacteria, fungi, parasite will likely be transmitted to healthy animal and make them sick

  The problem is that animal in incubation of disease look healthy but they can shed microbes

  Incubation: the time between being exposed to infection and showing first symptoms

  The animals look healthy but shed virus and can contaminate other animals
- People can transport and shed microbes through:



- Footwear are soiled when the farmer walk on the floor in the Live Bird Market, organic matter, feces full of microbes attach the sole and are transported to the house of the farmer and can contaminate his chickens
- Skin especially the hands are warm and humid it is perfect environment for microbes development. When we touch animals or material in contact with animals, our hands transport the microbes shed through nasal discharge, mouth, feces...It is essential to wash the hands with soap to decontaminate the hands



- Vehicles & equipments:
- Because wheels are soiled especially with droppings, feces and organic matter from the farm and can transport microbes from farm to farm
- Equipments like egg trays can be contaminated when coming back from the market or feeders/drinkers when bought in the shop where many farmers meet.



- Pests
- Insects are common vector of diseases; for example mosquitoes transmit Fowl Pox
- Rodents can transport Salmonella, E.Coli and pollute feed and water. They are reservoir of Leptospirosis that contaminate animals and humans



- Water
- The role of water is especially important for Bird flu transmission. Water Fowl like ducks can look healthy but they shed a lot of virus in the ponds. Virus can survive many days in the water and can contaminate chickens and humans when they use water of the pond.

2. Fundamentals of Bio-Security

When we know the main ways of spreading diseases, it is crucial to implement good practices that reduce the risk of the introduction and spread of disease agents. It is Bio-Security.
Of course rules of Bio-Security are easier to apply in semi-commercial farm where animals are kept in premises than in village where animals are often free ranging

- Prevent contamination from sick animals



➢ The risk is high when buying chickens and/or piglets from unknown origin

- It is important to buy animals looking healthy; bargaining animal in bad condition for a cheap price is a bad deal
- Quarantine new bought animals because even looking healthy they can be in incubation of disease. Incubation in general is from 2 to 15 days, and then if you keep animals isolated for 2 weeks, you can check if they are healthy, and if they become sick they will not contaminate other animals in the farm.



➢ The risk is important when using a boar for mating, because we do not know health status of the boar and what farms have been visited before. It is good to promote Artificial Insemination. It safer because the sow has no contact with the boar.



- Cattle can shed eggs of parasites without symptoms. When the farmer buy a cattle it is valuable to de-worm the cow 2 days before moving with specific treatment *(see module parasites).*



- Prevent spreading microbes by people

The best is to limit visiting your farm or premises. Other farmers, VAHWs and veterinarians, owner coming back from the market are high risk people because they visited places where big quantities of microbes circulate.

- Washing hands is crucial because the hand's skin is warm and humid, it is a good environment for microbes survival and development

- Middlemen and/or any outsider must wait at the gate of the farm/house

- VAHWs, veterinarian must change clothes/shoes before/after visiting animals in farms/villages.





- Prevent disseminating microbes by vehicles and equipment

➢ Motorbikes/vehicles coming back from Live Bird Markets, farms for delivering eggs or chicken must be cleaned
➢ No Motorbikes/vehicles can enter the farm/house





➢ Feeders, drinkers bought in the dealer shop must be cleaned and disinfected before use, because many farmers meet in the shop and shed microbes.
It is important to clean and disinfect regularly drinkers and feeders in the farm to prevent microbes to develop in rest of feed







- Prevent pest

➢ **Rodents;** are reservoir and it is important to control population of rats.

➢ **Insects:** population of flies and mosquitoes are closely link with cleaning and hygiene.
- To control population of flies, it is important to control places for flies' reproduction because each adult lay 500 eggs and the complete cycle to produce a new fly is only 8 days. Collecting and drying manure, cleaning spilled feed in pig pens, regular cleaning of feeders and drinkers will be effective measures.
- To control population of mosquitoes it is necessary to cut grass around premises, to dry puddles and to avoid any container containing stagnant water





- In general **hygiene** is crucial to prevent pests, insects and microbes to multiply; all humid and tepid places containing organic matter are good environment.

Cleaning villages regularly demonstrate a decrease of mortality on animals.







- Prevent infected water

When water is pumped from the pond it is necessary to cover the tank and to mix chlorine in the water to destroy viruses and bacteria. The water must be clear and in contact 20 minutes with chlorine to ensure proper disinfection.



3. Disinfection

- What is a disinfectant?

- Disinfectants are chemicals that kill pathogens on contact; they destroy bacteria, virus, fungi. Different disinfectants exist in the markets and should be chosen according their concentration (0.5%, 5%, …) and their efficiency vis-à-vis of what we wanted to do with.

E.g.: **- Iodine** is a good disinfectant, not dangerous but ina but inactive in case of residual organic matter and it is inactivated by sunlight

- Quicklime is caustic to organic matter and can destroy debris and germs. It can be used on carcasses (under wet condition). It is very hazardous.

- How to disinfect



- Only on clean surfaces: dirty surfaces or surfaces with plenty of organic matters cannot be disinfected. The technique of cleaning must be applied.
- Physical removing of organic matter: soil, manure, straw, feed…
- Soaking, washing with soap and brush, rinsing and drying before disinfection.
- Good dosage: This is mostly link with the concentration of the disinfectant and it use.
- Enough quantity: the quantity of disinfectant to be prepared is linked to the surface to be disinfected.
- Proper equipment: sprayer is adequate equipment to disinfect; they ensure good contact of very small drops of disinfectant with the materials to be disinfected.

WARNING: All disinfectants are toxic and hazardous when they are pure.





IV.
Managing health and welfare





Housing animals

Housing animals is a good manner to improve:

- Health; because when animals are not free ranging, they have less chance to be in contact with sick animals, they have less probability to ingest bacteria, virus and especially parasites that can survive and develop in the soil.
- Production; because housing young animals decrease the risk of predators and when animals do not have to walk to find the feed, they save energy. Animal kept in premises can receive well balanced diet and clean water contrary to scavenging animals.

Poultry

- Housing chicks

The main objectives of keeping young chicks in proper premises are:

- Factors increasing mortality of chicks: in the village dogs, cats, sometimes wild animals and motorbikes are a major cause of mortality in young chicks



- Welfare: when chicks are kept in a cage, they are in dry environment, protected against the rain and the wind, they do not misuse energy leading to weakness
- They get enough water to drink and enough feed to eat; they will not face deficiencies in the first at risk period of growing



- To facilitate vaccination; actually it is not easy to catch scavenging poultry
- To decrease risk of diseases because they have no contact with sick poultry and they cannot scavenge in rubbish where Salmonella, Pasteurella...like to develop

- Housing layers

In general layers scavenge but when the clutch is laid, they will brood the whole day; housing layers offer advantages:

- To offer a quiet and shady place to lay and especially layers are not perturbed by cocks



- To provide appropriate nests (Dimensions suitable for a basket or pot; nest should have a 25 cm base diameter, 18 cm high walls, and a 40 cm open top diameter)





- To provide water and feed in the shelter to prevent too much loss of weight during this period
- To protect layers and eggs against predators

- Housing broilers

Normally broilers are scavenging to decrease the cost of feeding and the cost of housing; they will roost in the night time in every place under the house or in the trees.
Providing a rudimentary shelter with perches for the night time can protect them against predators like stray dogs, and it will be possible to collect manure and use it as fertilizer.
Actually for broilers in villages, fencing animals is more realistic than keeping chickens confined because the farmer has to feed them.

- Fencing

The unrestricted free-ranging of poultry is often a problem because of the risk of diseases transmission or contamination in dirty environment (Salmonella, Pasteurella...) and threat of predators.
Fencing limited areas can be realistic issue offering advantages:

- the farmer distribute only complementary feed
- it is easy to maintain good hygiene in the place (no plastic bags and dirty puddles that offer a good environment for microbes

- decrease the risk of contact with other scavenging and may be sick poultry
- avoid that children can play where in area soiled with poultry droppings





Swine

Some villagers let pigs scavenging in order to decrease the cost o feeding; risk is high to be contaminated by sick pigs or dirty areas. Actually pigs spend a lot of energy to search little feed and the growth is dramatically low.
Housing pigs is necessary if villagers want to raise pigs to get income from this activity.

- Housing for mating

  After weaning, sows must have oestrus as soon as possible to prevent feeding sows not producing piglets. If sow are in good body condition they should show oestrus few days (5 to 10) after weaning. Stress and light are important.

  - The place for mating must be bright and a neon until 10 pm is an advantage.
  - The sow must not stay in quiet place; she needs stress and excitation (boar nearby, noise...)




- Housing pregnant sows



➢ Pregnant sows need calm and especially must not fight with other sows. It is recommended to keep pregnant sows in individual cages.

➢ The quality of the floor is crucial because the most important disorder in pregnant sows is lameness due to lesions of hooves, joints and legs. 90% of lameness is due to floors in bad conditions. When standing up and moving is difficult, sows will not eat and drink enough.

- Housing farrowing sow / nest

Design of farrowing pen is crucial for piglets' health and production:

➢ The sow must be comfortable to stand up easily and must have to drink ad libitum



➢ The sow must be contained in a cage, to prevent crushing piglets especially days following the birth. The cage must allow good access to the teats.





➢ Piglets must be protected from cold and air draught; it is important to provide an area well protected with source of warm during the night during the 10 first days of life. It is called the nest
If piglets feel cold, they lose a lot of energy to maintain the body



temperature; they become weak and cannot suck milk more. Cold on abdomen slow down the transit in intestine, E.Coli develop and the diarrhea starts.



- The floor must be dry to prevent microbes to multiply easily; slattered floors are more convenient than plain floors in cement, because urine and feces do not stay in contact with piglets.





- Housing weaned piglets

Weaning time is a big stress for piglets:

- They lose the warmth of the sow body; it is better to provide a source of heat the first week during the night time.
- Many small pens are better than big pens; it is important that groups of weaned piglets are homogenous to avoid harmful fighting, to prevent rivalry for eating and drinking; the smallest piglets will become weaker and weaker.





- To prevent competition, the number of nipples and length of feeders must be enough:
- The floor must be slattered floor to prevent dirt and humidity (good environment for E.Coli development)
- The good size of the pen is 2 piglets/m2

- Housing fattening pigs

Welfare and proper housing are closely linked with good performances of growth:

- It is crucial to ensure good growth that fattening pigs are split in homogenous group: same age, same weight



- The surface is about 1.5 m2/head

- Wall must be enough high (1,2m) to prevent fattening pigs to escape



- It is good to provide a bath, pigs can refresh but the water must be changed daily to prevent microbes develop in the water full of organic matter

- Water is often distributed through nipples; pigs arrive in fattening pen at 25 kg and stay there until 90 kg. Some nipples must be at 30 cm (1 nipple/pigs) high, some at 60 cm high (1 nipple/pigs)



- Housing boar

The pen of the boar request particular care:

- Floor in good condition to prevent any lameness; especially weakness or pain on rear legs impair capacity for mating
- The pen must be in fresh place because hot temperature decrease quality of sperm
- It is important that the boar can move easily, the surface of the pen must be from 6 to 9 m2.



Cattle

In Cambodia cattle are often kept under the house or in small cowshed nearby the house.

- It is recommended to protect the place under mosquito net; actually mosquitoes do not transmit diseases but cattle are disturbed by numerous bites during the night and cannot sleep quietly. General condition is impaired because they do not eat enough during the day time.



- Anyway, cattle need a shady place especially to eat and to ruminate, under the trees or under a roof and a place protected against heavy rain and lightning



- The distribution of grass must be done in adequate container to prevent waste and to offer a good access to feed to each cattle

- To ensure proper handling and safety for farmers and veterinarian, it is a very good idea to build a crush in order to examine animals or to inject medicines.



Feeding animals

Poultry

➢ Feeding

Some farmers shift production to semi-commercial scale and keep the animals confined in premises. They have to feed them because poultry cannot find other sources of nutrients.
They use complete commercial feed or concentrated feed (they mix about 20% of concentrate with local raw materials) or they produce the feed themselves; they mix raw materials with additives like vitamins and minerals and amino-acids.



In all systems it is recommended to feed young chickens until 21 days with commercial feed, to ensure a good start for growth and strong chicks without deficiencies



- Raw Materials

Raw Materials commonly used as complementary feeding for scavenging poultry are:

➢ Rice and rice by-products
It is the most common ingredient used as supplementation: broken rice, boiled rice, paddy, rice bran; it provides energy. Rice bran provides energy and protein (8-12%) and is rich in phosphorus and in vitamin B



- Corn

Corn should be the base of chicken supplementary feeding but it is not common in Cambodia to feed chickens with corn. Farmers must use crushed corn; it is a good source of energy and corn provide 9 to 10% of protein
Corn provide pigments that increase the yellow color of the skin and of eggs



- Banana stems

It is commonly used, but the benefit in poultry nutrition is limited. It is low in protein.



- Maggots

Insect larvae are produced with kitchen and vegetable residues placed in a tank to decompose; to increase the production, the farmer can add poultry droppings in the tank
The tank is protected with a cover during hottest hours to prevent death of eggs; larvae will develop in 5 to 10 days and are collected to feed poultry



- Earth worms

The farmer prepare a substrate to feed worms: mix cow manure, corn stalks, fresh leaves…with water, cover with plastic for good fermentation 2 weeks
Worms are cultivated in containers, under the shade and regularly watered
Worms are harvested after 1 month



- Termites

Straw (mixed with cattle manure) is chopped, placed in clay pots and moistened.
The mouth of the container is placed over a hole in a termite colony under construction
After three to four weeks, a new colony of termites should be established inside the container
Eggs and larvae are used to feed chickens

- Feed requirements

Feed requirements are difficult to estimate and to balance in scavenging poultry but it is standard for semi-commercial farms





➢ Energy

Scavenging and free ranging chickens spend a lot of energy to found feed.
Energy is provided by starch (rice, corn) and by fat (contained in rice bran)

➢ Proteins

Proteins and amino-acids are necessary for good growth and egg production: for example, in semi-commercial farms, broilers from 21 days need 19% of protein in the diet and layers need 16%
Availability of protein is a major constraint; farmers cannot use fishmeal or soybean for small scavenging flocks
Earthworms, maggot, termites, snails (for ducks) and insects are rich in protein
Young grass shoots help to redress the protein deficiency

➢ Vitamins and minerals

The levels of calcium (Ca) and phosphorus (P) in the diets are very low, for scavenging chickens.
Ca and P could be easily and cheaply provided in the form of shell grit (3-4 g a day for a layer)

- Feeders and drinkers

Water and feed must be distributed in feeders and drinkers to prevent wasting, ensure better access to the feed and the water and contain them in clean milieu



➢ 10 layers drink 5liter/day
➢ 50 broilers of 1kg drink 10 liters/day

Swine

- Feeding and stages

In swine the amount of the feed represents the highest cost of raising; it is important to know requirements to prevent deficiencies to obtain best performances of growth and reproduction. On the other hand, giving to high level of nutrients is a waste of money and can have impact on health.

➢ In fattening pigs, the objective is to produce more meat and less fat and to reach slaughtering weight as fast as possible.



Normally the life of fattening pig is divided in stages and each stage has **specific feed** (specific protein and energy content):

- First stage of post-weaning: from weaning (7-8 kg) to 12 kg

Piglets were used to suck milk; during the 1st stage they acquire ability to digest feed like rice bran, corn…this period last 2 weeks

For this transition period is very valuable to distribute post-weaning commercial feed.

For example crossbred piglets need feed with 20% of protein

- Commercial feed for weaned piglets is highly palatable to attract piglets, well balanced to ensure a good starting and contain specific raw materials (milk and soya proteins, extruded corn...) easy to digest.





- Second stage of post-weaning: this period last until the pig reach 25 to 30 kg (about age of 2 months and half).

For example crossbred piglets need feed with 18% of protein

- Growing stage from 30 to 60 kg (age about 4 months and half)

E.g.: crossbred pigs need 16% of protein in the feed

- Fattening stage from 60 kg to slaughter (80 to 90 kg at 6 months)

For example crossbred pigs need feed with 14% of protein

➢ In Breeding Pigs

- Pregnant sows: during the 3 first weeks of pregnancy, farmers must distribute more feed (500g more) because the sow produces the placenta to nourish the embryos.
During the last 3 weeks the fetuses grow a lot and it is necessary to increase the quantity of feed of 500 g/day
The diet is calculated to support production of fat, because the sow will need a lot of energy to produce the milk during lactation and will draw on one's reserves

- Lactating sows: the sow needs more energy and more protein to produce milk. The feed must be distributed at least 3 times a day to push her to eat a lot.
The quantity of feed distributed increase from the first day after farrowing, about 1 kg to reach maximum after 1 week.
The total quantity to be distributed varies with the number of piglets. For example a sow with 6 piglets requires about 5 kg of feed and a sow milking 10 piglets requires at least 6.5 kg of feed.



- Boars: they produce sperm and are often fed with feed for pregnant sows. It is necessary to provide regularly some supplementary feed containing vitamins and amino-acids.

- Feeding and performances

Growth of pigs is closely linked with

➢ The health status: chronic coughing, diarrhea impact a lot on growth. Mycoplasma decrease growth of about 20%
➢ The breed; crossbreeding local pigs with Duroc, Largewhite, Landrace or Maxter boars improve a lot growth and feed efficiency





➢ The feed: protein are necessary to produce lean meat; if the diet is too low in protein and rich in energy, pigs will grow slow and produce fat If the diet is too low in protein and in energy pig will be skinny	

To calculate growth performances, 2 indicators are critical:

➢ ADG (Average Daily Gain) equivalent to the gain in gram every day.
If we want to calculate ADG from weaning to slaughtering, the farmer check the weight the day of weaning: example 8 kg
The farmer check the weight the day of slaughtering: example 82 kg
The gain of weight is 82 – 8 = 74 kg = 74,000 grams
The farmer checks how many days from weaning to slaughtering: example he weaned piglet at 28 days and sell to butcher at 6 months equivalent to 180 days. Duration is 152 days
ADG is 74,000 grams divided by 152 days, meaning Average Daily Gain is about 487grams
This method is easy to implement and the farmer can control if his technique is better; when ADG increase it is indicator of good performance. If he can increase ADG to 550 g/day, he will sell the pig at 82 kg, 134 days after weaning in place of 152 days.

Calculation of ADG and FCR really help to improve fattening management; it is not complicated but pigs and feed must be weighed





➢ FCR (Food Conversion Rate) is the calculation of the quantity of feed to produce pig meat.
The farmer check the weight at weaning and at slaughtering; we calculated already the gain of weight = 74 kg.
The farmer calculate the quantity of all feed distributed during this period; for example 260 kg

260 kg of feed to produce 74 kg of pig; the FCR is 260 divided by 74 = 3.5 If the farmer improve his management of the farm, better breed, better feed, better health he can reach FCR of 3.0. This means that to produce the same pig of 82 kg he will spend only 222 kg of feed. He earns more money

- In small scale farms raising crossbred pigs, expected performance should be :
  - age at weaning: 28 days
  - weight at weaning: 8 kg
  - weight after 1st stage weaning (2 weeks special feed): 12 kg
  - age at 25 kg; 2 months 1/2
  - age at 60 kg: 4 months 1/2
  - age at 80 kg: around 6 months
  - Fat thickness: 15mm
  - mortality from post weaning to slaughtering: 5%

- Performances and feeding system

Farmers use different type of feeding systems according to the size of the flock and cash availability; the impact of the feeding system on growth has been measured by calculating ADG. The pigs have to be de-wormed regularly.

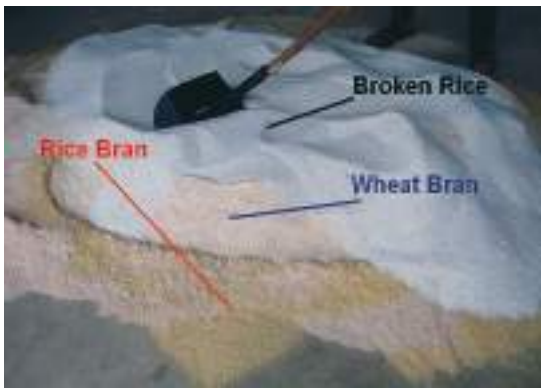
- Commercial feed: ADG = Around 700 g, meaning that pigs grow and average of 700 g every day from the weight of 30 kg to slaughtering at about 80 kg
- Traditional Home Made Feed (waste of kitchen + cooked rice + rice bran) : ADG = Around 300 g,
- Traditional Home Made Feed + Fish Meal (10%); ADG = Around 450g
- Traditional Home Made Feed + Basemix (providing, vitamins, minerals and amino acid Lysine) ; ADG = 600g

Experiences shown that in the same condition and with the same breeds, growth is closely linked with the diet. Better is the diet balance, faster is the growth.
Investment in better feeding creates more benefit for the farmer when he raises crossbred pigs in good health.

- Raw Materials and additives in swine nutrition

- Proteins are necessary to produce muscle
  Raw Materials contain various quantity of protein:
  - fish meal contains 40 to 65% of protein
  - soybean: 40%
  - wheat bran: 12-14%
  - rice bran: 9-12%
  - corn: 9%
  - rice: 6%
  - cassava: only 2%

Preparation of feed for pigs





➢ Amino-acids essential

If amino-acids are not enough, the farmer can give protein, energy, the growth will under normal level. They are 8 essential amino-acids and 4 are essential for growing:

- Lysin: the most important
- Methionin: enough in general in raw materials
- Threonin: 2nd after Lysin-must be add
- Tryptophan: rice provide enough



➢ Energy is fuel for the pig:

Raw Materials contain various quantity of energy linked with the content of fat and starch that are main sources of energy

- soybean and rice bran provide a lot of energy because containing oil
- rice, cassava, corn provide energy because containing starch

➢ Vitamins and Minerals

Vitamins and Minerals are never enough in the Raw Materials for pigs growing fast. It is necessary to buy products often called Premix that provide all required micro-elements: vitamin A, D E, B…minerals: Iron, Zinc, Magnesium… These elements are indispensable to ensure good growth, good reproduction and good health. They must be mixed every day in the diet.



➢ Example of formula to feed pigs from 30 to 90 kg calculated to provide the good level of protein, energy, essential amino-acid, vitamins and minerals:

- 35% of corn
- 10% broken rice
- 40% rice bran
- 10% soybean (cooked)
- 4% Fish meal
- 1% basemix (that provides amino-acid and vitamins + minerals)

➢ Water

The main nutrient for pigs is water; it is impossible to expect good growth or reproduction if the quantity and the quality of water are not sufficient. Average of water consumption is

- Pregnant sow: 30 liters/day
- Milking sows: 45 liters/day
- Growing and fattening: 15% of the weight equivalent to 1.5 liter of water for 10kg of pig



Cattle

- Techniques of feeding in Cambodia

Providing feed for cattle is a major challenge for 6 months of the year and this problem is compounded by labor demand for feeding cattle.

- Grazing
  - on paddy fields,
  - uncultivated land and bunds
  - around the rice field,
  - roadsides,
  - communal grazing land or forests
- Stall-feeding on homesteads
  - "cut and carry" grasses
  - rice straw









- Requirements of cattle

The specific physiology of digestion in cattle show that feed must provide two types of nutrients:

- Nutrients for the microbes in the rumen to produce protein and energy
- Nutrients directly digested by the cattle
- The needs vary
- according to the status of the cattle: pregnancy, lactation, work in the field or fattening
- according to the body weight; a cattle of 150 kg request less feed than a cattle of 300 kg

➢ Water

The lack of water decrease feed intake; a cow of 250 kg needs about 35 liters of water but this quantity increases a lot if:

- the temperature is high
- if the cow produce milk
- it the cattle work
- if cattle are fed with straw rather than with young grasses



➢ Quantity of feed

Animals cannot use the nutrients in the feed if they don't eat enough. The amount of feed consumed is very important

- Low quality forages are not palatable, cattle do not eat enough quantity and cannot get enough nutrients

- Cattle have limited capacity to ingest volume of feed.
If the nutritive content is low, the cattle even eating until full, cannot get enough nutrients

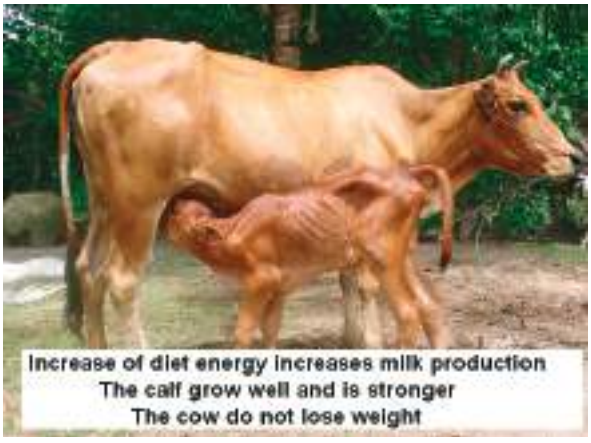


➢ Energy

Energy is needed for multiple purposes:

- Maintenance: to maintain body functions (digestion, breathing, temperature…)
- Pregnant cows: more energy is needed 1 month before delivery when the fetus grow fast

- Lactation: deficiency of energy impairs production of milk. The cow has to draw on one's reserves and become very thin.



- Fattening : the remaining energy can be utilized for body weight gain
- Work: it is evident that ploughing rice field request a lot of energy; if cattle are not well fed during ploughing rice field, they lose condition and work slowly

Energy is provided by

- cellulose: forages and straw contain a lot of fiber; high quality forages provide good supplementary energy
- starch is high in cassava root, corn and bran
- fat contained in rice bran

➢ Proteins: Crop Protein (CP)

The supply of protein to ruminants is specific and come from 2 sources:

- proteins contained in the feed like young shots, foliages: grass hay contain 7% of CP, King Gras: 8%, Leucaena leave: 18% and Cassava leave: 24% of CP





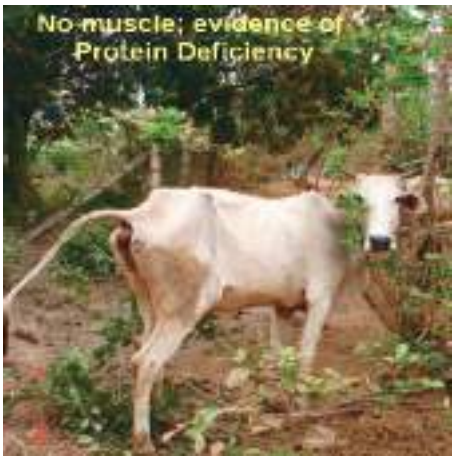


- micro-organisms in the rumen: production of billion micro-organism in the rumen are digested and provide protein to the cattle. Cattle can use as well urea that is transformed in ammonia to feed micro-organism. Urea is substrate to produce proteins only in ruminants.

The needs vary

- For maintenance: forages (CP concentration of 7%) are enough for cow protein requirements
- For lactation: milk contains a lot of protein and it is difficult to supply in the feed if distributing only forages and straw; one part of protein comes from the feed and often one other part comes from the muscles of the cow: the cow lose condition
- During gestation: fetus grows mainly the last month of gestation; it is important to increase protein content in the feed during this period by distributing concentrate or rice bran or straw treated by urea (equivalent 7-12% CP vs. straw equivalent to 2-4% CP)

- Growth: muscles contains more than 50% of CP, it is clear that growth requires a lot of protein



- Work in the field: if cattle are fed only with forages they cannot eat enough to replace energy and protein they lose during the work in rice field. They must receive supplementary concentrate feed; if not, they lose condition

➢ Minerals

Minerals make up a small portion of cattle's diet but cattle require numerous minerals (macro and trace) for maintenance, growth, and reproduction

- 7 macro minerals: Ca, P, Mg, Na, K, Cl and S
- 18 trace elements are necessary, Fe, Cu, Co, Zn, I, Mn, Se…



Soil and plant mineral compositions affect cattle mineral status. When cattle are deficient in minerals, we can observe discoloration of hairs, problems of reproduction. Farmers should put Mineral Blocks at disposal; cattle will lick everyday to get enough minerals.

➢ Vitamins

Vitamins are necessary to efficiently utilize other nutrients

- Vitamin A is the most important in cattle; it is essential for normal growth and reproduction, maintenance of skin, and bone development. High-quality forages and leaves provide enough quantity but not the straw
- The group of vitamins B is synthesized in the rumen

- Preparing a feed supplement

It is clear that during lactation, intense work or recovery of body condition for skinny cattle, feeding with only forage of various qualities is not enough.
The farmer can purchase high value forage made of King Grass, Guinea Grass, Napier Grass and some foliages like Erythrina and Leucaena



The other technique is to produce a Home Made Concentrate (HMC) that will provide a good quantity of nutrients in a small volume of feed.

➢ One recipe of HMC could be:

- rice bran 12 kg
- dried cassava chip 7 kg
- cassava hay 3 kg
- urea 0.3 kg
- salt 0.25 kg
- palm sugar 0.25 kg.

- Distribution of 200 g a day improves diet of 200kg cattle and 500g a day can support hard work and milk production. 1 to 2 kg a day will be distributed for about 6 weeks for fattening before selling to the butcher.
  Better to distribute half of the quantity in the morning and half in the evening
- Production of cassava hay (25% of protein)
  - Planting cassava on ridges at spacing 40, 60 cm between stem and between rows
  - Cassava will be harvested first at about 3-4 months of growth; Cassava can be harvested after the first harvest at subsequently two-month interval to make cassava hay from re-growth, hence at least 4-5 harvests can be done for the whole year.
  - After harvesting, cassava leaves are dried (1 to 2 days) to make cassava hay
  - Cassava contains a toxic called Cyanide Acid; drying reduces the level of HCN more than 90% and leaves are safe for feeding.
  - Sun-drying reduces moisture of cassava from 90% to 15%; cassava leaves can be conserved many weeks









- Preparation of the HMC
  - All components must be mixed carefully by hand
  - Dissolve palm sugar with water and then sprinkle into the pile and mix well.









- Straw treated by urea
  - This technique aims at increasing the nutritive value of the rice straw.
    Urea is commonly sold as fertilizer and is mixed with water with the straw. Ammonia is released through urea degradation done by the action of micro-organisms that are normal inhabitants of straw.
    - Ammonia will improve the quality of rice straw: dissolve the strong fiber, straw is more digestible
    - Ammonia increase the content of nitrogen in the straw and will support good development of microbes in the rumen
    - Treatment with urea increase the nutritive value and the feed intake: cattle eat more straw

- Production of Straw Treated by Urea

  Key factors

  - quantity of urea: 5 kg to treat 100kg of dried rice straw
  - moisture content: 1 kg of urea is mixed in 10 liters of water
  - treatment period: the straw can be distributed after 2 weeks of fermentation in dry season because the temperature is more than 30oC but we have to wait 3 weeks in rainy season because it is colder and the fermentation run slowly
  - hermetic sealing: the straw must be covered to avoid air to be in contact with the straw



















- Consumption of Straw treated by urea

  - A cattle of 300kg can eat 6kg/day
  - 2 cattle will eat 12 kg /day
  - Duration of fermentation is 3 weeks; the farmer must prepare the quantity to feed cattle during 3 weeks = 12 kg x 21 days = 252 kg
  - the volume of 100kg of straw treated by urea is average 1 m3. The silo must be more than 2.5 m3.
  - when the cattle eat the straw in the silo1, the farmer prepare the silo 2. When the silo 1 is finish after 3 weeks, the silo 2 is ready to be opened. When the cattle start to eat the silo 2, the farmer prepares gain the silo 1...

To feed the cattle with Straw Treated by Urea, the farmer must construct 2 silos of 3 m^3.









V. Handling and examination of domestic animals





Handling and examination of animals

- must be safe for the farmer and the veterinarian,
- must not cause stress to animal
- must be professional to identify and treat diseases

Poultry

- Examination of the flock

➢ **General aspect**

- Active chickens with bright feathers and good body development are signs of good health
- When dead chicken are found in good condition, the VAHW must immediately suspect acute disease killing chicken in short time: Avian Inflenza, ND,...





➢ **Posture**

- Chicken must be erect, active, alert
- When chicken stay apart, showing dullness and are easy to catch, they are likely sick





➢ **Walking**

- Backyard chicken need strong legs to scavenge
- Lameness: scavenging chickens often have injuries causing lameness; they cannot scavenge and find enough feed. Without proper treatment, chicken will lose condition and are easily caught by predators





- Close examination
  - **Handling (pictures have to be changed)**



During observation of the flock it is possible to identify sick animals: weakness, depression, lameness...

It is now necessary to catch sick chicken and to handle properly to make close examination

This examination can highlight some clinical signs that help to diagnose different disorders

- **Examination of the head**
  - Comb and wattles must be red, bright, waxy
  - Eyes must be shiny, bright alert
  - Nostrils are clean, no discharge and no breathing sounds



- **Examination of the breast**
  - To check if the breast is full or skinny; it is key indicator to detect insufficient feeding or chronic diseases (sometime difficult to see in layers because the feathers are well developed)
  - To see skin bruising



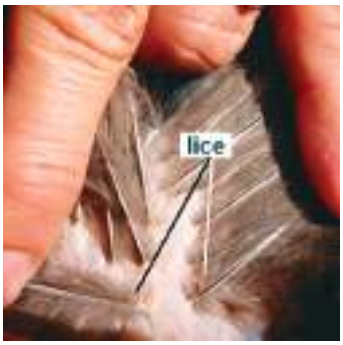
- **Examination of the vent**
  - to see signs of diarrhea
  - to see parasites





➢ **Examination of the skin**

On the body and on the legs
- to see injuries of fighting
- to see stains
- to see crust and follicles
- to see parasites





Swine

- General examination

➢ **Active**: normally when we arrive near the pen, pigs stand up because they are very curious. If the group of pigs stay sleeping, gathered in a corner of the pen, it is a sign of disease





➢ **Body condition**: homogenous pigs sign good management and good health
Under-developed pigs in one pen sign chronic diseases, or not enough feed





➢ **Moving**: it is important for the veterinarian to check if pigs can move normally. All pigs in the pen must be forced to stand up to diagnose reluctance to stand, painful legs...





- **Feed intake**: observation of the feeder show if animals eat well or not. When animals are seriously sick they stop to eat





- **Coughing:** when we arrive near the pen, pigs stand and move and it provokes coughing especially in the morning. If the pigs stay sleeping we cannot appraise coughing

- **Feces:** diarrhea can be seen on the floor, or under slattered floor (important to check)

  Constipation behind pregnant sows is important as well





- Close examination

Individual examination in pigs is not very easy because they are heavy, they move fast

- Checking temperature is essential; high temperature is sign of infection when pigs stop to eat. Temperature must be checked in the morning. Normal temperature is below 39°C but until 39.5^{o}C, it is not clear and must be checked again later.

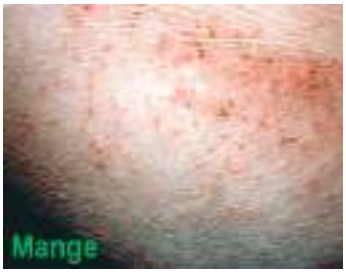


- Examination of the **eyes**:
  - eye discharge is common in CSF,
  - swollen eyelids is typical of edema disease





- Examination of the **skin**:
  - to detect hemorrhages under the skin (CSF),
  - red and raised square areas (Erysypela),
  - spots and crust (mange)...





- Examination of the **snout;** to see nasal discharge, blood or pus in severe respiratory diseases and to detect vesicles that appear in case of FMD





- Examination of **vulva** and the floor behind the sow must be done to identify:
  - Some vulval discharge, sign of cystitis or endometritis.
  - Swelling of the vulva is a sign of oestrus





- Examination of **udder** is easy when the sow is kept in farrowing crate. It is necessary to detect
  - MMA, mastitis
  - any lesion of the teats





- Examination of the **penis** and testicles of the boar:
  - to detect injuries or infection
  - to check if testicles are supple, without adherence and with equal size





- Examination of the **anus** allow:
  - to identify which pig has diarrhea in a group of pigs
  - to see prolapse of the rectum





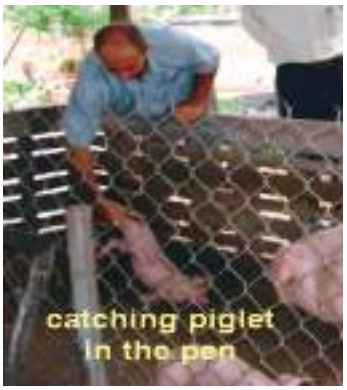
- Examination of the **feet**; when sow lay down, it is possible to observe hooves:
  - to see lesions of foot rot causing severe lameness
  - to see lesion of FMD

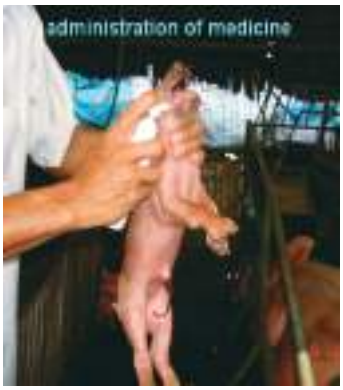




- Handling pig

  - **Piglets**: piglets are caught in the pen by one rear leg and are contained in various manners for injection, castration, teeth clipping...
    Piglets are not heavy but they move vigorously





  - **Fattening pigs**: in general farmers try to inject pigs without containing them; it is a cause of wrong injections. Some manipulations require the pig to be immobile and the farmer must use a pig catcher.
    Pig catcher can be only a strong rope with a slipknot. Actually when we catch the superior jaw, the pig strongly pulls backwards and if the rope is strongly handled, he cannot move more.







  - **Sows**: the pig catcher can be used for sows as well, but when sows are kept in individual crates, quite all manipulations can be done without catching them



Cattle

- General examination

➢ **Body condition:**

- skinny condition can be sign of feed deficiency, chronic disease or parasite infestation. Skinny cattle cannot recover easily and rapidly
- On the contrary, when an animal is sick and in good body condition, we must suspect acute disease





➢ **Skin aspect**:

- It is important sign in cattle; rough hairs, discoloration, crusts...are due to vitamins and minerals deficiencies.
- These cattle are weak to fight any infection.
- Photo-sensibilisation is common in Cambodia and easily identifiable





➢ **Moving**:

- first, the veterinarian must observe the cattle standing up to identify weakness (due to deficiency after delivery for example) or non-coordination caused by nervous diseases (like botulism)







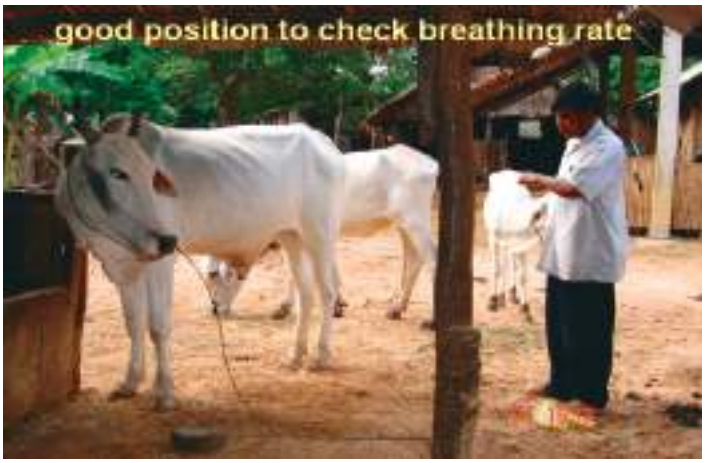
When the cattle walk, it is easy to see lameness:

- the animal stand but paddle from foot to foot,
- the cow inclines to lie down after few minutes,
- the animal refuse to prop up on one of the legs



➢ **Breathing**:

- In normal breathing thorax and abdomen move together with a rate/ minute is 10-20 for adult.
- In case of high temperature or respiratory disease, the rate increase clearly; the mouth can be open
- Coughing is easier to detect when the animal move.



➢ **Feces**:

Examination of feces gives information:

- color from black to greenish depending on feed and liver functioning
- presence of blood or mucus like in Liver Fluke
- diarrhea caused by too much young grass or parasites
- constipation when cattle eat not enough because of high temperature









- Close examination



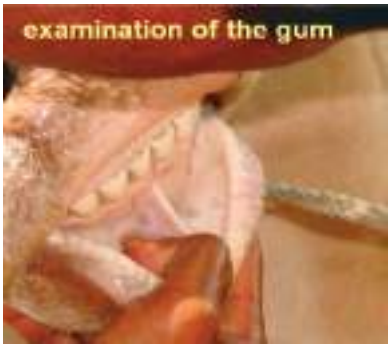
  - Check of **temperature**: 38 to 39°C for adults and 39 to 40°C for calves; high temperature in general is sign of infection.

  - Examination of the **eyes** allow to detect:
    - infection of conjunctiva that cause eye discharge
    - injury of the eye; often the eye stay closed
    - to assess the color of conjunctiva; pale conjunctiva are sign of anemia and often seen in Liver Fluke





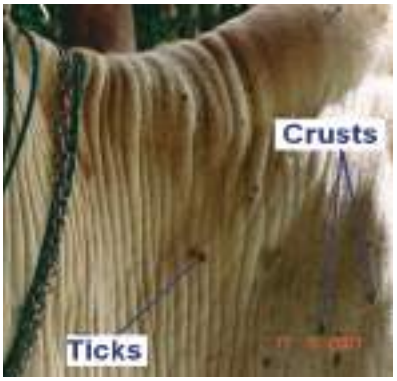
  - Examination of the **mouth**: the muzzle and the mouth must be examined especially in case of abnormal salivation; it can be due to FMD lesion on the gum and the tongue or due to foreign body in the mouth like a piece of wood.



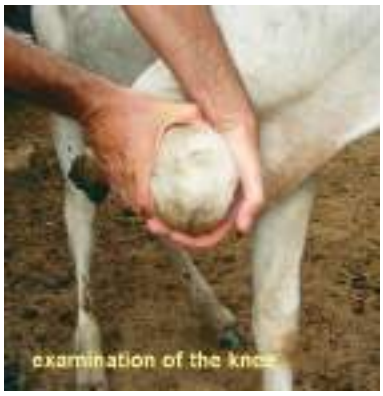


  - Examination (close) of the **skin** is necessary to:
    - see external parasites like ticks
    - observe crusts that can be caused by mange or other irritation
    - evaluate wound





- Examination of the **legs**: it is important to examine the sole, the hoof and the joint to know the cause of the lameness







- Examination of **udder** and milk: when the calf do not suck the milk or have diarrhea or do not grow well, it is necessary to examine udder;
  - Firstly to check if teats are not too big or malformed
  - Secondly the veterinarian must check if the udder is hard and if the milk is expelled normally to diagnose mastitis.







- Examination of **penis and testicles**:
  - Length of penis must be enough; it should come almost between the front legs during a full erection and extension.
  - A bull with a too short penis will not be able to breed.
  - The testicles should be freely moveable within the scrotum and should be symmetric



- **Rectal examination**:
  - This technique is useful to confirm if the cattle is pregnant (until 4 months because later uterus is heavy and plunge in abdomen)
  - With some training this examination allows to recognize cysts on the ovaries.

- Handling

➢ Handling a calf

One person can maintain a new born calf but two people are necessary to handle a 6 months calf

➢ Handling adult

- Traditionally farmers attach the cow with a rope to a tree, but it is absolutely not safe and not easy to manipulate the animal. This technique can be used only for a single injection or quick manipulation



- Handling the head strongly with catching the nose can limit movement but this technique can be used only with quiet and not too big animals



- Many rudimentary system are used to restrain cattle





- The best technique to handle safely cattle is to build a crush. The investment is limited, the crush can be shared by several farmers and farmers and veterinarians will not hesitate to manipulate cattle for routine care.





➢ Lying down a cattle

A rope of about 10 meters is necessary to force adult cattle to lie down in safe and non-stressful manner





VI. Practical procedures, emergency assistance and castration





Chickens

- Administration of medicines

➢ **Eye drop**: often use to administrate vaccine. The vaccine is mixed in colored solvent (usually dark blue) to see clearly if the drop is really in the eye of the chick



➢ **Injection**

- Are used to inject vaccines or other medicines like antibiotic
- Injection are made in the muscle of the breast
- Actually some medicine can be toxic when injected in the leg because going directly to the kidneys



➢ **Scarification**

This technique is especially used to administrate the vaccine against Fowl Pox in the wing web



➢ **In the water**

Vaccines, antibiotics, vitamins can be administrate in the water.
To make sure that all animals will receive the drug, it is better to take out the water for few hours, then when the water mixed with the product is distributed, the chickens are thirsty and drink all



➢ **In the feed**

Some medicines are not soluble or sometimes when farmers use medicines for human. It is more convenient to mix in the feed. But never forget that sick chickens continue to drink but stop to eat.

- Autopsy

All autopsies have to be done under supervision of Veterinarian Government Officer

A necropsy is an examination of a dead animal; the objective is to see lesion of organs to help to diagnose diseases**.** The only tool necessary to perform a necropsy is a sharp cutting
After autopsy the carcass must be burned or buried: do not through away, it can spread disease

Caution: Although few poultry disease can infect people, it is recommended to wear disposable plastic gloves during the necropsy procedure or to wash carefully hands with soap after autopsy

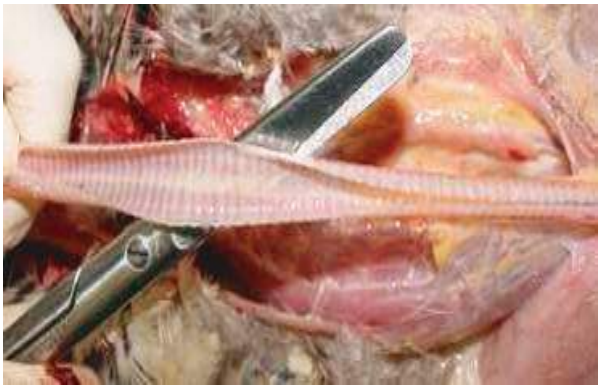
In case of suspected case of Avian Influenza (sudden high mortality) it is recommended not to make autopsy and to send carcasses to NaVRI

Necropsy procedure must be followed to be sure that all organs are checked; very often autopsy comes down to a rapid and superficial look that is not enough to diagnose diseases

➢ Inspection of the head

- **Eyes;** inflammation, unusual reddening is sign of respiratory disease, eyelids sticking together are seen in Coryza and important watery discharge in Avian Influenza, Infectious Bronchitis. Marek disease causes tumors resulting in irregularly shaped pupils and blindness (Marek Disease)







- **Inside the mouth;** pus or mucus are sign of respiratory diseases: Coryza, Mycoplasma, Fowl Cholera or Infectious bronchitis**.** Membranes and ulcers are observed in the wet form of Fowl Pox



- Inspection of the neck **Trachea;** the larynx and trachea are cut to observe clear exudates in Infectious Bronchitis**,** mucus with blood in Avian Inflenza, Laryngo-tracheitis and Newcastle. It is common to discover red worms in scavenging chickens.



- Inspection of the muscle The skin overlying the abdomen and breast (from neck to cloaca) must be removed to see emaciated muscles in case of chronic diseases or insufficient nutrition and bruising: it is hemorrhages caused by trauma, or infection with Staphylococcus or by Gumboro when hemorrhages are seen on the thighs



➢ Inspection of abdomen

- **Air sacs** and the liver appear immediately after cut of abdominal muscles; when air sacs are normal, it is difficult to observe because it is only a very thin transparent membrane.

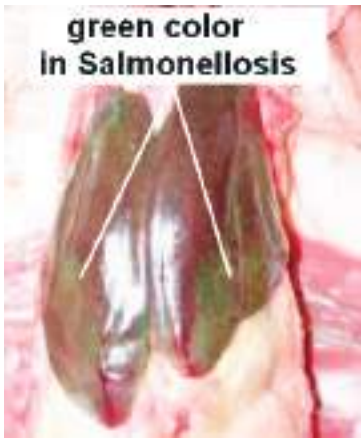


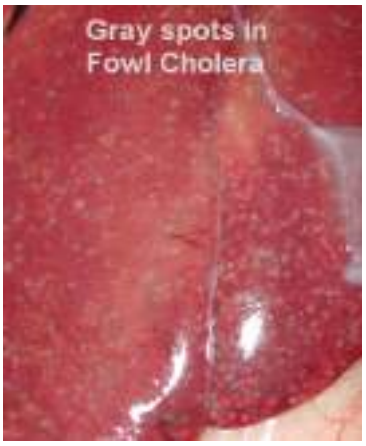
- In case of Colibacillosis, Mycoplasma or Infectious Bronchitis, the membrane becomes cloudy, covered by mucus or pus.





- **The Liver** is large and hides organs in abdomen; a green discoloration near the gall bladder is normal. Many lesions can be identified: swollen and green color in Salmonella, swollen with grey areas in Fowl Cholera, grayish nodules in Marek disease or covered by fibrin in case of Mycoplasma and Colibacillosis







After removing the liver, it is possible to continue inspection of other superficial organs

- Inspection of the spleen that become enlarged in Samonellosis

- Inspection of digestive tract
  - General inflamation of intestine is observed in Salmonellosis



- The proventriculus, the gizzard, intestine and ceca are cut

Hemorrhages are seen in the gizzard in ND, Ascaris are common in scavenging chickens and ceca are full of blood in case of Coccidiosis

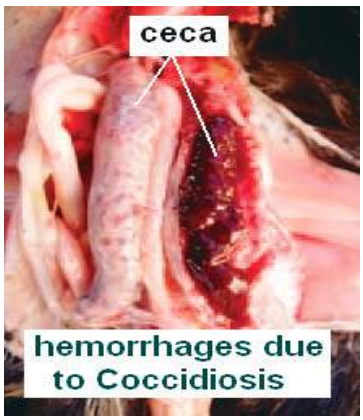








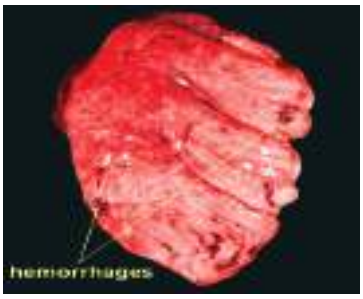




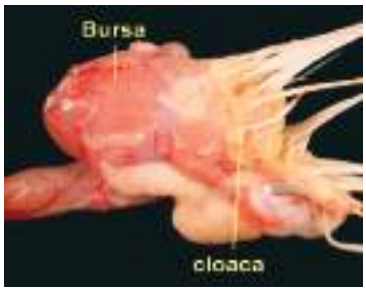
When all these organs are removed, deep organs are examined

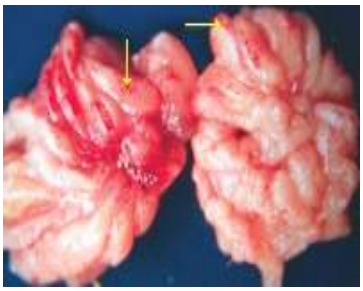
- **Lungs**, which are attached to the ribs are pink and become grayish in Salmonellosis, bloody in Fowl Cholera and Avian Influenza





- **Bursa of Fabricius** is a dorsal diverticulum of the region of cloaca that is found swollen with hemorrhages and cheesy content in Gumboro disease





Swine

- Administration of medicines

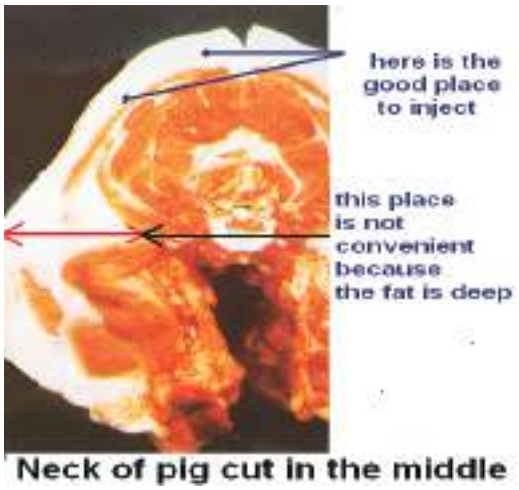
➢ Subcutaneous injection



- For piglets in post-weaning it is easy to inject under the skin in the neck, in front of the shoulder
- For sows, the fat in the neck do not allow injecting in this area

➢ Intramuscular injection

The problem is the thickness of the fat especially in sows; it is important to select the place where the fat is not too deep and it is crucial to use needle enough lengthy.





- When medicines are injected in the fat and not in the muscle, the product is not well distributed in the blood stream because vascular network is not developed in the fat.
- When medicines are injected in the fat they can cause necrosis and abscess.









- Intravenous injection
  - This site of injection is at the back of the hear, e.g. of Ocytocin in sows showing MMA.
  - It is important to know the technique because, injecting 0.5cc in the blood provoke milk ejection after few seconds but injection of Ocytocin in the muscle is ineffective for milk ejection.



- Oral administration
  - This technique is used with piglets to administrate antibiotic against diarrhea that go directly in intestine or Toltrazuril to prevent Coccidiosis.
  - Medicines are mixed in palatable clay in a bottle with a pump that deliver the exact quantity to the piglet



- Mixing in the feed
  - This way is very convenient to treat pigs group or to implement long treatment, for example respiratory diseases requested 7 to 10 days of antibiotic.
  - However often sick pig do not eat: it is necessary to inject medicines
  - Or they eat less than normal. If pig eats half a normal diet, the quantity of antibiotic is only half of dosage needed; the farmer must double the dose of medicine in the feed



- Mixing in the water
  - It is interesting technique because sick pigs stop to eat but they continue to drink.
  - Its is necessary to make sure that pigs will drink all the water mixed with medicines
  - It is important to check if medicines are soluble in water.



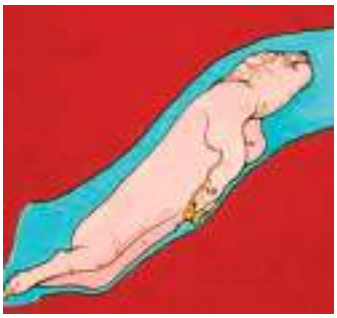
- Assistance to delivery

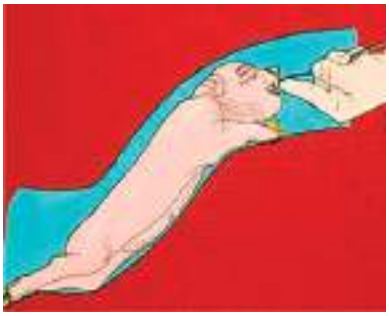
  - Before farrowing: it is important to identify signs of imminent farrowing:
    - 10 days before delivery, mammary glands enlarge and become firm and swell the vulva lips swell.
    - 8-12 hours before delivery, the milk arrives when pressing teats. 30 to 90 minutes before delivery, passage of blood tinged, oily fluid and meconium
    - In normal farrowing: 30 to 90 minutes after release of meconium, delivery starts, the first piglet appears
  - Identify difficult delivery
    - The last piglet is born more than 40 minutes before
    - The sow shows fatigue and rapid breathing
    - Common causes are:
    - Uterine inertia: inject 1 cc of Ocytocine and wait for 10 minutes; contractions should start again and the next piglet will be expelled
    - Improper presentation of piglet or too big piglets : manual investigation is required; by smooth palpation the veterinarian will appraise the position of the piglets and of the legs

    After investigation, antibiotic like TMP + Sulfa must be injected for 3 days to the sow



  - Management of improper presentation
    - Shoulder stuck: extend the legs without damaging uterus
    - Breech: hook index finger under the hock of hind legs/ extend the legs





    - Assist when piglet is too large: grasp head with finger and use a snare around the neck



  - Expulsion of last piglets
    - If the litter is large, more than 10 piglets the sow should be tired
    - Contractions will decrease
    - Piglets will be weaker because they stay to long in birth canal

  It is easy to save one or two piglets when checking assisting the final phase of delivery



➢ The placenta is usually delivered 2-4 hours after the last

The best is to inject systematically 2cc of Ocytocine in the muscle when the delivery is completed to make sure that no piglet remain in uterus and that all the placenta is well expelled

- Piglet care program

This program showed its efficacy to increase survival of piglets and then increase the number of piglets weaned



➢ Check breathing

- the mucus in the mouth and in the nostril must be removed to allow easy breathing
- When piglets are weak they will recover some vigor after drying and rubbing



➢ Colostrum intake

Colostrum is the first milk and excreted only few hours

- It is full of energy and antibodies that will protect the piglet against diseases
- Just after delivery strong piglets run to suck but weak piglets wander from sow
- It is crucial to ensure that all piglets can suck colostrum after birth



➢ Nest for piglets

Preparation of the nest is essential

- Piglets are cold especially in the night time; they lose energy and become weak and cannot go to the nipple and suck
- Abdomen is cold, E coli multiply and they get diarrhea



➢ Prevention program

- Against **infections**: microbes, especially Streptococcus have many opportunities to contaminate the piglets during the first day of life: through umbilical cord, through lesions of gum after teeth clipping and wound of tail docking

Infection can provoque septicemia, arthritis…

- Against **anemia** : The milk do not provide enough iron for piglets; it can cause anemia, poor appetite and slow growth risk of anemia
  Iron supplement must be injected in the neck the second day of the life and one more shot 7 to 10 days later



- Against Coccidiosis that provoke grey diarrhea when the piglet reach 7 to 15 days old; this diarrhea is difficult to treat; piglets do not die but are in very bad condition at weaning
  The treatment is only preventive and must be done with Toltrazuril, 3 days after birth



- Umbilical cord care
  - Objective is to prevent microbes to spread through the umbilical cord
  - Disinfection: umbilical cord must always be soaked in iodine as soon as possible
  - Better to cut and ligature the cord after disinfecting with iodine because sometimes it is bleeding









- Teeth clipping
  - prevent injuries during fighting among piglets
  - It prevent damage of the teats when piglets suck
  -
  - Must be done before 3 days
  - It is important not to damage the gum



- Tail docking

It reduces tail biting by other pigs and infections when piglets are older
  - quickly cut half to 3/4 of the tail
  - disinfect the tail with iodine
  - disinfect scalpel with iodine

This must be done before 3 days of age







- Castration of piglets
  - Castration is best done when piglets are about 7-10 days of age.
  - Proper technique and adequate hygiene are crucial
  - Piglets with inguinal hernia cannot be castrated

















- Artificial insemination

  In the next years Artificial Insemination in pigs will develop because it is the best way to import good genetic in the village and to decrease the risk of diseases transmission when the boar travel from farm to farm.

The technique to prepare doses of semen is made in AI center because it requires experience and equipment. Insemination of females can be done by veterinarian, VAHW or any farmer trained few hours.



- Collection of the semen
  - Boars are trained to jump on a dummy sow that stands for a sow; it is often made in wood and it is heavy to support the boar's charge.



  - When the boar is on the dummy sow and excited, the technician catch the penis and disinfect it.
  - After he start to massage the penis few minutes until the boar start to ejaculate
  - The sperm is carefully collected in a special glass with a filter to eliminate dirt and solid part of the sperm (it is called "tapioca")







- Preparation of doses of semen
  - The technician check the quality of the sperm (concentration of spermatozoids and motility) with a microscope
  - The sperm is diluted with a product called BTS which contains nutrients to feed sperm and allow long conservation and antibiotic to prevent contamination of sperm by bacteria
  - After dilution, the semen is packaged in doses of 100ml that contain approximately 1 billion spermatozoids









➢ Transport and conservation of semen
- The semen can be conserved 2 days in AI centers, in specific refrigerator which maintain stable temperature of 16oC
- Transportation from the AI center to the farm must be done with ice to ensure cold temperature but sperm must not be in contact with ice

➢ Insemination of gilts and sows
- The first step is to detect the proper period to inseminate; the farmer must detect when the sow is immobile
- Gilt must be inseminated 12 hours after detecting immobility and sows 24 hours after immobility.
- It is recommended to make a second insemination around 12 hours after the first one



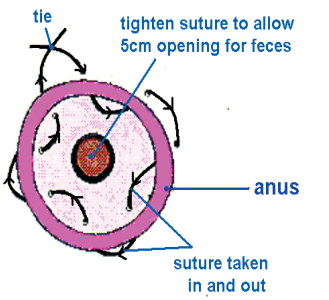




- Practical procedures

➢ Prolapse of the rectum
- Often the prolapse is cannibalized by other pigs: the pig must be isolated in individual pen
- Replace the prolapse and retain it by a purse string
-



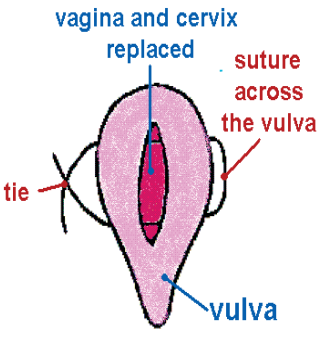


Technique to make a purse string suture when the prolapse is replaced

➢ Prolapse of the uterus
- In fact it is prolapse of the cervix; with advanced pregnancy and increased abdominal pressure the tissues are squeezed out through the vulva

Replace the prolapse and apply a suture across the vulva. Leave 25 cm overlap in a bow not too tightly so that it can be loosened easily if farrowing.





Technique to apply the suture

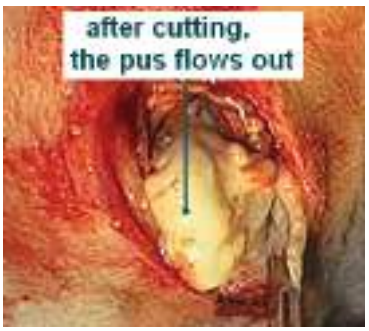
- Hernia
  - Common hernias in pigs are abdominal and inguinal hernia. The weakness of the muscles around the navel cause the umbilical opening not to close properly and the intestines protrude.
  - If the hernia is more than 30 cm of diameter, better to slaughter the pig. Anyway, pigs with hernia never grow well
  - Do not try to implement surgery



- Treatment of abscess
  - The abscess can be released once the content is fluid. To make sure, a clean needle is inserted in the softest part of the lump and with the syringe, a yellow creamy liquid is pumped
  - The abscess must be cut with a sharp blade at the bottom, through the hole, flush with running water, 2-3 times and after that iodine. Amoxicilline should be injected for 3 to 5 days (not in the area of abscess).







- Ear hematoma
  - Pigs may develop hematoma from shaking their head because of mange or ear infections
  - The hematoma will resolve by itself within 3 weeks.
  - It is not necessary to implement treatment except mange treatment in case of ear mange.





Cattle

- Administration of medicines

Like for all injections, it is important to use clean syringe and needle





➢ Sub-cutaneous injection

- Medicine must be injected under the skin; this technique is used for injection; e.g. Ivermectine and FMD vaccine

➢ Intra-muscular injection

- It is the most common route of administration.
- It must be done smoothly because if the cattle must be injected several days, animal must not be afraid of the syringe
- Products like Long Action antibiotics are oily and often volumes are from 20 to 30ml: it take time to inject properly the whole dose; animals must be handle safely











- Intra-venous injection
- This route of administration can be used to inject big volume like, to have very quick response to injection



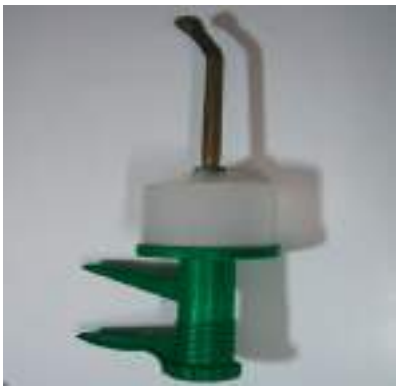
- Always check the medicine if the intra-venous route is allowed or not
- This technique require proper handling



➢ Oral treatment
- This technique is used to administrate de-worming drugs or for traditional medicines
- The objective is to prevent wasting by spitting out
- This technique must be implemented smoothly to prevent the product to go in the trachea and in the lung especially when administrating big quantities







➢ Intra-uterine medication

After delivery, in case of retained placenta, the veterinarian will remove it; but in general, pieces of placenta remain in the uterus and cause infections

Placing 2 or 3 boluses (big tablets of 10g) of antibiotic (often TMP+Sulfa) will prevent infection; these infections called endometritis are cause of repeat breeding and infertility



➢ Intra-mammary treatment
- It is not yet common in Cambodia to use intra-mammary medicines
- The advantage is to deliver antibiotic directly in the udder, in cisterns and alveoli to better fight infection causing mastitis
- This technique is especially used in dairy cattle



➢ Administration of eye drop

In case of

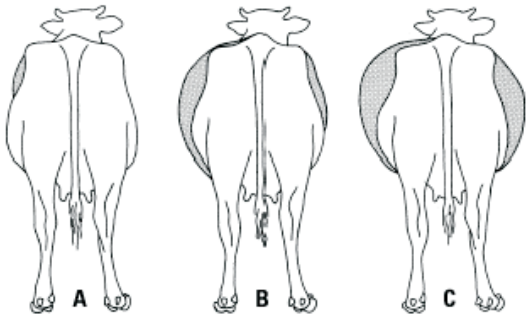
- important eyes discharge
- eyes becoming white
- close eyes

It is necessary to put eye drops containing antibiotic (e.g. gentamycine) to speed up recovery and to prevent the eye to become damaged

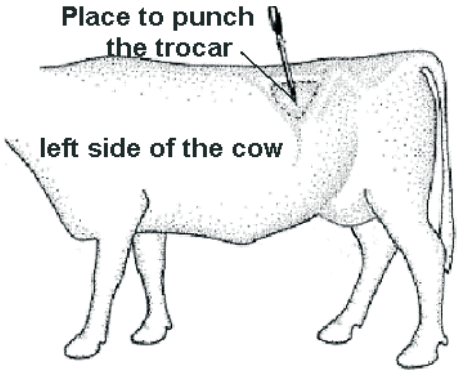


- Using a trocar in case of bloat

- Bloat can develop when too much gases are produced when grazing young wet grasses or if the cattle cannot eruct gases; foam develop in the rumen or foreign body stuck in esophagus. Some toxic like urea provoke severe bloat.
- Bloat can be mild (A), moderate (B) or severe (C).



- In case of severe bloat, gross distension of both sides of the rumen is evident, the animal may breathe trough the mouth and the tongue protrude. The cattle will die.
- At this stage it is necessary to make an opening in the rumen with a trocar or a knife
- This action will result in an explosive release of ruminal content and marked relief for the animal





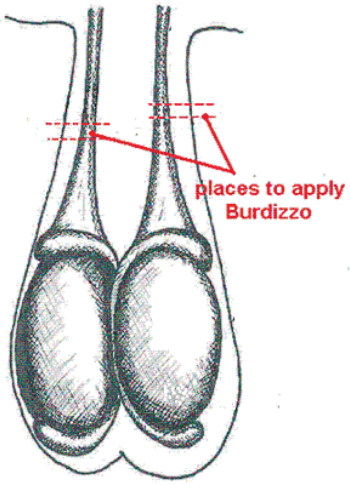




- Castration of male

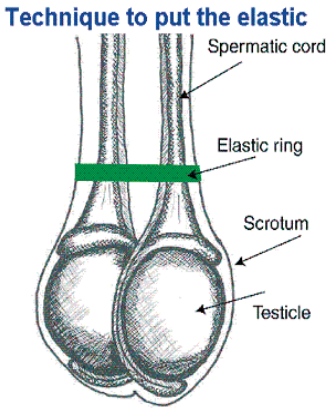
Castration can be done at any age up to 12 months but it is better to do it when animals are very young, before 2 months.

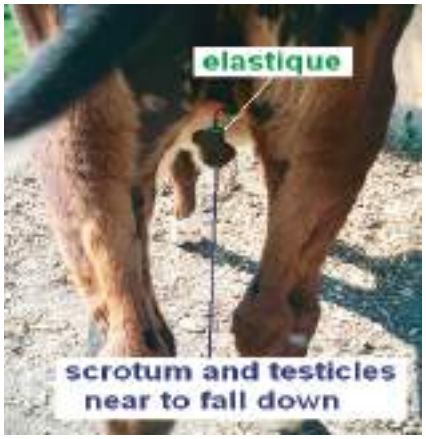
- Burdizzo
  - The Burdizzo crushes the blood vessels, interrupts the blood supply to the testicles and thus kills the testicles
  One spermatic cord must be clipped at a time; it is important to clip the 2 cords at different level to maintain circulation of blood in the scrotum





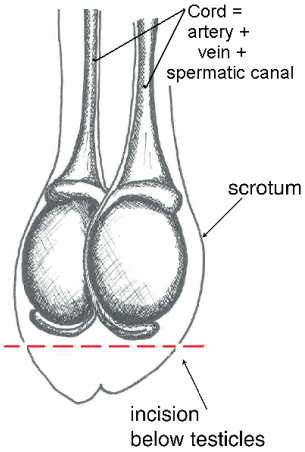
- Rubber rings
  - Elastic band castration cut off blood supply to the testicles: in time the scrotum and testicles fall from the body
  - Must be used only in calves less than 3 weeks of age
  - Calves must be vaccinated against tetanus and blackleg before castration





- Surgical castration
  - Before the operation, it is important to wash the hands, to boil instruments and to clean and disinfect the scrotum with iodine
  - A sharp knife is used to remove the lower third of the scrotum otherwise it will not drain well
  - Pull testicle through the incision, cut the white membrane and pull it away to separate the testicles; the tough cord contains the artery, veins and spermatic cord

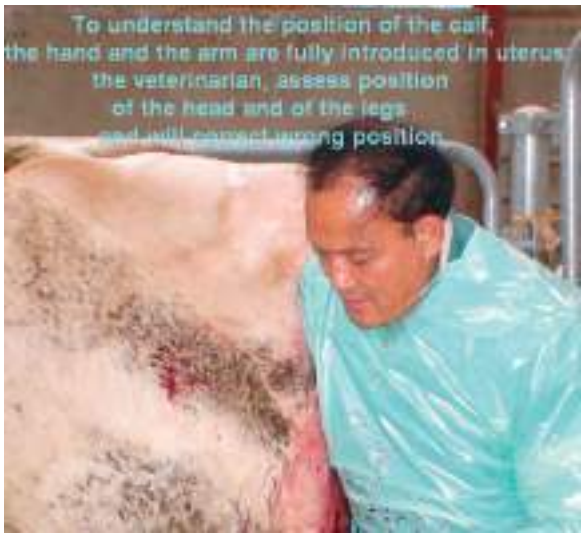
In calves pull the vessels until the strand breaks







- Assistance to delivery



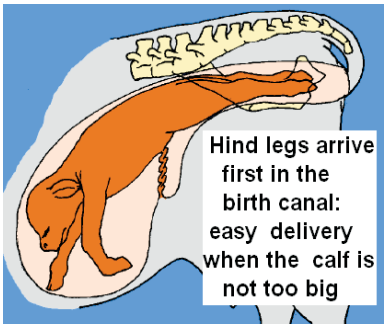
➢ Identify problem of calving

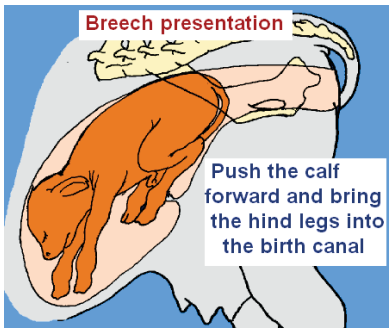
- Normal delivery in cattle should be completed within 2 hours after the water sac appears

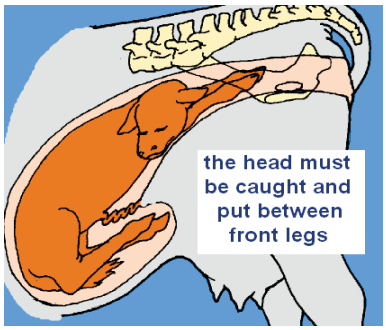
After observing a delay in delivery, a pelvic examination should be done
- to determine the extent of cervical dilation
- to determine the position of the fetus
- to determine if a correction can be made

➢ Causes of difficult delivery
Wrong position:
- The normal position of a fetus is with the front feet pointing out, right-side up with the chin resting on forelegs
- abnormal positions mainly are: backwards, with one or more front legs back, or with the head back

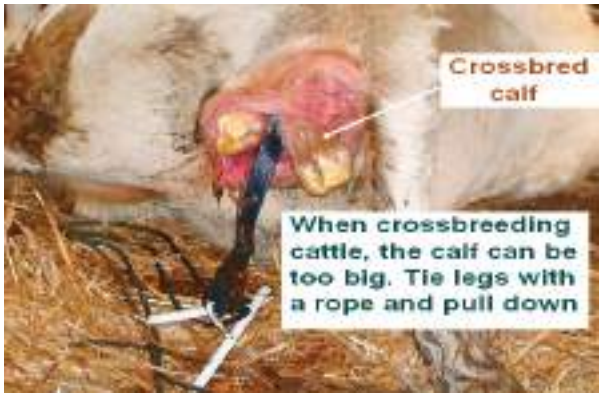








- Oversized fetus: rare in Cambodia; but if the calf die in uterus, quickly gas develop under the skin of the calf and the volume increases. It is necessary to tie the legs with a rope to pull out the calf
- When cattle are weak or in bad condition, delivery is long because contractions are not enough strong; 50 UI (5ml) of Ocytocin will strengthen contractions



- Care for newborn calf

- Clear any mucus from the calf's mouth and throat with your hand
- Then, if necessary, stimulate the calf to breathe by either rubbing it briskly, tickling the inside of the nostril with a straw or slapping it with the flat of the hand
- Disinfect umbilical cord with iodine
- Rub calf with salt if mother refuse to lick
- Make sure that the calf drink colostrum







- Retained placenta

- If the placenta is not released 24 hours after birth, the smell start to be strong and the risk of infection of uterus is high.
- 24 hours after delivery, the biggest part of membranes must be removed if possible: In general the placenta may detach without damage by applying slight tension to the membranes
- Administration of antibiotic is recommended; by injection or by placing boluses of antibiotic directly in the uterus immediately after removing the placenta
- Injection of prostaglandin (Lutalyse) with a booster 15 days later guarantee that the uterus is cleaned and safe for new fecundation.



- Prolapse of uterus

  - The rest of placenta is removed and the uterus is cleaned with water
  - The big job is to replace placenta; it is heavy and the placenta must be placed on a tray carried by two people, and then pushed carefully centimeter after centimeter until complete reduction. The work is more complicated if the cow lie down and do not want to stand. It becomes quite impossible to reduce when the cow is nervous, and continue to have strong contractions.
  - The vulva must be closed by sewing with a strong string for 3 days
  - Inject antibiotic: tetracycline for 3 days







- Artificial insemination

  - The sperm is collected from bulls of very high genetic value; for example using sperm of selected male can improve the capacity to produce meat for the progeny of local cattle.





  - The semen is stored in straws that are plunged in containers of liquid Nitrogen. This Nitrogen maintains a temperature of – 196°C in the tank. Thus, the semen can be stored for months or years.

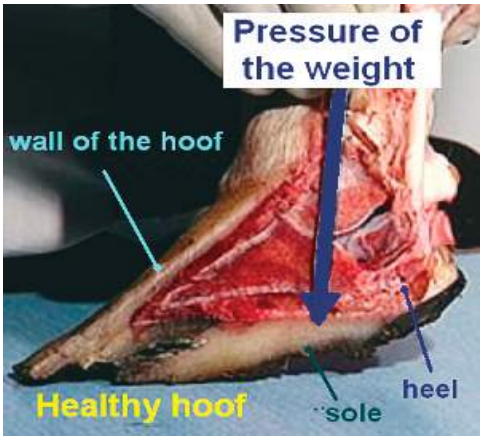
  - When the cow is detected in estrus, Artificial insemination must be performed 12 to 24hours after the starting; the best time is to inseminate 18 hours after detection of estrus.
  - Only experimented technicians can inseminate cattle. The technician takes a straw out of the tank; when the straw reaches ambient temperature, the spermatozoids “wake up”.
  - The technician makes a rectal investigation with the left hand and catches the cervix. With the right hand he introduces the straw of semen in the vagina and then through the cervix and inject the dose of sperm in uterus. To do that the technician use a specific catheter called a “gun”.

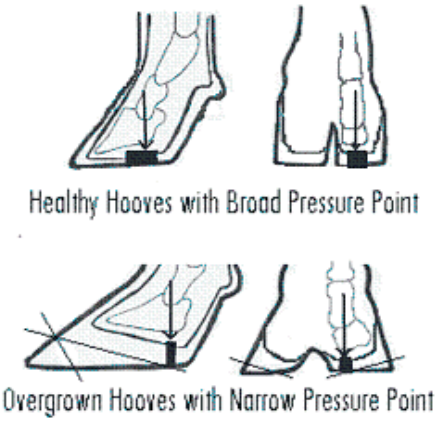
- Hoof trimming

- Because cattle are often working animals in Cambodia, the feet health is important to both well-being and to work well in the field. Cattle with lameness and overgrown feet suffer
- The hoof is like a fingernail and grows continuously, about 5mm a month. Some disorders like feeding, quality of the ground, injuries...can cause irregular growing and toes can overgrow.

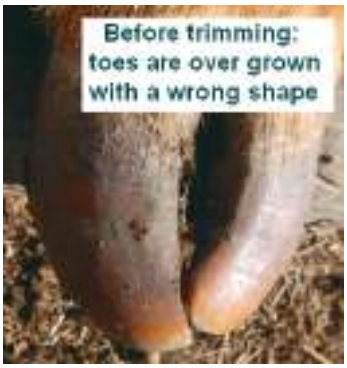


- The goal of hoof trimming is to return the foot to normal shape.
- The healthy hoof must have a short toe and a high heel
- As the animal hooves become deformed, the toes become elongated and the heel becoming worn away, the angle of the feet is tilted. The weight of the animal is not supported well by the feet causing pain and lame.

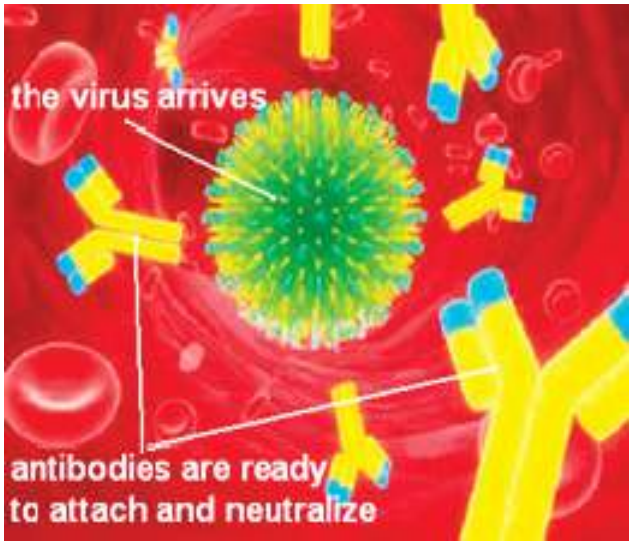




- Trimming hooves request experience and equipment.
- However, it is easy to trim the outer wall with a pincers perpendicular with the bottom of the hoof, and smooth edges with a rasp
- If you see any pink tissue, stop before you draw blood



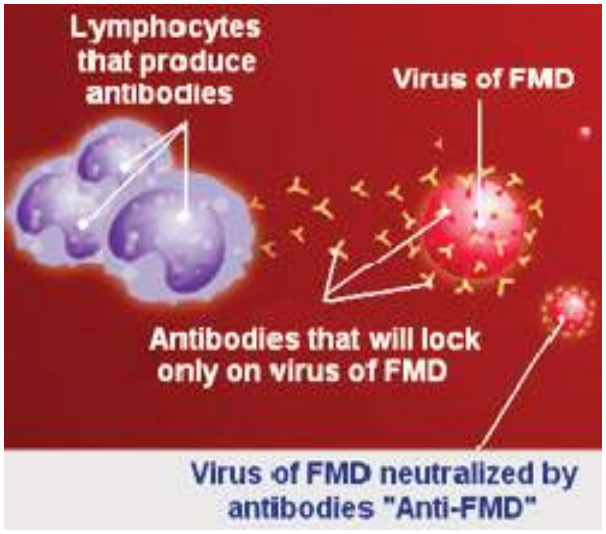






VII. Immunity and vaccination of the domestic animals





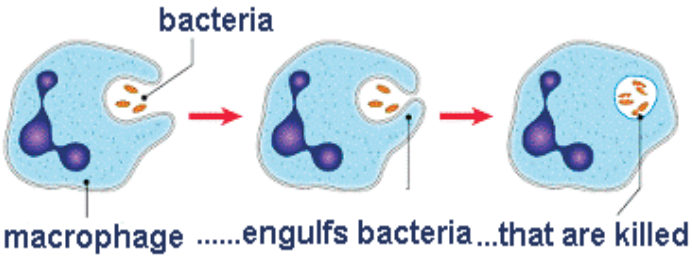
Immunity: how animals respond to infection

- **Immune System**

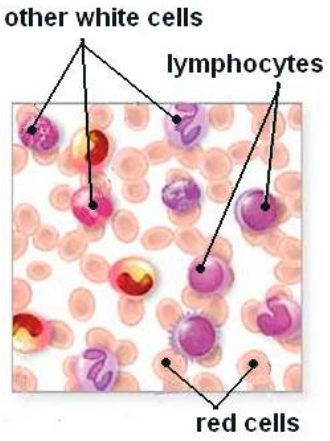
It is the body defense against infectious organisms. The immune system attacks micro-organisms that invade the animal body and cause diseases
The body uses two main systems of defense:

Macrophages are cells which engulf micro-organisms especially, when microbes enter through the lungs.

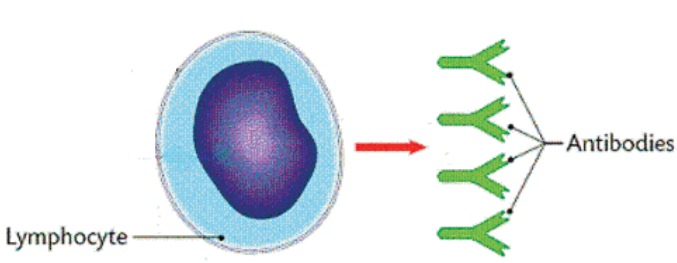


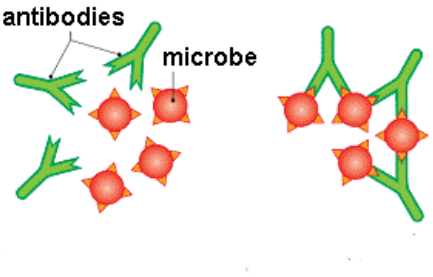


➢ **Lymphocytes** are white blood cells
They circulate through the body;
when these cells detect virus, bacteria or toxin, they will produce antibodies to neutralize these micro-organisms



Cells in the blood



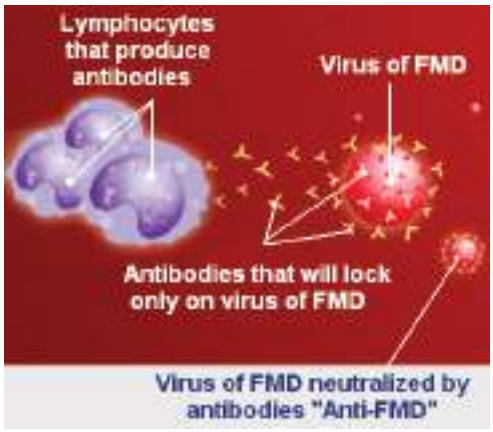


antibodies lock microbes (antigen), and neutralize them

➢ **Antibodies**

- Antibodies are proteins produced by white cells in the blood that lock onto virus or bacteria or other substances like toxins; these micro-organisms which attack the body and cause diseases are called **antigens.**

- Antibodies are **specific**: antibodies produced to neutralize FMD virus have no effect on CSF virus. One antigen induce production of specific antibody: it is why vaccine against FMD can protect only FMD disease.
- When antibodies can recognize an antigen and lock onto it, some cells (white cells in the blood), we can say "Killer Cells", will destroy the antigen (virus, bacteria, toxin) tagged by antibodies.



- Antibodies remain active for several weeks to several years, it depends of the virus. These antibodies protect animal against new attack of the same microbe.

- **Infection**

➢ **Microbes are everywhere in the environment** and in the body. In most of cases they are helpful but some are harmful and they can cause diseases. When the disease develops in animals, we can observe symptoms. The symptoms vary according to the organs targeted by the microbes:

- E.Coli multiply in the intestine and cause diarrhea,
- Pasteurella multiply in the lung and cause pneumonia: coughing, rapid breathing, nostrils discharge
- When harmful microbes multiply in the blood stream and spread everywhere in the body, it is called a septicemia and symptoms are severe, high temperature and depression and at least can cause rapid death.













➢ **Response to infection:** When animals face an attack by harmful microbes, they will put in action the defense systems to fight with the microbes which try to invade the body and to neutralize the microbes multiplying inside the organs:

1. **Macrophages** will engulf microbes especially those entering in the body through the lungs. These cells are in the alveoli, and will "eat" and destroy microbes, toxics...which try to pass through the lungs.

This system of defense is less developed and less efficient when animals are weak or hit by other diseases; for example:

- PRRS destroy the macrophages and facilitate invasion of the lungs by Pasteurella,
- Mycoplasma damage the epithelium of respiratory tract and microbes can attack and multiply easily.

Healthy animals in good condition can better fight infection

2. **Antibodies** will neutralize microbes.
   But production of antibodies can take several days.
   If the microbe is highly pathogenic, it multiplies very fast and invades organs and bloodstream quickly. The animal will be seriously sick and can die because it cannot produce enough antibodies in time.
   If the animal is healthy and in good condition when the microbes attack, it can resist better and longer until the body can produce enough antibodies to neutralize the microbes. But animal in bad condition become seriously sick very quickly.





In case of attack by bacteria, it is interesting to use **antibiotics**, because antibiotics can kill bacteria or stop multiplication of bacteria.
But antibiotics are inactive on virus; the only defense is production of antibodies.
Veterinarians often administrate antibiotics to animal hit by virus diseases, because they become weak and harmful bacteria can develop easily. For example fattening pigs with CSF often develop secondary infection caused by Pasteurella or Salmonella

- ## Vaccination

- Animals cannot deal with microbes very harmful that multiply very fast, we say highly pathogenic diseases (Avian Influenza, FMD, Hemorrhagic Septicemia...), because these diseases develop very quickly and immune systems do not have enough time to move into action.
- There is no medicine available to destroy or stop development of viruses; only immune systems can stop invasion by viruses. These diseases, caused by viruses cannot be treated but efficient prevention can be made by vaccination, when vaccine exist/available.

- Fundamental of vaccination is to contaminate the body with a virus or bacteria to induce production of antibodies.
- Live viruses or bacteria that have been modified by chemical or killed microbes will induce immune response, production of antibodies but will not cause the disease because microbes are killed or modified.

- The antibodies by vaccination will remain in stock several months in the body, and when the animal is in contact with harmful virus or bacteria, antibodies are ready in the body to neutralize the microbes immediately.





- It is clear that vaccines can be use **only as prevention**, because it takes from 1 to 2 weeks to produce antibodies.
- Vaccines must be used only on healthy animals, because we inject a "disease" to animals; even the virus or bacteria have been modified, animals can be little tired for some days and it requires healthy animals to produce enough antibodies.
- Vaccines are specific; FMD vaccine strain O, induces production of antibodies against FMD virus strain O. The cattle are protected if an outbreak occurs with FMD strain O. The cattle are not protected against strain A or Asia1. If we want protection against all strains of FMD circulating in Cambodia, it is recommended to use a trivalent vaccine against strain O + A + Asia1.



➢ Cold chain

- Vaccines are medicines containing modified microbes or killed microbes.
- They must be conserved in cold environment (2-8oC) from production in the company until administration to the animals; it is called the cold chain.
- Vaccine must be kept in normal temperature (2-3 minutes) before its administration.
- If the cold chain is not applied as recommended, the vaccine will not be efficient.











➢ Type of vaccines

Two types of vaccines are available:

- Killed vaccines: microbes are diluted in specific solvent and ready to use; only pump the proper dosage and inject to animals.

These vaccines must be utilized in limited time but it is possible to keep the rest of the bottle in cold place and to use it during the next days



For example vaccine against Black Leg is a killed vaccine

- Live vaccines: microbes are lyophilized and have aspect of white lozenge of powder; it must be diluted with sterile water solvent.

These vaccines must be use immediately after reconstitution; it is absolutely impossible to conserve rest of vaccine for next day, the vaccine will be ineffective

vaccine against CSF is a live vaccine



Preparation of Live Vaccine / example ND vaccine













- Vaccine label

It is crucial to read the label; unfortunately labeling is often in foreign language and the veterinarian must request clear recommendation from the dealer.
The sticker will inform on:



Composition: what virus is inside the bottle; it is too complicated to decode the name of the strains

The **name** of the vaccine gives information on the disease targeted, in general in foreign languages (CSF, FMD, HS...) with international acronyms but not understandable by farmers
Farmers and VAHW must request help from the dealer who should get clear information from the Company.









Dosage:
Commonly on vaccines especially for live vaccines, the laboratory do not indicate the quantity (how many ml per animal) but the number of doses (= number of animals).
Actually live vaccine must be mixed in solvent just before use or can be mixed in the drinking water
You must calculate the dose for one animal, after mixing with solvent
When you mix vaccine in drinking water for chicken you must mix 1,000 doses in 4 liters at 4 days but in 10 liters at 10 days or in 21 liters at 21 days







Injectable vaccines ready to use show clearly the dose to be injected

If the dose of vaccine injected is too low, the animal will not produce enough antibodies and the animal is not well protected

If the dose of vaccine is too high, the farmer lose money



The number of doses is clearly indicated on the vial
Dilute in solvent, dilute in eye-drop diluent, dilute in drinking water, but make sure that the vial of vaccine is used for a maximum of 1,000 heads



Route of administration
In cattle and swine vaccine are injected by intramuscular or subcutaneous route

But in poultry they are various route of administration of vaccines (eye drop, i.m., s.c., oral route, wing web)











Attention:

- It is forbidden to use disinfectants to clean syringes used to inject live vaccines; only traces of any disinfectant will kill the microbes contained in the vaccine
- When live vaccines are administrated in drinking water, make sure that the water is not treated by Chlorine or Iodine.
- Vaccines targeting bacterial diseases, Black leg, Hemorrhagic Septicemia, Fowl Cholera, cannot be used for animals under antibiotic

Expiry date

For vaccine, expiry date is important but only if the cold chain has been enforced from the day of production to the date of injection







Side effects: undesirable effects after vaccination

- In general after vaccination animals lose appetite for one day and temperature raise



- Swelling (painful) to granuloma can subsist few days
- Shock: The skin of the sow becomes red, and the animal shows difficulties to breathe, salivation become excessive and the animal can die (e.g. Aujesky vaccine)
  To decrease importance of reaction, it is important to avoid stress before and after vaccination, vaccination must be done during cool hours early morning, and it is better not to distribute feed before vaccination
  In case of shock dexamethasone must be injected

- Sickness: Sometimes pigs with sub-acute symptoms are vaccinated (eg., CSF); it provokes serious symptoms of high temperature, loss of appetite and sometimes the death. Before vaccination it is important to make sure that animals are really healthy
- Abscess are often due to wrong site of injection or dirty material to inject the vaccine; syringes
- Symptoms of the disease vaccinated: A live type of virus vaccine and produce a mild form of the disease, nodule at the injection site without severe symptoms (e.g., Fowl Pox).

• Antibodies

➢ **Definition:** animals have antibodies stored in the body because they have been sick before and the body produced antibodies that can remain several months or because they have been vaccinated against the disease and receive regular booster.

- E.g., sows often have high level of antibodies against CSF because farmer regularly vaccinate against CSF or sometimes the virus circulate in the farm, sows are little sick and produce antibodies.
- After farrowing, sows produce special milk for few hours called colostrum. This colostrum provides a lot of energy to newborn piglets and especially is very rich in antibodies.
- If the sow has been vaccinated against CSF few weeks before delivery, the colostrum is very rich in antibodies against CSF virus. The piglet will absorb these antibodies through the colostrum and few hours after its birth he is protected against the virus of CSF. If the virus of CSF enters the farm, piglets will not be sick



These antibodies will stay at high level until age of 7 weeks and later decrease fast. It means that you cannot vaccinate the piglet before 7 weeks of age, because the antibodies provided by the colostrum will neutralize the vaccine.

1. Recommendations:

   It is recommended to vaccinate sows during gestation because they will have high quantity of antibodies in the blood at delivery time and the colostrum will be very rich in antibodies and can protect piglets



2. It is crucial that all piglets drink the colostrum as soon as possible after birth, to get enough antibodies.
   It is necessary to help weak piglets to access the teats



3. Piglets cannot be vaccinated against CSF at any time. Vaccination at 2 weeks is ineffective if the sow has been vaccinated. Normal vaccination against CSF for piglets must start when the maternal antibodies decrease: 1st injection at 7 weeks and 2nd injection at 11 weeks.



If the farmer does not know if the sow has been vaccinated recently, piglets must start vaccination program at 3 weeks because they are not protected against CSF by maternal antibodies. The vaccination program becomes: vaccination at 3 weeks, 7 weeks and 11 weeks.

- **Serological tests**

  ➢ Definition

  A serological test refers to a laboratory test done on blood serum to control and detect antibodies

We know that after infection or after vaccination, the body produces antibodies that circulate in the blood; the objective is to identify which antibodies are circulating in the blood.
This technique is helpful:

- to diagnose disease; the body produces specific antibodies when invaded by one microbe
- to check if the vaccination is well done; the body produces specific antibodies after injection of vaccine

  ➢ How the serology can be done

  - It is necessary to collect blood sample in the field on animals to be checked







- The blood is collected in a “dry” tube (with red cover) and the serum appear after few minutes
- The sample must be send to National Veterinary Research Institute (NaVRI) in the Department of Animal Health and Production (DAHP) with ice to ensure a good conservation of the serum

• Vaccines and vaccination program

- Vaccination is an important tool to prevent endemic and severe diseases, but vaccination cannot be 100% effective; even with a complete program of vaccination, animals can become sick. Vaccination must be associated with good hygiene and bio-security and proper management.
- On the other hand, vaccines are expensive; it is important to evaluate the risk and impact of the disease before designing the vaccination program. For example, if farmers face problems of diarrhea caused by E.Coli during the first days after birth they can decide to vaccinate sows with a vaccine against E.Coli before farrowing...or they can decide to maintain good hygiene of the farrowing pen, and prepare a nest to protect newborn piglets against air draught and night cold.





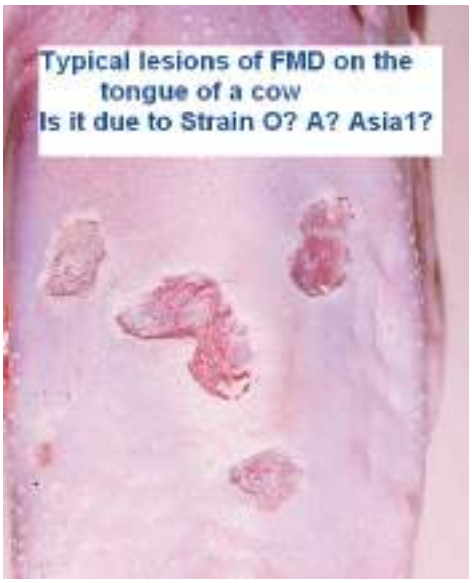


➢ Selection of vaccine

- **Diagnosis**. The first is the absolute identification of the causal agent; vaccines are specific for a disease and to prevent disease in the farm, we must be sure about the diagnosis.
  For example, it is common to diagnose Aujesky disease when nervous symptoms with convulsions are observed in post-weaning stage. But normally Aujesky provoke convulsions only in newborn piglets and in post-weaning Edema Disease or Streptococcus must be suspected. Vaccination against Aujesky is not useful.
  Serology or other analyzes in NaVRI laboratory can help to confirm diagnosis



Strain. Some diseases can show the same symptoms but the strain of virus varies and if the wrong strain is used in the vaccine, antibodies will not be capable tom neutralize the virus. For example we can recognize easily symptoms of FMD in cattle. To protect cattle in the neighboring commune farmers decide to vaccinate their animals. They will buy FMD vaccine monovalent with strain O because it is cheaper. This vaccine induces production of antibodies against the strain O. Unfortunately the symptoms of FMD were due to the strain Asia1...cattle are vaccinated against FMD, but they are not protected because the strain is different. We never know the strain before identification in laboratory and symptoms are similar for all strains. It is necessary to vaccinate animals with the trivalent vaccine which induce production of antibodies against strain O and A and Asia1



- **Mutation.** Some virus can change when they multiply and vaccines are not more effective. Example of PRRS outbreaks that occurred in 2010; a new highly pathogenic strain has been identified and vaccines used in Europe or America were not effective to protect against contamination. The vaccine only brought a new virus in the farms and made the situation more critical. Vaccination against PRRS is absolutely not recommended.

➢ Cause of failures of vaccination

- The cold chain has been broken; during the journey from the Company to the farm, the live vaccine (killed vaccine are more thermo-tolerant) encountered temperature above 8oC. Likely the virus contained in the vial will be partially or totally killed and will not induce production of antibodies.
- The vaccine is not produced with standardized quality. Purity and concentration is not enough to ensure production of antibodies.
- Control of expiry date show that the vaccine had gone out of date
- Level of maternal antibodies is still high; the vaccine is neutralized by these antibodies and must be injected again later to ensure strong immunity. Maternal antibodies are high during the suckling period.
- Incubation: the animal to be vaccinated looks healthy but it is already in incubation of the disease. Injection of the vaccine should provoke coming out of the disease and add force to the symptoms
- Injection material was dirty: organic matter, traces of antibiotics...will destroy the microbes
- Injection material has been disinfected by chemicals: live vaccine can be destroy with only a trace of disinfectant
- Technique of injection is wrong; especially in sows, when vaccines re injected in the middle of the neck with needles of 20mm, the vaccine is stored in the fat and not in the muscle. It cannot pass in the bloodstream
- pig under antibiotic treatment

➢ Suggestion of vaccination program for small farms

It is important to remember that only healthy animals can be vaccinated.

Poultry

- **Newcastle disease**
  DOC are vaccinated at 1 day by eye drop and receive booster 2-3 weeks later. Layers must be vaccinated one more time at 7-8 weeks.
- **Fowl Cholera**
  Used especially for layers at 12 to 16 weeks and the booster 4 weeks later. The objective is to inject the booster 2 weeks before laying.
- **Fowl pox**
  In case of outbreak: chicks from 10 days to 10 weeks
  Routine vaccination for Pullets: between 12 and 16 weeks
- **Gumboro**
  This vaccine can be administered in drinking water at 2 or 3 weeks.

Swine

- **CSF**
  Piglets at 3weeks (only if sows are not vaccinated regularly), **7 weeks** and **11 weeks** to be sure that maternal antibodies cannot neutralize the vaccine
  Gilts and sows at 6 months of age and later 1 month before farrowing; roughly sows are vaccinated twice a year.
- **Parvovirus in swine**
  Gilts: 2 injections apart 1 month; can be at 6.5 months and 7.5 months to organize the second injection about 2 weeks before mating
  Sows: 10 days before weaning
- **Aujesky**
  Gilts: 2 injections within 1 month at age of 6 months and 7 months
  Sows: 1.5 month before farrowing
  Fattening pigs do not need to be vaccinated
  This vaccination against Aujesky is recommended for medium scale farm
- **FMD**
  The vaccine against FMD need regular booster to protect pigs. Fattening pig will be raised only 6 months and cannot develop a strong immunity.
  The recommended program target gilt and sows. Female selected for reproduction should be vaccinated at 3 months with a second injection 1 month later.
  Booster every 4 to 6 months and it is important to re-vaccinate at any time in case of outbreak in the region.

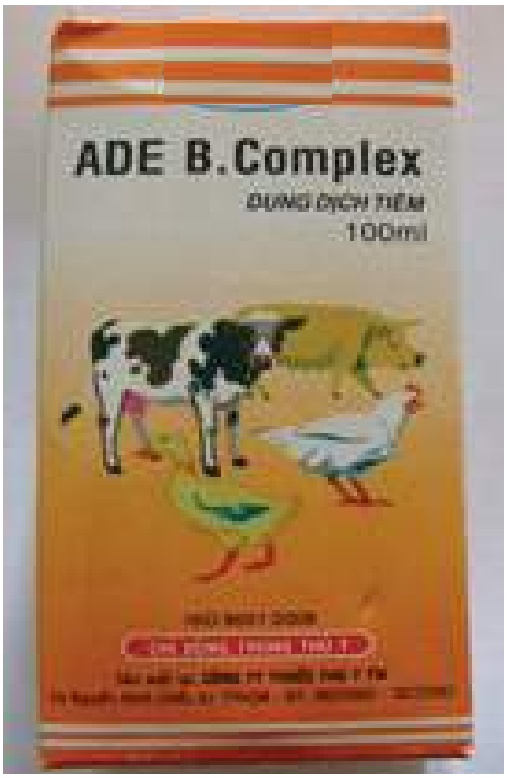
Cattle

- **FMD**
  1st injection at 4 months old, booster 1 month later; then, every 6 months
  In case of outbreak nearby the village, it is recommended to vaccinate all animals in the village; protection can develop very fast and even with one injection, cattle will be protected after few days.
- **Blackleg**
  1st injection: 2 months after birth; boosters: 1 month later, 1 year later and 5 years later
  This vaccine is highly recommended in communes with a history showing cases of Blackleg. The bacteria transform in spore and can survive years in the soil, and the disease can reappear at any time
- **HS**
  Habitually outbreaks of HS start with the rainy season. It is better to inject before beginning of rainy season.
  Actually, HS vaccination is made through vaccination campaign and access to this vaccine for farmer is not easy





VIII.
Medicinal treatment of diseases





Medicines are active drugs, it means that have an effect on animals
Medicines are used

- To preserve the health of the animals: to treat sick animals or prevent disease in herds or flocks of animals.
- to improve animal production: better reproduction, more meat, more milk

Efficacy and safety are the main concerns when using veterinary drugs

A. Types of medicines

Simplified categorization of medicines commonly used:

1. **Vitamins and minerals** that are crucial to maintain good health, to ensure growth and to smooth reproduction
2. **Antibiotics** necessary to fight infection caused by bacteria
3. **Anti-parasites** are active against parasites of the skin, in digestive and respiratory tract and against parasites of the blood
4. **Anti-inflammatory/analgesic** medicines can fight inflammation, fever and pain
5. **Hormones** are active on genitals and reproduction
6. **Vaccines** prevent diseases especially caused by virus
7. **Disinfectants** can control bacteria, virus, fungi in environment
8. **Antidote**, to treat from poisoning and medicine overdoses

Vitamins and Minerals

1. Roles of vitamins

Vitamins are nutrients that regulate use of energy and protein for health, growth and reproduction. Without vitamins nutrients in the feed will not be properly utilized

- **Vitamin A** is essential for healthy eyes, hair and skin and have impact on reproduction

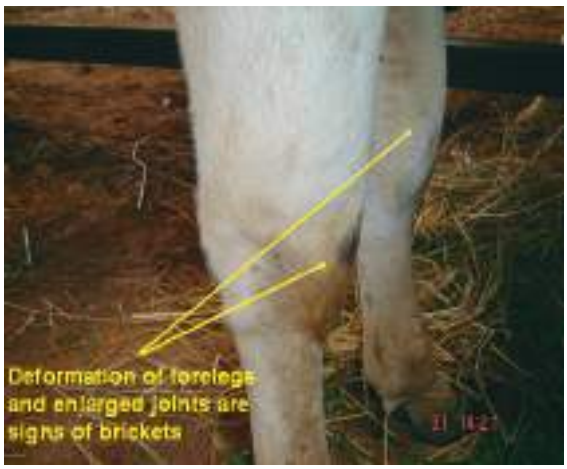


- **Vitamins B** make a group of many vitamins, B1, B6, B12…
  Some vitamins B have an important role in growing performances because they help animals to absorb proteins; deficiency of vitamins of group B cause low growth and bad feed efficiency
  The Vitamin B12 has a role to help animals to recover after bleeding.

- **Vitamin C:** is a general stimulant and has a role to decrease impact of stress. Causes of stress are varied, hot climate, chronic diseases, change of feed...and cause higher sensitivity to diseases and clear decrease of feed intake.
  Mixing feed or drinking water with Vitamin C minimizes the effects of stress.



- **Vitamin D**: Vitamin D is necessary for the growth and maintenance of bones and teeth because it stimulate use calcium and phosphorus.
  Deficiency cause the same signs that deficiency in calcium and phosphorus: severe rickets



- **Vitamin E** plays a key role to mount an effective response to disease. Increase of vitamin E give significant response to health problems like scour in newborns, MMA, or mortality in broilers

2. Sources of vitamins

- Vitamin A: grass, cassava leaves, fish meal and fish oil
- Vitamin B: whole grains, cereals
- Vitamin C: fruits, water grasses
- Vitamin D: fish meal and fish oil
- Vitamin E: whole grains, oil







Bad conservation of raw materials, long storage and light destroy vitamins quickly. Except scavenging animals, in general swine and poultry request regular (the best is daily) supply of additional vitamins to ensure best growth and reproduction.
The bacteria of the rumen have ability to synthesize vitamins of the group B. Vitamin needs of cattle is confined largely to A, D and E.

3. Roles of Minerals

Minerals have 3 major roles in animals:

- Provide structural material to bones
- Functioning of the nerves: allow electrical impulses to be transmitted across nerves
- Responsible of chemical reactions in the body; digestion, contraction of muscle, immune function...

Major minerals are:

- **Calcium**

Calcium accounts for about 2% of body weight and 99% of calcium are stored in the skeleton.

Calcium is essential for animals to produce good bones, eggs and to have good growth

Powder of dried shell provide calcium

Proper supply of calcium is not enough; Vitamin D is necessary for good absorption of Calcium

Deficiency causes rickets in poultry, cattle and swine.

In poultry deficiency in calcium cause thin eggshell and decreased egg production; it is necessary to provide powder of oyster shell to fit with the needs



Cattle and sows need a lot of calcium when producing milk; especially just after delivery a big quantity of calcium is pumped and can cause weakness and paralysis; the veterinarian must inject calcium (calcium gluconate)

- **Phosphorus**

Act along with calcium and other minerals for growth, mineralization of bones and muscle development. Phosphorus is important for reproductive performances. 80% of Phosphorus is stored in the bones

It is necessary to provide supplementary phosphorus for animal with rapid growth; in general phosphorus is supplied in association with calcium because they "work" together.

DCP (Di Calcium Phosphate) is a good source of phosphorus and calcium.

Do not use natural phosphates used in rice fields because containing some toxic (fluor) for animals



- **Magnesium**

Magnesium has roles equivalent to phosphorus. It acts along calcium as well.

Magnesium has important role in many chemical reactions in the body.

Deficiencies affect muscle contraction, and nerve impulse: tremor, muscular weakness, nervousness...

Cereals and molasses are good sources of Magnesium.

- **Iron**

Piglets need Iron for growth and have a limited stock of Iron in the body at birth. Unfortunately the milk of the sow cannot supply enough Iron for normal growth and after 7 days, piglets will face Iron deficiency. Neonatal piglets require supplemental intake of iron to prevent anemia. Iron Dextran is well absorbed by piglets.
All piglets must get injection of Iron the second day after birth and a booster 10 days later to prevent anemia and weakness.



4. Key products

There are different categories of animals needing supplementary vitamins and minerals:

- Thin animals showing rough or discolored hairs; they have general deficiencies and of course vitamins and minerals deficiencies. It is important to supply complete range of vitamins and minerals needed for digestion, absorption of proteins to support recuperation of good body condition.





- Animals hit by chronic diseases because they eat less, and functioning of immune system requires more vitamins and minerals. In case of internal parasites the need of vitamins is increased as well.
- Animals recovering from acute diseases: during the diseases animals do not eat or eat very little and they draw on once reserves. They need supplementary vitamins and minerals to recover quickly and to build up reserves again.
- Animals with fast growth; raw materials in the feed cannot provide enough and well-balanced quantity of vitamins and minerals. It is necessary to mix the feed every day with vitamins and minerals, often called premixes.





- Animals producing milk and eggs to improve production, to prevent exhaustion of reserves and to increase quality of eggs and milk.
- Some vitamins and minerals can stimulate specific functions and must be administered during limited time; vitamins ADE are recommended to stimulate estrus and are injected after weaning.

• Injectable

- **Vitamin ADE**: used in injection in cattle and sows especially after weaning to stimulate manifestation of estrus





- **Vitamin E + Selenium**: used in sows. Injection once a week, 3 weeks before farrowing, improve vigor of piglets at birth and prevent splay-leg piglets





- **Iron Dextran**: must be injected systematically to piglets 2 days after birth and a booster 10 days later to prevent anemia









- **Multivitamins products**: these products combine all essential vitamins: Group B and Vitamin C with vitamins ADE and K. In general these multi-vitamins are injected once a week, to help recovery or on thin animals with multi-deficiencies









- **Vitamin B12** is used to fight anemia, after bleeding, in stomach ulcers (the stomach bleeds) of swine or in case of liver fluke.
  Often Vitamin B12 is associated with other products like phosphorus (Carasil) and become a strong stimulant, with iron dextran (Iron B12) to better fight anemia in piglets or with selenium and magnesium to tone up muscle especially for splay-leg in piglets (Biodyl)









- **Calcium** can be injected to sows and cows just after delivery, when the production of milk capture a lot of Calcium and the mother become weak, cannot stand up and show rapid breathing

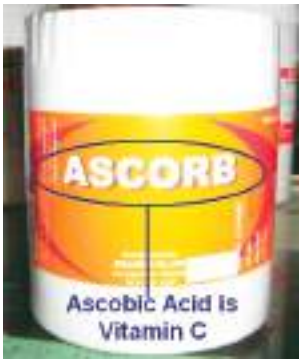





- **Oral**
  - **Vitamin C** or Ascorbic Acid is important in Cambodia because it is the main medicine to decrease impact of heat stress.

It is used in broilers, mixed in the drinking water:

- ❖ to stimulate immunity of DOC the first days after delivery (often associated with antibiotic)
- ❖ to decrease effect of heat during the last week of growing when animals are panting (3 g in 10 kg of feed)
- ❖ It is commonly used for boars during the dry season to increase the quality of sperm (1 g per day/boar every day)





- **Premixes** are powder products which provide vitamins and minerals to animals. These products are especially used in pigs and poultry when the farmer produces the feed himself with local raw materials. Actually these premixes are automatically in commercial feed sold by companies.

Premixes are calculated according to requirements of different species; composition of premix for fattening pigs is different from the composition of sows (sows need more vitamin A, D and E, more biotine...). Premix for broilers is different from premix for layers.

Some premixes are labeled for all species, for fish, pig, cattle and broilers. These products are often of low quality.







- **Multivitamins** are soluble powder providing high level of all vitamins (higher level than in premixes) and can be mixed in the feed of pigs. These products are mainly used to help sick animals to recover after disease or when animals are weakened by vaccination







- **Calcium and phosphorus.**

  Calcium alone is especially recommended for layers because they need about 0.5g of calcium every day to produce eggshell. The good source is powder made from oysters.

  For other species phosphorus must be provided at the same time than calcium to promote good growth of the bones; the good ratio is offered by DCP, a white powder that is not soluble and can be mixed in the feed.

  For example 10 to 20g/day can cover needs of growing pigs and lactating sows.







1. Antibiotics

1.1 Definition

Antibiotic are the most used medicines to treat animals, they are essential for health; unfortunately antibiotics are often used to treat disorders that do not respond to antibiotics

Antibiotic are not active against virus

Antimicrobial are medicines which **destroy or inhibit the growth of bacteria**.
They are used for external and internal infection



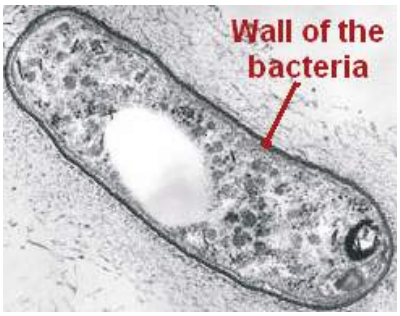


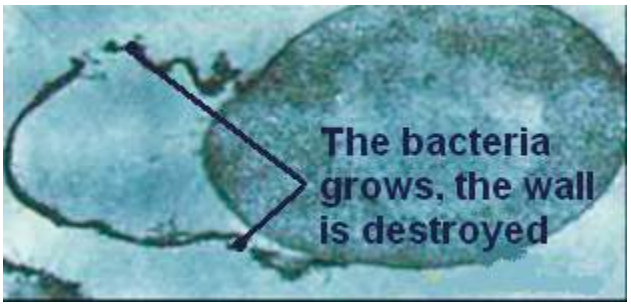
Antibiotics can be naturally produced by fungi and industrial production is made by process of fermentation; micro-organisms grow and produce antibiotic that is purified.

1.2 Types of antibiotics

Antibiotics are split in two groups according to the way they can stop bacterial infection:

- **Bactericidal** antibiotics; they kill bacteria
  Example Penicillin stop formation of the wall that protect bacteria; the bacteria growth but cannot divide or sometimes the wall ruptures





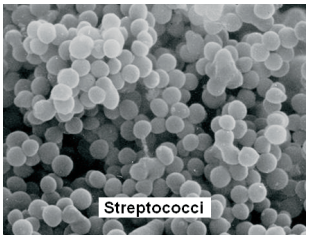
- **Bacteriostatic** antibiotics; they stop bacteria from multiplying
  Example: Tetracycline block production of proteins in the bacteria, and therefore the bacteria cannot grow nor divide

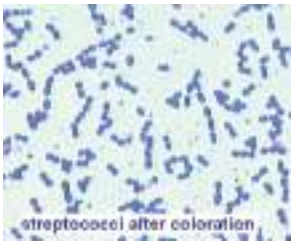
1.3 Spectrum of antibiotics

There is no antibiotic that can kill all bacteria: antibiotics are effective against some groups of bacteria.

- Bacteria Gram+ and Gram-

After a test of coloration, bacteria are divided in two groups:
Gram –, become pink/red after coloration E.Coli, Pasteurella, Salmonella...
Gram + become purple/blue after coloration, Streptococcus, Staphylococcus, Clostridium (anthrax, blackleg)...









- Spectrum is divided in two:

- Narrow-spectrum targets specific types of bacteria such Gram+ OR Gram-
  Example: Penicillin and Macrolides are active only on Gram + but Colistine is active only on Gram –
- Broad-spectrum targets a wide range of bacteria Gram + and Gram –
  Example: Enrofloxacine, Doxycycline are active on Gram + and Gram –

- Families of antibiotics
  Antibiotic are classified in families. When antibiotics from the same family, they have the same chemical structure

Major families of antibiotics commonly used for animals are

- Beta-lactamines: Penicillin, Ampicillin, Amoxicillin, Cephalosporins
- Polypetptide: Colistine
- Quinolones: Flumequine, Enrofloxacine
- Aminosides: Gentamycine and Streptomycine
- Sulfamides: Sulfadimidine, Sulfamethoxine, Trimethoprim (TMP)
- Phenicols: Florfenicol, Thiampnenicol, Chloramfenicol (it is banned in many countries)
- Tetracyclines; Oxytetracycline, Doxycycline
- Macrolides: Tylosine, Spiramycine, Erythromycine

  Lincomycine and Tiamuline are in very close family

- Combination of antibiotics

- Combining two antibiotics can be done to obtain a wider spectrum

  Example: Ampidexalone is a combination of Ampicillin that kill bacteria Gram + with Colistine that kill bacteria Gram -; the combination of Ampicillin with Colistine is wider that the spectrum of Ampicilline alone or Colistine alone. Other famous combination are Penicillin + Streptomycine (Penstrep), Sulfonamide + TMP (Septotryl)

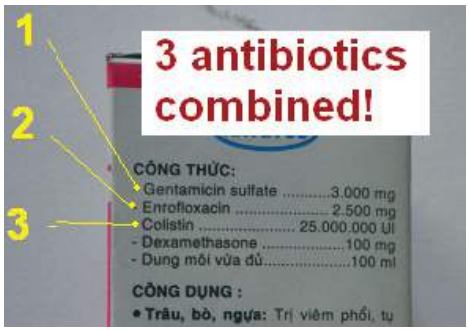
- Never combine more than 2 antibiotics because effect of numerous antibiotic mixed together is not predictable
  When you see medicines mixing 3 or 4 or more antibiotics, do not buy, it cannot be produced by reliable manufacturer



- Antibiotic synergism occurs when the effect of combination of 2 antibiotics is more powerful than using only one antibiotic:
  - ❖ Ampicilline+Colistine, Sulfonamide+TMP,
  - ❖ Tetracycline + Macrolide (Tylosin + Oxytetracycline),
  - ❖ Tetracycline+ Sulfonamide

- Antibiotic antagonism occurs when the effect of combination of 2 antibiotics is less powerful than using only one antibiotic: Betalactamine+Macrolide or Betalactamine+Tetracycline; if you find medicines which contain amoxicilline and oxytetracycline, do not buy, it cannot be produced by reliable manufacturer





If you find medicines combining more than 2 antibiotics, do not buy it, it cannot be produced by reliable manufacturer

If you find medicines containing Chloramphenicol, do not buy it, it cannot be produced by reliable manufacturer



1.4 Selection of antibiotics

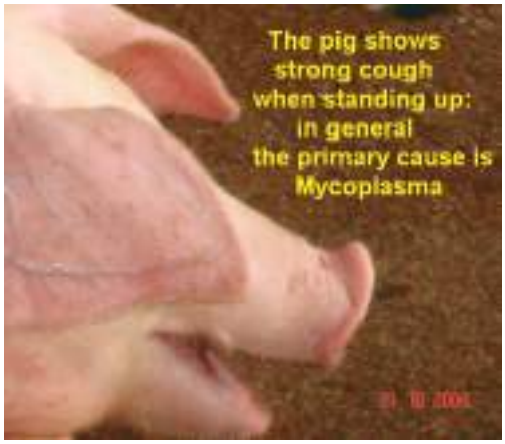
- **Identification of the disease**: it is important to know if the cause of the disease is bacteria. If the disease is caused by a virus, a parasite or a nutritional deficiency, the antibiotic cannot treat all the diseases.







- **Identification of the bacteria**: it is important to know what kind of bacteria causes the disease to better choose the antibiotic.
  Example: coughing in fattening pigs is common
  If you choose Amoxicillin, it is effective against Pasteurella; pigs will be better for few days but will have a relapse... because in general Pasteurella are secondary infections when the respiratory tract is damaged by Mycoplasma.
  Amoxicillin is not effective to kill Mycoplasma because this microbe does not have a wall.
  The veterinarian will be more successful if he selects an antibiotic affective on Pasteurella AND Mycoplasma, like Tetracycline or Florfenicol.



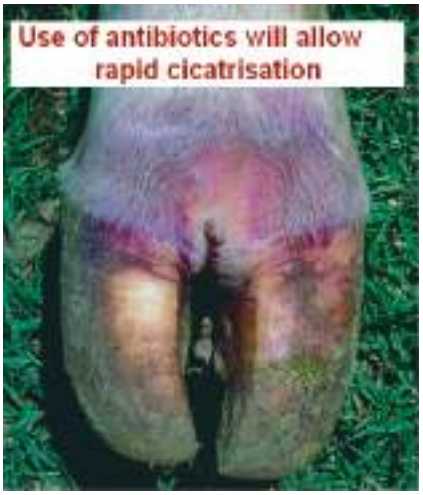




Mycoplasma is a very small bacteria without wall. Betalactamine family have no action on these bacteria

- **Secondary infections**: we know that antibiotics are not effective against virus but animals facing viral diseases are severely depressed, they cannot eat and drink a little. This weakness give opportunity to bacteria to develop and to provoke a supplementary infection called secondary infection.
  For example pigs with CSF after few days will show diarrhea often caused by Salmonella and coughing due to Pasteurella. It is recommended to administrate broad spectrum antibiotic like TMP+Sulfa to decrease the impact of secondary infection.





1.5 Guidelines to choose antibiotics

- **skin infections**: amoxicilline or lincomycine or TMP sulfa
- **respiratory diseases in all species**: tetracyclines (in association with macrolides), florfenicol or enrofloxacine
- **endometritis**: enrofloxacine or amoxicilline
- **cystitis**: enrofloxacine or TMP/Sulfa
- **streptococcus piglet**: amoxicillin or penicillin
- **diarrhea in piglet and calf**: colistine or enrofloxacine
- **diarrhea in fattening pigs**: tylosin, tylosin + gentamycin
- **colibacillosis in chicken**: Amoxillin, Flumequine
- **mastitis**: TMP/Sulfa (sow) amoxicilline (cattle)
- **arthritis**: amoxicilline or lincomicine
- **erysipelas**: amoxicilline or tylosin
- **protection** against secondary infection in case of viral disease: TMP/sulfa, OTC

1.6 Common available Antibiotics in Cambodia

Antibiotics showed below are common products identified in some retailers.

- Betalactamines









- Tetracylines









- Colistine (in general associated with amoxicillin or ampicillin)









Spectinomycine
+
Colistine

- TMP + Sulfa









- Macrolides









- Quinolones









- Phenicols



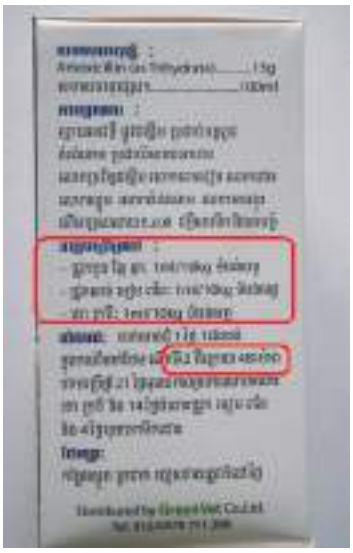






1.7 Administration of antibiotics

- **Dosage:** according indications of the label after **good estimation of the animal weight.**
  It is recommended to double dosage for the first injection in respiratory diseases
  It is more difficult to use antibiotic in powder to mix in the feed, because sick animals eat a little. Actually the label often mentions a “Preventive Dosage” to be used when animals are healthy and eat normally; the label mentions as well “Curative Dosage” that is often double because animals eat less and they need to absorb enough antibiotics.



- **Rhythm** : it is important to maintain a minimum level of antibiotics in the blood along the day and antibiotic must be regularly administered.
  For antibiotic mixed in the feed, pig and chicken eat all the day and will get the dose step by step
  When antibiotic are injected, it is important to follow recommendations on the label. Example Ampidexalone must be injected morning and afternoon but Septotryl only once a day.
  Some products are called “LA” and can be injected only every two or three days.
  Example Longamox is Amoxicillin Long Acting and is injected within 2 days.

- **Duration**: 3 to 5 days is normal duration of treatment. Sometimes the treatment can last 7 days especially in respiratory diseases, but never less than 3 days

Do not change antibiotic after one day and again if the treatment is not successful. In case of failure of the treatment it is necessary to:

- examine again the animal to confirm the diagnosis. Often after one or two days new symptoms appear
- make sure that the quality of antibiotic is good. Some products are very cheap, produced by unknown manufacturers and contain nothing.

2. Anti-inflammatory medicines

These medicines are indicated for the treatment of inflammation.

Inflammation is a protective response of the body to infection, injury or irritation, in an attempt to contain the problem in a limited space.
Inflammation can affect external organs like joint (we say “arthritis”) and internal organs like bladder (we say cystitis).
When the inflammation involves external organs, signs are:

- Redness
- Swollen
- Painful
- Local heat





2.1 Role of anti-inflammatory drugs

Inflammation is a process, it is not a disease, and should be a short-tem process to protect the body.
However it may require a treatment if it continues to persist or if it is causing significant pain.
For example in case of mastitis the udder can be swollen, hot and become hard; it causes a clear discomfort for the cow or the sow, which stops to eat and fights the progeny when moving toward the teats.
Injection of anti-inflammatory medicine, will decrease the heat of the udder, it will become supple and antibiotic will be more active on the infected tissue.



2.2 Types of anti-inflammatory drugs

Anti-inflammatory medicines are available in 2 categories:

- Steroidal: like Cortisone, Prednisolone or Dexamethasone, these medicines have a strong anti-inflammatory response

  Often Dexamethasone is combined with antibiotic especially in medicines to treat infection of respiratory tract because the infection cause inflammation of the bronchi and the lungs (animals cough) and antibiotic are more active and the animals recover better when inflammation is treated.



- Non-Steroidal: like Aspirin, Paracetamol, Analgin. These medicines have less powerful action on **inflammation** but they have clear effect to decrease **pain** and to decrease **fever**.

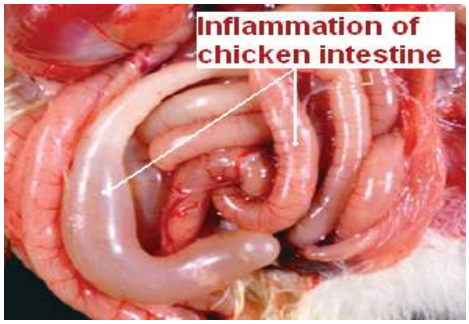
2.3 Usages of anti-inflammatory medicines

- Organs commonly affected by inflammation:

- Joint, it is arthritis; it can be caused by an injury, the microbes enter through the wound and invade the joint. Or some microbes like Streptococcus can enter the body of the piglet during teeth clipping, tail docking and few days later arrive in the joint and cause arthritis.

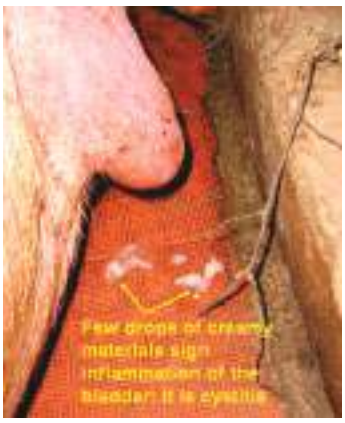


- Intestine, it is enteritis; it can be caused by bacteria like E.Coli or Salmonella which attach and damage the wall
  Or by irritant matter like when young animals eat sand



- Bladder, it is cystitis; it can be caused by infection, or if animals do not drink enough, minerals produces some microscopic stones that are abrasive for the bladder. The sow urinate small jets of urine because of painful spasms and often finish with small quantity of pus





- Trachea and bronchi, it is tracheitis or bronchitis; it can be caused by microbes like Mycoplasma that damage the wall of trachea and bronchi
  Or by gases like ammonia when manure is not removed. It provokes irritation of trachea and bronchi.

  In both cases the result is strong coughing.



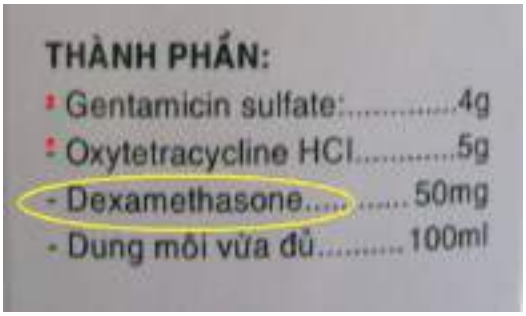
- Eyes, it is conjunctivitis, eyes are painful, eyelids remain closed, conjunctiva is red and swollen, and causes a discharge



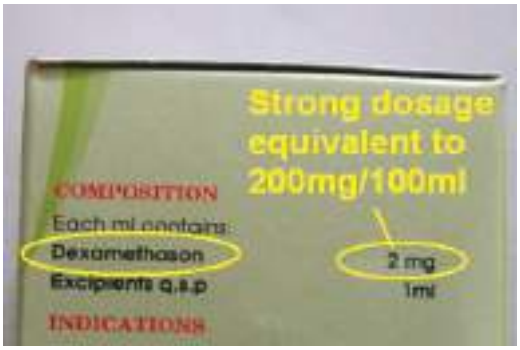


- Use of anti-inflammatory medicines

- In general when inflammation is caused by systemic **infection** (diarrhea, pneumonia, septicemia...), it is interesting to inject antibiotic combined with Dexamethasone.



- In case of **local inflammation** (joint, udder...), Dexamethasone is injected separately because the dose needed is higher. In general the dose is 1to 2 mg of Dexamethasone for 50 kg.



- **Abscess** is an inflammation process as well; but in this case anti-inflammatory drugs must not be used. When the abscess becomes supple, it must be opened for drainage

- **Injury** cause local inflammation: the skin is red, it is painful, swollen and hot; but inflammation is part of cicatrisation process.

  Do not use anti-inflammatory medicines to treat wound



- Non-steroidal medicines are often used to treat high **fever and pain** rather than inflammation.

  For example, it is crucial to treat lameness in sow with this type of medicine; if one leg is painful, the sow cannot stand up normally, cannot eat and drink enough resulting in serious health problems

  Using these medicines to decrease high fever helps animals to recover because they feel better, drink more and can eat again

- **Allergy**: Dexamethasone is also used to treat allergy; some animals can show an excessive response when they are in contact with chemicals, medicines, plants...
  - ❖ Common allergy are seen on the skin, with redness and itch. Pigs can become allergic to insect bites and can develop strong reaction. Only one pig show the symptoms in the pen. In general animals continue to eat.
  - ❖ Cattle can eat plants that cause an allergy to the sunlight; few days after eating the plants, the animal can develop lesions of the skin on large zone, like sunburn from moderate to very severe. Dexamethasone must be injected at the initial stage.



❖ Allergy can be caused by injection of medicines. It is not rare that some sows show a strong reaction to injection of Aujesky vaccine. Few minutes after injection, the sow is getting nervous, the skin becomes red, the sow breathes rapidly and salivates a lot. In few cases, the sow can lie down and becomes unconscious until coma and death. It is urgent to inject Dexamethasone to decrease the signs.

2.4 Side effects

Anti-inflammatory drugs cannot be used on long-term program in animals because side effects are numerous.

- Stomach upset/ulcers

In general, anti-inflammatory medicines cause irritation of the stomach until stage of ulcer. Pigs are sensitive and can stop to eat because of stomach pain. Distribute palatable, doughy feed.
It is recommended to limit use for 3 days.

- Abortion

Steroidal anti-inflammatory drugs can provoke abortion when they are injected during pregnancy; the risk increases after 2 month ½ of gestation in sow and after 6 months of gestation in cow.
Do not use Cortisone and Dexamethasone during gestation.

- Weaken immune system

Cortisone and Dexamethasone depress the immune response if used on long term; the body cannot fight well against infection. This is important especially for diseases caused by viruses: antibodies are the only response (antibiotic are not active against viruses) and Cortisone will decrease production of antibodies.
Do not use Cortisone or Dexamethasone during viral diseases
Do not vaccinate and inject Dexamethasone at the same time; response to the vaccine will be low

2.5 Products available in the market

- Injectable

❖ **Analgin** family (actually the real name of the chemical is Dipyrone): good effect on pain and fever. But activity of this medicine is short and in general persists only 1 hour after injection.
Injection must be in the muscle (and not in the fat in pigs) to prevent irritation

❖ **Phenylbutazone**: this non steroidal medicine is active on inflammation, pain and fever. The activity continues 24 hours.

Like with Analgin, it is important to inject intramuscular with proper technique









❖ **Tofedine** is a non steroidal medicine active on inflammation, pain and fever. Duration of action is 48 hours.
Injection does not cause irritation

❖ **Ketofen** is a non steroidal medicine active on inflammation, fever and especially pain. Ketoprofen is most-commonly used for musculoskeletal pain from soft-tissue injury, osteoarthritis or other bone and joint problems.







❖ **Paracetamol** is a non steroidal medicine active on inflammation, pain and fever but the duration of action is only few hours.
This medicine does not cause strong side effect on the stomach like Ketofen











❖ **Dexamethazone** is a steroidal medicine with strong effect on inflammation, but not on fever and not on pain.
Duration of action depends of the diluents (from 1 hour to 2 weeks!); in general products available in Cambodia are active 24 hours.









- Oral

❖ **Paracetamol** can be used mixed in the feed or in the drinking water
To increase feed intake of pigs having fever
To decrease pain, especially joint and leg pain in sows
To increase growth of broilers during hot season
To strengthen the chicken legs





3. Anti-parasites medicines

Parasites are organisms that either live in the body, they are called Internal Parasites, or live on the body, they are called External Parasites
Parasites cause despoilment and poor growth, can transmit diseases and are source of discomfort.
It is important to control parasites in animals for better health.

3.1 Control of external parasites

- Carbaryl is used to control external parasites in poultry; these products are available in the form of dusting powders. They have low toxicity and very short persistence.
To treat poultry, spray the vent and fluff areas from beneath the bird. Sprayed application can be made to the litter surface to control black beetles.
Do not repeat treatment more often than every four weeks. Do not apply within seven days of slaughter.
500g of Carbaryl 5% can treat 100 birds.

- Asuntol 50, is used to control of ticks, sucking and biting lice, fleas, depluming mites, and sucking flies, fly larvae in wounds and mange mites domestic animals (except cats).
It is a white powder to be diluted in water (1g /liter of water). After dilution in water the product can be used for 6 months.
Asuntol is generally used for hand spraying and wash treatment.
Asuntol is highly toxic by inhalation and ingestion; signs of poisoning include diarrhea, drooling, difficulty in breathing, leg and neck stiffness dilation of the eye pupils

- Ivermectine:

❖ **Mange**: this medicine is useful to control suckling lice and mange; to eradicate mange in pigs it is necessary to inject 2 times within two weeks or to mix Ivermectin in the feed for 7 days

❖ **Ticks**: Ivermectin does not result in prompt death and detachment of ticks but does interrupt feeding (it reduces the number of engorged females) for 2 weeks and the egg production.

❖ **Flies**: Ivermectin is effective on dung-breeding flies, because after treatment, larva cannot develop in feces of cattle for about 10 days.

Ivermectin must be injected by sub-cutaneous route

3.2 Control of internal parasites

- In Poultry

Worms are common in scavenging chickens and make birds less efficient and more susceptible to other diseases; preventive treatment should be made every 3 months using Tetramisole (100mg/ one adult chicken)

- In swine

Two main medicines are available: **Levamisole** and **Ivermectin.**
Actually, now Ivermectin are widely used because they can control worms and external parasites.
Ivermectin can be injected (sub-cutaneous route) or mixed in the feed (for 7 days)
Many types of Ivermectin are available, some are high quality products, and some are uncertain quality products.



- In cattle

Levamisole: lung worms and intestinal worms are killed by Levamisole but for many years, farmers prefer to treat parasites with Ivermectin because it is active as well on external parasites. **Before** Levamisole is widely used because the price of Ivermectin is unaffordable, but now many manufacturers sell Ivermectin with low prices (but efficacy of products is not guaranteed).



Ivermectin: for cattle some manufacturers produce Ivermectin "Super", meaning they combine Ivermectin with another medicine (Clorsulon) that is active on Fasciola (only adults, it does not kill eggs). This product must be used regularly to be efficient against Liver Fluke.

Albendazole: it is the best choice when cattle are suspected to be infested by Fasciola; the risk is high when cattle are grazing in wet area where snails are living. This product is active as well on lung and intestinal worms.
Albendazole is administered by oral route









Dovenix: it was a famous product in Cambodia because it is very efficient against Fasciola, but only Fasciola. This product can be administered by sub-cutaneous injection or by oral route.



3.3 Protozoa: Coccidiosis

Coccidiosis is especially harmful for young animals; it causes diarrhea with blood in chicks and calf and can develop and cause death.
In piglets it causes grey chronic diarrhea and animals arrive at weaning in terrible condition.







- In poultry:

Toltrazuril, Amprolium, some sulfonamides like Sulfadimidine or Sulfamethoxine are active against Coccidiosis
When using feed for chicks (0 to 21 days) on the bag, the company mentions that the feed contains Salinomycine; it is to prevent Coccidiosis

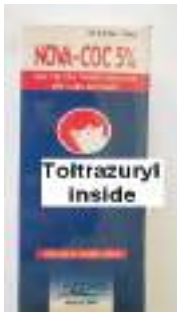






- In swine:

Toltrazuril is the only efficient medicine; it must be used only as preventive treatment, it is not efficient to treat the diarrhea



- In cattle

Sulfonamides, Totrazuril and Amprolium can be used to treat coccidiosis.

3.4 Parasites of the blood

Parasites of the blood are transmitted by ticks or flies.

Local cattle and Zebus are normally resistant to these diseases, but in crossbred cattle or in case of weakness, Babesia and Trypanosoma can develop from subacute to acute form
Treatment must be done with Berenil or Trypamidium





Trypanosomiasis regularly kills horses in Cambodia









4. Hormones

These medicines are used to treat disorders of reproduction in cattle and in swine

- To induce oestrus (female are in heat)

- **Estradiol** (Corpuline) especially used in gilts or heifer to provoke estrus when they show no sign (red vulva, excited by the male...) after the normal age of puberty.
- **Prostaglandin** (Lutalyse) can be injected in cow without oestrus after weaning of the calf, because the ovary can be "blocked" by a cyst
  Of course very skinny cattle do not need hormone but need good feed to recover proper condition to show estrus.

- To induce delivery; sometimes sows do not deliver yet at 115 days of gestation. Injection of **Prostaglandin** will induce farrowing few hours later. Of course the farmer must be sure of the date of mating and calculate well the date of delivery.

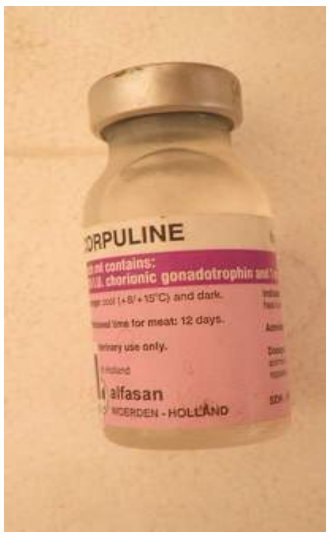
- To increase contraction of uterus during the delivery
  Piglets are delivered regularly and about every 20 minutes. If there is more than 30 minutes from the previous piglet, injection of **Ocytocin** (1ml in the muscle) will increase power of contractions and facilitate expulsion.

- To facilitate expulsion of placenta
  In sows, to make sure that the whole placenta has been expelled, it is recommended to inject 2ml of **Ocytocin** in the muscle when delivery is finished

- To provoke milk ejection
  Ocytocin stimulate milk ejection after delivery. In case of MMA (no milk) in sows just after delivery, it is crucial to inject 0.5 ml of **Ocytocin** to induce ejection of milk and especially of colostrum.

- To stimulate drainage of uterus in case of discharge
  When the uterus contains pus, it is important to stimulate contractions to expel all dirty material from the womb. But Ocytocin can stimulate contractions ONLY during delivery. To provoke contractions in case of infection of uterus, we must use **Prostaglandin**





5. Vaccines

Vaccines are used to **prevent diseases** (never to treat diseases) because after injection of vaccine the animal will produce antibodies to protect against microbes attack.
It is impossible to protect animals against all diseases circulating in Cambodia. It is necessary to select useful vaccines according to the risk.
When vaccines are selected, it is important to follow a program of vaccination to make sure that the animal is protected regularly against the vaccinated diseases.

5.1 Vaccines for poultry

- For backyard chickens

❖ Newcastle:

- Live vaccines are under powder form to be mixed in solvent, and must be used immediately. The rest of the vaccine cannot be kept for next vaccination
  Alive vaccines are administered by eye drop or in drinking water
- Inactivated vaccines are ready to use. It is possible to pump only few doses in the bottle and to keep the rest between 2 and 8°C for many days. The vaccine can be kept between 15 and 25 °C for 2 or 3 hours.
  But this vaccine must be injected (sub-cutaneous or intra-muscular route)









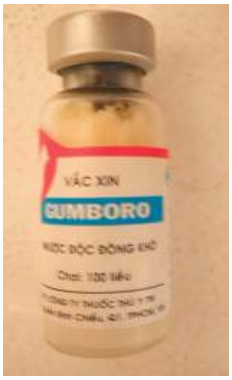
❖ Fowl Pox
Live vaccine with specific technique of administration: wing web route

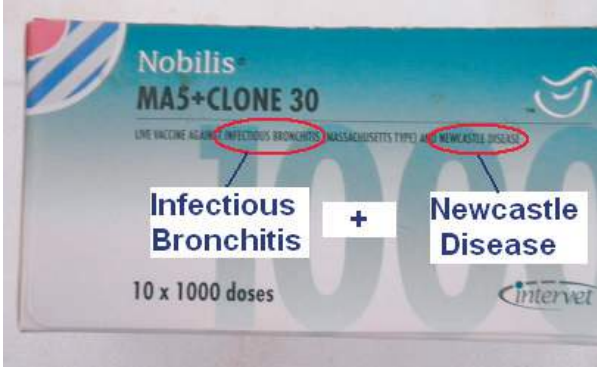




- For semi-commercial farms (chickens kept in premises)

Supplementary vaccinations are recommended:
❖ Gumboro
❖ Infectious Bronchitis (IB)





5.2 Vaccines for swine

- Smallholders

❖ CSF: It is the most important vaccination that must be regularly done with a proper program of vaccination.









❖ FMD:
The regular vaccination with a **trivalent** (O+A+Asia1) vaccine is highly recommended for sows, boars and gilts







- Semi-commercial farms
  Supplementary vaccinations are recommended:

❖ Parvovirus: this vaccine must be done on sows and gilts two weeks before mating to prevent reproductive failure. Boars must be vaccinated as well
The vaccine is often combined with Erysipelas vaccine



❖ Aujesky: this vaccine is especially recommended for sows, gilt and boars.
Sows are vaccinated during gestation and boars are vaccinated twice a year



Vaccines against Atrophic Rhinitis, Mycoplasma, E.Coli, PRRS and Circovirus are not necessary in general and can be used only after proper diagnosis and risk assessment within the farm and neighboring area.
Vaccines against Pasteurella and Salmonella are not recommended

5.3 Vaccines for cattle

- FMD: cattle must be vaccinated regularly against FMD with a Trivalent Vaccine (O+A+Asia1).
  Cattle vaccines, in general are in alum-solvent and can be injected once a year
  When outbreaks occur in the neighboring communes or districts cattle should be re-vaccinated in emergency.



Trivalent vaccine with aluminium solvent

- Hemorrhagic Septicemia
  The alum-vaccine must be given at 6-months intervals, especially must be injected before rainy season
  There is a good protection of calves with maternal antibodies; cattle must be vaccinated during last months of pregnancy





6. Disinfectants

Disinfectants are chemicals that destroy microbes: viruses. bacteria and fungi

6.1 Disinfectant for the skin

These disinfectants are applied directly on the skin after cleaning to removed soiled materials. The most commonly used are:

- alcohol
- Iodine product are brown color; the famous one is Betadine
- Many products to treat injuries like lesion of FMD are marketed; often they are in form of spray because it is possible to apply disinfectant without handle the animals.
  These products generally combine disinfectant like Methylen Blue or Gentiane Violet and various antibiotics (Tetracycline family in majority)









6.2 Disinfectant for premises

All disinfectants should be used after cleaning. Organic matter, dust, decreases a lot efficacy of disinfectant.
These products must be diluted in water. It is important to follow recommendations of the manufacturer. Disinfectants are highly concentrated and must be handled with precaution.



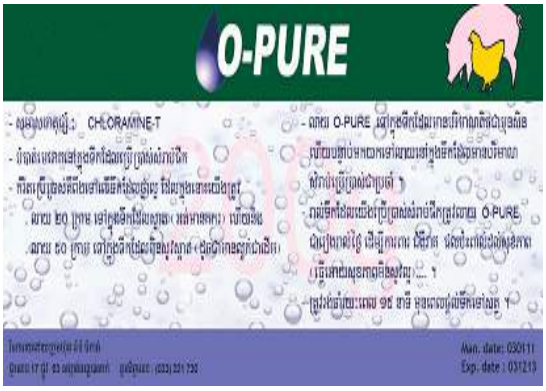






6.3 Disinfectant for drinking water

The water is the most important nutrient in term of quantity. In majority drinking water are polluted by microbes especially coming from animals feces.
Disinfection of water is important to prevent contamination by H5N1 when the water is pumped from pond, river or tank not protected against wild birds or ducks.
Systematic treatment of drinking water with Chloramine is a good practice



7. Antidote

Antidote is a substance to stop and eliminate the poisoning caused by chemical substances: pesticide, medical reaction:

- Atropine is used to eliminate poisoning when the animal eats dipterex or pilocarpine. Atropine can be combined with antibiotic
  to treat severe diarrhea. Atropine is against the intestinal, tracheal contractions and to release painfulness.
- Adrenaline is used for emergency case to treat the reactions caused by bitten animal, vaccination reaction or penicillin.

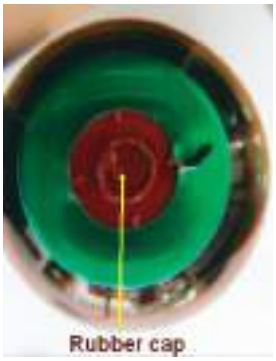


A. Presentation of medicines

1. Injectable

The medicine is stored in a bottle often in tainted glass to protect the medicine against the light. The bottle is closed by a rubber cap; this rubber cap can be punctured several times. The rubber cap is sealed by an aluminum cap to ensure that air cannot penetrate in the bottle. Often a supplementary plastic cover is set on the bottle to show that the vial is new





- Ready to use

Remove the plastic cover, remove the central part of aluminum cap and the rubber cap appear. The needle is punctured in the rubber cap and the medicine is pumped in the syringe.



- Always use clean needle because dirty needle will introduce microbes and organic matter in the medicine during puncture. It will decrease the quality of the product during storage
- Do not inject air in the bottle to facilitate pumping because air is not sterile and it will contaminate the medicine

The most common presentations are vials of 250 ml,100 ml, 50 ml and 20 ml

This presentation is mainly used for live vaccines and for few medicines like Berenil. This technique is to ensure better conservation.
Vaccines can be kept only one to two hours after mixing with the solvent. Berenil can be conserved 7 days.



2. Oral powder



Powders are mixed in the feed or in the drinking water when they are soluble.
It is an easy way to administrate medicines especially to group of animals

In general powder is used for premixes (provide vitamins and minerals) and preventive treatment but not to treat sever diseases because sick animals often stop to eat.

Products are packaged in small bags of 100g for smallholders, 1 kg...until bags of 25 kg for commercial farms.

3. Oral liquid



These medicines must be administrated by force and it is necessary to handle animals properly.
It is a common presentation for anti-parasites drugs like Albendazole for cattle
This presentation is used to administrate medicines that must act directly in the digestive tract like medicines against diarrhea of piglets or against Coccidiosis
It is often packaged in bottle with a pumping system that delivers the proper dose to the animal.

4. Tablets/Bolus



Tablets are common presentation to treat dogs and cats but are rare for pigs and cattle.
Some farmers use tablets or capsules especially when using medicines for human
Boluses are big tablets that are used to administer antibiotic directly in uterus just after delivery

5. Eye-drop



Eyes are very sensitive and we can only use eye-drop to administrate medicines in the eyes. Non-specific products burn and are painful for eyes.
Eye-drops are used as well to dilute vaccine for chicks. Often they are tainted in blue, to make visible the drop in the eye and to make sure the chick is well vaccinated

6. Cream and spray



Cream and spray are for local use especially for skin lesions.
These medicines must be used on clean skin; hears must be cut, crust must be removed and the wound must be washed with clear water and soap.
Sprays contain disinfectant and antibiotics. They are used to treat lesions on the feet (FMD, footrot...) because the farmer can spray the products at a distance

B. Administration of medicines

<u>Efficacy</u> of medicine is very closely linked with proper administration of medicine.

VAHW must strictly follow indications provided by medicine producer; these indications are clearly explained on the label

Dosage: quantity of product to be administered
Route of administration: method to administer the product
Rhythm of administration: when administer the product and how long

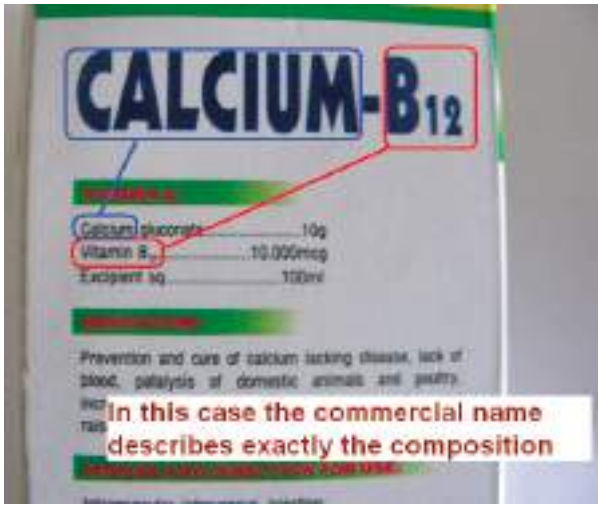
1. Reading the label

1.1 Composition

All indications are clearly written on the label but label are in general in foreign language.

It is important to check the composition because it indicates **what is inside the bottle**; the commercial name can give some indications about component of the products but it is important to systematically verify
Some manufacturers do not fit with standards of formulation; make sure that not too many types of components are combined.
Some products can have the same components but the dosage can be very different.







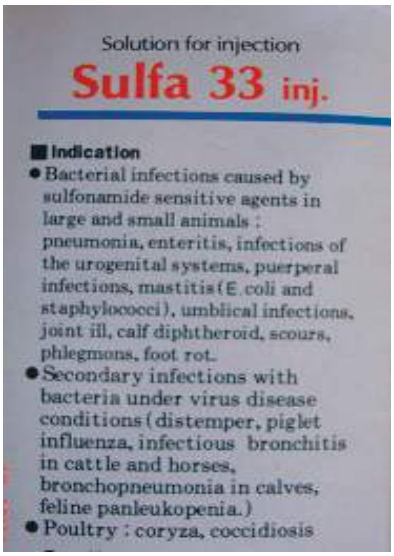






English	French	Vietnamese
Composition/Formula	Composition	Thành Phàn
■COMPOSITION Each ml contains Gentamicin sulfate ..... 5mg(Activity) Iron Dextran ..... 100mg(as Fe)	COMPOSITION Triméthoprime..... 40,000 mg Sulfaméthoxypyridazine..... 200,000 mg Excipient QSP..... 1,000 ml	THÀNH PHẦN: trong 100ml Paracetamol.....10g Vitamin C.....10g

1.2 Indications



List of indications is often not very helpful because the manufacturer wants to show that the product can treat many diseases and indications are extensive and not precise: when reading the label of Sulfa 33, we can see that this antibiotic can treat quite all infectious diseases in swine cattle and poultry!
Better to refer to your experience and your knowledge to determine the proper use of the medicine.

1.3 Dosage

It is important to check the dosage:

- It means the quantity to be injected that in general depend of the weight and is mentioned in **ml** (of medicine)/**kg** (of animal)
- Or the quantity to be mixed in the feed or the water, it is mentioned in **g** (of medicine)/**kg** (of feed) or **g** (of medicine)/**liter** (of water)

	English	French	Vietnamese
Dosage	Dosage	Dosage	Cách Dùng
Treatment	Treatment	Curatif	Tri Bênh
Prevention	Prevention	Preventif	Phòng Bênh
Poultry	Poultry	Volailles	Gà
Swine	Swine	Porcs	Heo
Cattle	Cattle	Bovins	Bò
Once a day	Once a day	1 fois par jour	Ngày 1 lân
During 3 days	During 3 days	pendant 3 jours	Trong 3 ngày

2. Homogenizing the product



Before injecting a medicine, it is necessary to shake vigorously the bottle to make sure that the active substance is well mixed with the solvent.

3. Proper dosage

- For injectable medicines the dosage depends of the weight of the animal. It is crucial to estimate correctly the weight of animals.
  In general young animals are over-estimated and adults are under-estimated. Many medicines indicate the dosage 1ml/10 kg, it means that a sow of 250 kg must receive an injection of 25ml; it is not easy to inject 25 ml to a sow, it is necessary to use a pig catcher and often it is recommended to split the dose and therefore to inject 2 times. On the other hand the cost of 25 ml is much higher than the cost of 10 ml.
  Two good reasons to estimate the sow around 120kg...but the quantity of medicine will be not enough and cannot treat the disease!
- For medicines to be mixed in the feed, it is very important to change the dosage for preventive dosage when the pigs or chickens eat normally and treatment dosage when animals are sick.
  Actually, a pig of 50 kg eat 2 kg of commercial feed every day, but when the pig is sick, it will eat only 1 kg per day or less. If the dosage is 100g of medicine in 50 kg of feed, when pigs eat only 1 kg the farmer must mix 100g of medicine in only 25 kg of feed to be sure that the pig get enough antibiotic.

4. Rhythm of administration

After injection some products are **active** in the body of animal for few minutes to several days.

- **Few minutes**: Ocytocine…it means that a second injection can be done about 30 minutes after the previous one
- **1 hour**: Calmagine, Analgine…
- **12 hours**: Ampidexalone, Biocolistine…If the medicine is injected in the morning, the second injection must be done in the evening to maintain a good level of antibiotic in the body
- **1 day**: Septotryl, Frecortyl...in this case the medicine will be injected the day after.
- **2 days**: Tolfedine, Longamox…in this case the second injection is made 2 days after the first one
- **3 days**: Remacycline, Longicine…
- **> 7 days**: Iron Dextran…

5. Necessary equipment

- For injection, adequate syringe and needle are needed

- **The volume of syringe** must fit with the quantity to be injected; impossible to measure 1 ml with a 20 ml syringe or to inject 30 ml in 3 times with a 10ml syringe



- **The length of needle** must be adequate especially for intramuscular injections in pigs; thickness of fat for a 250 kg sow in the neck is more than 30 mm; Needle must be at least 40 mm



- **The diameter of needle** must fit with the product to be injected; oily (Long Acting product) are viscous and must be injected smoothly in short time with bigger needles

- For oral powder

  Small farmers cannot afford a mixer. Medicines must be mixed step by step to make sure that the mixture is homogenous, that all pigs will eat the same quantity of medicine.

  100 g will be mixed first in 1kg of raw materials, this mixture will be mixed in 5 kg of raw materials and at least the mixture is mixed in 50 kg of feed.

C. Residues

1. Definition

Veterinary medicine residues are small amounts of veterinary medicines that can remain in animal products such as meat, eggs or milk after injecting or administering medicines.

If the meat, egg or milk is eaten by people short time after treatment, they will absorb small doses of medicines administered to animals.



2. Risks

Small amount of medicines can have important effect:

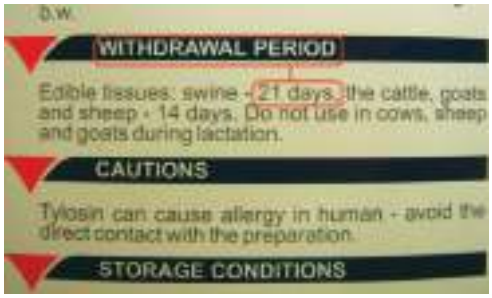
- Allergy; some people are allergic to Penicillin, and only traces of Penicillin will cause allergy



- Resistance to antibiotic treatment; eating regularly animal products with trace of Tetracycline result of E.Coli resistance: it means E.Coli can adapt to Tetracycline and now Tetracycline is not active against E.Coli in human

- Toxic; trace of Chloramphenicol can provoke fatal anemia in human

3. Prevention of residues



- Manufacturers of medicine indicate a **withdrawal period** on the label: it is the waiting time after treatment, that must elapse before animals products, meat, eggs and milk can be eaten

- In general, the good practice is to use medicines only when it is necessary; often better management can solve majority of problems of health.
  When medicines are necessary, it is important to use medicine of good quality, with the proper dosage and adequate duration of treatment.

D. Conservation of medicines

The quality of medicines can be guaranteed only if the storage is made in good condition; many factors can impair the conservation of medicines:

1. Heat



- Vaccines are the most sensitive medicine to heat, especially live vaccines. The cold chain is crucial: the temperature of vaccine from manufacturer to the farm must always be maintained between 2°C and 8°C.



- All medicines are damaged by high temperature, more or less when temperature is above 25-27°C

2. Light

Medicines must be stored in dark environment, often they are packaged in boxes and bottles are in tainted glass. Vitamins are easily damaged by light.

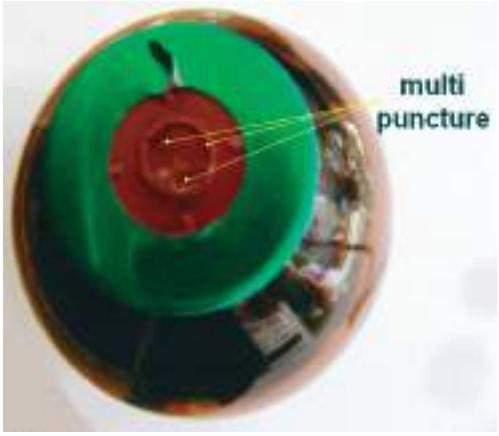






3. Oxidation

Vials of medicines have a rubber cap that can be punctured several times. However each puncture allow air to enter the bottle and the oxygen of air will provoke oxidation
For example tetracycline turns from light yellow to dark brown in vial already pierced
When you start to use a vial of medicine try to finish it in few days



4. Moisture

In some case the powder becomes very hard like stone and can be administered after grinding

- This problem occurs mainly with powder if the bag is not really well sealed or after opening, especially during the rainy season
  It is interesting to choose products packaged in plastic boxes if they must be conserved several weeks
- In some case the powder becomes very hard like stone and can be administered after grinding
  Sometimes mould develops and medicines get a green color or a bad smell: do not use it



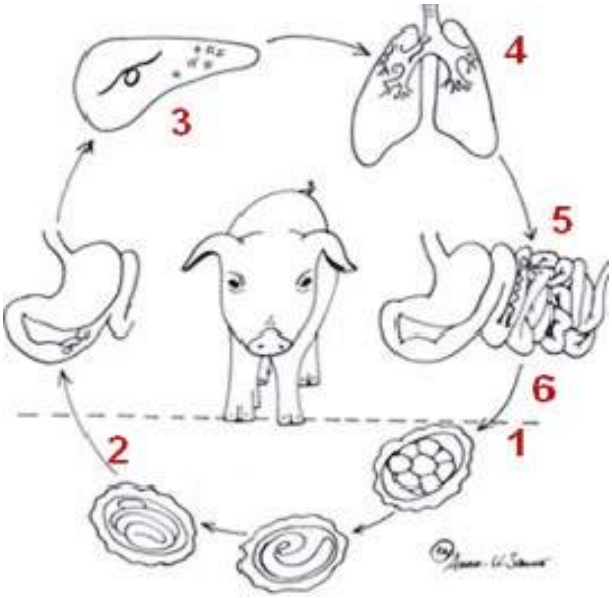


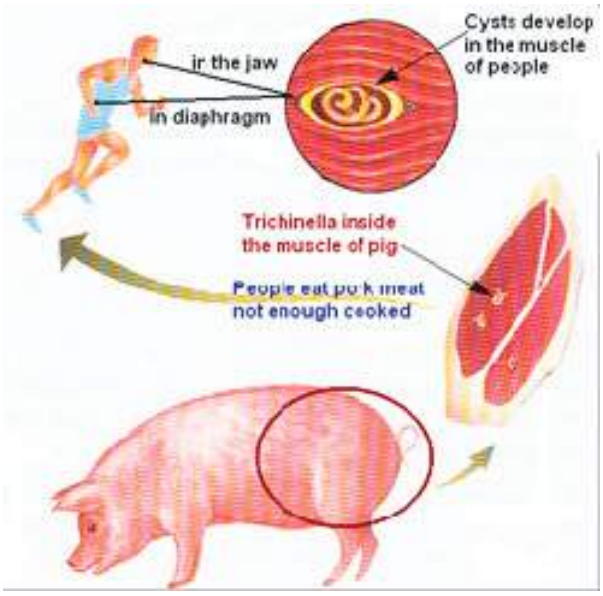


5. Expiration

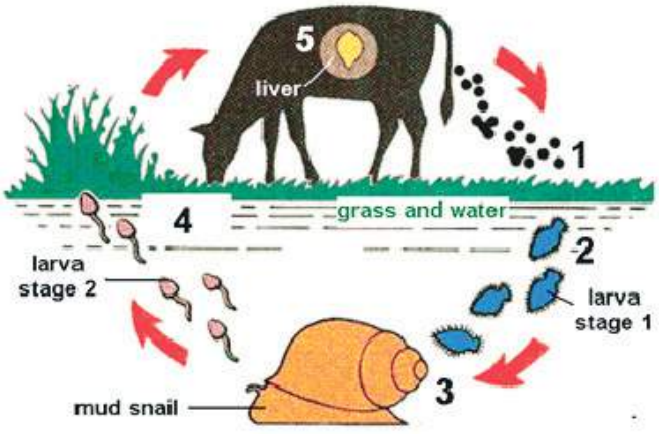
Normally medicine must be used before expiring date
Medicine like vitamins, vaccines cannot be kept a long time; it is important to respect expiry date
However some medicines like antibiotic can be used many months after expiry date if the conservation is good

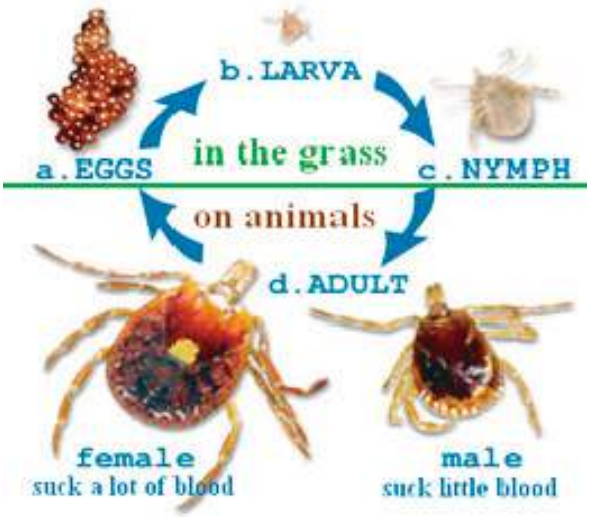






IX
Parasites





Parasites are organisms that either live inside the body, we say Internal parasites, or externally: on the skin or in the skin, we say external parasites.
In general parasites are harmful for animals and it is important to control parasites because they impair animal health by:

- Despoilment and poor growth
- Causing diseases
- Transmission of diseases
- Disturbing animals

Cycles of parasites

All parasites have a development cycle from egg to adult (apt for reproduction). Generally different stages are:

egg **larva** **adult**

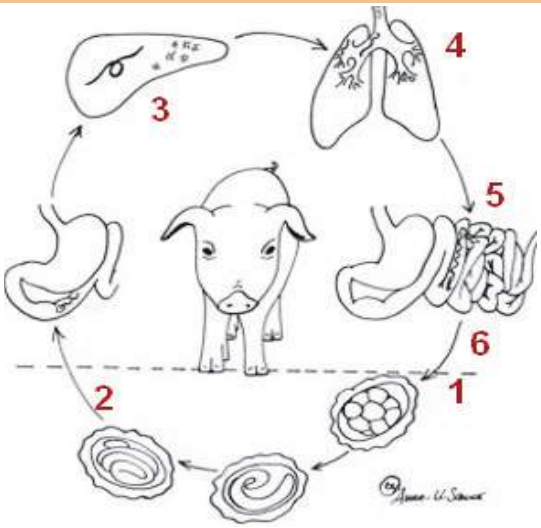




1. Direct cycle

It requires only one animal for development of all the stages.

Example Ascaris in pigs; the complete cycle in the pig takes 2 weeks to 2 months after eating eggs







When the larva is in the intestine, it migrate to the liver through the blood



After that, move to the lungs and then to the trachea to be swallowed and return in intestine



When the larvae arrive again in intestine after this long trip, they transform in adults and lay eggs



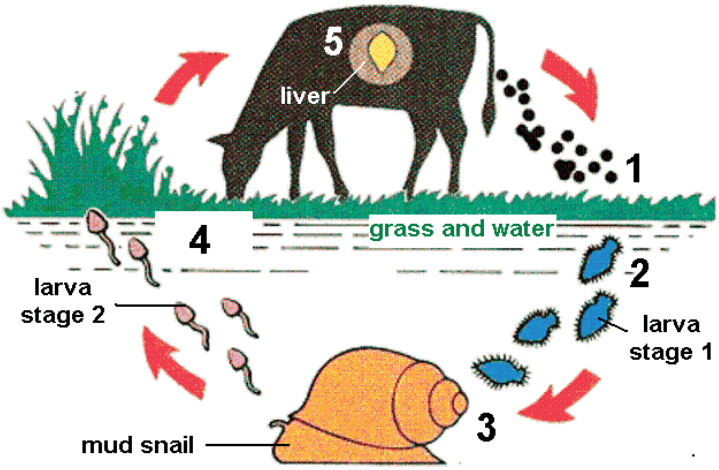
Eggs are excreted (need of microscope to see eggs in feces) and adult can be excreted too when they are too plentiful



2. Indirect cycle

It always requires another animal for development from egg to adult:

Example, Fasciola in Liver Fluke in cattle. To complete the cycle the Fasciola need a **cattle and a snail**









The snail will lay new larvae in the grass (we say second stage)

The larva after ingestion migrate to the liver and transform in adult and will start to lay eggs that go to intestine and feces





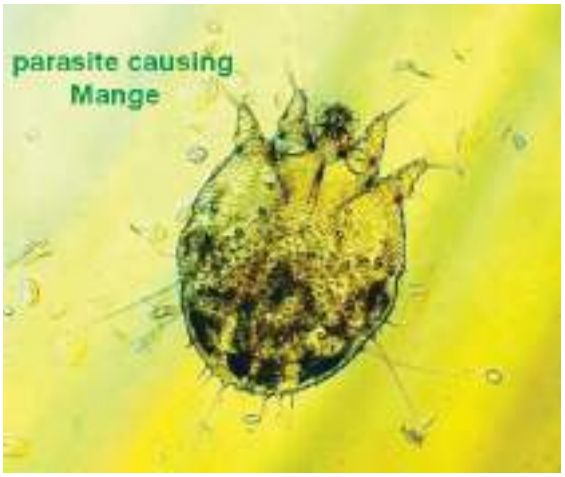
External parasites

1. Specific impact of external parasites

1. Lesion of the skin

Mange is a very common disease of the skin especially in pigs that is caused by a parasite

Entire life cycle (10 to 15 days) occurs on the pig but mange can survive on the soil (near 4 weeks if soil is wet)



The adult female deposits eggs in tunnels that are burrowed just under the skin surface; it scratches a lot and animals rub vigorously, shake the head and develop red colored blisters.



a. Blood depletion

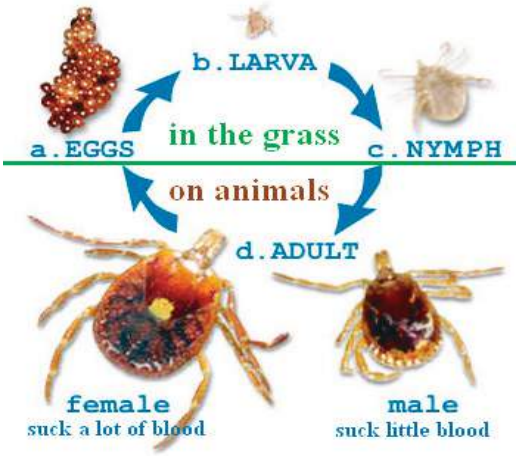
The only source of nutrition that **ticks** use is the blood sucked from animals; the mouth is like a harpoon; it cuts into the skin to pump the blood from animals. Large tick numbers can lead to blood loss and weakness especially in calves.





Ticks go through different life stages: egg, larva live in the grass and adult live on animals (and sometimes on humans)

Animals are contaminated in the grass, shrubs…



A female tick live on animal and fed with blood (it will swell to about 200 times its original size)

Then it drops to the ground where it will lay its eggs and die after

Larvae develop and move into grass in search of their first blood meal.

If animal passes by, they attach themselves and crawl upward to suck blood.









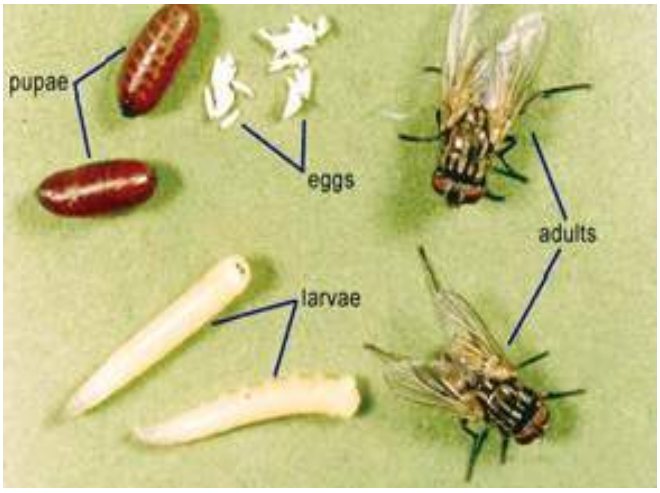
b. Annoyance and stress for animals



It is caused especially by **flies** when they are too many. We can observe this problem especially in swine, in farrowing and weaning pens where many flies can cause stress
It is difficult to control flies because they multiply very fast

The complete life cycle from egg to adult able to lay eggs is short :7 to 14 days

One fly adult lay up to 400 eggs

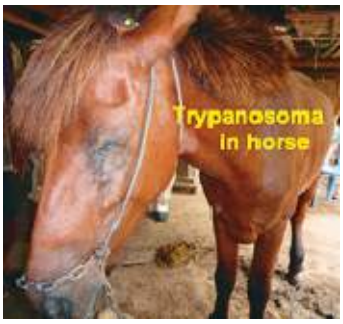


c. Transmission of diseases

Flies
In pigs, heavy flies infestation transmit E. coli, salmonellae, streptococcus and maintain greasy pig disease (staphylococcus) and coccidiosis in farrowing pens
Horse flies can transmit Trypanosoma (parasite of blood) to cattle and horses

- Mosquitoes
  In chickens, mosquitoes are responsible of transmission of Fowl Pox this disease cause mortality in chicks and typical infected crusts in broilers and layers







❖ Ticks
They can transmit Babesia and Anaplasma (parasites of the blood); local cattle are not susceptible with these diseases but imported dairy cattle, crossbred cattle are at risk to Babesia and Anaplasma:



- Ticks in humans
- When cattle live under the house, when children take care of cattle in the field, ticks can attach on people and suck blood.
- it is difficult to remove and painful
- it causes strong irritation
- ticks can transmit severe diseases to people



2. Control of common external parasites

2.1. Lice

I. In poultry

❖ The lice found on poultry do not suck blood; they feed on dry skin scales, feathers, and scabs; the entire life cycle of the lice occurs on the chicken (it cannot be transmitted to humans)
Lice eggs stuck to feathers, especially around vent causing irritation, loss of vent feathers and scabs around vent.

❖ Treatment of lice is made by Carbaryl; because the life cycle of lice is approximately 2 weeks, treatments should be repeated every 2 weeks as needed

II. In swine and cattle

❖ Lice are **blood sucking,** cause irritation and severe infestations can cause anemia.
Parasites are 3mm long and are found behind the ears, elbows and between the legs.

Ivermectin (1ml/50 kg in cattle or 1ml/30kg in pig) and Asuntol (1g/ liter of water) can be used for treatment

2.2. Mange

❖ Mange is mainly seen on pigs and is spread by contact. Mange of pig cannot be transmitted to humans.
Washing pig every day maintain humidity in the pen and good condition for mange survival



- The intense irritation causes the pig to scratch and rub vigorously, ear shaking, red-colored blisters, dark crust develops in the ears
  Because of the serious irritation, swine, especially young pigs, will not feed well and thus will grow slow and can develop skin infections



- Injection of Ivermectin (sub-cutaneous) two times within 12 to 14 days; dosage for Ivermectin 1%: 1ml for 30 kg
  Or use of Ivermectin in the feed for 7 days
  Or spray insecticides like Asuntol (more difficult to implement)



2.3. Flies



- Flies (domestic flies) cause annoyance in poultry premises, in pigs, especially in farrowing pens and post-weaning pens and in cattle. They can transmit and maintain disease: it is important to control flies population

- Control of flies requires control of larvae (maggot); breeding requires 35°C for eggs hatching and high humidity is ideal: manure is the best place for flies breeding
  If the breeding grounds can be removed, the reproductive cycle will be broken or much reduced: **less larvae = less flies**
  Other common breeding places are: waste feed, crust on top of slurry, cracks in walls, bedding used in farrowing houses



Butox (2ml/ liter of water) is an insecticide with low toxicity for environment and can be used to kill insects on animals and in resting sites. 3 to 5 liters of solution are needed to treat a cattle of 250 kg and 1 liter is needed to spry on 20m^2 of wall



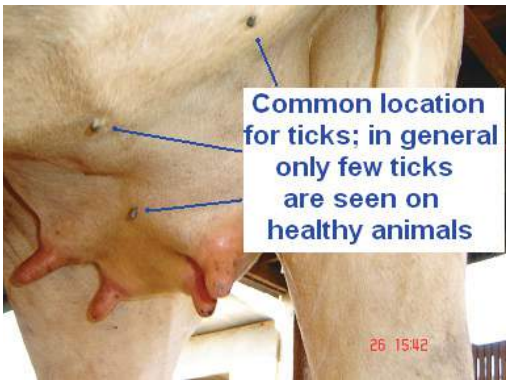
- Sporadically cattle are disturbed by **horse flies.** They are bloodsucking insects and bites are painful; they are active in the daytime. Numerous bites can cause blood loss (20 to 30 flies would take 20 teaspoons of blood every 6 hours).



- Control is not easy; these flies will swarm persistently around animals and feed where the spray of insecticide coverage was not complete (underbelly or legs), and it is difficult to locate and eliminate breeding sites in wetlands

2.4. Ticks

Ticks are mainly seen on cattle and scavenging pigs



- In Cambodia cattle are tick resistant (Zebu and Cau Baye); treatment against ticks are only occasional when farmer can see more then 40-50 females full of blood on one animal
  Actually few ticks on cattle are necessary to ensure slight infection with diseases transmitted by ticks and maintain immunity

- Treatment can be made by spraying insecticide like Asuntol (3 g/liter of water to kill ticks) or by injection of Ivermectin (1ml/50kg in cattle and 1ml/30kg in swine)

It is recommended to spray Asuntol under the house when cattle are infested because larva live in the grass and the soil and can jump on people

- Biological control can be made by scavenging chickens which eat ticks and wild birds (Egret family) pick ticks on cattle



2.5. Mosquitoes

- In chickens, mosquitoes are responsible of transmission of Fowl Pox
- In pigs, it is common to see one or two pigs in a pen with infected spots after numerous mosquitoes bites. Often pigs have susceptible skin because they have mange. This "allergy" to mosquitoes, results in strong infection of the skin, poor growth and low value of fattening pigs.



- Mosquitoes do not transmit diseases to cattle, but important population of mosquitoes during the night impair cattle resting and they are not active during the day time, they sleep. They cannot graze enough they move to bad condition.
- Control of mosquitoes is not easy but cutting grass, drying puddle and eliminating all stagnant water (even very small quantity) decrease significantly population of mosquitoes.







A. Internal parasites

1. Specific impact of Internal Parasites

1.1. Chronic loss of body condition

Worms, especially worms of the intestine, impact animal health because they absorb essential nutrients during digestion in intestine causing deficiencies in the animal.

For example, in pig, adult worms of Ascaris feed from nutrients in the intestine; heavy infestation leads to thin piglets and less resistant to infection at the age of 2 months

The risk is also high for scavenging chickens; different types of round worms, that live in small intestine or in gizzard cause slow growth and loss of condition.

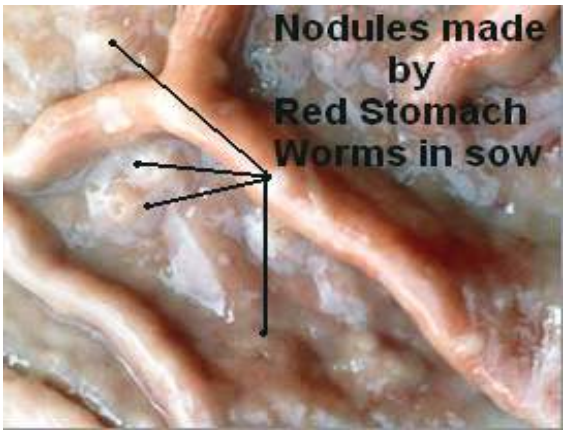


1.2. Reluctance to eat

Worms in stomach and intestine cause irritation of these organs resulting in reluctance to eat: animals heavy infested eat less, without appetite.

In cattle parasites of stomach are found in abomasum (fourth chamber of cattle stomach) and not in rumen.

It is important to check animal temperature: in general, when animals show fever + reluctance to eat, infectious diseases must be suspected, if the temperature is normal, internal parasites are likely cause.



1.3. Diarrhea

Irritation and inflammation by worms of the lining of the intestines cause diarrhea. When the liver is damaged like in Liver Fluke caused by Fasciola, the digestion is impaired and diarrhea occurs.



1.4. Coughing

During the cycle in animals, larvae of Ascaris travel through the lungs and provoke pneumonia and coughing

Lung worms in cattle cause a lung disease in cattle with clinical signs similar to those caused by viruses, bacteria; it causes verminous pneumonia or bronchitis.



Mature lung worms live in the bronchi resulting in rapid breathing and coughing and nasal discharge



1.5. Rough hairs

Worms' burden causes multi-deficiencies and is often combined with poor nutrition; the symptoms are similar as symptoms noticed in vitamins and minerals deficiencies



1.6. Anemia



Worms can cause lesion of the lining of stomach or of the liver and cause bleeding
Red stomach worms are 1cm long worms in sows, they live in stomach and suck blood causing reluctance to eat, loss of condition and anemia.
In cattle, Fasciola cause bleeding lesion in the liver and then anemia.
When anemia is developing, edema appear especially under the jaw.

1.7. Decrease immunity

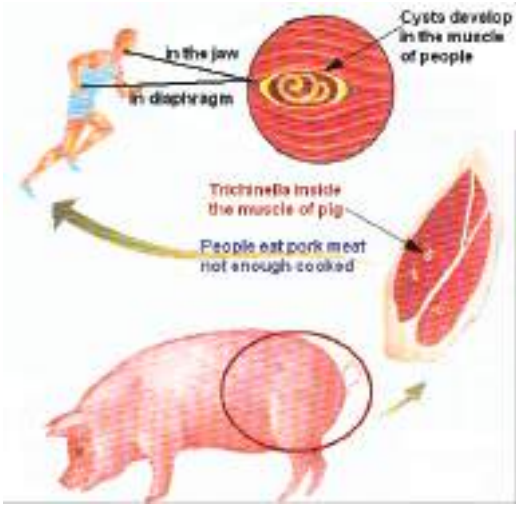
In cattle, the brown stomach worm (in abomasum), called Ostertagia is one of the parasites that suppresses the immune response in cattle.

1.8. Mortality



In some areas calves may become very weak and die at around 3-4 months old; this is caused by a worm called Toxocara, whose larval stages live in the cow. The calf ingests the larvae through the milk in the first 2 weeks after it is born, the worm grows in the calf, weakening and sometimes killing it

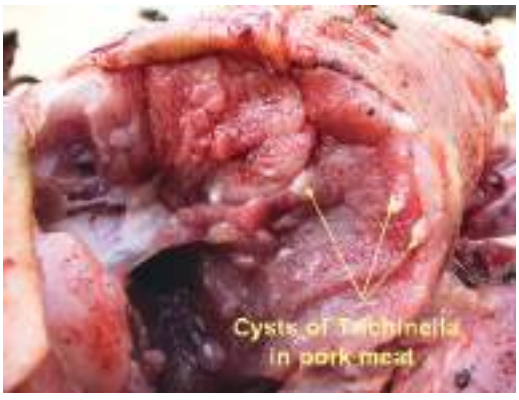
1.9. Zoonotic diseases (transmissible to humans)



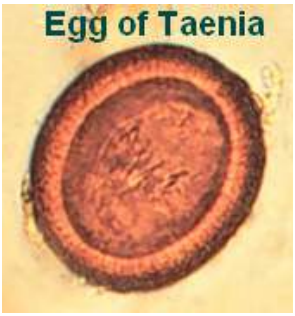
- **Muscle Worms (Trichinella):** it is a round worm, 2 to 4 mm long that forms cysts in the muscles of pigs. When inadequately cooked pork is eaten by humans they cause disease in people
  The female worm lives in the intestine and produces many larvae which travel through the intestine into the blood; some of these larvae eventually stop and form cysts in the muscles and remain viable for many years. It has little effect on the pig, but when people eat larvae contained in the muscle, these larvae migrate from the intestine of people, to their muscles particularly those of the diaphragm and jaw.

Symptoms show two phases:

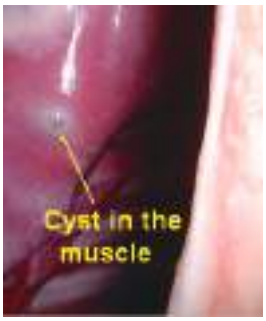
- **The initial phase** (intestinal): abdominal discomfort, diarrhea, and nausea that begins one to two days after ingestion
- **The second phase** (muscle): muscle aches, itching, fever, chills, and joint pains that begins about two to eight weeks after ingestion.



❖ **Taenia** is adult tapeworm that lives in human and dogs; it is 2 to 7 m in length and can survive 25 years in human. Often there is only one Taenia in intestine
People release eggs in feces and can contaminate grass and water; these eggs can survive several months in the environment
Intermediate host are pigs and cattle, they eat eggs in contaminated grass or water. Pigs are intermediate for one Taenia called Taenia Solium and cattle are intermediate for Taenia Sagninata.
Eggs become larva in intestine of pig or cattle and pass in various organs; it is called cysticercosis because cysts develop in muscle, liver, brain







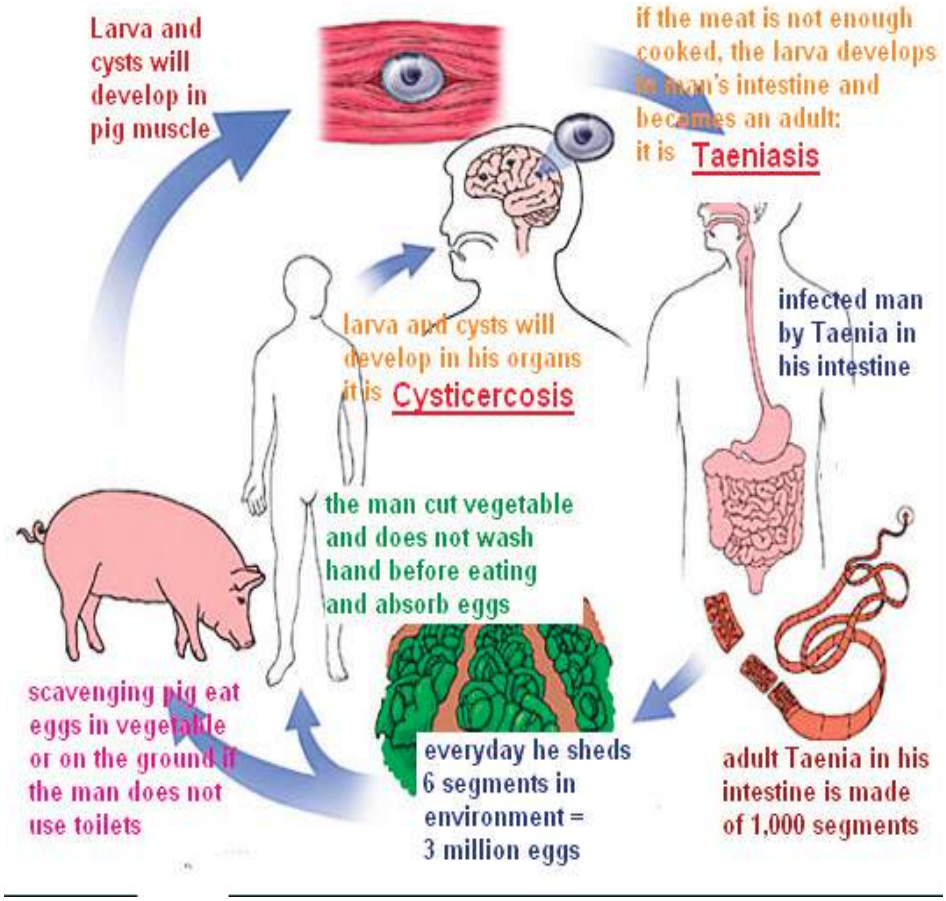
Human can be contaminated in two ways:

- If people eat pork or cattle meat without cooking it well, the dormant larva goes out of the cyst in the intestine during the digestion and matures into adult. The adult is composed of segments about 1 cm long. When the Taenia becomes very long it is made of about 1000 segments. Each segment contains about 50,000 eggs and infected people can shed 5 or 6 segments per day, equivalent to 3 million eggs. This disease called **Taeniasis** is often without symptoms; people can be tired and noticed white segments in feces.



- If eggs are ingested, due to poor hygiene (not washing hands before eating), the resulting disease is **cysticercosis**. Egg transform in tiny larvae that penetrate the intestinal wall and enter the bloodstream. They travel to muscles or other tissue such as the liver or the brain. Lastly, they transform into cysts which size varies from 0.5cm to 20 cm. They can live in the tissue for many years without causing any symptoms, but eventually they get old and their shell structures start to leak causing an inflammatory response. Common symptoms include: muscle spasms, dizziness, headaches and can lead to death.





2. Control of common Internal Parasites

2.1. Worms (roundworms) /nematodes

❖ In swine: **Ascaris** adults live in intestine; they can live one year and lay a lot of eggs every day (> 500,000). These eggs are very resistant in the environment.

Piglets can be contaminated by eggs expelled by mother and attach on the skin of udder: it is important to de-worm sows before farrowing and to clean sows with soap before entering in farrowing pen (especially around anus and the udder) to remove eggs of Ascaris.

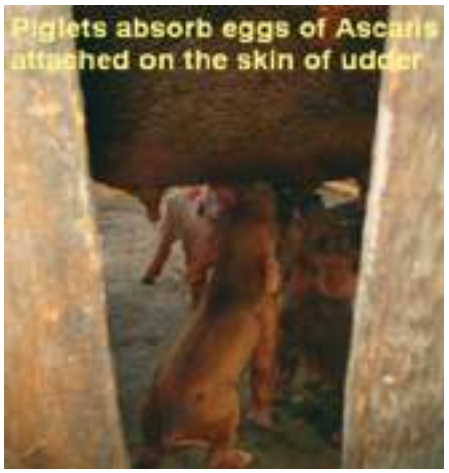
Actually, pregnant sows are the reservoir of Ascaris

To treat Ascaris and other roundworms in pigs, Ivermectin 1% (1ml/30kg) or Levamisole 7.5% (1ml/10 kg) can be used for prevention and treatment:

- Sows should be treated 2 weeks before farrowing
- Piglets are treated 1 week after weaning

For **Trichinella**, there is no treatment. The important recommendation is to eat pig meat well cooked.





❖ In chicken, roundworms of **Ascaris** family have the same cycle. The eggs are ingested by a chicken where it reaches the proventriculus and hatches; larva and adults develop in small intestine, feeding on gut

content and making a vast amount of eggs excreted in feces and then eaten by other chickens.

Treatment is made with Piperazine, Levamisole and Tetramizole: 1 day of treatment twice within 3 weeks



- In young calves, **Toxocara** is a round worm that can be lethal, especially in Buffaloes. This worm must be prevented or treated by giving Pyrantel, Piperazine or Levamisole systematically when calves are two weeks old. Ivermectin is not efficient.

For other roundworms of intestine and lungs in cattle, Ivermectin 1% (1ml/50kg by sub-cutaneous route) is the most popular medicine. Levamisole 7.5% can be used as well (1ml/10kg)

2.2. Tapeworms / Cestodes

There is no treatment for cysticercosis in swine and in cattle. Prevention and treatment of Taenia should be made in humans.



2.3. Fluke /Trematodes

Two medicines are recommended to treat **Fasciola** and other roundworms:

- Ivermectin combined with Clorsulon. It is easy to inject but Clorsulon do not kill eggs of Fasciola and must be administered regularly
- Albadenzole is the most popular in Cambodia. It can kill round worms and Fasciola (adults +eggs)



2.4. Protozoa

Protozoa are single-cell organisms;

Coccidia are Protozoa and cause a parasitic disease of the intestinal tract of animals, it is called Coccidiosis

The disease spreads from one animal to another by contact with infected feces and cause diarrhea which may become bloody.

Coccidia are intra-cellular parasites; they live and grow in the cells of the wall of the intestinal tract; they produce eggs which are passed in the feces. These eggs called oocysts are very resistant to environment and disinfectant. Moist areas out of direct sunlight can harbor oocysts for a year or longer

- **Coccidiosis in chickens**

It affects mostly groups of young birds (around 3 weeks)

When Coccidiosis start in the group of chickens, we can see some birds showing lethargy, ruffled plumage, thirst and diarrhea having blood in it. Without immediate treatment chicken will die

Prevention: it is only good hygiene. Keep dry floors in premises and distribute feed and water in appropriate feeders and drinkers; feed and water must not be soiled by droppings.









Coccidiosis can be prevented by medicines mixed in the drinking water when they are 2 weeks old: Sulfa 33 (this medicine can be injected or mixed in the drinking water), Amprolium, Toltrazuril during 3 days

Commercial feed for chicks until 3 weeks often contain medicines to prevent Coccidiosis; on the bag, the manufacturer adds on the label “contain Salinomycin or Monensin or Lasalocid” . These 3 chemicals are used to prevent Coccidiosis

Treatment: the same medicines are used for treatment but for 5 days

❖ **Coccidiosis in pigs**

Coccidiosis affects piglets from 1 to 3 weeks of age.

It causes a typical diarrhea from yellow to grey color rarely with blood with a consistency varying from creamy to doughy

In general piglets do not die but they become thin, with rough hairs and are not very active. Actually when they reach weaning time they have low commercial value



Treatment can be done with Sulfadimidine (Sulfa 33, Septotryl) but the result is mitigated

Prevention is crucial to prevent wasting piglets at weaning: administrate Toltrazuril (Baycox, Anticoc) once, 3 days after birth.



Good hygiene can decrease the quantity of coccidia in the pen: clean pen (feces, creep feed on the floor…), renovate the floor to prevent poor wet floor surfaces, control population of flies, use disposable material to put in the nest (remember that eggs (oocysts) are very resistant to disinfectants), or wash tissues and dry it under the sunlight

❖ Coccidiosis in cattle

It causes an intestinal disease of young cattle, usually 3 weeks to 6 months old, but it can affect cattle up to 2 years old

Symptoms are diarrhea with chronic emaciation; in severe cases, the manure contains blood and mucus and tail and hindquarters are soiled with sticky, black manure. Straining at defecation is common

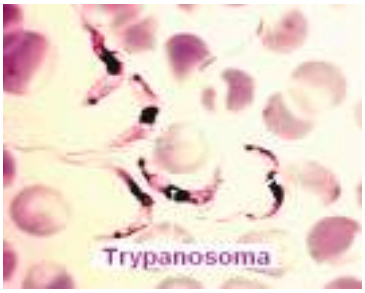


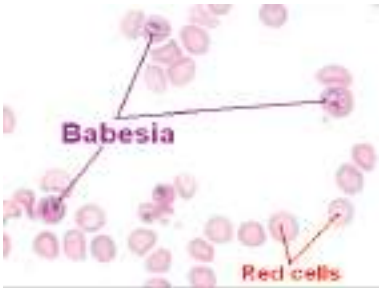
Treatment can be done with Sulfadimidine (Sulfa 33) in injection or by oral route or by Amprolium (10mg/kg/day) for 5 days

Prevention can be done with Amprolium (5mg/kg/day) for 21 days

2.5. Hemo-parasites in cattle

These parasites are parasites of the blood. The 3 main diseases are Trypanosomiasis and Babesia which have been identified in Cambodia. Anaplasmosis is likely circulating in the country but has not yet been formally identified







Diagnosis is easy after coloration of a drop of blood and examination under microscope

❖ Trypanosoma

Actually local cattle and buffaloes develop sub-acute or chronic form of the disease, but in case of fatigue due to hard work in rice field, nutritional deficiencies, weakened immunity, and chronic diseases or in crossbred animals, these parasitic diseases can emerge in acute form and cause the death. Horses are more susceptible to the disease.

This parasite is transmitted by blood-sucking flies like horseflies.

Symptoms the most observed are:

- Intermittent high fever (400C)
- Weakness and loss of body condition until skinny
- Anemia and edema of lower body parts
- Discontinuous diarrhea impossible to treat
- Inflammation of eyes with discharge
- Abortion
- Nervous syndrome, shaking seizure by seizure



Trypanosomiasis regularly kills horses in Cambodia and symptoms are specifics:



Treatment

- Trypamidum: used at dose of 1mg/kg injected once on muscle or veins.
- Berenil: used at dose 3.5mg/kg weight injected twice 7-8 days apart

❖ Babesia

Bovine babesiosis is a febrile, tick-borne disease of cattle and buffalo, caused by one protozoan parasite called Babesia.
The clinical signs vary with the age of the animal and the species and strain of the parasite (in Cambodia, we can find two Babesia, one is called Bigemina, the other is called Bovis). Most cases of babesiosis are seen in adult cattle, animals younger than 9 months usually remain asymptomatic Symptoms the most observed are:

- High fever with temperatures reaching 41.5 °C for several days, with anorexia, the rumen stops to contract and we can see clear reluctance to move





- Reddened conjunctiva at the beginning of the disease become pale and then yellow after few days
- Urine become dark red to brown and produce very stable froth
- Nervous symptoms like incoordination when moving and teeth grinding

Treatment

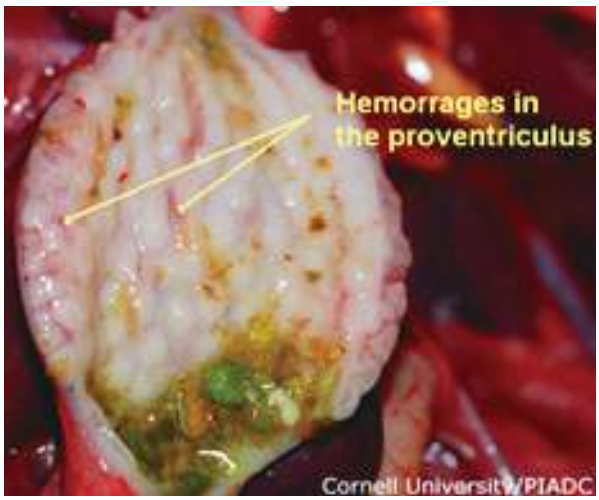
Berenil® is used and given by deep IM injection at 3.5 mg/kg.

❖ Anaplasma

In ruminants, Anaplasma invades the blood and multiplies in red blood cells
Ticks are vectors and can transmit Anaplasma
Symptoms are sub-acute and can be observed in cattle older than 9 months:

- Fever
- Progressive anemia
- Jaundice
- Dropped ears

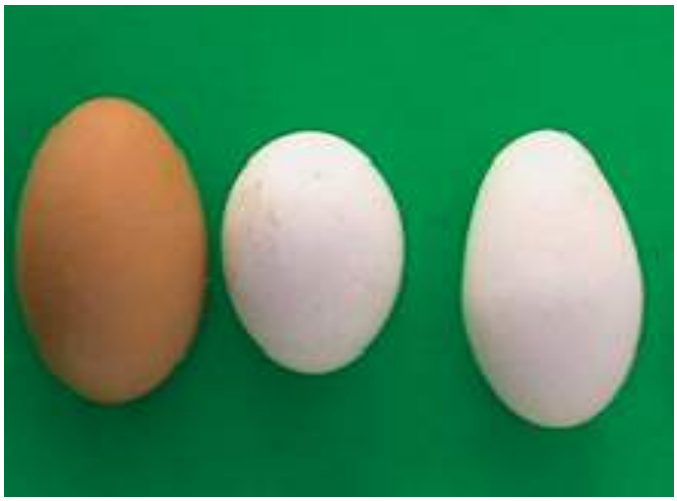
But, imported dairy cattle can show peracute form of the disease within a few hours.
Zebu appear to possess a great resistance to Anaplasma
Treatment: by antibiotics of the Tetracycline family.A commonly used treatment consists of a single IM injection of long-acting oxytetracycline at a dosage of 20 mg/kg.





X.
Poultry diseases in small flocks





Diseases with respiratory symptoms

Symptoms of typical poultry respiratory problems include: Runny / watery eyes, swollen sinuses, wheezing, sneezing, gurgling / rattling, and difficulty breathing.

1. Newcastle disease

- Caused by a virus; there are various kind of viruses and the course of the disease vary according to strain.
- Symptoms



In Cambodia, acute Newcastle disease circulates but symptoms can vary from remarkably high mortality to moderate symptoms (death occurs 1 to 3 days after onset).
  - High virulence virus can cause sudden mortality and spread rapidly in the flock. Sometimes we can observe chickens with ruffled feathers, they do not eat, do not move and can have greenish-dark watery diarrhea
  - Newcastle is not only a disease that cause massive and sudden death; low virulence virus causes mild-respiratory symptoms: gasping, coughing and sneezing.
  - Nervous signs of tremor, twisted neck usually follow the respiratory symptoms.
- Sudden drop in egg production should suggest ND disease as well

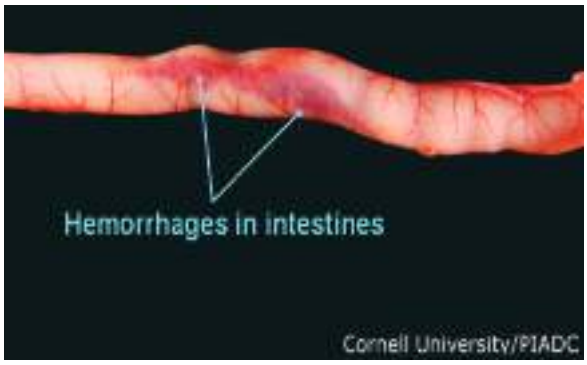


- Transmission is
  - The virus can survive in the environment especially in droppings
  - Direct, from bird to bird, by feces and respiratory discharges. The risk is high when introducing new poultry bought in the wet market; it can look healthy but the chicken could be in incubation of ND disease and contaminate the whole flock (average incubation is 5 to 6 days)
  - Indirect: the most indirect way to introduce ND disease in the flock is owner or visitors who transport virus on the shoes or clothes after visiting the wet market or contaminated farm





- ❖ Lesions observed during autopsy
  - No difference with lesions in HPAI
  - Significant gross lesions are found in birds infected with high virulence strains: hemorrhagic internal lesion on the proventriculus, intestine, trachea and edema of the head and of the neck





- ❖ Treatment
  - No treatment because it is caused by a virus
  - When the disease is caused by low virulence strain, severe symptoms are due of concurrent bacterial diseases (Mycoplasma, E.Coli…) and treatment with antibiotic (Doxycycline) will prevent high mortality. Often low virulent ND disease is not diagnosed, only the bacterial secondary infection is identified.
- ❖ Prevention
  - For small flock the vaccine I2 from Navetco is the most adequate because it does not request a strict cold chain, it can be transported and stored at room temperature.
  - Vaccination reduces clinical signs but does not prevent virus replication and shedding; Vaccinated poultry tend to have milder infections. In one epidemic mainly affecting vaccinated chickens, flock mortality rates vary from 30% to 60%. Vaccination of chickens at 7 and 28 days provided protection until they reached market weight.
  - The I-2 vaccine also spread to in-contact non-vaccinated chickens and protected them



2. Infectious Bronchitis (IB)

- ❖ It is caused by a virus
  - This disease is considered the most contagious poultry disease known.
  - The disease is spread by air, by people visiting infected houses, feed bags, infected dead birds, and rodents.
  - This disease affects only chickens
  - Rapid morbidity in chickens up to 100%, but mortality is limited (<10%)

  Often the disease is complicated by secondary bacterial infections: Mycoplasma and E.Coli

- ❖ Symptoms
  - Respiratory signs as abnormal breathing; broilers and layers are gasping, coughing and have tracheal rattles
  - In chicks, it is more serious: conjunctivitis (eye inflammation) followed soon by nasal discharge, and cheesy exudates in the trachea (windpipe). Birds become asphyxiated due to the lug of exudate in the trachea.
  - Drop in egg production up to 50%
  - Misshapen or soft shelled eggs
  - Watery content of eggs
  - No diarrhea and no nervous signs



- ❖ Treatment
  There is no specific treatment, though antibiotics are run for 5-7 days and may aid in combating secondary bacterial infections.
- ❖ Prevention
  Often vaccine of IB is combined with ND disease.
  Chickens are susceptible unless they have been vaccinated; good prevention requires specific programs and in general is implemented only in commercial farms.

3. HPAI

It is caused by a virus called H5N1

- ❖ HPAI must be suspected when acute and high mortality occur in a flock, in a village
  When death is rapid, lesions cannot develop; do not practice necropsy but call the District Vet or call directly Hotline of NaVRI (012 833-795 or 012 214-970); they will need carcasses to perform analysis to make sure that H5N1 virus is cause of the disease or not.





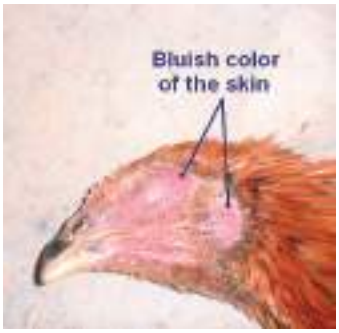
- ❖ Symptoms can vary from a mild disease with little or no mortality to a highly fatal and rapidly spreading epidemic; waterfowl, including for example wild ducks, are generally more resistant to avian influenza than are domestic poultry. Viruses that cause no obvious disease in waterfowl can be highly pathogenic in domestic poultry. In very acute form, birds stop to eat, stay apart with head in shoulders and ruffled feathers and die within few hours.













In less acute case, it is possible to see:

- Heavy difficult breathing,
- Paralysis and tremor of head,
- Combs and wattles swollen, bluish color
- Hemorrhages under the skin of the legs





In ducks symptoms are often mild:

- Sleepy state with head touching the ground
- Eyes are white
- Eyelids are swollen







- ❖ Transmission is mainly made through feces; Waterfowl act as a reservoir of avian influenza virus by carrying the virus in their intestinal tract and shedding it in their feces
  Treatment: none
- ❖ Prevention: bio-security
  The guidelines to prevent H5N1 at the village or small flock level are linked to the risk of transmission:

- Infected birds: introducing poultry bought in the market that can be in incubation is a high risk. These birds should be quarantined in isolated place before to be introduced in the flock.
- Waterfowl like ducks can be silent carriers; they are not sick but they shed a lot of virus that can contaminate chicken and cause outbreak. When farmers raise poultry in premises, nets must avoid wild bird to enter the premises
- People visiting the live bird market are likely transporting the virus on the shoes, on the hands. Cleaning shoes and hands with soap when coming back from LBM decreases the risk to introduce the virus







4. Fowl Cholera

- This disease is caused by bacteria, Pasteurella, and can be classified in respiratory disease as well because symptoms are both digestive and respiratory; Fowl cholera (avian pasteurellosis) is an acute contagious septicaemic disease with high morbidity and mortality, especially in ducks. But chronic form often occurs
- Symptoms

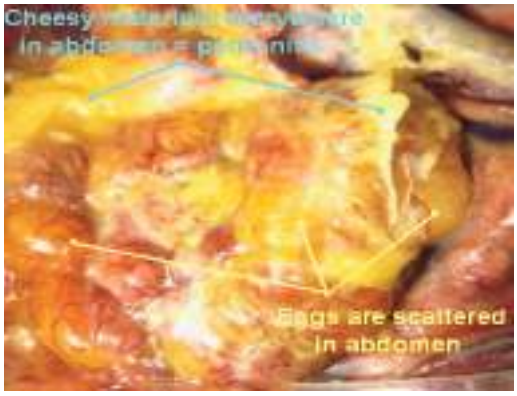


  - In acute outbreaks, dead birds may be the first sign
  - Wattle and combs become blue before death
  - Diarrhea is aqueous and white at first and tends to be green, mixed with mucus.



  - As fowl cholera becomes chronic, chickens develop abscessed wattles and swollen joints and foot pads. Caseous exudate may form in the sinuses around the eyes.

❖ Lesions
- Petechial hemorrhages on the heart, on the spleen, on intestine and abdominal fat
- Enteritis and pneumonia
- Pin pointed yellowish necrotic spots on liver
- Fibrinous peritonitis, ruptured ova in layers





❖ Treatment
TMP+ Sulfa and family of Tetracycline are effective.
Treatment should last more than 3 weeks because Pasteurella can survive a long time in the environment if it is wet, protected against sunlight and full of organic matter



5. Infectious Laryngo-Tracheitis (ILT)

Caused by a virus that is easily transported in the air

❖ Symptoms
- The clinical sign usually first noticed is watery eyes.
- Affected birds remain quiet because breathing is difficult.
- Coughing, sneezing, and shaking of the head to dislodge exudate plugs in the windpipe follow; chickens extend their head and neck to facilitate breathing

- Blood-tinged exudates are expelled from the trachea of affected birds. Many birds die from asphyxiation due to a blockage of the trachea



❖ Treatment
Antibiotic to prevent secondary bacterial infection
It is recommended to vaccinate the flock when the outbreak start (normally vaccination is only used to prevent disease but in ILT it can be used as treatment)



5.1 CRD / Mycoplasma

- Caused by a bacteria
  This microbe can spread rapidly in chicken house from chicken to chicken. But the most common mean of spreading is the trans-ovarian route: eggs are contaminated in the genital tract of the layer and the new born chick is contaminated.
- Symptoms of Mycoplasma vary from wetness around eye to swelling around eye with open mouth breathing and gurgling throat sounds.
  Actually it is important to know that Mycoplasma is the primary cause of CRD, Chronic Respiratory Disease in chicken; it damages the respiratory tract and other infection like E.Coli, Coryza or IB can develop easily.







- Lesions
  Air sacculitis: air sacs are not more transparent and thin, we can observe mucus in mild stage to cheesy material or pus in severe cases with secondary infection by bacteria like E.Coli



- Treatment
  Doxycycline and Tylosin are common effective antibiotics against Mycoplasma
  Doxycycline is often use for treatment, combined with Colistin to treat secondary infection by E.Coli
  Tylosin must be used for DOC. The day of arrival of DOC the drinking water must be mixed with Tylosin to destroy Mycoplasma transmitted by the layer and to prevent spreading Mycoplasma in the farm. It is recommended to mix Tylosin for 5 days to avoid CRD.

5.2 Fowl Pox

- It is caused by a virus. Avian pox is a relatively slow-spreading viral disease
  This virus can be transmitted by contact or by mosquitoes bite
  This disease spreads slowly in the flock, and then it can be affected for several months
- Symptoms
  - Dry pox starts as small whitish foci that develop into wart-like nodules. Lesions are most commonly seen on the featherless parts of the body: comb, wattles, ear lobes, eyes, and sometimes the feet.
  - Wet pox is associated with the oral cavity and the upper respiratory tract, particularly the larynx and trachea. It is characterized by plaques in the mouth and upper respiratory tract.

- Fowl pox can cause depression, reduced appetite and poor growth or egg production. Mortality is important in young chicks.
- The course of the disease in the individual bird takes three to five weeks.
-





- ❖ Treatment: none
  Prevention
- ❖ Vaccination by the wing web method; the chicks may be vaccinated as young as one day of age
  Vaccinated birds should be examined for takes about seven to ten days following inoculation. A take consists of swelling of the skin or a scab at the site where the vaccine was applied. It is sign of successful vaccination

5.3 Coryza

Caused by bacteria, in chicken only, spread from bird to bird and can contaminate the whole flock within 10 days



- ❖ Symptoms
  - Swollen of infra-orbital sinuses, nasal discharge and sneezing, matted eyes
  - Drop in egg production up to 40%
  - In general there are no severe respiratory signs and no nervous symptoms.
  - The disease duration is long from 2 to 3 weeks



- ❖ Treatment

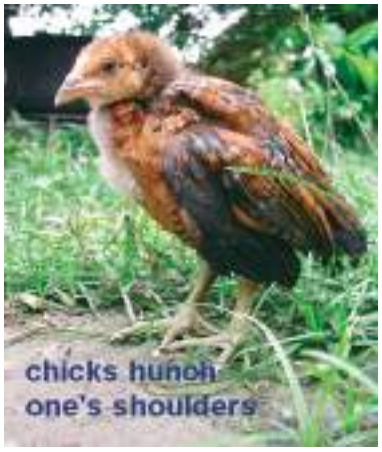
Tetracyclines and Erythromycine are effective; the treatment must be done at last 2 weeks

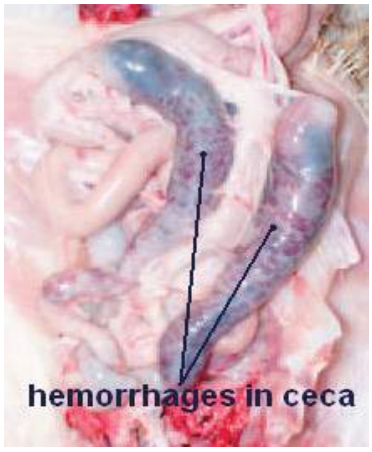
Diseases with digestive symptoms

Symptoms of typical digestive system problems include: Loss of appetite, swollen crop, diarrhea, or soiled vent

1. Coccidiosis

- Caused by coccidia (they are many types of coccidia) which are protozoa, single-cell parasites
  Coccidiosis is common in younger birds; the most risky period is at the age of 3 weeks
- Symptoms:
  - Birds that have Coccidiosis often display characteristic posture. They hunch up, fluff up and can drop their wings.
  - They may have diarrhea with soft mucoid feces and bloody droppings
  - Chicks are thirsty







- Prevention:
  Improve hygiene: dry floor (especially around drinkers) and control of flies population
  Medicines can be used:
  - mixed in commercial feed like Salinomycine (it is mentioned on the bag)
  - mixed in the drinking water when chicks are two weeks twice apart 10 days: Toltrazuril, Sulfa 33, Amprolium
- Treatment:
  Sulfa 33 (sulfadimerazine): 10 ml in 1 liter of water during 3 to 5 days or Toltrazuryl (Baycox) or Amprolium

2. Salmonella

- Salmonella is a bacterial disease. Many types of Salmonella exist and some can cause problems for human health. mainly, two types of Salmonella can provoke disease in poultry flocks:

  - Salmonella (Pullorum) can affect chicks; mortality is confined to first 3 weeks of life. Death begins at 5-7 days but the first indication is an excessive number of dead-in-shell chicks and deaths shortly after hatching.



Chicks show weakness, huddle together (like they are cold) and have chalky white/grey diarrhea that stuck the vent



- Salmonella can cause disease in adults; it is a septicaemic disease with high mortality. Layers show drop in egg production, decrease fertility and hatchability.

The most characteristic clinical sign is mucoid yellow to green or brown diarrhea associated with thirst

Salmonella should always be considered in the differential diagnosis of any case of enteritis
Salmonella of chicks is spread primarily through the egg, from hen to chicks. It can spread further by contaminated incubators, chick boxes, premises, feeders, drinkers…

❖ Lesions



- Chicks that die within 1 week of age show unabsorbed yolk sac in the abdomen
  Chicks that die within 2 weeks of age show unabsorbed yolk, peritonitis (cheesy substance in abdomen), fluid around the heart (pericarditis), swelling of the spleen, grey necrotic spot on the liver

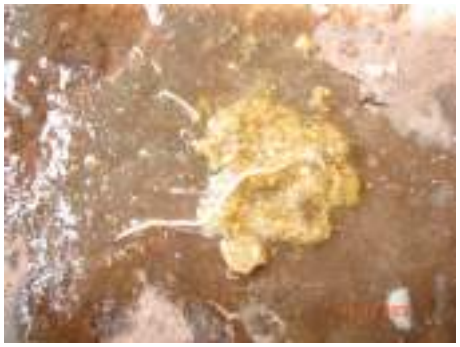


- In layers, genital tract can be atrophied and deformed
  Spleen is enlarged
  Liver get a typical bronzed color

❖ Treatment
Antibiotics like TMP+Sulfa can reduce mortality but antibiotics cannot eradicate the disease from the flock

2.1 Worms

❖ Intestinal parasites (worms) are very common in chickens in the backyard type poultry flocks. The presence of a few parasites does not usually cause a problem. However, large numbers can have a devastating effect on growth, egg production, and over-all health
Of all the intestinal worms, Ascaris, living in small intestine, inflict the most damage.
Different types of round worms can be found in the esophagus, in the crop, in the gizzard or in the ceca.
Roundworms are passed from chicken to



chicken by ingesting eggs in contaminated water, feed…or by eating earthworms carrying the parasite.

❖ Symptoms
- Poor growth and miserable appearance
- Sometimes we can see worms in the feces
- Diarrhea
- Decreased egg production
- Less resistant to other diseases

Young birds are affected more severely; in severe infections there can be intestinal blockage by the worms, causing death.

❖ Treatment
Tetramizole and Levamisole are medicines commonly used to treat parasites in poultry.



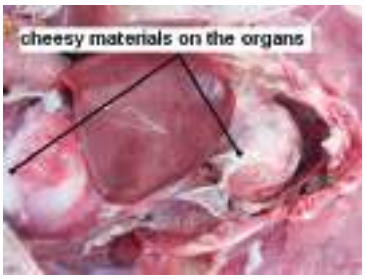
2.2 Colibacillosis

❖ Caused by E.Coli, it is the commonest infectious disease of farmed poultry.
E. coli is a normal contaminant in the intestines; however, when chickens are under stress or other infection (Mycoplasma…) they develop septicemia with E.Coli. Also, the dust in the poultry house contains a lot of E.Coli.

In chicks, the infection is made via the egg; feces contaminate the surface of the hatching egg and E.Coli penetrate through the shell.

Symptoms
- High mortality in chicks
- High embryonic mortality
- Respiratory distress
- Diarrhea white to yellowish green
- Infection under the skin, known as cellulitis







❖ Lesions
- Fibrinous material on the heart, the liver and the air sacs
- Abnormal yolk sac in chicks; abdomen is distended, yolk is abnormal color, cloudy and foul smelling
- The difference with Salmonella is absence of grey necrotic spot on the liver

❖ Treatment
Resistance with many antibiotics Chlortetracycline combined with Colistine or Flumequine combined with Amoxicilline are recommended

1. Infectious Bursal Disease (IBD) or "Gumboro"

This disease is caused by a virus

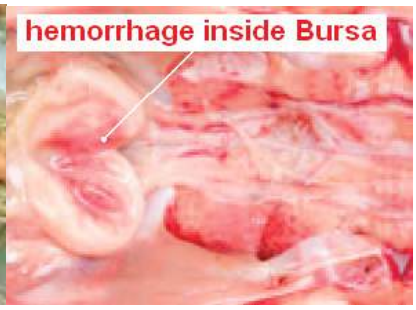
- ❖ It impairs immunity system:
  - chickens become more susceptible to other diseases; other respiratory and digestive diseases develop easily and are difficult to treat
  - chickens fail to develop a good immune response to vaccines; vaccines are less effective



- ❖ Symptoms
  - Infected birds may not move much,
  - have no appetite
  - and become dehydrated.
  - A white diarrhea sticks the vent feathers
- ❖ Lesions
  - Hemorrhages in the thigh and pectoral muscles
  - The virus invades the cloacal bursa that becomes enlarged, edematous with bloody or mucoid contents inside
  - In chronic form Bursa becomes firm and atrophic







- ❖ Treatment

  No treatment because it is caused by a virus. However antibiotic should be mixed in the drinking water for 10 days because Gumboro disease decreases the immunity and chickens will be easy target for all microbes circulating and will cause secondary bacterial infections.
- ❖ Prevention

  Vaccination is the principal method to control IBD. Vaccination of breeder flocks is especially important, to confer maternal antibodies that will protect chickens from early infection.

2. Duck Plague

- ❖ Caused by a virus in ducks and other waterfowls

  The disease follows a very acute course, spreading rapidly and causing sudden deaths.

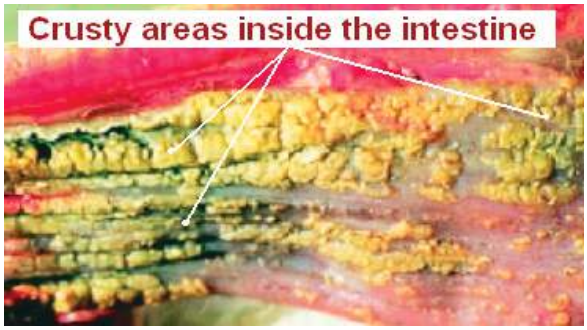




- ❖ Symptoms
- Ducks are very sensitive to light: sick ducks seek dark areas, closed eyes
- Ataxia.
- Extreme thirst.
- Severe diarrhea
- Occasionally prolapsed penis
- Tremor and paresis

❖ Lesions

- Severe enteritis.
- Crusty plaques from esophagus to bursa (covered by yellowish plaques in later stages).
- Hemorrhage in intestine, body cavities, heart…



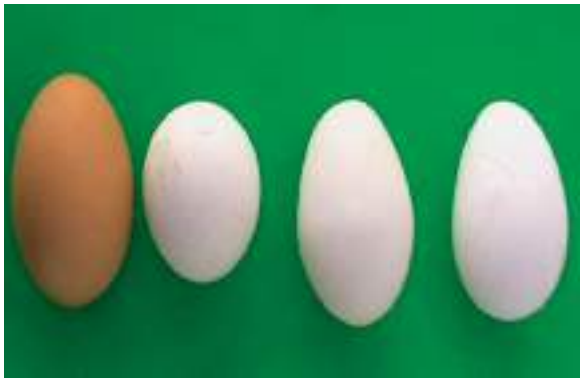
❖ Treatment

No treatment because it is a virus.

Vaccine can be used to stop disease spreading and can be used to treat infected animals (normally vaccines are used only to prevent the disease)

A. Diseases and disorders impairing egg production

Signs are clear drop in egg production and typical egg problems: soft or missing egg shells, wrinkled or misshaped eggs, watery whites or blood spots inside eggs.



1. Infectious Bronchitis (IB)

❖ Impact on egg production

- Decrease of egg production occurs almost as the same time as the respiratory signs
- <u>The drop in egg production is more than 50%</u>
- Egg production recovers after 5 to 6 weeks, but at lower rate
- Soft shelled eggs and deformed eggs
- Aqueous albumen



❖ Lesion

Hemorrhages in ovary

Yellow fluid in abdomen due to egg's yolk in the peritoneal activity . Chickens that have had IB, especially during the first week of life, may never be good layers because the oviduct becomes atrophied

2. Deficiency in calcium

❖ The egg shell is composed primarily of calcium carbonate. The pullet's requirement for calcium is relatively low during the growing period, but when the first eggs are produced, the needs increased at least four times (4g/day)

❖ Inadequate calcium consumption will result in <u>decreased egg production</u> and lower egg shell quality: thin and soft shell



- ❖ Hens store calcium in some bones; in case of deficiency the hen will use this stock of calcium and bones become brittle. In severe cases, hens are unable to stand.
- ❖ Calcium can be supplied in the diet as either DCP or oyster shell.

3. Mycotoxins

- ❖ Fungi grow on stored feed ingredients where moisture content is over 12%, especially corn grains; these fungi produce mycotoxins. We can see fungi in the feed stuff but we cannot see mycotoxin; only analysis in laboratory can detect it
- ❖ Ducks are more vulnerable to the toxin than chicken.
  In acute forms of the disease, mortality can be as high as 50 percent.
  Common adverse effects include less resistance to diseases (immunity low) and dramatic reduction of egg production.



- ❖ The main source of mycotoxins is corn when it is harvested late or not enough dried. The best prevention is to buy corn of good quality.
  To neutralize mycotoxins some products (like clays) are on the market; for example, mixing Detox, 100g to 200 g in 100kg of feed adsorb mycotoxins

4. Lice

- ❖ Chicken lice feed on dry scales, feathers, or scabs on the skin. As lice scratch the skin, it causes constant irritation; chickens become nervous and behave abnormally.
- ❖ Heavy infestations impair egg production up to 20%
- ❖ Normally external parasites are controlled by Carbaryl (twice apart 4 weeks) but it is strictly forbidden to use Carbaryl when eggs are sold for human consumption



5. Worms

Ascaris is the most common round worm of poultry. It may not cause significant mortality but mild to severe infestation retard growth and impair egg production



6. Newcastle

- ❖ Dramatic and prolonged drop in egg production; this sign is observed in cases where the disease is prolonged (in association with signs of torticollis)
- ❖ Hemorrhages of ovarian follicles

7. Lymphoid Leukosis

It is caused by a virus
The disease occur during the laying period in birds older than 6 months

- ❖ Signs are
  - Decrease of feed intake
  - Cessation of egg production



- ❖ Post-mortem observation shows tumors of the liver, the spleen, Bursa of Fabricius and ovary.

B. Diseases with additional nervous symptoms

Typical nervous symptoms include twisted neck, drooping wings, paralysis, and blindness

1. Marek disease / paralysis

Disease caused by a virus; it is a type of avian cancer

- ❖ Symptoms
  - Tumors can develop in different organs causing different symptoms:
  - The classical type mainly attacks peripheral nerves and consequently causes paralysis of wings and legs.
  - Tumors can develop in eyes and cause irregular pupils and blindness
  - Tumor in liver, spleen, muscles appear in acute form; birds die rapidly with massive internal tumors
  - The virus can develop in feather follicle giving typical skin lesion and give the most infective form of the disease because a lot of virus is shed by the skin



- ❖ Lesions
  - Tumors are present in one or more of visceral organs and tissues and cause nodular or diffuse enlargement of the organ
  - In classical form, nerves become thickened as much as 3 or 4 times the normal



- ❖ Prevention

-Young chicks have the highest susceptibility
-Chicks can be vaccinated at the hatchery.
-While the vaccination prevents tumor formation, it does not prevent infection by the virus.

2. Newcastle disease / neck twisted

- Some strains of the ND virus can damage the nervous system
- Nervous symptoms generally follow respiratory signs
- Chickens can have turned heads, neck twisted.
- They also walk in circles or may have difficulty in walking.



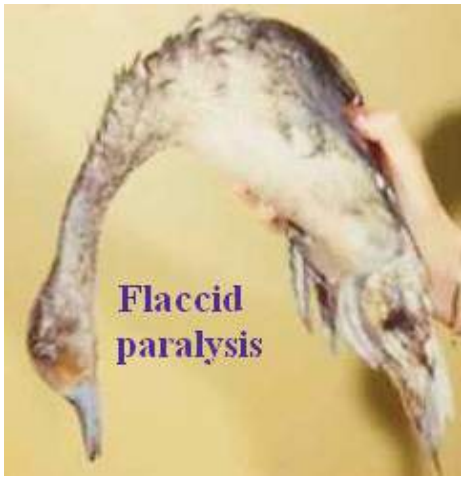
3. Avian Encephalomyelitis / tremor



- It is caused by a virus and it affects chicks
  Chicks are infected through eggs
- Symptoms

-The disease starts directly after hatching
-Affected chicks first show a dull expression of the eyes, followed by progressive incoordination, sitting on hocks
-Tremors of the head and neck become evident especially after exciting the chicks
-In advanced cases, many chicks will lie with both feet out to one side and die.
-Mortality rate vary from outbreak to outbreak

4. Botulism /flaccid paralysis



- Botulism is an intoxication caused by the toxins produced by bacteria called Clostridium.
  Decaying bird carcasses on poultry ranges, wet litter or other organic matter, and fly maggots from decaying substances may harbor botulism.
  There is no spread from bird to bird.
- Symptoms
  - Flaccid paralysis of legs, wings, necks and eyelids is observed.
  - Then the birds fall into a deep coma with neck and head typically extended forward
- Prevention:
  Incinerate or bury dead chickens promptly.
  Control flies.

C. Diseases and disorders causing difficulties to move

Lameness, swollen joint, injuries and nutritional disorders are common causes. Well balanced diet and especially supply of vitamins and minerals during the first weeks of life can prevent many problems.

1. Lameness



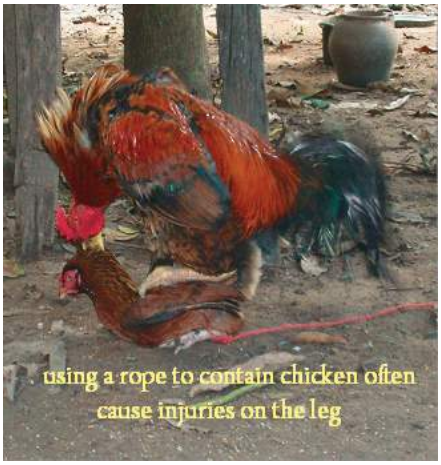


- Staphylococcus / abscess of the feet

It causes a swollen abscess on the underside of the foot and the birds become lame from swollen foot pads

The microbe lives in the soil and survives in stagnant rain puddles
Treatment can be made by mixing Erythromycin in the feed for 5 days

- Worms / unsteady gait in ducks
  If an adult duck goes lame, the first thing to check is that they have been wormed recently

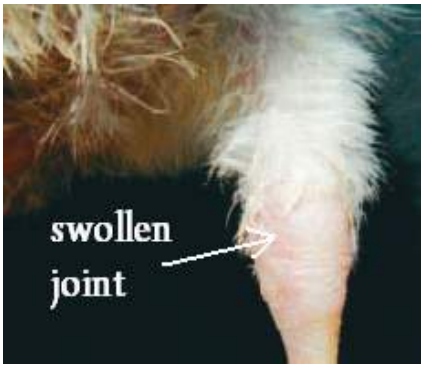


- Injuries / cut grazes
  In case of lameness, it is important to make a close examination of the legs and feet (especially underside of the feet)
  Moderate injuries are only cleaned and disinfected; serious injuries can request mixing of antibiotics in the feed like Erythromycine, Doxycycline or Amoxicilline
  When lameness occurs, remove the bird from the rest of the flock and raise in a small pen with easy access to fresh water and feed to limit the birds movement



- Vitamin D deficiency / reluctance to move
  Vitamin D is needed for absorption of calcium (Ca) and phosphorus (P), and in the formation of normal skeleton.
  Nutritional deficiencies of Vitamin D3, causes soft bones and an increase in lameness in chicks; they rest frequently in a squatting position, they have a reluctance to walk, and show a stiff gait

2. Swollen joint
   - Salmonella
     Salmonella (Pullorum) causes death in chicks in the first weeks of life. In somewhat older birds, the disease can be sub-acute; lameness and joint swelling are the main sign



   - Mycoplasma
     Birds infected with the respiratory form exhibit respiratory distress and poultry infected with the joint form show lameness, followed by lethargy, reluctance to move, swollen joints, stilted gait, loss of weight, and formation of breast blisters.
     Treatment requires antibiotic: Tylosin or Doxycycline



3. Curled toe
   Vitamin B2 deficiency will cause a high incidence of curled toe, straddle legs and chicks going down on their hocks
   It is usually seen in birds up to three weeks of age
   Mixing feed with premix or multivitamins products during the first weeks of life, will prevent these problems

D. Diseases and disorders affecting external appearance

Feathers, combs, skin and emaciated condition can reflect external disorders or be extra signs of general diseases



1. Wattle and combs

   Swollen in Fowl Cholera

   As fowl cholera becomes chronic, chickens develop abscessed wattles



- Nodules in Fowl Pox

  The nodules develop on non-feathered areas, wattle and combs are likely places to develop nodules

2. Eyes



- Watery, red and inflamed

  A number of respiratory diseases can cause conjunctivitis, including Newcastle disease, Laryngotracheitis, Infectious Bronchitis, Bird Flu, and Mycoplasma. These infections do not damage the eye itself, but cause the bird discomfort, leading to rubbing and scratching of the eyelids



- Swelling in Coryza and Mycoplasma

  In second stage, eyes are swollen and we can observe pus-like discharge; the eyelids are irritated and may stick together



- Marek disease

  This disease develops tumors in organs. Tumors can also occur in the iris inside the eye and cause blindness

  .

3. Nostril discharge



- IB / watery

  Water to mucus, colorless discharge



- Coryza / pus

  Swelling around the face, sticky discharge from the nostrils and eyes, labored breathing, and rales are common clinical signs

❖ ILT / blood

Blood-tinged exudates and serum clots are expelled from the trachea of affected bird; blood is mixed with mucus and often make dried marks around nostrils



4. Lesions of the skin

❖ Fowl Pox / wart-like nodules

This disease cause wart-like nodules on the non-feathered parts of the head and legs



❖ Marek disease / nodules on the skin of the legs

Mainly on legs; nodules are at the base of feathers



❖ Vent irritated /Gumboro

In Gumboro disease, watery droppings lead to soiling of feathers around the vent, and vent pecking





❖ Scab / mites

Scaly leg mites bore under the scales on the legs of the chicken. The scales enlarge, get rough and become infected. If not treated early the bird may go lame.

To treat, soak the bird's legs in an oil or cream to suffocate the mites. Treat every 3 to 4 days for 2 weeks. The old scales will then fall off over time and be replaced with new scales



- Injuries / cannibalism

  Cannibalistic birds cause injury to another bird by picking at each other's feathers, toes…sometimes until death.

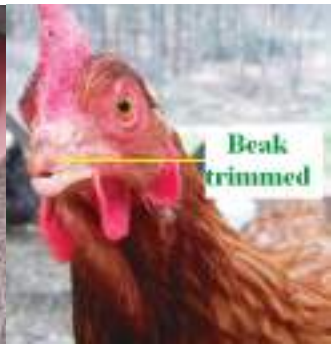
  Unfortunately when it starts, this behavior tends to spread in the flock

  Combining birds of different ages, breeds, colors or sizes that have not been reared together often upsets the social order of the flock, thus increasing the chances of cannibalism.

  The only proven method that is effective in preventing and stopping cannibalism is beak-trimming (cutting the upper part of the beak)







5. Appearance of feathers

- Eggs on feathers /Lice

  Lice eggs are laid in clusters and may be stuck onto feathers; Adult Lice do not suck blood. They feed on dry skin scales and feathers

  Treatment by Carbaryl; but Carbaryl cannot be used on layers when eggs are sold.



- Feathers not enough developed or picked / deficiency in methionine

  Lack of Methionin impairs development of feathers

  Picking is often due to a lack of protein and amino-acid in the diet, especially in methionine. Feathers are rich in methionine; if they don't get what they need, they will pull feathers from other chickens and even from themselves, and eat them



- Ruffled feathers/Diseased birds

  Quite all infectious diseases and parasites like Coccidiosis provoke loss of condition, depression and ruffled feathers. It is sign of serious problem of health






- Loss of feather/ Molting

  Normally, each year chickens molt or lose the older feathers; they start to lose feathers on head, then neck, then body and finally on wings and tail. During this period (about 6-7 weeks) generally hens stop to produce eggs.



- Feathers of the vent stuck/ Salmonellosis

  Chalky to sticky droppings cause vent pasting



6. Emaciation

- Worms

  Especially worms of the intestine, absorb essential nutrients during the digestion in intestine causing deficiencies in the animal



- Leukosis

  Leukosis characteristically produces lymphoid tumors, particularly in the liver and spleen. The tumors may also affect other organs such as ovary and lungs. Affected birds show loss of appetite, progressive emaciation



- Off feed / nutritional deficiencies

Of course insufficient feeding is cause of bad body condition.
This is common in layers that must draw on one's reserves when they brood

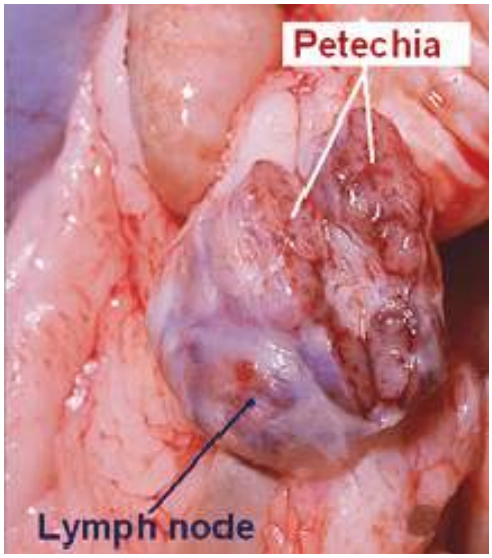






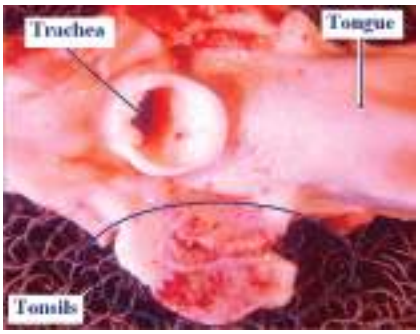
XI.
Swine diseases





Major Endemic Viral Diseases

1. CSF



1.1 Cause

- It is a virus; CSF cannot be treated by antibiotics
- This virus infect only swine
- We can find a lot of virus in tonsils, that explain transmission of the disease: virus is excreted by mouth, nose and eyes

At present CSF cases are often under-diagnosed because for few years PRRS got an important media coverage. Symptoms can be similar with a rough approach. But good investigation and clinical examination with observation of lesion in carcasses will help to make the good diagnosis. On the other hand, highly pathogenic cases of PRRS are in fact combination of CSF and PRRS.

1.2 Virulence

It is how fast the virus replicates when infecting pig: multiplication of the virus can vary from very fast to relatively slow.
In the farm, the disease will vary from **acute** (pigs will die very quickly) to **sub-acute**; often pigs will not die but always are weak and grow slow

1.3 Transmission

- Pigs can become infected by contact, mouth to mouth with infected pigs
- By sperm when mating with infected pig
- Trans-placental infection for fetuses: the sow can contaminate fetuses during gestation
- When feeding pigs with inadequately cooked garbage that contain meat, or organs of infected pigs
- By people and equipments: farmers, VAHW and veterinarians visiting farms after contact with infected pigs carry virus on shoes and clothes and can spread the CSF







1.4 Symptoms



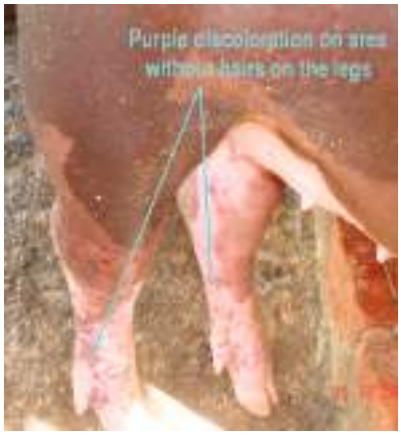
- Clinical signs usually appear 5-10 days after contamination
- One permanent sign is high temperature >41 ^{o}C and antibiotic are ineffective to decrease fever
- Pigs can shed virus before showing symptoms: they can spread the disease when they still look healthy

❖ Acute disease:
Often seen in fattening pigs 30-60 kg

- high fever
- depression and weakness
- conjunctivitis
- incoordination when walking
- purple discoloration of the skin
- other infection may occur: green profuse diarrhea (Salmonella) and respiratory symptoms







- high mortality within one to two weeks after initial symptoms

❖ Sub-acute disease
It occurs when strains have low virulence or when pigs are vaccinated with vaccine of uncertain quality or when the cold chain is broken. Another cause can be an inadequate vaccination program or a wrong technique to inject pigs (injection in the fat and not in the muscle)

- Fever: can be the only sign but high lasting fever that cannot decrease with use of antibiotic must suggest CSF
- Small area of hemorrhage under the skin
- Pigs huddle together and are inactive and eat a little

Often secondary infection by bacteria cause more serious disease; Salmonella and Pasteurella often develop on these pigs and provoke green and profuse diarrhea and/or serious coughing and dyspnea







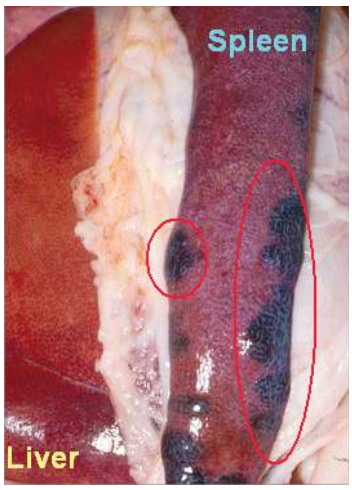
❖ Symptoms in sows
- stillborn piglets
- mummification
- abortion
-birth of weak and small piglets

These symptoms are similar to those observed in
case of PRRS but one symptom is typical: new born piglet are trembling just after birth; it is clear sign that low virulence virus circulate in the farm or vaccination is not adequate

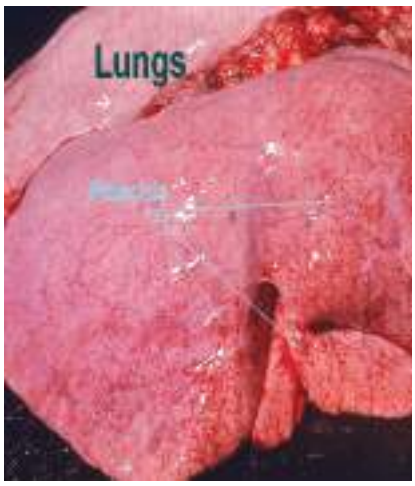


1.5 Lesions

Sometimes symptoms are not so clear except the high temperature that cannot decrease with use of antibiotics, but typical lesions can be seen on carcasses
The most common are:
- Dark red infarcts along the margins of the spleen
- Petechiae in the lungs
- Hemorrhages in lymph nodes







1.6 Treatment

Cause is a virus: no treatment

When the diagnosis of CSF is clear, it is not recommended to implement a treatment because after 10 days of injection of antibiotic, pigs can survive but will grow very slow and at the end it is a loss of money.

For gilts, young boars or sows the fundamental of treatment are:

- Decrease temperature to encourage feeding: inject Paracetamol
- Protect swine against secondary infections, Florfenicol, Doxycycline in case of green aquous diarrhea, Tylosine + Gentamycine or as a last resort Enrofloxacin
- Stimulate the immune response and fasten recovery by injecting vitamins and stimulant

1.7 Prevention

It is essential to prevent CSF by proper vaccination; it is the most essential vaccination even in small flocks. It is not possible to farm swine successfully at small or large scale without implementing proper program of vaccination against CSF.

Select vaccine that have proved efficacy from well-known manufacturers Ceva, Intervet or Hipra

The program of vaccination can be:

- Piglets vaccinated at, 3-7 and 11 weeks: the vaccination at 3 weeks is important only if sows are not regularly vaccinated. If sows are vaccinated, especially one month before farrowing, the colostrums and the milk will be full of antibodies against CSF and will protect piglets at least until 7 weeks
- Sows must be vaccinated 1 month before farrowing to increase antibodies in the milk
- Gilts must be re-vaccinated at 6 months (if gilts are bought outside the farm with uncertain vaccination program when they are piglets, it is important to inject CSF vaccine a second time at 7 months)
- Boars must be vaccinated every 6 months

2. FMD

2.1 Cause

- FMD is caused by a virus, antibiotics cannot treat the disease
- 7 different strains of the virus circulate in the world; in Cambodia 3 strains called O, A and $Asia_1$ have been identified

2.2 Transmission

- The virus is very resistant in the environment and can be transported by the wind
- Transmission primarily occurs via respiratory aerosols, it means droplets expelled with air through the nose, contain virus: it is the main way for spreading the disease from infected pig to healthy pig
- People can transport the virus on the shoes, on the clothes, on the hand, on the hairs; the FMD virus can survive for 1-2 days in the human respiratory tract, thus spreading to animals

FMD in pig is very contagious, spread quickly and it is very difficult to protect farms against contamination, but pig shed virus for a short time, they are not long-term carriers FMD outbreak spread quickly but last few weeks

2.3 Symptoms

- Pigs will generally develop signs in 3 to 5 days after contact with infected animal.
- Fever and vesicles (blisters) on the feet, mouth and teats are the characteristic lesions of FMD
- Pigs have severe hoof lesions with vesicles on the coronary band and inter-digital space. They cannot walk and eat, it is very painful, they shout day and night
- Vesicles are often seen on the snout







2.4 Treatment



The treatment can only prevent secondary infections of lesions of the feet and to decrease the pain:

- Paracetamol can decrease inflammation, pain and fever
- TMP+Sulfa or Tetracyclines can protect against bacterial infections of the feet

Local treatment can be implemented; after washing lesions of the feet with soap, external disinfectants that combine Methylen Blue or Gentiane Violet with Tetracycline are sprayed twice a day

Sick pigs cannot walk because of the pain; it is important to ensure watering and feeding individually

2.5 Prevention

- Two types of vaccine are available: monovalent vaccine that protects against the strain O (the most common in pigs in Cambodia) and trivalent vaccine that protects against the strain O + A + $Asia_1$.
- The vaccination is effective in swine only if they are injected regularly; cattle can be protected few days after injection of FMD vaccine but pigs do not show very strong immune response.
- It is recommended to vaccinate sows with trivalent vaccine twice a year and to inject a booster in case of outbreak in the province
- Piglets and growing pigs can be injected with the monovalent vaccine but often will show signs of FMD

3. PRRS

3.1 Cause

The virus attack and destroy macrophages that are responsible to catch and destroy microbes entering in the body especially through the lungs.
Development of the disease is closely linked with secondary bacterial infections and role of other viruses like CSF.

3.2 Transmission

- Saliva, feces, urine, colostrums of infected animals spread the virus
- People with shoes, clothes and hands can transport the virus
- Needle used to inject medicines can contaminate pigs
- Semen of the boar can spread the virus
- Ducks are suspected to be vector of the disease

3.3 Symptoms

Symptoms vary according to sanitary and health status of the pigs; some strains are called “Highly Pathogenic” and cause serious disease with high mortality

❖ Sows

In Cambodia, symptoms in sows are the most obvious sign of the disease and are quite clear:

- Several sows stop to eat. This anorexia will last from 7 to 10 days
- Temperature is high, 40°C (in CSF temperature is>41°C)
- Many sows abort
- Farrowing occurs at 108-111 days
- At birth, piglets are weak and we can see a lot of mummified piglets
- Mortality in maternity is high and we can see many sows with only 2, 3 or 4 piglets
- Sucking piglets often have diarrhea that is very difficult to stop
- Some sows die
- Few sows show a blue color of ears, it is why this disease is called “Blue Ear Disease”. Actually it is rare and we cannot make the diagnosis with this sign.







❖ Post-weaning piglets

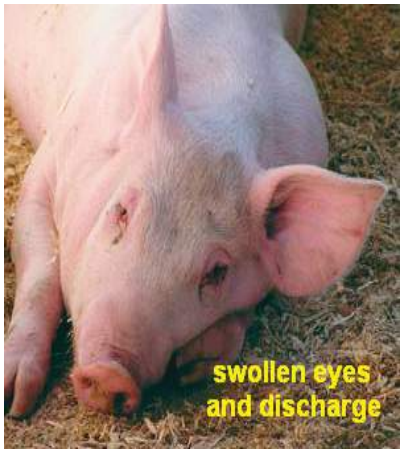
PRRS virus destroys lung macrophages and weaned piglets are not longer protected by maternal antibodies.

- Strong cough and dyspnea
- Wasting condition with rough hairs, exudative dermatitis

- Mortality is limited when piglets are treated by antibiotics to limit effects of secondary infections but they will grow slow with many problems of health along the fattening period

❖ Growing and fattening pigs

- Fever and coughing especially in farms with endemic problems of Mycoplasma
- Swollen eyes with discharge
- Redness of the skin, like a sun tan
- Feed intake decrease and loss of body condition







3.4 Development of the disease

- Sows and boars shed PRRS virus during 2 weeks only but fattening pigs shed an average of 2 months.
- Fetus contaminated during gestation (especially if the sow become sick after 75 days of gestation), if they survive, will shed virus during 5 months. These piglets are weak at birth, it is recommended to remove them (be careful when buying piglets from unknown origin!)
- Piglets in post-weaning maintain the infection in the farm; their immunity is low because they are not more protected by maternal antibodies, they are contaminated by fattening pigs that shed virus for 2 months without symptoms. Virus multiplies a lot in these weakened post-weaning piglets.

3.5 Diagnostic

The laboratory of NaVRI can confirm the disease with specific analysis
The test is not very sensitive, it is necessary to collect blood on 12 pigs as a minimum to make sure it is positive or negative
Analysis cannot make difference between pigs infected by PRRS virus and pigs vaccinated against PRRS

3.6 Treatment

The disease is caused by a virus and there is no treatment but proper use of medication can reduce significantly the impact of the disease

❖ Lactating sows: inject Tetracycline Long acting, 2 days before farrowing, the day of farrowing and later mix Doxycycline for 1 month in the feed

- ❖ Pregnant sows: mix Doxycycline for 6 weeks for all pregnant sows. If some do not eat, inject Long Acting Tetracycline
- ❖ Piglets at weaning: mix Florfenicol in the creep feed, one week before weaning and continue two weeks after weaning
- ❖ Post-weaning piglets and fattening pigs must be treated according to symptoms. Antibiotic against respiratory diseases and against fever

3.7 Prevention

❖ Bio-security is the most important issue; fundamental rules are:

- Limit visit in the farm especially be careful with veterinarian, other farmers
- Nobody can visit the farm without changing clothes, shoes and washing hands
- Never buy post-weaned piglets from unknown source
- Use different and cleaned needles for different groups of pigs in the farm

❖ Vaccination

- The virus of PRRS disease mute (can change) easily; they are many different strains of virus.
- During outbreaks of PRRS, causing mortality, vaccines cannot be used to control the outbreak
- Vaccines are live modified vaccine, it means that vaccination introduces the virus in the farm and this virus can spread from pigs to pigs and mutate.
- PRRS vaccine can be used only in infected farms to improve survival of newborn piglets and improve reproductive performances. The vaccine cannot be used to control acute outbreaks.

4. RESPIRATORY DISEASES

4.1 Prolonged not productive cough



❖ Mycoplasma

- It is the most common cause of coughing in Cambodia.
- Mycoplasma damage the respiratory tract and secondary infections can occur with Pasteurella and can cause severe pneumonia
- Significant difference between temperature in the building in the day time and the night time (>10°C) facilitate development of Mycoplasma

Symptoms

- 7-8 coughs per episode
- coughing is stronger in the early morning
- moderate fever: 39.5^{o}C
- appetite decrease but pigs still eat
- Often Mycoplasma circulate in the farm and pigs start to cough when they are 2 months old, after treatment coughing decrease but regularly appear again until slaughtering.
- Pigs start to cough at age of 2 months but they are contaminated during the first days after weaning

Treatment

Oxytetracycline, Doxycycline, Tylosin, Florfenicol

Amoxicilline is not effective against Mycoplasma. When using amoxicilline, often pigs are better during the treatment because this antibiotic destroy other bacteria like Pasteurella but few days after the end of the treatment, cough start again and stronger

Prevention

Mix antibiotic in the feed:

- During 10 to 15 days immediately after weaning because piglets are contaminated when they are not more protected by antibodies of the milk. Doxycycline and Florfenicol are recommended to be mixed in the feed
- When moving pigs from post-weaning pen to fattening pen, they have stress and Mycoplasma can develop. Mix in the feed, Tetracycline, Tylosine or Florfenicol for 5 to 7 days



❖ Swine Flu (virus)

Swine Flu was brought out with the fear of major human outbreak due to the virus H1N1. Until now this virus has not been identified in Cambodia.

Symptoms

- Very acute disease: the day before pigs are healthy and in the morning 90% pigs are sick with:
  - severe coughing and labored breathing
  - temperature >40oC

pigs will recover in 5 days

Treatment: none because flu is caused by a virus

Inject antibiotic to prevent secondary infection by bacteria: Pasteurella, Mycoplasma…Oxytetracycline for 3 to 5 days

4.2 Difficult breathing and discharge



❖ Pasteurellosis

It is often combined infection with Mycoplasma

Symptoms

- Pus discharge from the nose
- Coughing ; but coughing is short and can be painful
- Rapid breathing
- Fever > 40°C
- Blue discolored skin particularly on the extremities of the ears (it is not PRRS)
- Pasteurellosis

Treatment

- Tetracycline, Florfenicol, Enrofloxacine can be used in severe cases but never forget that using regularly enrofloxacine cause resistance and later this antibiotic will be not more effective…It is important to inject double dose the 1st day

Prevention

- The best prevention is to make a good control of Mycoplasma

- **Vaccination against Pasteurella are not useful** because anyway Pasteurella live in the respiratory tract; they will multiply and invade lungs only when pigs are weakened

❖ Actinobacillus (bacteria)





Symptoms

- **Froth with blood discharged** from the nose
- Very acute, incubation 12 hours
- Short cough:1 to 3 coughs at a time
- Severe heavy breathing difficulties
- Fever > 40°C, severe depression Death

Treatment

- Amoxicillin , TMP + Sulfa, Enrofloxacine

4.3 Lesions in the lungs

Lesions in the lungs are different for all diseases. It is important to check lungs when pigs die (case of Pasteurellosis and case of Actinobacillus). Lesions of Mycoplasma can be seen in abattoir because in general pigs do not die from Mycoplasma.









5. ENTERIC DISEASES

5.1 Diarrhea



❖ E Coli in newborn piglets

Symptoms

- Occur before 5 days
- Yellow, creamy with mucus
- Wet and dirty around anus and tail
- Later dehydrated

Treatment;

- Piglets: inject all piglets in the litter with Colistin+ Ampicillin **morning and evening**
- Sow: TMP+Sulfa to decrease contamination of the milk with E.Coli

Prevention:

- Ensure colostrum consumption: the farmer must help piglets to drink colostrum immediately after birth because the milk contains antibodies that protect against E. Coli
- Prevent cold and air draught: when abdomen is cold E. Coli multiply. Prepare a nest and for the nighttime install warmers



❖ Coccidiosis

Symptoms

- From 7 to 21 days after birth
- Diarrhea from yellow to grey-green color
- Consistency: mix creamy and doughy
- Wasting piglets but death is uncommon

Treatment

Difficult; inject sulfadimidine or sulfadimethoxine

Prevention

It is the most efficient way

Toltrazuril (Anticoc, Baycox) 3 days after birth, once, by oral route

❖ Bloody diarrhea of piglets / Clostridium

Symptoms

- Piglets rapidly develop a rotten smelling diarrhea which is often blood colored 1 to 7 days after birth
- Many piglets die
- It is common in scavenging piglets

Treatment

Amoxicillin by injection or better in the mouth



❖ E Coli in weaned piglets

- Symptoms

  Usually within 5-7 days of weaning
- Consistency from very watery to a paste
- Wide range of color from grey white, yellow and green; color is not of any significance (no blood or mucus)
- Dehydration with rapid loss of weight

Treatment

Antibiotics: Colistin, TMP+Sulfa, Gentamycin, Enrofloxacin

Prevention

- Prevent cold in the night; before weaning piglets receive armth from the body of the sow and in general pen in maternity are well protected against air drought. The first days in post-weaning pen, they are cold and it is necessary to provide heat especially in the night time

- Give specific feed for weaning; digestive tract of weaned piglets is not used to digest raw materials; distribution of specific post-weaning feed from commercial well-known companies facilitate digestion
- Mixing Colistin in the feed the first week after weaning, can prevent diarrhea

❖ Grey diarrhea / Ileitis



Symptoms:
- In fattening pigs or in sows
- Chronic watery, sloppy diarrhea of grey color with loss of condition/bad performances
- Or acute bloody scour with anemia (white conjunctiva)

Treatment:
Tylosin, Tylosin + Gentamycin, Tiamulin

❖ Salmonellosis

It is often seen as secondary infection on pigs infected by CSF



Symptoms
- Foul-smelling watery diarrhea which may be blood stained
- Respiratory distress, coughing,
- Red skin and skin of tail, ears are blue.
- Jaundice because of liver damage

Treatment: difficult
TMP + Sulfa or Enrofloxacine

Prevention
- Do not vaccinate
- Good hygiene, disinfect and control rats and mice

5.2 Constipation



Constipation is little quantity of feces and dry feces. Pregnant sows are subject to constipation; all diseases like CSF, PRRS causing high temperature, lead to low appetite and then to constipation.

❖ Before farrowing
- In general sows move to a special maternity pen, 7 to 10 days before delivery.
  It causes a big stress and the sow loses appetite for few days.
- Some farmers decrease the quantity of feed few days before delivery because they think that it will smooth it.
  Actually constipation can cause difficult delivery, contamination of milk by E.Coli and is a major cause of MMA
- It is important to move the sow at least 10 days before farrowing, after 3-4 days she will eat normally and the constipation disappear
- Do not decrease the quantity of feed before delivery; increase of the feed up to 4 kg is better. It prevents constipation and provides supplement energy for the work of delivery.

It is not good to have fat sow before delivery, but this must be managed during the whole pregnancy. Decreasing the feed in the last week of pregnancy will have no impact on body condition but can impair weight of newborn piglets and make delivery more difficult

Treatment

- Sow must walk
- Distribute fresh fodder
- Administrate paraffin oil (300 ml/day)



❖ Problem of feed formula

Fiber ratio in the feed is the main indicator to prevent constipation in sows. When sows eating normally, face persistent problems of constipation during pregnancy it is necessary to check if the feed formula contains enough fiber: the best sources of fiber is bran, especially wheat bran of second quality

5.3 Anorexia

❖ High temperature

Symptoms

- Pigs cannot eat
- Fever is > 40°C in the morning
- It is impossible to identify other signs of disease; often other symptoms will appear after 2-3 days when the disease develop in the farm

Frequent causes

Septicemia: when bacteria develop in the whole body trough blood stream; these infections are acute and often the animals only show severe weakness, high temperature and anorexia.

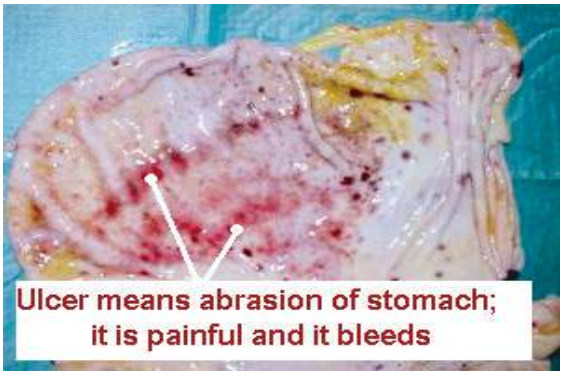
- Retention of a dead pig; few days after farrowing the sows cannot eat and temperature increase. Discharge will be observed after few days if septicemia does not develop before.
- Retention of afterbirth; see symptoms above
- Other bacterial septicaemia (e.g. erysipelas)
- Cystitis/ pyelonephritis: when infection of bladder (cystitis) reach kidneys in sow, infection will develop in septicemia





- **CSF** atypical: high temperature that last many days in pigs with ineffective action of antibiotics must remind CSF.
  The vet must visit again the farm few days later and conduct autopsy to identify typical signs of CSF
  Treatment
- Wide spectrum antibiotics must be injected as soon as possible
- Paracetamol can be used to decrease the body temperature; Paracetamol does not damage too much stomach wall
- Inject as soon as possible antibiotic wide spectrum (Enrofloxacine, Tetracycline), double dose

❖ Stomach ulcer



Symptoms
- Common in sows and fattening
- Not eating but no fever
- Pale skin (hemorrhage in the stomach)
- Constipation with dark feces (digested blood)
- Vomiting

Causes
- Not enough fiber (add wheat bran)
- Bad quality of raw materials in the feed

Treatment
- Distribute feed 4-5 times a day, mixed with water to make feed doughy
- Distribute fresh forage
- Inject stimulant to increase appetite and Vitamin B12 to fight anemia

5.4 Worms



Symptoms
- When infestations are massive, it is possible to see worms in the feces; worms are 250 to 400mm long
- Many worms in the intestine absorb food leading to bad body condition.
- Larval migration (see chapter on parasites) in the lungs causes coughing

Treatment
Ivermectine 1%: 1ml /30 kg
Prevention
- 2 weeks before farrowing for sows
- during post weaning for piglets

6. LAMENESS

It is necessary to enter the pen to force all pigs or sows to stand up: it is the only way to observe lameness
Diagnosis and treatment of lameness is important:
- Sows do not drink enough; it cause cystitis
- pigs do not eat enough leading to constipation and bad performances
- animals suffer; stress cause weakness and immune low response

6.1 Arthritis





Arthritis is inflammation of a joint caused by bacteria
The commonest bacteria in sucking pigs is Streptococcus but other microbes can cause arthritis: Erysipelae

Symptoms

- Lameness, swollen joints
- Piglet shows pain
- Reluctance to stand

Treatment

Lincomycin, Amoxicillin as soon as possible to prevent chronic arthritis

Prevention in piglets

Inject ½ ml of Amoxicillin LA 1 day after birth

6.2 Foot rot





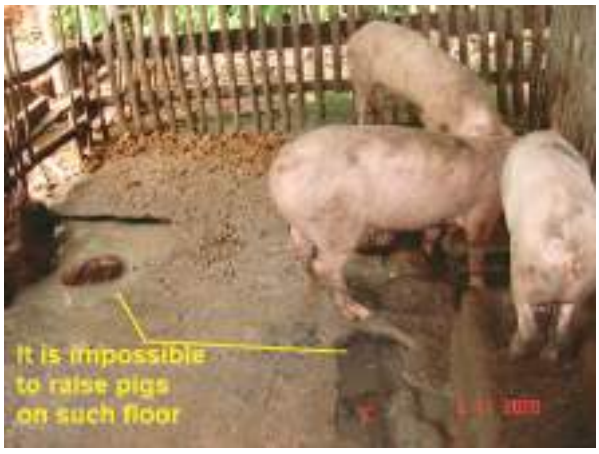
It is infection of the hoof, in the tissues between the claws and on coronary band; very common on sows raised on bad floors

Symptoms

- The sow is very lame with a painful swollen claw.
- A swelling is visible around the coronary band and forms an abscess

Cause

In general it is due to bad floor in cement or substandard cages in iron; when sows have regularly problem of foot rot it is valuable to renovate concrete floor



Treatment

- Lincomycin / TMP+Sulfa
- Rice hull on the floor: a layer of 20cm will protect against contact on cement floor
- Spray OTC on wound to facilitate healing

6.3 FMD

One of the main symptoms in FMD in swine is dramatic lameness and pain in many animals in the pen. A close examination of the feet and of the snout can show typical lesions.



Symptoms

- Sudden lameness.
- Animals prefer to lie down.
- When they move, they scream loudly and limp painfully.
- Blisters on the upper edge of the hoof, where skin and horn meet
- Blisters develop on the snout as well

Treatment:

See paragraph on FMD

6.4 CSF

Many diseases with high temperature can lead to reluctance to move, but CSF cause typical laziness and lack of power in the legs

Symptoms

- If you get them up they may wander to the feeder but eat very little or nothing and wander away again to lie down
- Typical staggering walk; partial paralysis of the hind end results in a drunken walk and a tendency to fall in a sitting or lying position







6.5 Dog sitting position

Symptoms

- The sow seat like a dog with splay legs
- Stiffness
- Sudden acute lameness during lactation or immediately post weaning



Causes

- Too heavy sows
- Heavy milk production.
- Low feed intake in lactation
- Shortage of vitamin D3.
- Low calcium in the diet

Treatment

Vitamin D3 + Calcium (Cofacalcium)

Prevention

DCP: 30 g /day after farrowing

6.6 Splay-leg



Symptoms

- The piglets are unable to stand, the hind legs deflected laterally.
- Easy to be crushed by the sow, the piglet cannot move away
- Poor / low viable piglets.

Treatment

- 25mm wide elastoplast and tape the hind legs
- massage the muscle
- Assist piglet to suckle 2 to 3 times/day

Prevention

Vitamin E + Selenium can be injected once a week to the sow during 3 weeks before farrowing



7. SKIN DISEASES

7.1 Greasy skin / Exudative Dermatitis



Cause: staphylococcus, it is a bacteria. These bacteria invade abraded skin and cause infection

Symptoms

- Commence with small, dark brown, localized areas of infection around the face or on the legs
- These areas show greasy feel, look like dirty
- The brown color gradually involves the whole of the body
- Severely affected piglets can die.

Prevention

- Avoid wet floor, abrasive floor that make lesions on the knees
- Clip teeth carefully, prevent lesion of chicks
- Disinfect udder of sow twice/day with iodine because udder is a reservoir for infection



Treatment

- Nothing is very effective
- Amoxicillin LA, Lincomycin
- Spray disinfectant on the skin (TH4: 2ml in 1 liter of water)

7.2 Red raised areas / Erysypelas



This disease is caused by bacteria and exists in quite all farms; this disease is uncommon before 3 months of age

Symptoms

- Large raised diamond areas turn from red to black: Often these lumps can be palpated in the early stages before anything can be seen
- Sometime sudden death due to septicemia and heart failure
- Very high temperature (>41oC), refusal to feed

Prevention:

Possible to vaccinate breeders at 4 months, 2 times, 4 weeks apart: Ruvax from Merial is available in Cambodia

Treatment:

Inject Penicillin or Amoxicillin 3 to 5 days

7.3 Red pimples / Mange





It is caused by a parasite and affects growth of pigs

Symptoms

- Red irritation over the skin mainly the back and the flanks
- Irritation and rubbing
- Ear shaking with brown dark material inside

Prevention

Treat pigs every 3 months with Ivermectin

Treatment

Ivermectin: 1ml/30 kg twice within 2 weeks because the cycle of parasite is 10 to 14 days; *Ivermectin must be injected by sub-cutaneous route*

Ivermectin can be used, mixed in the feed everyday for 7 days. It is the most effective way to treat mange

7.4 Red spots / Insects' Bites



Symptoms

- Red spot and skin irritation
- Loss of blood and poor growth

Prevention

- Clean resting sites of the flies (easy to see in the premises)
- Identify the breeding grounds. clean waste feed accumulated in and around pens, remove crust on top of slurry that is a major breeding grounds, renovate concrete because cracks and crevices in walls are an attractive area for flies to breed

Treatment

- Spray insecticide (Trichlorfon) on resting sites
- Spray Butox every 2 months on animals
- Inject dexamethasone if serious irritation and amoxicillin if spots are infected (violet swellings, crusts)



7.5 Reddened skin / Sunburn

Quick examination of the environment and short interview of the owner will show that the animal stayed under the sunshine

Symptoms

- Red skin
- Wet dermatitis
- Pigs show pain / discomfort
- Fever
- Sever sunburn can be fatal is dehydration is severe and when the body temperature is above 42°C

Prevention

Ensure shade in the pen

Treatment

- Spraying water on the body of the pig to decrease temperature
- Ensure drinking because pig can be dehydrated
- Inject Paracetamol to decrease temperature of the body and inflammation

The signs of PRRS in fattening pig can be very similar to sunburn but eyes are swollen, pigs cough and reproductive failures are identified in the farm

7.6 Purple discoloration / CSF

Symptoms

- Skin goes purple, first over the ears and tail, followed by the snout, lower legs, belly and back.
- High temperature > 40oC, for several days
- Drunken walk; tendency to fall to a sitting or lying position





Treatment/Prevention

See chapter on CSF

7.7 Cyanosis



❖ Salmonellosis: Salmonella bacteria are widespread in human and animal populations. Some of them can cause disease in pigs.

Severe S. choleraesuis infection occurs typically at around 12 to 14 weeks of age

Symptoms

- The skin of the extremities (i.e. tail, ears, nose and feet) becomes blue
- High fever > 40oC
- Pneumonia, respiratory distress
- Foul-smelling diarrhea
- In pigs less than 6 months

Prevention

- Improve hygiene: regularly disinfect
- Be careful with water bath in the pen, if the disease occur, it is a perfect environment for development of Salmonella
- Vaccine are not useful

Treatment

TMP + Sulfa, Enrofloxacine (but can create resistance very fast)

❖ PRRS

This disease is now well-known in Cambodia and often called “Blue Ears Disease”
This blue discoloration of ears (cyanosis) can be seen in some sows and pigs; but it is rare and it is not a major symptom of the disease. Anorexia, fever, abortion and weak or mummified piglets at birth are more evocative than the blue ears.
See paragraph on PRRS

8. REPRODUCTIVE DISEASES

8.1 Parvovirus





Small mummified fetuses of various size

It is most common cause of infertility.
This virus exists in all farms
When a gilt or sow get infected for the first time when it is not pregnant, there are no clinical sign

Symptoms

In pregnant sows

❖ If the sow becomes infected from 0 to 35 days of gestation: some fetuses die and will be completely absorbed in uterus and signs will be **small litters** (4-5 piglets) or **repeat breeding** if all embryos die

❖ If sows get infected after 35 days, bones start to develop and the piglets become **mummified**. The virus progress slowly from piglets to piglets: at birth we will see mummified piglets from varying size (30 to 160 mm)

Abortion is not a feature of Parvovirus disease

Treatment / None

Prevention

Vaccination: gilts and sows must be vaccinated 10 to 15 days before mating or AI

- Gilts must receive 2 shots. First mating is planned at 8 months; vaccination at 6,5 months and booster at 7,5 months
- Sows must be vaccinated 1 week before weaning



8.2 Vulval discharge

The origin of vulval discharge can be:

- the bladder: it is a cystitis
- the uterus: it is an endometritis

Symptoms

- The disease may be prolonged and not fatal.
- Pus in the urine or a slight discharge clinging to the vulva
- Pus on the floor of the pen

Treatment

It is essential to treat any type of vulval discharge even the sow looks healthy; from bladder or from uterus, the infection will not disappear and need appropriate treatment. It infection of bladder are not treated it may develop to fatal nephritis (infection of kidneys). If infection of uterus are not treated it may cause infertility (embryo cannot develop in uterus damages by pus)

Antibiotics: Tetracycline or TMP+Sulfa are mixed in the feed for 1 to 3 weeks

8.3 Metritis post-partum

Symptoms

- Discharge, abundant with foul smell from vulva - white or brown color
- It occurs 4-5 days after delivery
- The sow shows fever > 40°C
- The sow cannot eat or eat very little





- It is often combined with sign of mastitis, udder hard and agalactia (no milk)

Treatment

- Antibiotic: injection of TMP+Sulfa, Enrofloxacine, Amoxicillin, OTC for 3 days
- Prostaglandin one time only to remove all infectious materials from the uterus

Prevention

Inject all sows with 2 ml of Ocytocine at the end of delivery to ensure complete expulsion of placenta

8.4 Abortion



Abortion is defined as the interruption of the fetal stage of pregnancy between day 35 and day 110 of gestation, and it is characterized by the expulsion of the fetuses.

All infectious diseases associated with high fever (>41oC) like CSF or Erysipelas can cause abortion, but it is not a feature of the disease

In Cambodia, high rate of abortion must suggest:



❖ PRRS

- Gestating sows are off feed 7 to 10 days
- Sows may have fever up to 41°C
- In 4 to 6 weeks, **abortion rate can reach 50%**
- Abortions occur at all stage of gestation but mostly in late gestation
- During this period the mortality of sows can be over 10%

❖ Leptospirosis

Cause

Most frequently, leptospirosis is introduced through the **urine** of carrier pigs (infected pigs are seldom visibly ill) or occasionally by rodents.

The bacteria can be transmitted from pig to pig or ingested in food or water contaminated by infected urine of rats

Once the disease is established in the farm, it is difficult to eliminate

Clinical signs can be identified in pregnant sows

Anorexia and fever in the sow are occasionally noted 2-6 days prior to abortion.

Sows or gilts **abort** within l-3 weeks of the expected farrowing date or delivered a litter of dead, full-term piglets.

Lesions: autopsy of newborn piglets show excessive fluid and fibrin in the peritoneal cavity and sometimes jaundice

Treatment

A single dose of streptomycin at 25 mg/kg of body weight eliminates leptospires in most pigs; it is recommended to make this treatment for pigs that are introduced in the farm

Tetracyclines or better, Tetracycline + Tylosin, can be mixed for 2 weeks in the feed to control the disease in the farm

❖ Mycotoxins

Corn is often contaminated by mycotoxins when it is has been harvested late or not enough sundried for proper conservation.

It is impossible to observe mycotoxins in the raw materials; only analysis in laboratory can detect mycotoxins.

Symptoms in sows

Sow vomit

Abortion occur 2 days later



❖ Dexamethasone

Injection of dexamethasone during the 3 last weeks of gestation provoke abortion

8.5 Infertility

It is incapacity for a sow to produce piglets

❖ Anoestrus



Definition

The normal estrus cycle of the sow is 21 days (actually from 18 to 24 days).

Estrus normally appear at 6 months in gilts and 5 to 7 days after weaning in sows

Sometimes this estrus does not come out: it is anoestrus. Therefore it is impossible to mate or inseminate the animals.

Causes

- Bad body condition at weaning

Some sows have been not enough fed during lactation, or she cannot stand up easily to eat when she has a painful leg

It results in a skinny animal at the weaning time and estrus will not appear before recovering a standard body condition

It takes long time to recover and it is beneficial to better manage feeding of lactating sows to prevent bad condition at weaning



- Improper detection of estrus

Crossbred pigs show slight signs of estrus; especially in gilts, swelling and reddening of the vulva may not be obvious and nervous animals do not show typical behavioral change

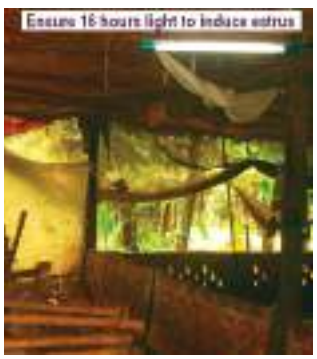
It is important to observe carefully gilts everyday and to check immobility to identify the first estrus (in general, gilts are mated at the 3rd estrus around 8 months)

- Improper technique to induce estrus

Stress, light, stimulus by the boar and extra feeding are necessary to induce estrus. If sows or gilts are kept quiet in removed and dark place, without boar in the environment and getting restricted diet, it is likely that estrus will not become manifest









- Cysts on ovaries

The presence of multiple cysts in the ovaries of sows results in prolonged **anoestrus**; this problem affect less than 10% of anoestrus

❖ Repeat breeding

Definition

The sow or gilt has been inseminated / mated but few weeks later she will show again signs of estrus. If the estrus comes 21 days (actually from 18 to 22 days) after previous estrus, we say regular repeat breeding.

Causes

- Generalized diseases

PRRS is now a common cause of repeat breeding and other reproductive failures, abortion, stillbirths, weak newborn piglets…

Repeat breeding are not regular and occur 21 to 35 days after mating



- Endometritis

Inflammation and infection of the uterus is not compatible with development of placenta and survival of embryos; the pregnancy will be terminated.

Repeat breeding is the most important sign; these animals are often clinically normal but a mild vaginal discharge may be seen

These infections are caused by bacteria that enter the uterus after farrowing or during estrus

- Treatment: the bacteria involved in endometritis are mainly E. Coli, Staphylococcus and Streptococcus

Tetracycline, Amoxicillin or TMP+Sulfa are mixed in the feed for 1 week, starting the first day of estrus



- Boar sterile

The semen of the boar must be of good quality to ensure fecundation; boars can look healthy, in very good condition with ideal testicles but the quality of the semen can be insufficient.

Common cause is overuse of boars; normally boars cannot mate or be collected more than 3 times a week because the concentration of spermatozoids will decrease dramatically.

The other reason is fever; testicles need low temperature to produce spermatozoids, it is why they are outside the body. When the animal is sick, with high fever >40°C, the sperm will be sterile 3 weeks later. At this time the boar has recovered but the sperm does not contain spermatozoids.

8.6 Low litter size

When fetuses die before 35th day after mating, the bones are not yet formed; if some disease or infection kills some fetuses before the day 35, it will result in small litter, less than 6 piglets

❖ Parvovirus (before 35 days)

It is the main cause of small litters. When the virus invade uterus before 35 days, it kill fetuses selectively. These dead fetuses do not have bones and are completely absorbed. The result is **small litter** of 3 to 6 piglets



❖ Endometritis

When the uterus is partially damaged by infection emerging after farrowing, the placenta will not be able to develop normally because it cannot fix on the whole surface of the uterus.

The result is small placenta, damaged placenta and not enough space for implantation of many embryos

Result is **small litter**

It is important to have clean uterus after farrowing: inject 2ml of ocytocin when the delivery is finished to make sure that the whole placenta is expelled and inject 1ml of prostaglandins (Lutalyse), 48 hours after delivery to make a good drainage of uterus.

❖ Quality of semen

- The mating process must last up to 15 minutes to allow the 400ml of semen to be inseminated; if the mating process is interrupted, **the size of the litter is low**
- If the boar serve twice a day, the amount of spermatozoids is low, resulting in **low size litter**
- Boars younger than 9 months produce **small litters**

❖ Movement/stress

After mating, sows must be moved within 3days or at least 28 days after breeding. Normally implantation of embryos occurs on Day 13.

The stress of moving before the implantation of the embryo in the placenta, result in **low litter size**

8.7 Weak and mummified newborn piglets

When fetuses die in uterus after 35 days, it cannot dissolve because of the bones and it becomes mummified: the eyes sink, the fetus becomes dried and dark brown, and bones remain intact. Mummies are born with the remainder of the litter.



More common diseases are:

❖ Parvovirus

Many mummified piglets; they are small (30 to 160 mm) and of various size.

❖ Aujesky Disease

Delivery of mummified piglets; other piglets are weak and some show convulsions

❖ PRRS

2 or 3 mummified piglets per litter. Often delivery occur 3 to 4 days in advance

❖ CSF

The disease causes death of fetuses during gestation. Delivery of weak piglets and **mummified piglets** is common. The typical sign is that some of the alive newborn piglets are trembling.

8.8 Agalactia

Cause

MMA (Mastitis Metritis Agalactia) is a common problem in sows

Generally caused by bacterial invasion of the udder and subsequent production of toxins; vulval discharge and constipation are frequently associated with this problem



Signs

The syndrome usually occurs within 12 hours of parturition.

When pressing the teats the milk does not flow, piglets are hungry.

Sows do not eat after delivery, and show depression and restlessness when being suckled

Affected sows may have a slight fever, 40-41°C

This problem must be treated in emergency because if piglets cannot suck the colostrums they will not receive antibodies from the sow and be weak. When piglets cannot suck quickly after birth, the lose energy, become cold and inactive; it is a good environment for diarrhea

Treatment

Injection of 0.5ml of ocytocin in the blood provokes ejection of the milk after few seconds. It is important to prepare piglets for sucking before injecting

Injection of TMP+Sulfa to the sow to control development of E. Coli in the udder

Injection of Dexamethasone if the udder is hard and hot

Special care of piglets: help the weaker ones to access the teats and prepare a comfortable nest to prevent cooling







8.9 Mastitis

E.Coli, Staphyloccocus and Streptococcus can enter the udder and cause mastitis in one or more mammary gland.

Symptoms vary from acute to chronic, but in general mastitis caused by E.Coli are more acute and severe.

- Fever
- Mucous membranes of her eyes are brick red.

- Affected glands swollen, red color and painful
- Piglets are squealing due to lack of milk.













Treatment
Antibiotics: TMP+Sulfa, Amoxicillin+Colistin
(for acute cases, see MMA)
Prevention
Clean Udder
Clean environment
Proper teeth
Clipping to prevent lesions/cuts of the teats

9. NERVOUS DISEASES

9.1 Edema disease

Associated with weaning and changes of diet.
It is caused by *E. coli* bacteria that produce a toxin. Toxins damage the small blood vessels especially in the brain and cause edema: nervous signs appear
Symptoms

- About 2 weeks after weaning; can be only sudden death
- Incoordination; piglet walk like drunk
- **Convulsions**
- Swollen eyelids
- Stop eating but temperature normal







Treatment

- Isolate piglet in quiet environment
- Inject Sulfa+TMP/ Enrofloxacine

Prevention

- Special feed for weaning is often above 20% of protein; dilute this feed with 20% of feed for pregnant sow to decrease ratio of protein
- Decrease the quantity of feed for other piglets: do not distribute ad libitum but limit to 50g of feed for 1kg of bodyweight
- Disinfect the water with Chlorine to decrease E.Coli population

9.2 Streptococcus

It is common in weaned piglets; sometimes the farmer only find one or 2 beautiful piglets dead without symptoms





Symptoms

- Conjunctiva red
- Ataxia
- The animal then lies on its side with **convulsions**
- and die few hours later
- Temperature > 41°C



Treatment

It can be effective only if the treatment start in the earliest stage of the disease when they have hesitant walk or when they stay immobile in a corner of the pen

- Remove the piglet and keep in quiet environment
- Inject first Dexamethasone
- Inject Amoxicillin

Prevention

- Disinfection of the pen for post-weaning before moving piglets inside the pen
- When one piglet is infected in the pen, mix amoxicillin in the feed for other piglets (5 days)

9.3 Aujesky Disease

In piglets less than a week old
Some piglets with hind leg paralysis may sit on their haunches in a "dog-like" position. Others may become recumbent and paddle, or walk in circles and show **convulsions**
Some piglets may die within hours with no symptoms.
Mortality in this age group is very high; once neurologic signs develop, the animal usually dies within 24 to 36 hours

Convulsions are not a sign of Aujesky Disease in post-weaning; Streptococcus must be suspected if the temperature is >41oC or Edema disease is the temperature is normal but not Aujesky.

Aujesky diseases can be diagnosed when dogs and cat becomes sick in the farm after eating raw meat from infected pigs:
In dogs, symptoms include intense itching (to the point of self-damage), jaw and pharyngeal paralysis, howling, and death. In cats, the disease is so rapidly fatal that there are usually no symptoms.

9.4 Tetanus



Cause
Often bad technique and lack of hygiene during castration
Symptoms: symptoms described below are permanent and do not disappear after a while

- Piglet is hypersensitive
- Stiffness of legs and muscles
- Erect tail
- Muscular spasms of the ears and face

Treatment
In early stage, high dose of penicillin daily

9.5 Newborn piglets trembling

Cause
CSF
Signs

- Muscle tremor, only seen when piglets are walking around and not when they are asleep
- Nervous symptoms, shaking of the body
- Incoordination
- Often dog sitting

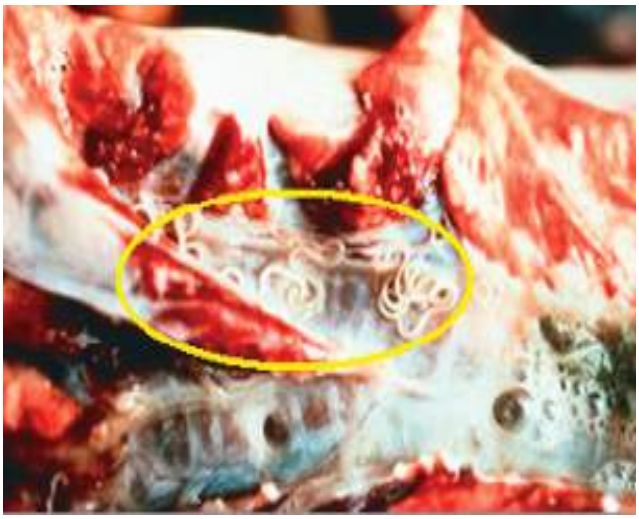
9.6 Rabies



Pig must be bitten by infected dog or cat
Symptoms

- Difficulty to walk
- Nose twitching
- Rapid chewing and excess **salivation**
- Muscular spasm and tremor
- The muscles may also go into spasm.
- Death usually ensues within 3 days.

Remember danger of rabies in human





XII.
Cattle diseases





A. SUDDEN DEATH

B. Animal are simply found dead

C. Animal die in around 24 hours with non specific symptoms

D. Animal die in few hours with identifiable symptoms

Treatment cannot be implemented but good diagnosis is crucial to protect other cattle in contact with the dead ones



1. Anthrax



Caused by a bacteria: Bacillus Anthracis
Cattle are contaminated through the soil
This disease can be transmitted to humans by contact, breathing or oral route

Symptoms

- From normal appearance to dead in few hours; most animals are simply found dead
- Dark bloody discharges from mouth and anus after death
- After death, the animal's body rapidly decomposes

In less acute cases:

- Great weakness and fever up to 41.5^{o}C
- Difficulty breathing
- Blood in urine, milk, feces

Uncoordinated movements and convulsions.

Lesions

It is not recommended to open the body of cattle dead because the blood of dead animals will spread a lot of microbes in the land around; microbes will transform in spores and survive many years in the soil. Actually most outbreaks occur in areas where animals have previously died of anthrax.

Treatment: very early with penicillin or tetracycline, but in general when symptoms are identified, it is already too late

Prevention

- Vaccination is very effective but full immunity takes 10 to 14 days to develop
- Cattle at risk (for example cattle grazing in a field where one animal has been found dead from Anthrax) must be immediately treated with a long-acting antibiotic to stop potential incubating infections.
- Vaccination can be done ~7-10 days after antibiotic treatment. (Antibiotics must not be used at the same time as vaccines)

2. Black leg

Cause is a bacteria: Clostridium Chauvei

- This disease cannot be spread from animal to animal
- The bacteria is ingested when cattle are grazing short grass; with strong rain spores (form of bacteria that survive many years) can float or cattle and can eat some soil with the grass



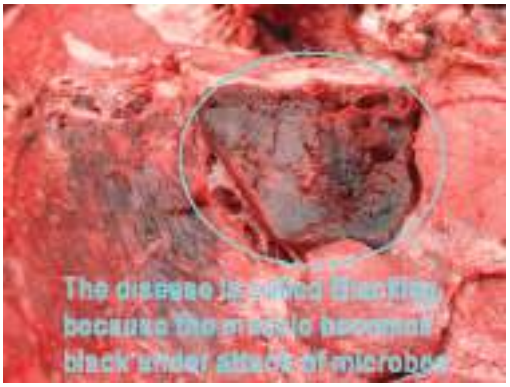
Symptoms

- This disease occur mainly in young animals 6 to 24 months in good condition
- Death is sudden, 12 to 48 hr, often without symptoms
- In most cases the animal is found dead without being previously observed sick.



Less acute cases:

- Severe lameness
- Characteristic edematous and crepitant swellings develop in muscle of the hip, neck or shoulder
- At first, the swelling is small, hot, and painful
- As the disease rapidly progresses, the swelling enlarges, there is crepitation on palpation
- The skin becomes cold and insensitive
- Lesions
- The affected muscle is dark red to black and spongy giving this feeling of crepitation when pressing the muscle



Treatment: very early, at the stage of lameness with hot and painful swelling, by injection of high dose of penicillin/amoxicillin

Prevention

- Vaccination is effective: usually farmers use “7 ways” vaccine against Clostridium diseases: Blackleg, Tetanus, Botulism…
- Cattle at risk (cattle grazing in a place where an animal died of Blackleg previously) must be immediately treated with a long-acting amoxillin to stop potential incubating infections.
- Vaccination can be done only ~7-10 days after antibiotic treatment. (Antibiotics must not be used at the same time as vaccines)



1. Hemorrhagic Septicemia (HS)
2. Caused by a bacteria: Pasteurella Multocida of Type B
3. Buffaloes are more susceptible than cattle
4. Incubation is very short: animal become sick few hours after contamination by contact with a sick animal



Symptoms

Death occurs in 6 to 24 hours; in HS it is possible to observe typical symptoms before the death:

- Reluctance to move,
- High fever,
- Salivation, and serous nasal discharge
- Respiratory distress, bloody discharge
- Edematous swelling of the head, neck, and brisket region

Lesions

- Edema infiltration in the swollen jaw and neck: gelatinous mass colored in light yellow

Treatment

The disease develop quickly and it is difficult to treat on time

- Sulfonamide (IV), Tetracycline (IV), Enrofloxacine are recommended for treatment,
- First injection with double dose (20mg/kg)







- It is interesting to treat cattle in close contact with a sick animal to stop the disease in incubation

Prevention

Vaccination

- The vaccine must be given at 6-months intervals, especially must be injected before rainy season
- There is a good protection of calves with maternal antibodies; cattle must be vaccinated during last months of pregnancy

5. Urea poisoning
6. Cattle are attracted by the smell of urea and are used to eat bags with rest of chemicals



Symptoms

- The period from urea ingestion to clinical signs is 20-60 min
- Death will occur within 2 hours

Early signs:

- Twitching of ears and facial muscles, grinding of the teeth, frothy salivation
- Incoordination, tetanic spasm and aggressive behavior
- Ruminal tympany (bloat)
- Forced rapid breathing
- Treatment in emergency

Give to drink 2 to 5 liters of vinegar (or acetic acid at 5%)



3. FMD

Caused by a virus Virus (microscopic) / antibiotic are not active

Several strains (7) exist and the strains O, A and Asia 1 have been identified in cattle in Cambodia

The virus can spread from pigs to cattle because pigs shed a very high quantity of virus and cattle very susceptible with the aerosol infection

Symptoms

- Fever and anorexia; anorexia is due to fever and to vesicles in the mouth which are painful and therefore cattle cannot eat
- Vesicles appear on the tongue, dental pad, gums, lips (rare in pigs), causing extreme salivation
- Blister lesions are seen on the coronary band and inter-digital cleft of the feet. Infected animals sway from one foot to the other due to the tenderness of the feet
- Vesicles may also appear on the teats and udder
- Death is common in calve because of myocardium damage









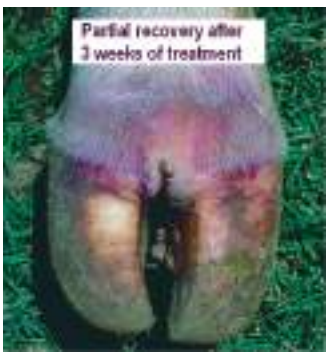
Treatment

It is caused by virus / no treatment

Vaccination of sick cattle is ineffective

Objective of treatment is to prevent bacterial infection:

- Inject 5-7 days TMP+Sulfa or OTC
- Wash lesions of the feet with soap



- Spray disinfectant with *violet de gentiane* + OTC on the feet after cleaning

Animal cannot walk, eat and drink:

- Provide grass and rice bran mash and water
- Keep animal in the shade to reduce dehydration



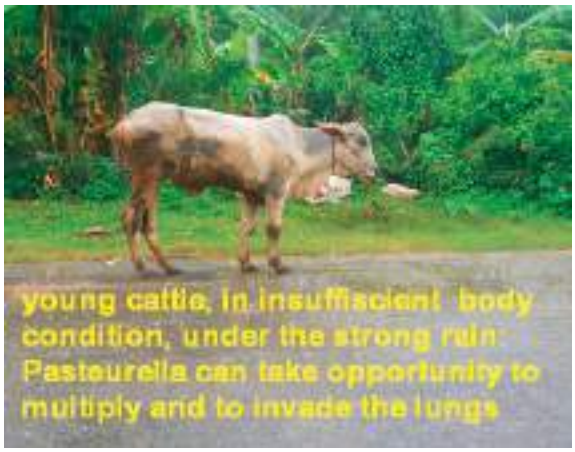
Prevention

The vaccine is effective and it is beneficial to vaccinate cattle twice a year.
It is important to use the trivalent vaccine against strains O + A + $Asia_1$
Cattle can develop immunity very quickly after vaccination; it should be effective to vaccinate immediately when the farmer know that suspected cases have been detected in the neighboring villages or in the village.
Unfortunately it is not so easy to buy doses of vaccine in emergency and often suppliers run out of stock very fast when outbreaks extend.

4. RESPIRATORY DISEASES

4.1 Pneumonia

All cattle are susceptible to respiratory disease, but it usually begins when an animal is stressed.



Cause

Common stressors include variations in temperature, exhausting work, insufficient feeding and watering. Dry and dusty conditions can also augment the problem.
The most common microbe involved in pneumonia is Pasteurella; this microbe leaves normally in the upper respiratory tract (nasal cavities, larynx and pharynx) but not in the trachea and in the lungs.
In healthy cattle Pasteurella multiply slowly and the macrophages and antibodies destroy them. But in case of stress the immune defenses are weakened and cannot control the invasion of lungs by Pasteurella. In addition, if the respiratory tract is irritated by dust microbes can develop easily.
The result is development of pneumonia



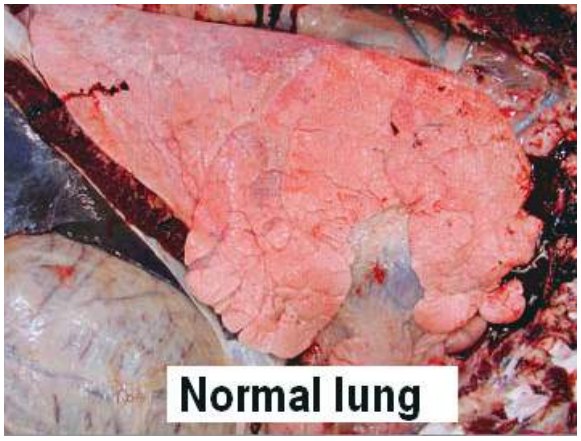
Symptoms

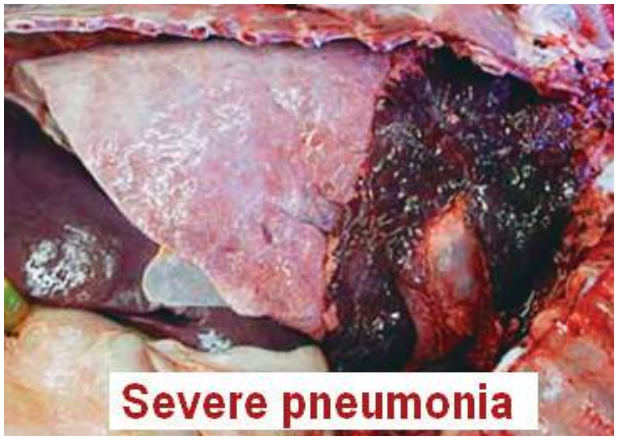
When the Pasteurella is called type B, it causes the Hemorrhagic Septicemia with rapid death (see paragraph on HS). Other types of Pasteurella cause Pneumonia less acute, but Pneumonia is always severe illness that must be treated immediately.
Pneumonia can hit calves and older cattle

- Animals exhibit an increased respiratory rate
- Fever >40oC and loss of appetite
- Coughing
- Nasal discharge

Lesions.
A severe necrotizing (the lung is not more elastic) fibrinous (cheesy material) pneumonia develops

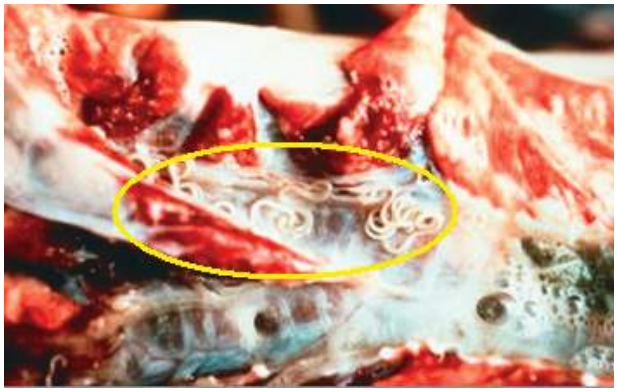
Treatment
Antibiotics: Tetracyclines, Florfenicol, + Anti-inflammatory medicines: Paracetamol, Tolfedine, Ketophen





4.2 Lung worms

This worm is called Dictyocaulus
Lung worms cause a lung disease in cattle with clinical signs similar to those caused by microbes
Mature lung worms live in the bronchi and produce eggs



Symptoms

- Coughing
- Temperature can reach 40 °C in severe infestations
- Nasal discharge
- Grunting
- In general associated with poor body condition and rough hairs



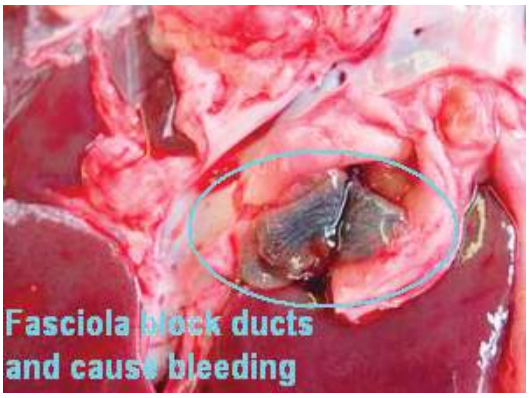
Treatment: one time

- Albendazole: 10ml/100kg
- Ivermectine: 1ml/50kg

In severe cases (high temperature and depression) , antiparasite drugs must be associated with antibiotics like in Pneumonia

5. ENTERITIC DISEASES

5.1 Liver Fluke



It is caused by a parasite, Fasciola Hepatica. Larvas are ingested when grazing. The cycle of Fasciola requires a small snail; it is why wet areas are more likely infested with Fasciola

Symptoms:

Liver fluke disease can be acute, sub-acute or chronic: the signs in the cow are all due to liver damage, with the symptoms varying depending on number of flukes present in the liver. Disease is due to hemorrhage and tissue damage from migrating immature fluke in the liver, and from damage to bile ducts (obstruction) and blood loss due to adult fluke Signs are



- Loss of appetite
- Weight loss and emaciation
- The animal becomes anemic (color of mucous membrane become white (normally it is pink)
- Chronic diarrhea

Swelling of the jaw

Treatment

Dovenix, Albendazole/ Two treatments may be needed per year



5.2 Intestinal worms

Worms of the intestine

Cattle are infected by ingesting larva during grazing: adult worms in cattle produce eggs that are passed in the manure. The eggs hatch in the grass, producing larvae that develop and move up onto the pasture grasses where grazing cattle consume them



Symptoms

- weight loss
- reduced feed intake but no fever
- diarrhea, green and profuse
- rough hair

Treatment

- Levamisole, Albendazole…
- Ivermectine 1%: 1cc/ 50 kg SC

5.3 Coccidiosis



It is caused by microscopic, one-celled parasites. Coccidiosis occurs more frequently in calves from one to six months of age

Symptoms

- Loss of appetite and weight causing a general emaciation
- Profuse diarrhea that can contain blood and mucus
- Straining at defecation (abdominal pain)

In less acute disease (common)

- Dull and broken hair and a poor general condition
- Diarrhea turns blackish and mucous-like and can form a compact lump of feces stuck around the tail
- Treatment
- Sulfa 33 for 5 days



E.Coli

Calves ingest the bacteria when suckling or it can enter through the umbilical cord.
Diarrhea caused by E.Coli occurs during the first days after calving

Symptoms

- Diarrhea yellow-white
- Calf becomes very weak/stop suck
- Infection of the umbilicus, joints and general septicemia may also occur

Treatment

First diarrheic newborn calves should be taken off milk immediately
When the calf is severely dehydrated (sunken eyes), it is necessary to inject fluid (Serum) in intravenous or to give by oral route some water mixed with electrolytes (water alone does not work); often in countryside electrolytes are not available and it is possible to mix 3 big spoons of sugar and ½ big spoon of salt in 2 liters of mild water.
The calf must drink 1 liter every 6 hours.
Most dehydrated calves suffer from low body temperature and they must be kept in warm environment especially in the night time.
Antibiotic should be injected: Colistine, TMP+Sulfa



Prevention

Calves are born without antibodies against E.Coli. They will receive these antibodies through the milk of the cow. But only the colostrum is very rich in antibodies and will be produced only few hours after delivery. It is crucial to ensure enough intake of colostrum during the 12 hours after birth.

5.4 Salmonellosis



In the environment, Salmonella survives for 4 to 5 years in water, soil, dust, moist areas out of direct sunlight: hygiene around the house and in the village is crucial to control Salmonella

Symptoms

Infection can range from apparently “healthy” carrier animals to those that show acute signs of the infection

- **High fever**
- In adult cattle we can see severe and foul smelling diarrhea with varying amounts of blood, mucus, and shreds of intestinal lining.



Abortions may occur in infected cattle.

In chronic cases, following an acute episode, fever is intermittent and watery diarrhea persists, resulting in progressive dehydration and weight loss.

In calves 2-12 weeks old, the disease most commonly affects calves that do not drink the colostrum. It causes high fever profuse yellow diarrhea with or without flecks of blood and mucus, rapid dehydration and death within 24-48 hours

Treatment

- Like for E.Coli, rehydration must be implemented in emergency
- Use of antibiotics is uncertain because Salmonella have developed a lot of resistance to antibiotics
- Treatment will last at least 6 days
- TMP+Sulfa , Colistine+Ampicilline, Enrofloxacine can be used but resistance appears very fast. In general Salmonella are resistant to Tetracyclines

5.5 Occasional diarrhea

Sometimes diarrhea is the only symptom; cattle do not show general signs but we can observe watery feces



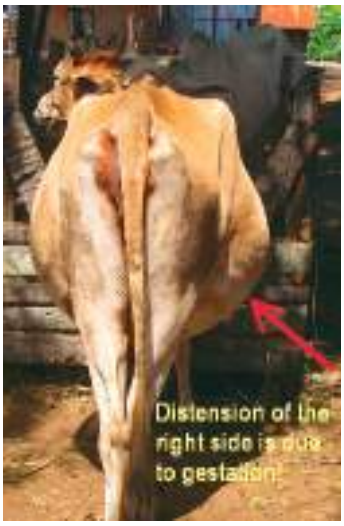
In general it is caused by fault in feeding:

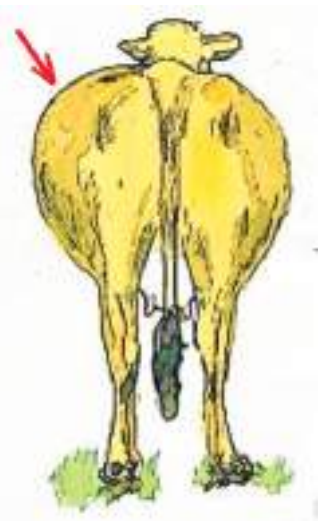
- A sudden change in the animal's feed
- Beginning of rainy season, high intake of young grasses cause diarrhea
- Feed is old, decaying or fermenting (corn, rice bran)

Treatment:

- New grass or feed must be distributed step by step
- Keep the cattle under the house and distribute straw of good quality
- Remove soiled feed

5.6 Bloat





Symptoms

- Bloat is the distension on the left side of the cow
- Beating the rumen shows that it is full of gas or of foam
- The cattle cannot eruct gas produced in the rumen
- The rumination stops
- The drum-like rumen presses on the diaphragm making breathing very difficult

Temperature is normal

Causes

- **Foreign body**

Often the cause is foreign body in the esophagus (corn stalk, fruit…)
The vet must palpate pharynx and esophagus through the skin to identify where it obstructs



Treatment
The vet must try to remove stuck feed by hand
Pierce rumen with a trocar when bloat is severe to release gas
Always inject antibiotic to prevent peritonitis

- **Wet young grass**

This may happen suddenly, especially when the animal is grazing on wet pasture in the morning. The cattle eat too much young grass when rainy season start
It may cause sudden death
Prevention
Don't give hungry animal free access to dangerous grazing



Treatment

- Dose 300-500 ml oil by oral route

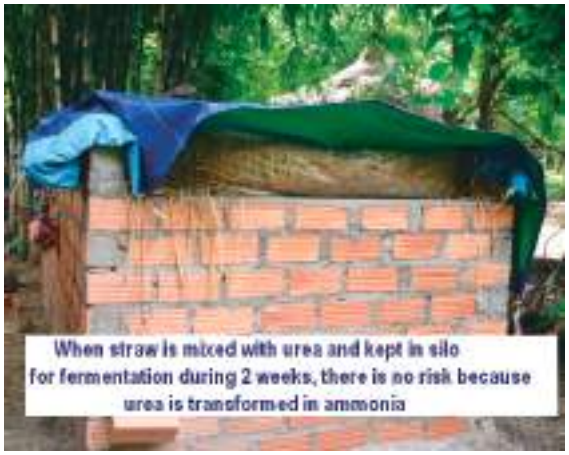
- **Urea poisoning**

It can occur when cattle lick rest of urea in a bag
Second common cause is when farmers use technique of spraying directly urea on straw to improve feeding- this technique require gradual adjustment
Symptoms
Severe bloat
Muscle tremors that progress to incoordination
Death within 2 hours
Treatment: 2 to 5 liters vinegar are administered by oral route



6. SKIN DISORDERS

6.1 External parasites



6.1.1 Flies

Many types of flies can annoy cattle
Some are **blood-sucking**, causing depletion of blood especially in young animals, lesions of the skin and permanent annoyance because the bite is painful
Some are **non-blood sucking**, causing annoyance when they are too many (>100 flies/animal), they can spread bacteria or virus and they are source of irritation when they feed on the mucous membranes of the eyes
Flies can lay in wounds and maggots will develop; firstly, maggots will "clean" dead and infected tissues but without control, after this stage, they will invade and eat healthy tissues.







Control
Two products are available to control flies on cattle:
- Permethrin (Butox)
- Coumaphos (Asuntol)

6.1.2 Mosquitoes



Mosquitoes suck blood from cattle. They breed in water and are usually more abundant in shaded areas, where cattle normally sleep. They do most of their feeding in late afternoon and at night, causing annoyance: the animals cannot sleep and in the daytime, they are too tired to graze. They lose body condition
Control

Burning leaves and weeds to produce smoke that keeps mosquitoes far from animals
Install mosquito net to protect the stable area during the night

6.1.3 Ticks

When cattle are heavily infested, ticks can be found anywhere on the body. On a lightly infected animal the main places to look are the tail butt, belly, shoulder, dewlap and ears.

- Ticks suck blood from animals, and large tick numbers can lead to blood loss and weakness especially in calves
- Ticks have long mouthparts and can cause severe skin damage
- Ticks can spread diseases agent: babesia, anaplasma







Control

- Permathrin (Butox): immediate action
- Coumaphos (Asuntol): immediate action
- Ivermectin (Ivomec) ; the maximum efficacy is achieved 4-5 days after injection

6.1.4 Mites



Mange causes intense rubbing, scratching of the skin followed by hair loss and a thickened, crusty skin. The lesions can cover the entire body.

Control

It is difficult because mites burrow into hide

Injection of Ivermectin is the best control technique

Asuntol can be used

A second injection or application is necessary 2 or3 weeks later according to the cycle of the parasite

6.2 Photo-sensibilization

Signs

- The skin may be red and swollen
- Develop blisters that crack
- Patches of skin may slough off







Cause

- Hyper-sensitivity to medicines: sulfa
- Fungus in Brachiaria grasses
- Liver damaged (fasciola…) that cannot eliminate toxins

Treatment

- Keep animal under the shade
- Early stage: dexamethasone
- If many crusts: antibiotic like Amoxillin LA

6.3 Discoloration

Discoloration of hairs and skin is often linked with bad body condition, rough hairs
Common cause is deficiency in Vitamin A, Zinc and Copper
Another cause is lesion caused by insect bites or any healing; hair will grow again with different color





Treatment with one or two injection of vitamins is rarely successful

- All minerals and vitamins work together; correction of deficiencies is complex
- It requires daily intake of well balanced recipe of vitamins and minerals
- The best is to distribute concentrate for 3-4 weeks

6.4 Wound



A wound is a cut of the skin; deeper wound can involve muscles, joints
All wounds bleed, are painful and can become infected with microbes or invaded by maggots.
If maggots invade the wound, only spray insecticide in the wound (Raid) and after few minutes remove maggots (it bleeds) with a clipper and treat like a normal wood

Treatment

Clean the wound with a lot of water and brush gently: it is 90% of the treatment of the wound
Cut away the hair
Apply Iodine (if wound is clean) or spray containing Tetrcycline and Gentiane Violet
If the wound is deep, inject antibiotic: Amoxillin LA, Oxytetracycline LA



6.5 Warts



Warts are caused by a virus called papillomavirus
This virus can spread to other cattle when grazing in bush (virus is on branches and penetrate in small lesions of skin)
Normally cattle are not sick
No treatment
Cattle warts usually shrink and drop off after 3 to 6 months

7. LAMENESS

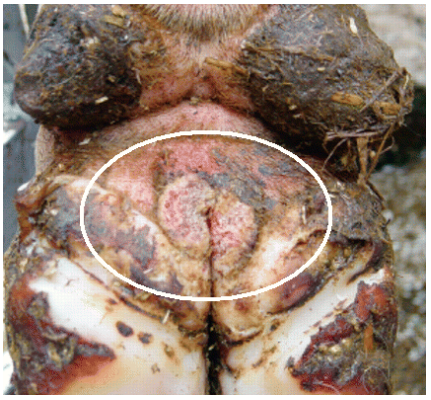
In Cambodia, cattle are mainly used for draft power: strong legs and feet are crucial to achieve the work in the field.

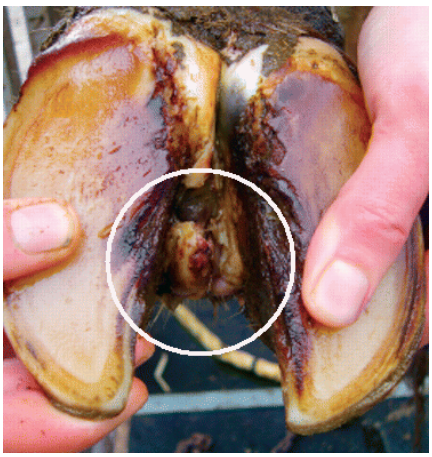






7.1 Digital Dermatitis





Digital dermatitis is a skin disease of cattle, which usually affects the skin on the bulbs of the heel.
Digital dermatitis can also be found between the digits

Symptoms
Cattle with digital dermatitis may show signs of lameness when standing or when moving. The most commonly seen presentation is the standing animal that flicks its foot repeatedly for no obvious reason
Cattle are less powerful when working in rice field, they get lame
The disease is commonly seen when cattle work in mud; it is very common for cattle ploughing rice fields
Interdigital Dermatitis can easily transform in Footrot
Treatment
If digital dermatitis is not treated it can persist for months
By footbath: the farmer must find adequate container and handle animals properly to maintain the foot during few minutes in a bath containing:

- Formalin 3% twice daily/ 3 days

- Copper Sulfate 5%

In severe cases antibiotic must be injected: TMP+Sulfa or Long Acting Oxytetracycline

Prevention

Make sure that the floor is soft and dry in the shelter where cattle are kept

7.2 Foot rot

Foot rot is a necrotic infection (tissues are infected and then destroyed with foul smelling) of the interdigital skin (between the digits)

Cause

Wet feces and mud can soften the skin between the toes, making it susceptible to injury. Infectious agents gain entry through the skin as a consequence of injury caused by sharp pieces of stone, metal, wood… Working in mud is clearly a cause of foot rot

Symptoms

- Lameness appears suddenly; usually only one foot is affected
- Fever
- Swollen foot
- Break in the skin between the claws, little pus may be present

Treatment

- Sulfa 33 IV is effective
- TMP+ Sulfa 3 days
- Long Acting Tetracycline



7.3 Arthritis

It is inflammation of a joint in general combined with infection

Causes



- Joint injury; usually a single joint is affected

Other general infection which develop in joints especially in calves; the infection comes from umbilicus, lungs or digestive tract: Mycoplasma, E.Coli or Salmonella

- Cow milking with Calcium, Phosphorus and micro-elements deficiencies . In calves it causes rickets with deformation of the forelegs and enlarged carpal joints.

Symptoms

- Marked lameness.
- Pain at palpation of swelling joint
- Low appetite
- Fever

Treatment

- Antibiotics: Tylosin, Lincomycin, Tetracyclines during 5 to 7 days
- Drugs to minimize pain and inflammation: Paracetamol, Dypirone, (Analgine, Calmalgine)



7.4 Paralysis

Long recumbency

- Radial (front leg) paralysis when thin and weak cattle do no stand for many days
- Nerves are not protected by muscle and are damaged when cattle lie on one side on hard surface

Treatment

Help weak cattle to stand up twice daily

- Inject stimulant: Carasil, Hematopan B12

Rub shoulder and thigh with straw

8. DISASTROUS BODY CONDITION

It is common to see in Cambodia skinny cattle with rough and discolored hairs and exhausted appearance.





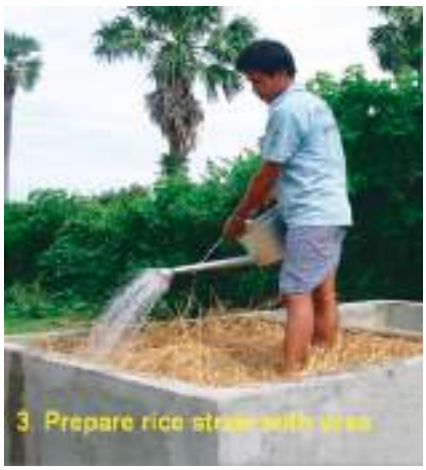
It is not so easy to recover standard body condition. Main causes should be:

8.1 Deficiencies

Insufficient feeding (quality and quantity) is the main cause by far.
Injection of multivitamins medicines or stimulant is not enough
It is compulsory to distribute grasses of good quality (providing proteins) and/or Home Made Complement (see chapter on cattle feeding)
It takes about 6 weeks to recover a proper body condition with a diet containing enough energy and proteins; 3 possible techniques are adequate:







8.2 Milking



It is not rare to see calves older than 6 months and continuing to suck the mother.
Cows cannot eat enough, if they do not receive feed complements, to maintain milk production. The cow need to draw on one's reserves and will lose body condition.
It is necessary to wean calves before 6 months (separate cow and calf) to prevent disastrous body condition.
Skinny cattle cannot show estrus.

8.3 Parasitism



Heavy infestation by worms impairs the body condition but Liver Fluke can lead to disastrous body condition when anemia develop
It is necessary to de-worm cattle twice a year, at the beginning and at the end of the rainy season, especially if cattle graze in group and graze in wet areas.

8.4 Blood parasites



Babesia, Trypanosoma and likely Anaplasma are circulating in Cambodia.
Trypanosoma is regularly found on cattle but impact on health and bad body condition is not clear.
In case of disastrous body condition with intermittent high fever and eye discharge it is recommended to inject Berenil to control Trypanosoma

9. REPRODUCTIVE DISEASES

9.1 Metritis / Vulval discharge



Clear vulval discharge is normal during estrus or few days after delivery
But sometimes we can observe pus in the discharge; in general it is caused by infection of uterus: it is endometritis
Causes

- Normal uterus is a sterile environment
- Just after delivery, uterus is contaminated with many microbes coming from vagina, but normally after few days uterus can eliminate microbes and prevent infection
- Sometimes infection will persist and bacteria will develop because uterus cannot eliminate bacteria (retained placenta, disorder in production of hormones…); it produce pus and provoke vulval discharge

Symptoms



- Pus or dirty materials can be seen at the vulva
- Foul smell is common

Low appetite

Treatment

- Inject prostaglandins: 2 times apart 11 to 14 days to drain uterus: it open the neck of uterus and induce contractions, dirt materials are expelled (Ocytocin cannot be used because this medicine does not “open” the uterus and can induce contraction only during the delivery)
- Inject antibiotics: Tetracycline or Tylosin for five days
- It is not recommended to “wash” uterus with solution of Iodine or Permanganate. It cause irritation and large volume of liquid impair uterus involution

Prevention

Cows at risk are cow which faced problem during delivery requiring manual investigation to assist, when placenta is retained, when mastitis occur just after delivery Inject prostaglandin 24 hours after delivery and again 2 weeks later

9.2 Anoestrus

Anoestrus means that non-pregnant cow does not request the bull; it is normal during the first phase of milking calf.

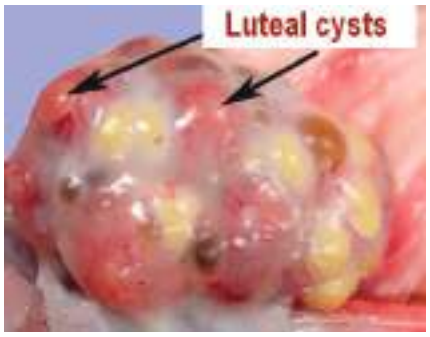
Causes

Some common disorders can induce long anoestrus, we can say infertility:

- Poor body condition inhibits cyclic activity in the cow
- Suckling by the calf
- Cystic ovary







Treatment

- Proper feeding and weaning on time will facilitate appearance of estrus
- If the cattle is in good condition, treat luteal cysts: Prostaglandins 5ml of Lutalyse induce estrus after 3 to 5 days

9.3 Repeat breeding

Cows show normal heat cycle every 3 weeks but cannot get pregnant after mating; repeat breeding is defined as a cow that has not conceived after 3 or more services associated with true estrus.



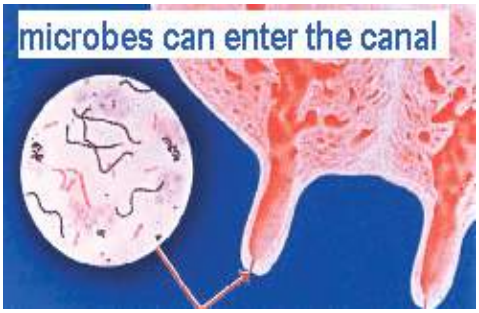
Causes

- Endometritis: it is a nonspecific infection of uterus caused by bacteria invading uterus just after delivery; actually embryo cannot develop properly in infected uterus. This endometritis is some time difficult to diagnose because cattle do not eject systematically pus.
- The bull can be sterile; it is recommended to change the bull next service

Treatment

- Prostaglandins: 2 times apart 11 to 14 days
- Antibiotics: Tetracycline or Tylosin for five days

9.4 Mastitis



Mastitis is the inflammation of the mammary gland. This disease and resulting infection can significantly reduce milk production.

Cause

It is caused by bacteria

Germs can enter through injuries or through the canal of the teat



Symptoms

- Most mastitis cases involve one quarter (one teat) of the udder, with normal milk production from the other three quarters.
- In acute cases, the quarter is swollen, hot, and red, with few production of milk. Fever, depression and shivering are common. The cow may flinch or kick when the udder is touched because the quarter is sensitive
- In sub-acute and chronic form, there are no fever or general signs, but milk production is low, the quarter can be tough. The cow defend when the calf try to suck; the calf is hungry and lose condition



Treatment

Treatment must be implemented early to be successful

- Inject Ocytocin (5ml) to facilitate udder draining
- The milk in the sick quarter must be roved by hand milking (it is important to maintain the cow in a crush because it is painful) twice a day for 2 days
- Injection of antibiotic: Sulfa+TMP or Amoxicilline 3days
- If the udder is very hard, inject once Dexamethasone or Tolfedine to decrease inflammation

