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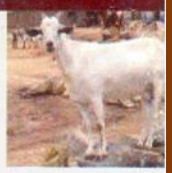

Training Manual for Community Animal Health Workers/Paravets

in Ethiopia, Kenya, Sudan and Uganda

Dafa Alla Ibrahim Osman
Melaku Tefera
Dickson M. Nyariki
Savino Biryomumaisho

Organisation for Social Science Research in Eastern and Southern Africa

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Dryland Husbandry Project (DHP)

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No. 1. Dryland Husbandry Project in the Sudan: Workshop Report
Institute of Environmental Studies and Faculty of Veterinary Science-Camel Research Centre (University of Khartoum) and Range and Pasture Administration, Ministry of Agriculture, Khartoum, Sudan. Addis Abeba, November 1996. /DHP-Sudan/

No. 2. Dryland Husbandry Project in Kenya: Workshop Report
Department of Range Management and Institute of Dryland Research, Development and Utilisation (IDRDU), University of Nairobi, Nairobi, Kenya. Addis Abeba, July 1997. /DHP-Kenya/

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Abdillahi Aboud, Delius Asiimwe and Mustafa Babiker. Addis Abeba, June 2001. /DHP Regional Office/

No. 7. Dryland Husbandry in Ethiopia: Research Report
Edited by: Mitiku Haile, Diress Tsegaye and Tegegne Teka. Addis Abeba, December 2001. /DHP-Ethiopia/

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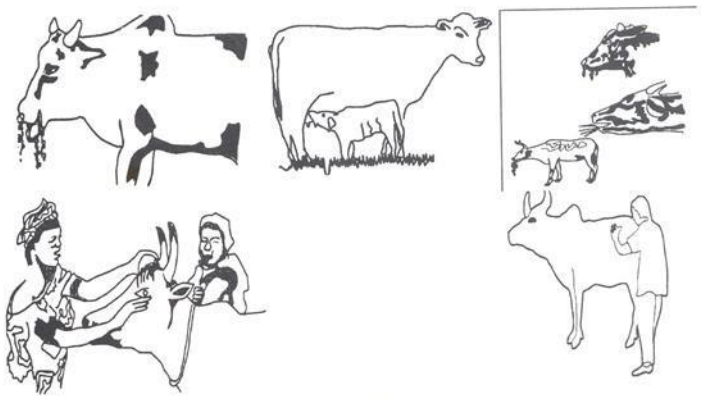

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Our appreciation is also extended to the Executive Secretary and all staff members of OSSREA for their generous help as well as for the friendly atmosphere they created during the preparation of the manual.

Last but not least we would like to thank all people at the DHP country level who helped in one way or another during the preparation of the country manuals and this training manual.

We hope that this manual will be of value to all those who are concerned with the life of animals, specially the trainers of Community Animal Health Workers or paravets in the DHP countries and in other countries.

The Authors

Preface

The Dryland Husbandry Project (DHP) operates in the pastoral areas of Ethiopia, Kenya, Sudan and Uganda. The pastoral and agro-pastoral environments occupy the peripheral areas. Pastoralists live in areas where health services are not available to themselves and to their animals. The conditions of animals determine the standard of living of pastoralists. Poor animal health and lack of veterinary services hinder efforts in livestock production and in poverty alleviation in the pastoral areas. Although traditional healers and herders have found ways of looking after animals through ethnoveterinary practices, the benefits of modern veterinary services have not been used in the pastoral areas. This is because veterinarians are not available in the rural dryland areas. Hence, it is important that intervention is necessary in animal health care to increase animal production and pastoral welfare.

DHP took animal health care as one of its key objectives in its action-oriented activities. This was implemented by training pastoralists and agro-pastoralists as Community Animal Health Workers (CAHW) or as Para-veterinary (Paravet) service providers. Paravets learn the basic elements of what causes, symptoms and treatment of some common animal diseases in a scientific way. Veterinarians keep contact and provide technical advice to paravets. As Paravets carry new ideas to look after animals, they can serve as development agents in the pastoral areas. They could also teach community members on animal health care and could serve as early detectors of animal diseases in the pastoral areas. This information is useful to veterinarians, government institutions and NGOs. Training of Community Animal Health Workers is also an issue of capacity building at the local level.

Preface

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Community members identify the pastoralists for CAHW/ Paravet training. Interested and willing members of the pastoralists are trained. The veterinarians along with knowledgeable people in the pastoral community identify common animal diseases. It is on these identified diseases that professionals would offer training. Those who had knowledge in ethnoveterinary practice were given priority for training. Such an approach would link the local knowledge and practice with that of modern veterinary services in animal health education.

When we come to gender, males in the pastoral and agro-pastoral society mainly conduct ethnoveterinary practices. Because of the social and cultural factors in some societies, paravet training was left to male. In the successive DHP Community Animal Health Workers training, it was only males who attended the programme. DHP raised the issue of female participation in paravet training and discussed the matter with pastoral community members and reached agreement for their participation. The practice of female paravets showed the pastoral community that they could treat animals using modern medicine. The involvement of females in paravet training and practice brought some changes in gender roles in the pastoral and agro-pastoral communities.

A training manual is first prepared on the commonly identified diseases. Senior professionals prepare the manual in the language of the people or the official language of the country. It is on the basis of this manual that Community Animal Health Workers are trained. The manuals have been revised and used for more than five years in all DHP countries. Government institutions and NGOs use the manuals.

This training manual is a combined work of the four manuals that were prepared in the DHP countries. The idea of merging the four country training manuals into one volume presents the common animal diseases, the means of treating them and the approaches used. The other objective of producing this publication is to provide the region with a training manual that has proved useful on the experience of the four DHP countries. This manual contains basic information on body parts and their functions, restraining of animals, methods of diagnosing diseases, causes of disease and their transmission. It also includes disease control and prevention, handling of drugs and their administration, some common diseases, poultry diseases and hygiene, meat inspection, and wound treatment and minor surgical procedures.

This manual is prepared by veterinarians from the University of Khartoum (Sudan), Mekelle University (Ethiopia), University of Nairobi (Kenya), Makerere University (Uganda). Merging the manuals demanded a lot of hard work. OSSREA would like to thank the authors for their unreserved efforts to prepare a manual that would help the trainers and beneficiaries in the four DHP countries and in the region that have similar animal health care problems. Training manuals of this nature are rare in the region. This training manual is perhaps the first publication in the region. We hope that this manual will serve as a basis to further develop future training manuals in the region.

Tegegne Teka
Regional Co-ordinator, DHP

CHAPTER 1

INTRODUCTION

The Dryland Husbandry Project (DHP) has several activities in the participating countries, namely, Ethiopia, Kenya, Sudan and Uganda. One of the major activities of the project is improvement of delivery of veterinary services among the pastoralist communities in the project areas. The chosen areas for participation are dry and located in remote places.

Livestock production is important not only as a source of wealth and income but it is also a mode of life for the pastoral population in DHP countries. In addition to providing food, animals are also used for transport and provision of draught power.

Matters pertaining to prevention and treatment of livestock diseases as well as livestock production are a responsibility of veterinary officers and livestock workers. An important sector of these workers consists of what we call Paravets or Community Based Animal Health Workers (CAHWS). The need to train CAHWS arises because of the inability and unavailability of veterinarians to physically reach all animals due to the vastness of the dryland areas and in many cases, the nomadic lifestyle of the pastoralists.

One might ask: what are the benefits of training paravets? In answer, one should bear in mind that the majority of these paravet trainees come from the pastoral tribes. They, therefore, know much about animal health care. Much of that knowledge, however, is not scientifically sound. The training of these paravets, therefore, aims at giving them suitable information to correct any unsound knowledge they may possess.

This manual has been developed to provide the paravets with knowledge about causes of disease on a scientific basis instead of attributing any disease to mythical causes, for example evil eye and witchcraft. The trainee will further be given information on symptoms, diagnosis and treatment of important diseases, correct doses and administration of drugs.

The training will concentrate on communicable diseases to protect the life of both man and his animals since some animal diseases can be transmitted to man and vice versa. The paravets should be in a position to advise the pastoralists about the dangers of zoonotic diseases.

The principle of selecting paravet trainees should be based on the fact that they are members of the pastoralist community. The community leaders in conjunction with trainers select suitable candidates for training. Preferred are those who can read and write. A paravet should be 18 years and above and both genders (men and women) should be included to ensure women's participation.

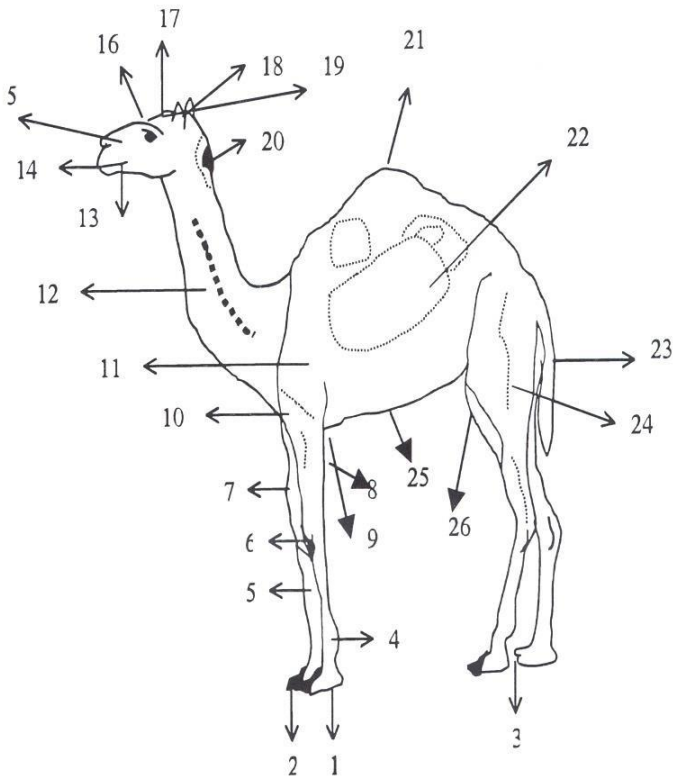
Lastly, we emphasize the importance of continuous working contact between the paravets and veterinary officers. In this way, the programme will be executed properly and the paravets will always be under close supervision by the veterinarians. The paravets form a linkage between the pastoralists and veterinarians. The paravets on their part are required to notify the veterinary authorities of any outbreak of any disease.

CHAPTER 2

BODY PARTS AND THEIR FUNCTIONS

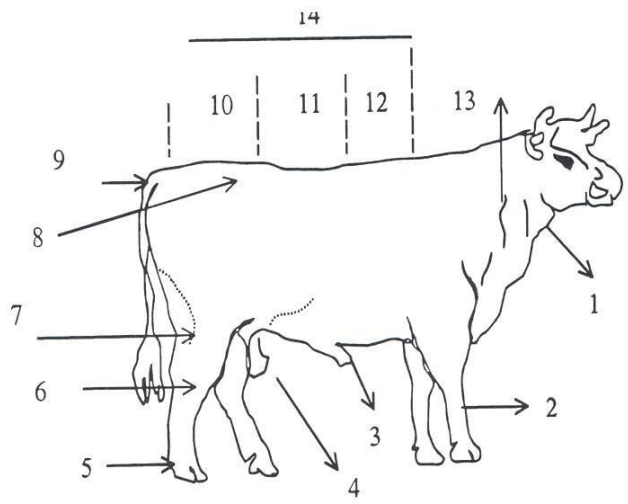
BODY PARTS

Body parts of a camel



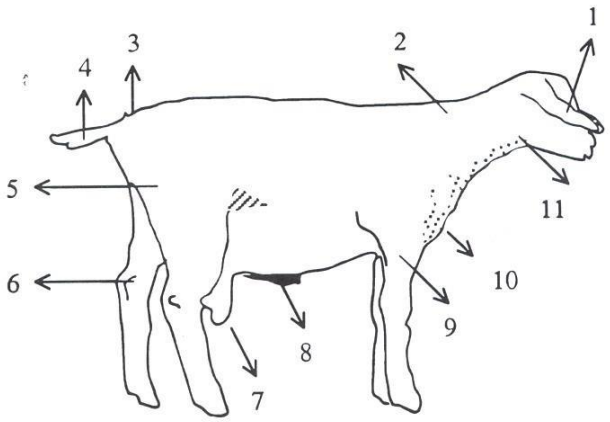
1 Foot
2 Toe nail
3 Cleft between toes
4 Fetlock
5 Shin
6 Knee
7 Forearm
8 Elbow pad
9 Boss
10 Chest
11 Shoulder
12 Neck
13 Jaw
14 Lip
15 Nostril
16 Eyebrow
17 Forehead
18 Ears
19 Hollow behind eye
20 Poll gland
21 Hump
22 Ribs
23 Tail
24 Flank
25 Stomach
26 Back pad

Body parts of an ox



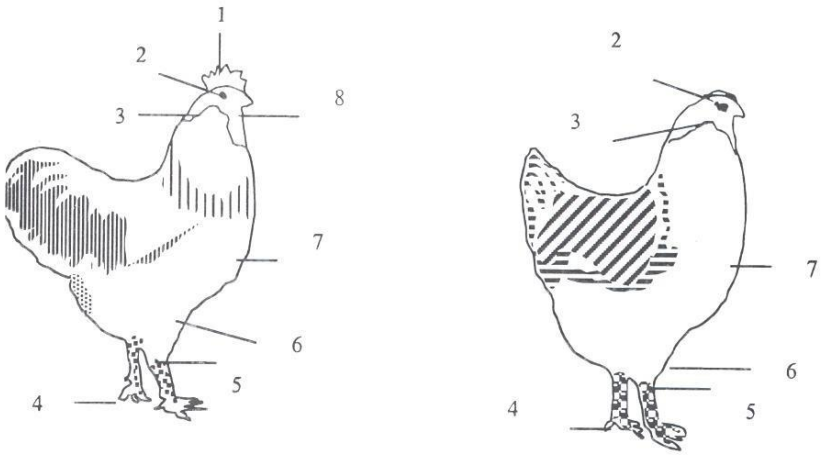
1 Throat
2 Knee
3 Penis
4 Testicle
5 Hoof
6 Hock
7 Thigh
8 Hip
9 Tail
10 Rump
11 Loin
12 Chine
13 Neck
14 Back

Body parts of a goat



1 Ear
2 Neck
3 Hip
4 Tail
5 Thigh
6 Hock
7 Testicle
8 Penis
9 Forearm
10 Chest
11 Throat

Body parts of chicken



1 Comb
2 Eyes
3 Ear
4 Claw
5 Hock
6 Thigh
7 Breast
8 Wattles

FUNCTIONS OF BODY PARTS

In the study of all life around us, scientists use an instrument called a microscope. This makes it possible to see very small things that are invisible to the naked eye. Many of the secrets of life have been revealed with the aid of the microscope.

A microscope is a magnifying instrument. It can magnify the original size more than a thousand times.

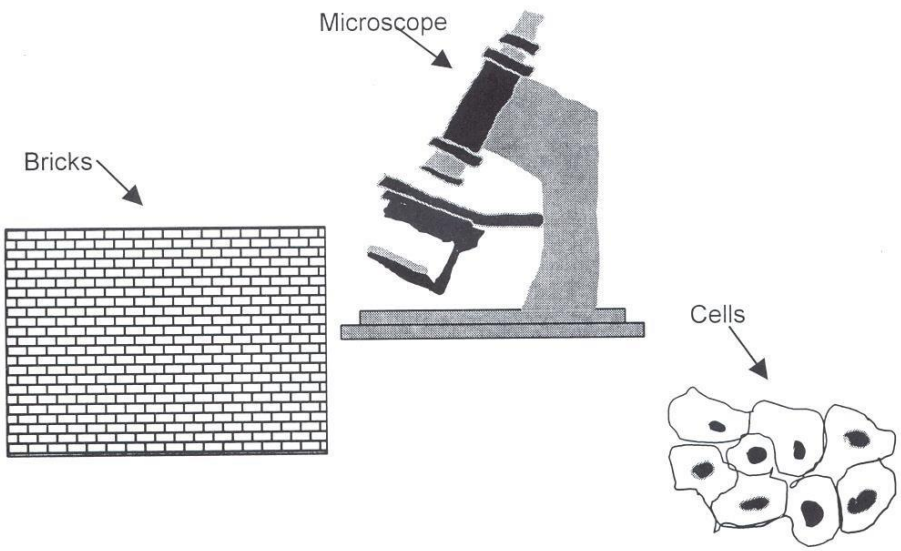
The Cell

Cells are the smallest living units of the body (that can only be seen with a microscope). Just as bricks are the smallest units of a brick wall, the cell is the smallest unit of the body. There are different types of cells.

A group of similar cells doing the same function is called a tissue. Examples of tissue are nerve, fat, bone, blood, and muscle.

A group of tissues form an organ. Organs form special parts of the body that perform definite functions. Among the important organs of the body are the heart, lungs, stomach, liver, kidney, uterus, and brain.

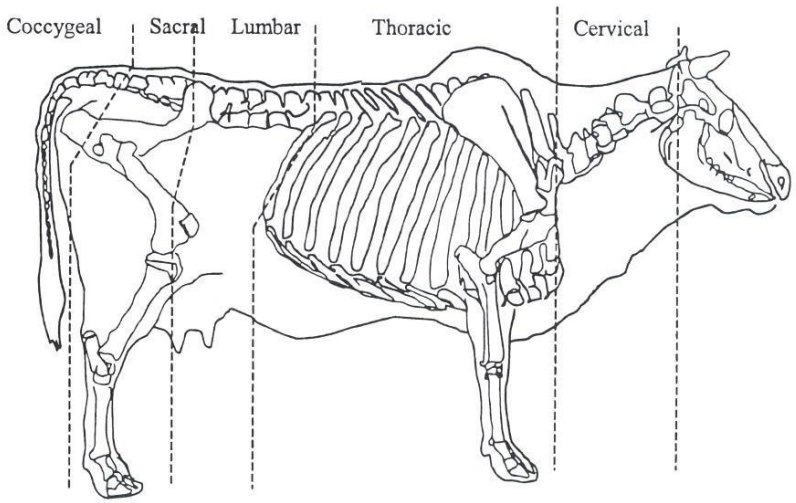
A group of organs form body systems while a group of systems form an organism.



The Musculo-skeletal System

Animals that have a backbone are called vertebrates. A vertebrate skeleton has axial and appendicular parts. An appendicular skeleton includes the bones of the forelimb and hindlimb. The axial skeleton consists of the vertebrae.

Meat consists mainly of muscle along with varying amount of connective tissue.



Functions of the musculo-skeletal system

The main function of the musculo-skeletal system is locomotion. Others are:

- Protection of the vital organs
- Support the body
- Attachment to muscle

The skin

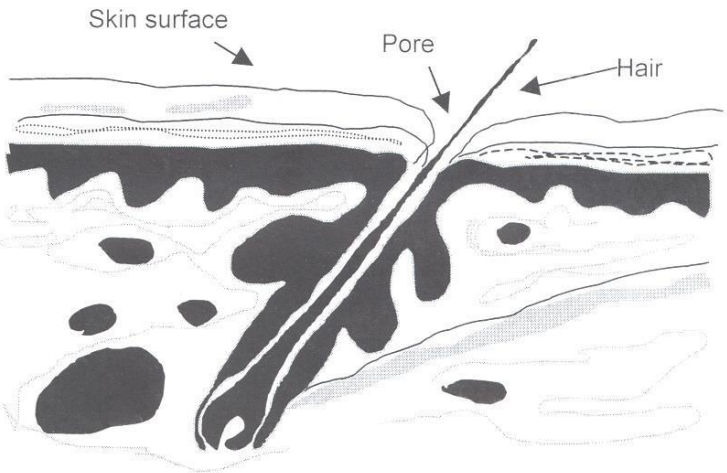
The skin has three layers:

- The epidermis
- The dermis
- The hypodermis

Hairs are structures of the epidermis, which arise from hair follicles. They cover the body surface of mammals. The skin protects the animal against mechanical injuries. It acts as a sensory organ for touch, temperature and pain stimuli. It aids in temperature regulation through the activity of sweat glands.

Vitamin D is formed in the skin through the action of sunlight. Vitamin D hardens the skeleton.

A cross-section of skin



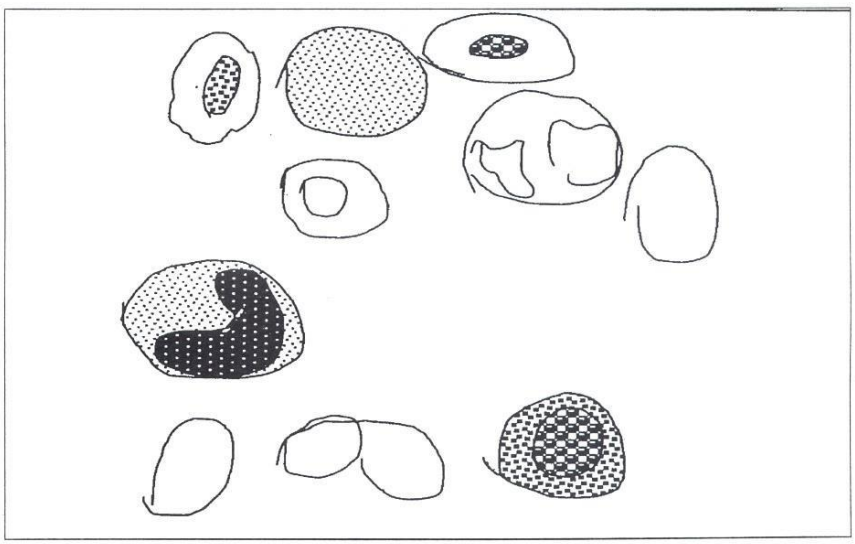
The blood

Blood is a fluid located within a closed compartment. There are two types of blood cells, namely the red blood cells and white blood cells. These cells are suspended in a fluid called plasma.

The blood acts as a transport medium. Red cells carry oxygen and carbon dioxide gas to and from lungs. White blood cells fight disease.

As blood moves around the body, it:

- Carries water
- Carries nutrients to the cell and waste products away from the cell
- Transports heat from hotter to cooler regions
- Coagulates to block open wounds

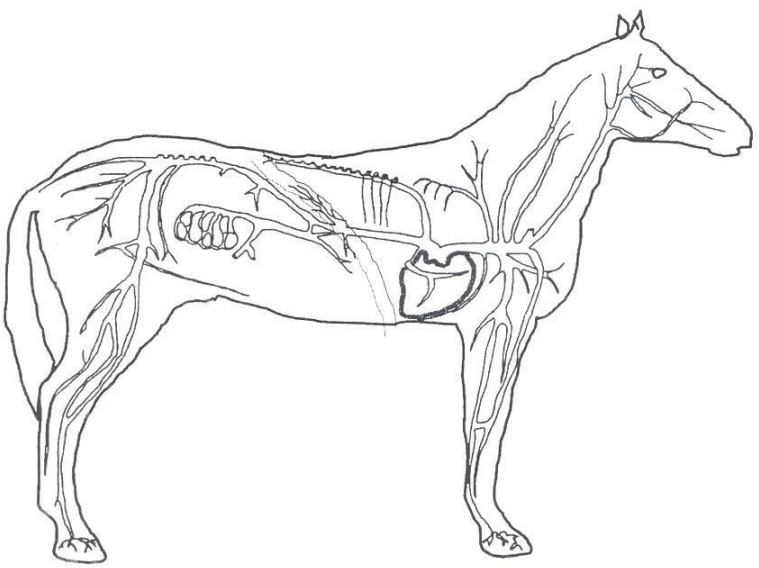


The heart is part of the circulatory system. It is divided into four parts. The two upper halves are called auricles while the two lower parts are called ventricles. The four parts communicate through openings or doors called valves.

The main function of the heart is to pump blood to the body.

Blood is pumped through pipes called blood vessels. The blood that is pumped from the heart to different parts of the body is clean and contains many nutrients.

Blood returns from the body to the heart through blood vessels called veins and contains waste materials. The blood vessels that transport clean blood are called arteries.



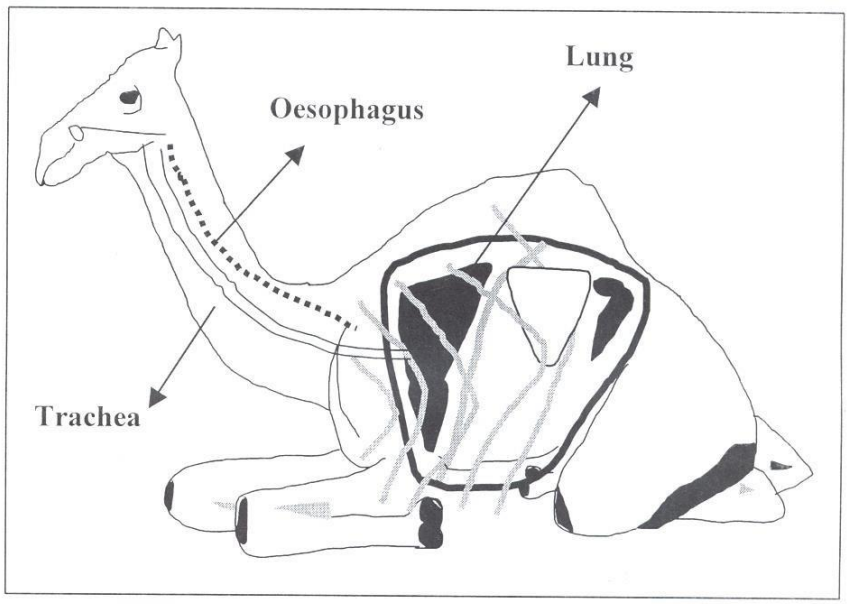
The Respiratory System

The respiratory system includes:

- The lungs, which are in the thorax
- The trachea in the neck region
- The upper respiratory tract, which includes nostrils and nasal passages

The voice is produced in the larynx.

Animals take oxygen from the air. The oxygen is used to release energy. Then the cells give off carbon dioxide and water. This takes place in all the cells.



The Digestive System

There are three classes of animals on the basis of feeding habit. They are:

- Carnivores
- Herbivores
- Omnivores

Carnivores eat the flesh of other animals. Most of their digestion is enzymatic (e.g. dog, cat, and hyena). Herbivores feed mainly on plant materials (e.g. cow, sheep, goat and camel). Omnivores feed on both plant and animal matter (e.g. pig, man and poultry).

The digestive system consists of the mouth, teeth, tongue and long tubular parts:

- The oesophagus
- The stomach
- The small intestine
- The large intestine

The liver and the pancreas are attached to the small intestine.

The food eaten by farm animals, which is in the form of large particles, should be broken down into simpler compounds. The process of breaking down feed into simpler compounds is called digestion. This is done in the alimentary canal.

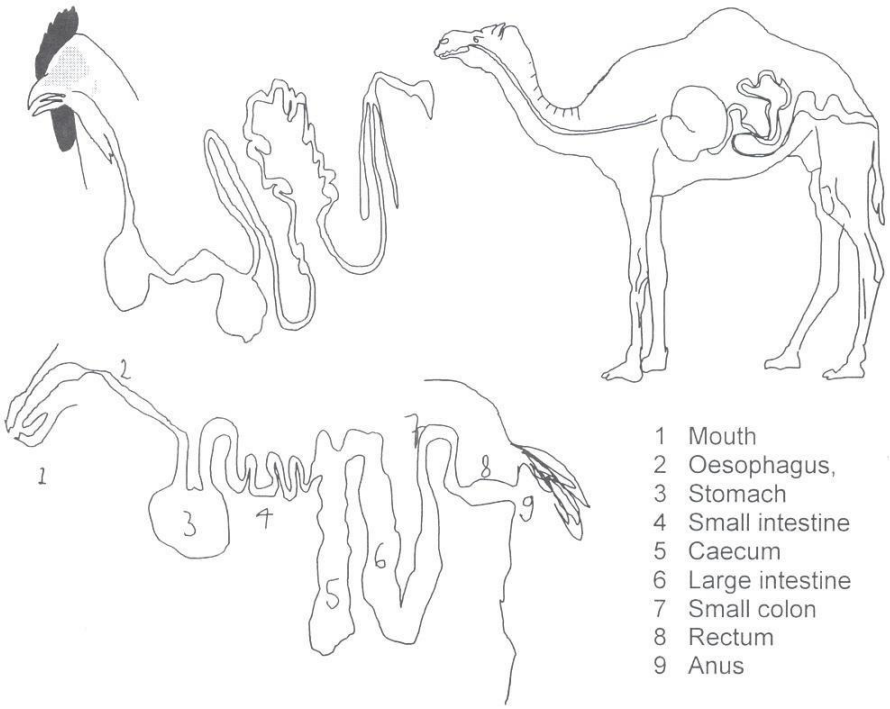
Digestion may be grouped into three stages:

- Mechanical, which involves chewing and muscular contraction of the alimentary canal

- Chemical, brought about by the juice called enzymes produced along the alimentary canal
- Microbial, through microbes found in the alimentary tract that ferment the food that can not be digested by the body enzymes

Farm animals digest their food in different ways. Animals such as sheep, goat, cattle and camel have a multiple stomach (four compartments). When the food is first swallowed, it is stored in the first stomach. When the animal is resting, it brings back the food for rumination. The food is re-chewed and mixed with saliva.

Digested food is absorbed into the blood through a process known as absorption. Undigested food passes as faeces.



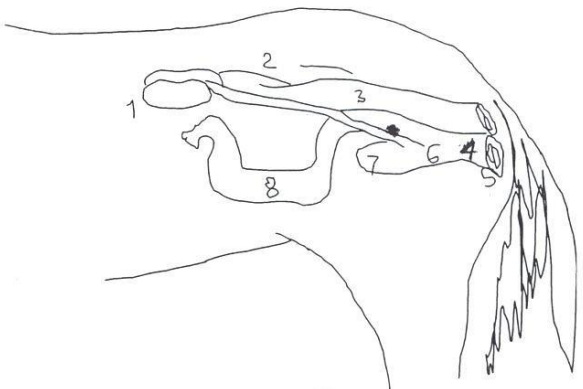
1 Mouth
2 Oesophagus,
3 Stomach
4 Small intestine
5 Caecum
6 Large intestine
7 Small colon
8 Rectum
9 Anus

The Excretory System

Each kidney is a filter that removes wastes as blood passes through it. The kidney removes poisonous wastes from the blood. Wastes are formed all the time in every cell of the animal body.

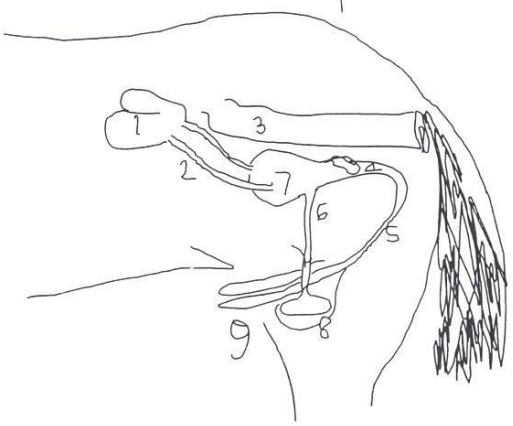
The animal body is like an engine that breaks down fuel with the help of oxygen that the animal breathes. Every engine produces smoke. The body cells also produce water, carbon dioxide and other wastes such as urea. Some of these wastes pass into the blood and are removed in the kidney.

The filtrate (waste) is called urine, which is stored in the urinary bladder before it leaves the body.



Urinary system of Female

1 Kidney
2 Ureter
3 Rectum
4 Vagina
5 Vulva
6 Urethra
7 Bladder
8 Uterus



Urinary system of male

1 Kidney
2 Ureter
3 Rectum
4 Accessory gland
5 Urethra
6 Sperm duct
7 Bladder
8 Testis
9 Penis

The Reproductive System

The reproductive system of a cow is inside the body of the animal. The cow has a pair of ovaries that produce an ovum every three weeks, if the cow is not pregnant.

The spermatozoa or sperms are the male reproductive cells. They are produced in the testicles. The sperm swims in the uterus and fuses with the egg. This process is called fertilization.

If a cow is not successfully mated, the cycle comes regularly once every 21 days. This is called the oestrus cycle.

Good knowledge of reproduction enables one to select animals for breeding. In this way one will get bigger animals that grow faster and stronger. These will produce more milk and meat and work more, provided they are fed properly.

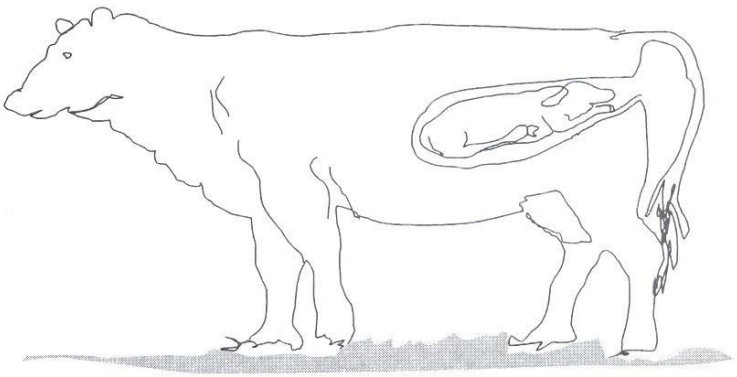
Oestrus cycle

Most cows come to heat every 18 to 24 days all year round. Most cows are on heat for one day.

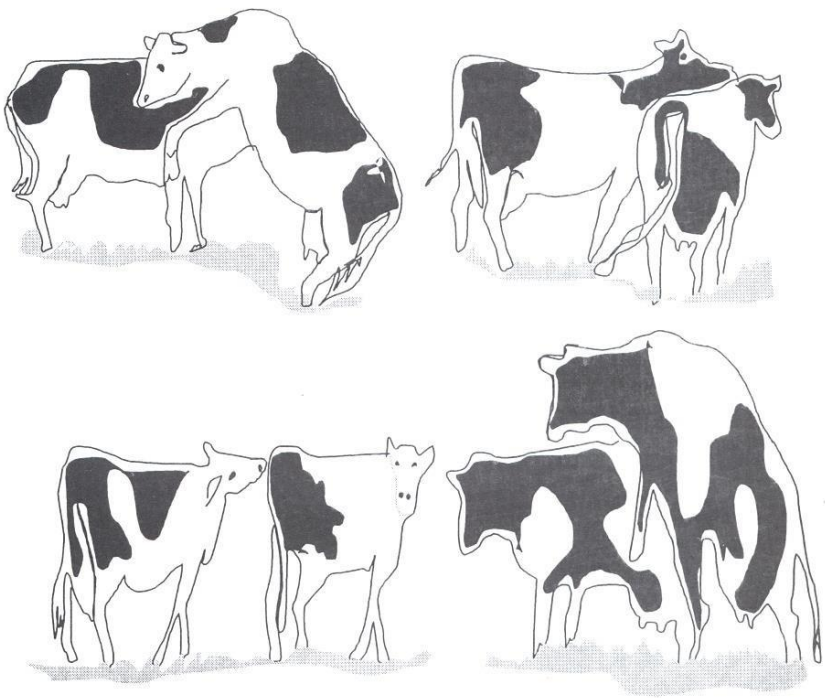
The best time to breed is near the end of the heat period. The following are signs that are observed when a cow is on heat:

- String of clear mucus on tail or hind quarters
- Trying to ride other animals
- Wandering around
- Bellowing and crying

If a cow is properly mated, the embryo grows in the uterus and gives birth to a young calf after nine months.



A cow giving birth



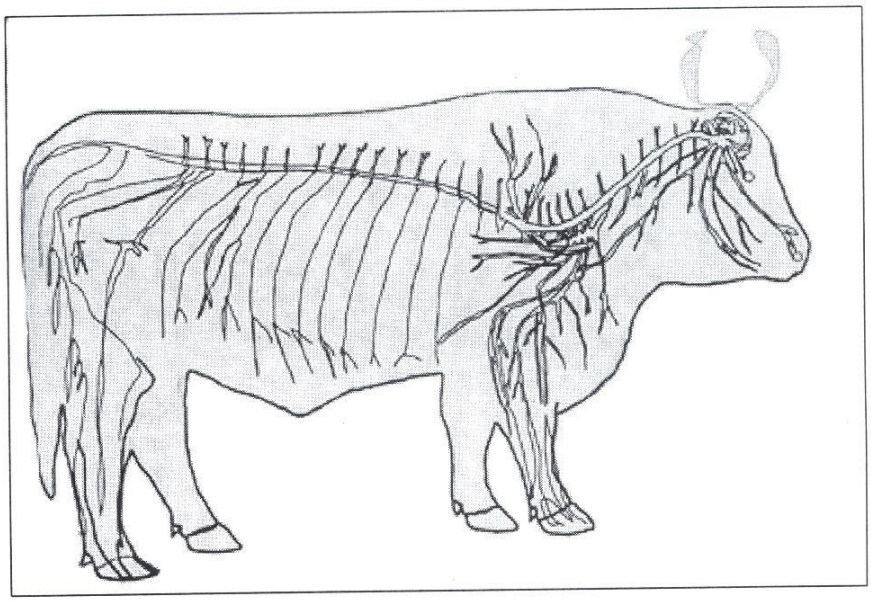
Signs of heat

The Nervous System

The nervous system controls the functions of the different systems of the body and their interaction. The nervous control is concerned with the animal's sensations of its external and internal environment and with conscious and unconscious activities.

Nerve impulses are transported to the brain through a network of nerve cells called neurons. The nervous system consists of a network of peripheral neurons, the spinal cord and the brain.

Some controls are voluntary, such as walking. Others are non-voluntary, such as the heartbeat and digestion.



Body Systems and Organs

Body system & organ	Function	Signs of health	Signs of disease
Circulatory system, heart & blood	- Regulation of body temperature - Pumping of blood through body - Transport of nutrients & gases (oxygen/carbon dioxide and others)	- Normal heart beat rate	- Mucous membranes pale - Congested abnormal heart beat - Fever - Cold - Dullness - Swollen lymph nodes
Liver & gall bladder	- Production of bile for digestion, storage of bile in gall bladder - Filtration of blood to eliminate poisons - Building of nutrients, breakdown of nutrients	- Good digestion - normal stools	- Problems in digestion - Mucous membranes become yellow due to accumulation of toxic substances (poisons stay in body)
Muscles & skeleton	- Give body frame and shape - Important for movement (co-ordination) & posture	- Good body condition - Moving around, playing, fighting - Proper co-ordination	Limping, cramping, paralysis, reluctance to move, emaciation & loss of body weight, wounds, fractures
Reproductive system Cow: Ovaries/uterus /vagina/vulva Bull: Testicles/penis	- Production of new calves - Production of milk - Production of meat	- Normal milk production - Giving birth in regular intervals	- Not giving birth - No or reduced milk production - Discharge - Abortion - Not serving - Swollen testicles/prepuce - Not fertilizing
Nervous system: Brain, spinal cord & nerves	Co-ordination of all body functions e.g. thinking, heartbeat, breathing, eating, walking	- Good body condition - Moving around, playing, fighting, eating, sleeping etc - Proper co-ordination - Animal attentive with normal behaviour	- No feeling of pain - Uncoordinated movement - Paralysis - Turning disease - Abnormal behaviour

Body system & organ	Function	Signs of health	Signs of disease
Skin & hair Hooves	- Protect the inside - Regulate body temperature - Enable animals to walk on hard ground	- Smooth hair coat & skin - Strong, well formed hooves without cracks	Skin and hair: - Can be affected if the animal is generally sick e.g. has worms, East Coast Fever or Trypanosomosis. - Rough and starring coat - Can be sick on its own in case of ectoparasites (lice/mites/ticks) may be seen - Excoriations, wound, scab and scars due to itching and scratching. In case of fungal infection hairless round spots of greyish colour may be seen. - In case of bacterial or viral infection you may see nodules, lumps, abscesses, blisters and others - Udder: Red/hot/painful/swollen /walking in a problem Hooves: limping, cracks
Horns	Weapons for fighting	Strong shiny horn	
Digestive system Mouth, teeth Tongue Oesophagus Stomach Small intestine Large intestine Anus	- Uptake of food and water grinding/swallowing/tasting - Transport of swallowed food to the stomach - Storage & digestion - Absorption of nutrients Absorption of water Expulsion of waste from body	- Feeding well - Good appetite - Chewing curd - Normal stools - Good body condition	- Lack of appetite - No chewing of curd - Loss of weight & body condition - Rough hair coat - Bloating (swollen abdomen) - Tinted stool (blood, mucous, pus) - Diarrhoea - Constipation

Body system & organ	Function	Signs of health	Signs of disease
Urinary system Kidneys Bladder	- Regulation of water & minerals of the body - Removal of waste from the blood - Storage & excretion of urine	-Normal urination	- Stop of urination - Painful urination (arched back) - Blood in the urine
Respiratory system Nose, larynx, trachea, lungs	- Smelling, breathing, intake & filtering of air - Exchange of gases (uptake of oxygen in exchange for carbon dioxide) - Production of voice	- Normal breathing rate	- Different breathing pattern, e.g. panting (increased frequency), enforced breathing (use of abdominal muscles) grunting, coughing, sneezing, - Excretions from nose; mucous, blood, pus - Open mouth breathing

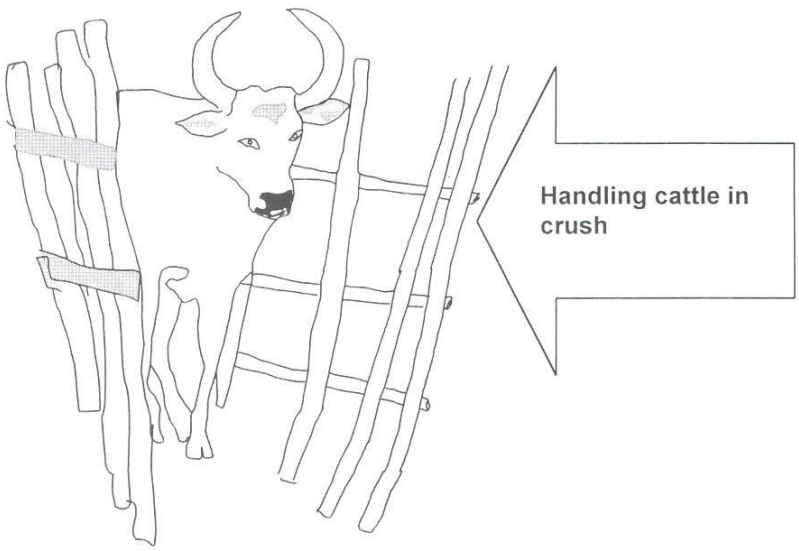
CHAPTER 3

RESTRAINING ANIMALS

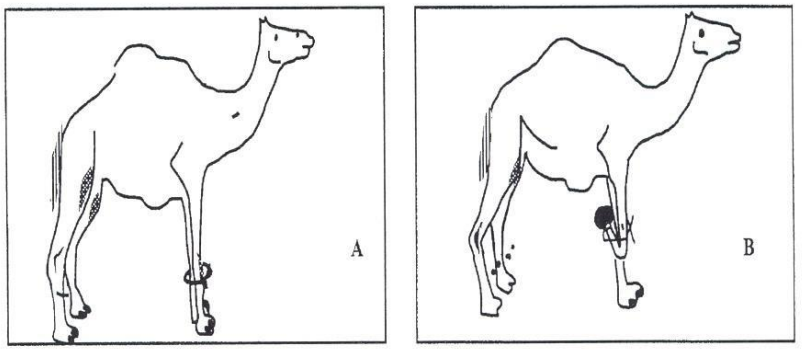
Animals are restrained during examination or treatment. The method of restraint used depends on the temperament of the animal and animal species. Animals can be restrained in a crush or by using robes.

A 15m long robe is required for casting large animals or using special facilities such as twitch. If the animal is to be cast, it should be done on a dust free soft ground or a straw cushioning. Care should be taken to avoid fracture. Animals should not be cast for long time

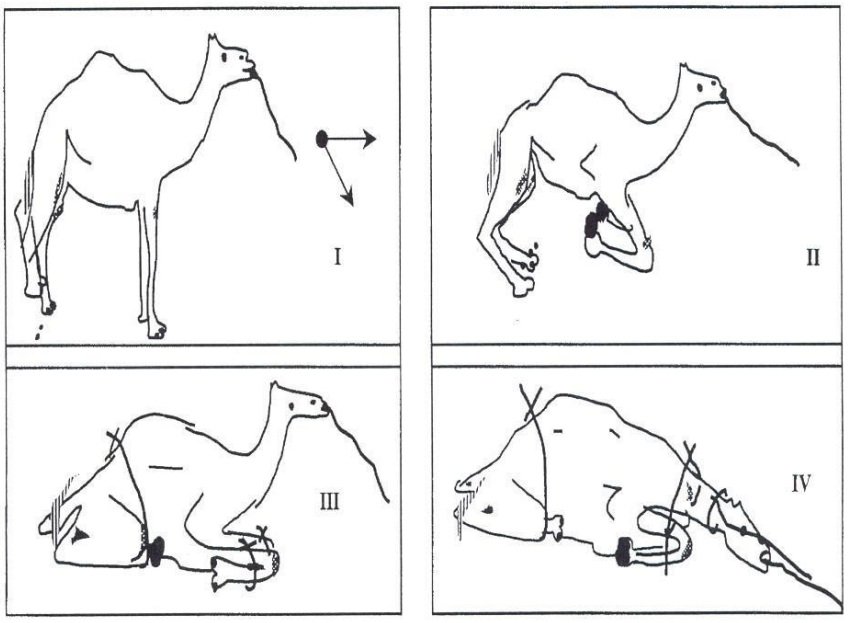
Animals can also be restrained using chemicals called anaesthesia.



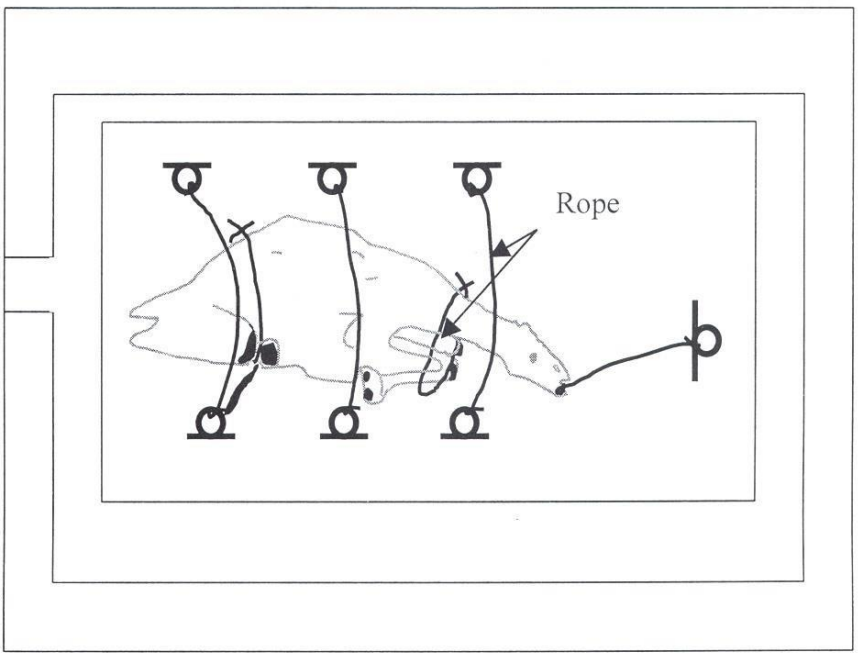
Handling cattle in crush



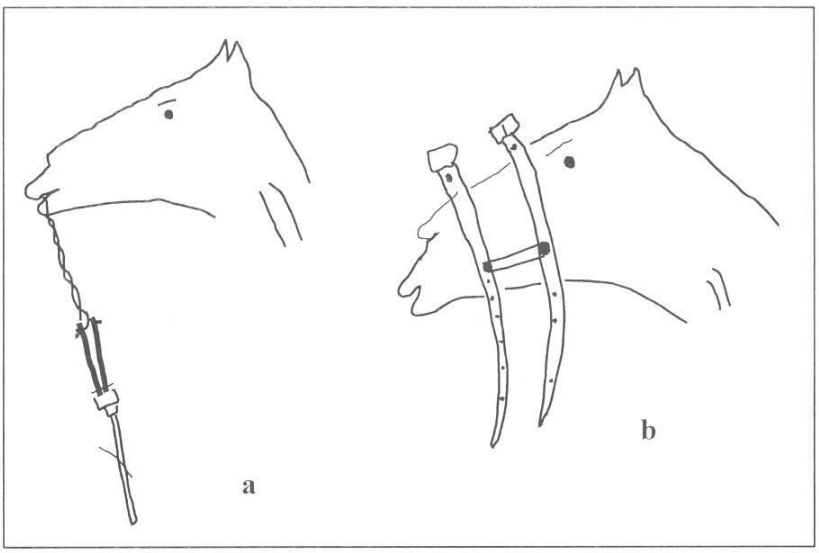
Restraining the camel in standing position. **A**, Foreleg ring tie and **B**, foreleg bend tie



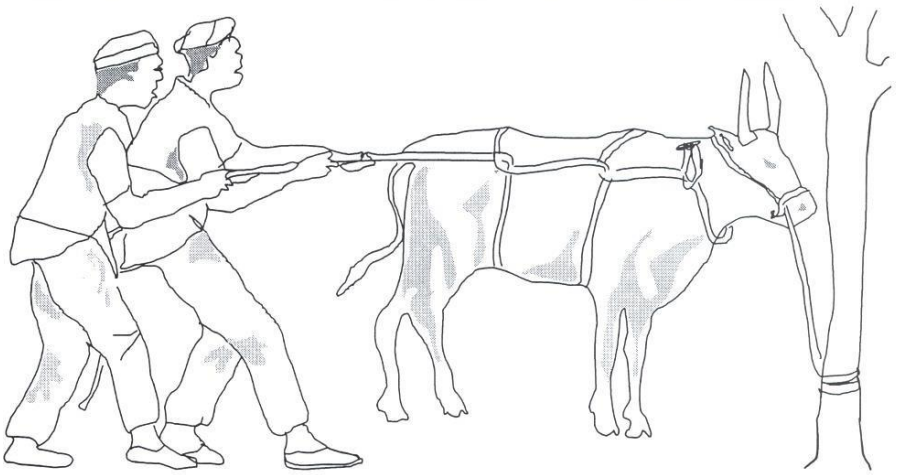
Steps of restraining the camel in sternal recumbence: A loop is passed on the mandible, then the mouth rope is pulled forward and downward. Simultaneously light stroke on the knee is necessary (**I**). The previous step is continued until the camel becomes fully recumbent (**II**), then a rope is passed underneath the hindlegs and tied over the back. The forelegs are also tied while bent (**III**). Finally, the rope attached to the mouth is pulled forward and downward to keep the neck flat on the ground (**IV**).



Design of camel crush. Note that ropes are passed over the back and tied to the rings fixed on the floor and additional ropes are tied between the hind and forelegs.

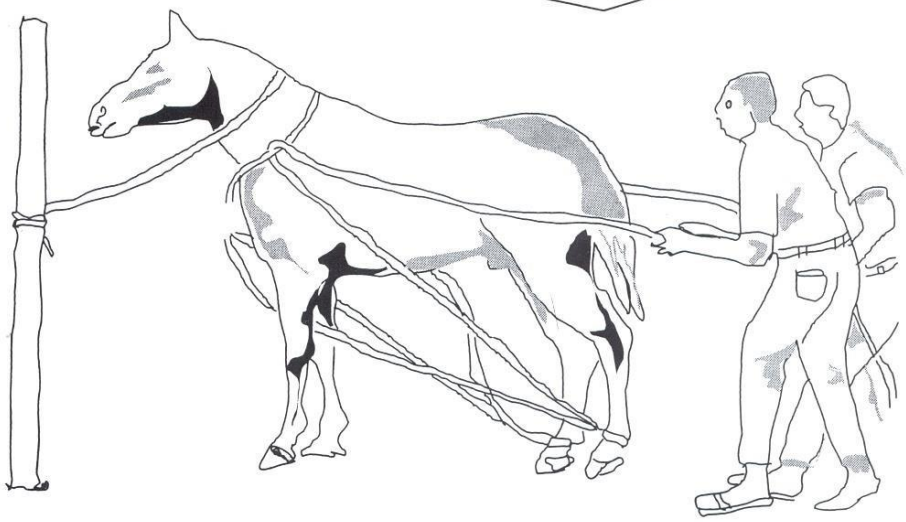


Restraint equipment for the camel: A camel holder (**a**); a camel muzzle (**b**).



Casting an ox

Casting a horse

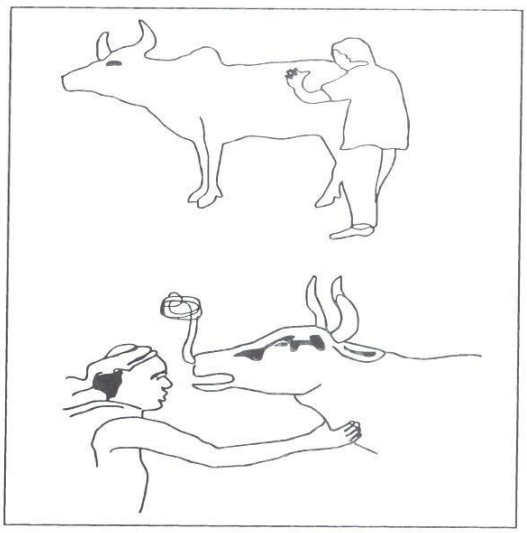


CHAPTER 4

METHODS OF DIAGNOSING DISEASES

Clinical examination of the animal is important to make a diagnosis. Diagnosis is important in order to give correct treatment.

Animals cannot communicate their illness directly. Complaint about a disease comes from an attendant or the owner.



Procedure of clinical examination

Patient's data

The first procedure is taking the patient's data such as the species, age, sex, number affected, number of animals dead, and tota number of animals in the area.

History

History taking is an important part of clinical examination. One makes inquiry on whether the animal eats and drinks, the type of faeces, colour of urine, duration of illness, and behaviour.

Any disease which spreads rapidly and affects many animals should be reported to a veterinarian or any government official.

To sum up, history taking by the paravet is an attempt to collect necessary information about the disease case from the owner and to know the reason why an animal is brought to the paravet.

Clinical examination

Inspection: The first step is to inspect the animal from a distance. One looks at the skin. The skin is "the mirror of health". If the animal is healthy, it has a shiny smooth skin. If the animal is sick, the skin looks rough. Usually the body condition is scored as 'good' or 'emaciated'.

Behavior of the animal: One should be able to detect any abnormal behaviour of the animal under examination. An animal may become dull and recumbent, with the neck flexed as in a parturient cow.

An animal may become restless, tend to kick the ground as in colic; or it may be vicious and attack other animals or objects as in rabies.

Wounds associated with convulsion are suggestive of tetanus.

Circling in ruminants can be a sign of a parasite cyst in the brain.

Lameness causes abnormality in gait

Body temperature: Body temperature is measured by inserting a thermometer into the rectum. The thermometer must first be shaken down so that the column of mercury settles at the lowest point (bottom). The thermometer must be greased before being inserted in a spiral movement. It must be held in place by the operator for about two minutes, should the animal kick and damage or dislodge the thermometer. When the thermometer is withdrawn, it is wiped clean with the use of cotton wool, but care must be taken not to touch the mercury reservoir before reading.

Normal body temperature (see Table) varies between species. Under normal conditions, body temperature is slightly higher in pregnant females than in non-pregnant ones, in young than old animals, and in small animals than in large ones. A rise in body temperature may be a result of natural causes such as high humidity, or heavy hair coat. Pathological conditions which are accompanied by a rise in body temperature are those caused by viruses, bacteria, fungi, and some parasites.

Symptoms of infection

The following are the symptoms of an infected animal:

- Sudden onset of disease
- It stops feeding and drinking
- Breathing may be irregular and difficult
- It appears dull
- Production of milk may drop or stop
- It has high body temperature
- It may shiver

- It has dry muzzle
- The hair may erect and the ears may droop
- The heart beat becomes abnormal
- It voids small and abnormally coloured urine
- There may be coughing and nasal discharge
- There may also be excessive salivation and diarrhea

Normal average temperature of farm animals

Species	Normal temperature	Critical temperature
Cattle	38	39
Sheep	39	40
Goat	39.5	40.5
Camel	37	41
Pig	39	40
Donkey/Horse	38	39

Pulse rate: In horses, the pulse is taken from the *facial artery* as the artery winds around the ventral border of the molar part of the mandible. In cattle and in camels, the pulse is usually taken from the *median caudal artery* (artery of the tail) about 10cm from the anus. In dogs, cats, sheep, goats, and calves, the pulse is taken from the *femoral artery,* in the medial aspect of the upper part of the thigh.

It is advisable to measure the pulse for more than one minute, and then calculate the number of pulses per minute. When the pulse is being taken, the examiner looks not only for the rate but also for the regularity of the beat. The pulse is felt by putting a finger, or two fingers, on the artery without undue pressure. See the Table below for pulse rates of farm animals.

Many factors tend to affect the frequency of the pulse. Some of these are:

- Species: The pulse is higher in animals of small size (e.g. cat) than in animals of large size (e.g. horse)
- Size and weight: In members of the same species, the pulse is usually higher in those of smaller size or weight
- Age: In newborn and young animals, the rate of the pulse is normally higher than in adult animals of the same species
- Sex: The pulse rate is generally higher in females than in males of all species
- Pregnancy: The pulse rate increases with the stage of pregnancy
- Ambient temperature: Warm environments affect the pulse rate
- Inflammation: Pain and rise of body temperature tend to increase pulse rate
- Fear, excitation: These also increase the pulse rate

Pulse rate of farm animals

Species	Normal pulse rate
Cattle	45-80 (120-150 in calves)
Sheep/goats	70-90
Camel	30-50
Horse/Donkey	28-40

Respiration: The examiner should stand behind or at the side of the animal. He should be able to have a good view of the thorax and abdomen.

When observing the act of respiration, it is advisable to concentrate on the following:

- The number of respirations per minute
- The rhythm of the respiratory process
- The characteristics of respiration

Respiratory rate varies between species: (see Table). There are many factors that may speed up the rate of respiration. These factors include excitation, hard work and high environmental temperature. Respiratory rate may increase under disease conditions.

Respiratory rate of farm animals

Species	Normal respiratory rate
Cattle	10-30
Sheep	10-20
Goat	25-35
Camel	5-12
Horse/Donkey	8-10
Pigs	10-20

Auscultation: The method of auscultation is performed for the purpose of detecting abnormal sounds generated in organs. It is used mainly in the examination of the lungs and heart, with the aid of the stethoscope. Sounds that are not heard in the healthy lung or heart indicate a malfunction in one or both these two organs.

Percussion: This is one of the common diagnostic methods. It is used mainly in the examination of the lung, heart and abdominal organs. Percussion is performed with the help of a hammer and pleximeter, or simply by use of hands. The latter is especially used in small animals.

CHAPTER 5

CAUSES OF DISEASE AND TRANSMISSION

Diseases can be defined as any changes in the state of an animal or its organs that affect the proper performance of its normal function. A normal animal has the following characteristics:

- It moves about steadily
- It breathes steadily and easily
- It eats well
- It has a loose shiny skin
- It has bright eyes and moist nose
- It excretes soft dung
- It should be able to reproduce a healthy calf every year
- It should maintain its level of milk production

Pathogens

There are a number of things or agents, which cause or bring disease to animals. These are microbes, parasites, and physical and chemical agents.

Microbes

Microbes are tiny microscopic organisms that may cause a disease. They can be bacteria, viruses or protozoa.

Viruses: Viruses are the smallest micro-organisms. They are unable to reproduce and function outside the body of living things. Because of their very small size they can easily be carried in dust, water and air.

Bacteria: Bacteria are very small organisms. Some are harmful while others are useful. For example, the normal bacteria of the gut help in digestion of fiber.

Bacteria in unfavorable environments produce resistant bodies called spores. Spores can live for many years in soil so causing disease outbreak.

Some bacteria produce toxins and impair body functions by destroying tissues.

Protozoa: Protozoa are parasites. They are small animals that cannot be seen with a naked eye. They are mostly transmitted by flies, mosquitoes, ticks and tsetse flies.

The signs of microbial diseases include the following:

- Sudden onset of disease
- Animals may stop feeding and drinking
- Breathing may be irregular and difficult
- Animals appear dull
- Production of milk may drop or stop
- Animals may have a rise in body temperature
- Animals may shiver

How are microbes transmitted? Infection may come from:

- Carrier animals
- Contaminated soil, water and or feed
- Faecal matter
- Body secretions—nasal discharge, saliva and blood
- Dead animals

Disease may be transmitted in one of the following ways:

- Breathing contaminated air
- Feeding on infected food
- Drinking contaminated water
- Direct contact with sick animal

Other ways of disease transmission include:

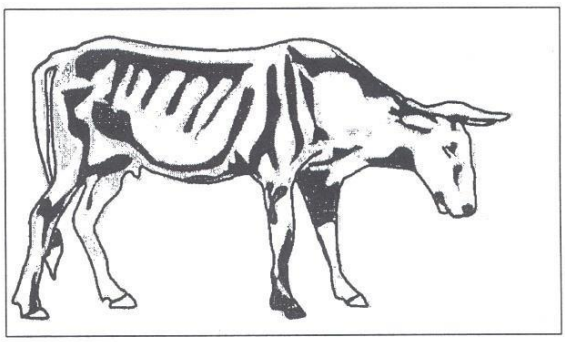
- Ticks, flees, flies and lice through sucking blood of infected animal
- Unhygienic milking practices
- Wounds through the skin
- Birth canal
- Navel contamination of young animals
- Use of harness

Some of the factors that predispose animals to disease include:

- Overcrowding
- Poor nutrition
- High environmental temperature
- Deprivation of water
- Unclean surroundings in which micro-organism can survive and multiply
- Fatigue caused by too long trekking
- Age

Nutritional diseases

Nutritional diseases arise from lack of nutrients such as protein, vitamin, mineral and carbohydrates.



Nutritional deficiency can occur if the animal does not get enough quantity of feed.

Animals should be provided with water considering the species of the animal and the location.

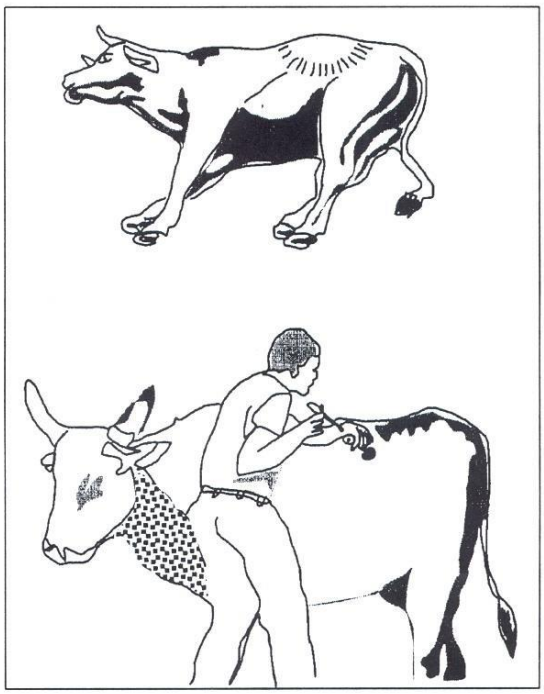
Adding one tablespoon of urea to every 15 liters of drinking water makes ruminants to grow much better, produce more milk and perform work better.

In addition, green forage and mineral salt should be provided in the form of lick.

Excess feed may cause ruptured stomach, constipation or accumulation of gases in stomach - a condition called bloat.

Poorly stored feed, especially in moist conditions, develops moulds, which can produce poisonous substances.

Some chemicals are poisonous and interfere with body functions.

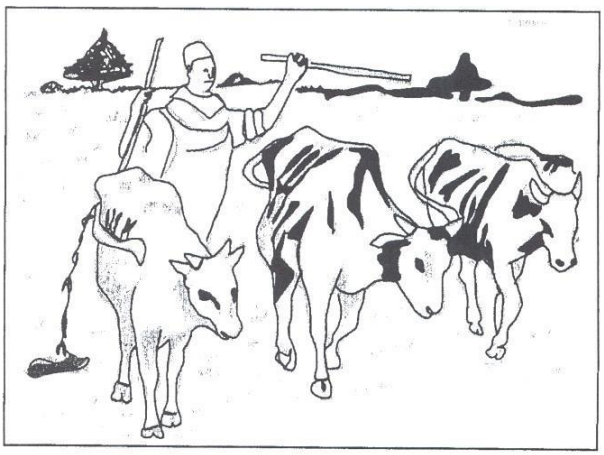


Hereditary causes of diseases

Some diseases may transcend from parents to offspring, for example, dwarf calves. Parents with known desirable characteristics should be chosen. Some of the characteristics that should be considered are milk, meat and power. Selection can also be done through body conformation. For example, dairy cows are selected based on udder shape and triangular body shape.

Parasitic diseases

Parasites are organisms that depend on others for food. Some parasites live inside the body of the animal while others live outside the body.



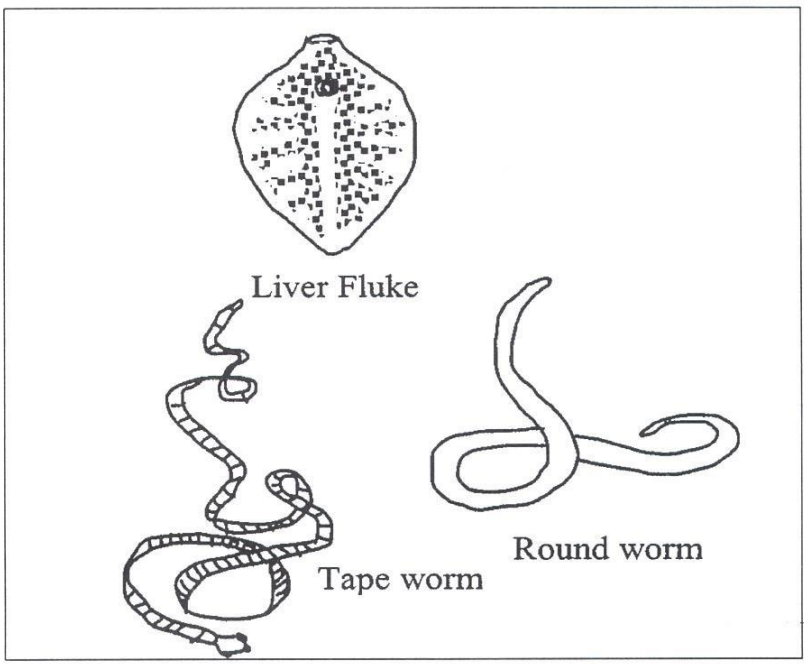
The following are some of the damages caused by parasites.

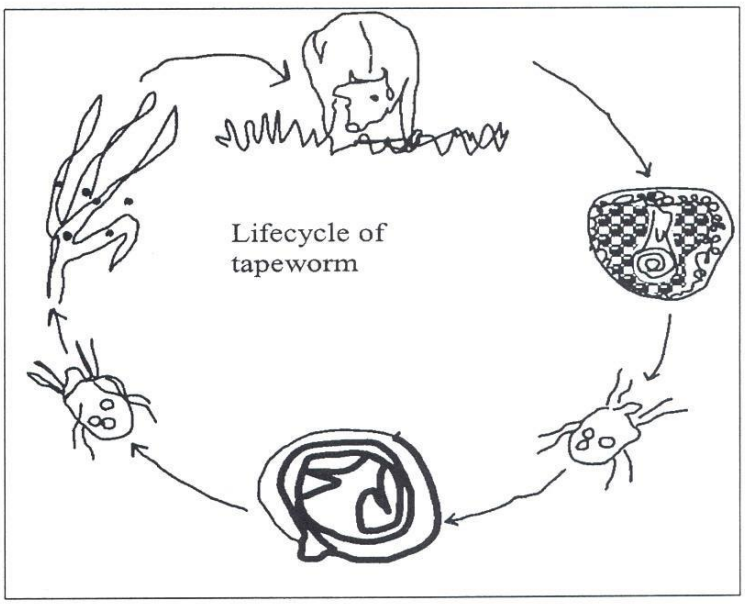
They:

- Deprive animals of digested nutrients
- Suck blood
- Cause mechanical obstruction
- Destroy tissues

- May transmit disease
- Reduce host resistance to other infections
- Cause impaired production

Endoparasites are parasites that live inside the body of animáls. They are mainly worms, such as tapeworms, roundworms and flukes.





The main symptoms of worm infestation include the following:

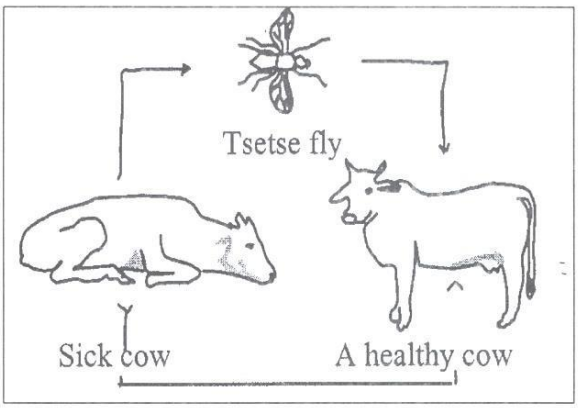
- The animal lacks vigour
- Poor appetite
- Loss of body condition
- The animal shows diarrhea with mucus or worms
- The animal eats soil or other organic matters
- The animal has rough hair coat
- Pale mucous membrane
- Bottle jaw
- Low production of milk
- Poor draft power
- Less number of calves per cow

Ectoparasites are parasites that live outside the body. They consist of flies, lice, ticks and mangemites.

Ectoparasites suck blood of the animal

They may transmit infectious organisms

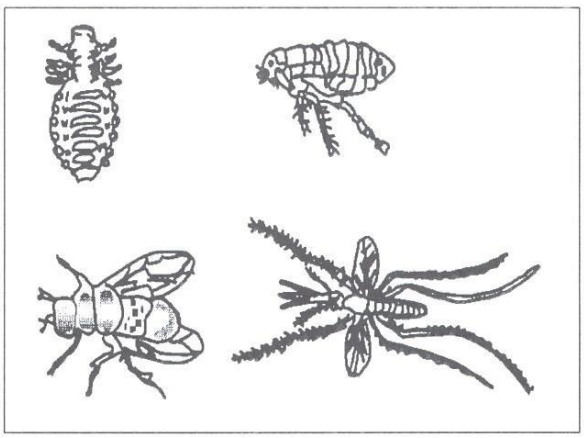
For example, ticks transmit red water, East Coast Fever and dermatophilosis.



They damage the skin by chewing

They cause itching, and as a result the animal rubs against an object

They also cause wariness, and as a result the animal cannot feed properly.



Physical causes of disease (trauma) include:

- When animals are fighting
- Injuries caused by objects
- If animals are beaten or if they stumble in sloppy areas
- Automobile accidents and other sharp objects may cause wounds
- Injuries can be inflicted to organs and may include cuts

Wounds are the sites where infections may take place.

CHAPTER 6

DISEASE CONTROL AND PREVENTION

Keeping animals healthy is more important than treating the disease. Farmers spend a lot of money to buy medicine for treating their animals.

In order to keep animals healthy, one must observe the animals daily. One should follow the following programs:

- Vaccination
- Deworming
- Disinfecting
- Isolation and Quarantine
- Waste management and disposal
- Disinfection and sterilization

VACCINATION

A vaccine produces immunity or protection against a given disease. Vaccination stimulates the production of antibodies. There are different forms of vaccine.

It is important to vaccinate animals because vaccinated animals suffer less and recover faster from the effect of disease.

The following are some of the guidelines for vaccination:

- Vaccines spoil easily, therefore special care and precaution are necessary for their proper use
- Only a person who has special training should vaccinate
- Avoid vaccinating an animal in very hot weather
- Vaccinate before anticipated disease outbreak

- Do not consider vaccination as a substitute for sanitation and other preventive management practices
- Use sterile instruments
- Use the recommended solvent—do not make a substitute
- Avoid contamination with other chemicals
- Do not use leftover vaccines
- Do not vaccinate weak, sick and very young animals
- To avoid contamination, use separate needles for injecting animals and for dissolving the vaccine
- For further information follow the instruction on the packing

The following are the steps in administering a vaccine:

- Assess the health status and the age of the animal
- Restrain the animal properly
- Dissolve and mix the vaccine (with its solvent if needed)
- Clean the preferred site for injection (using alcohol)
- Administer the recommended amount in the right location
- Properly mark vaccinated animals for identification

Vaccines are made from disease causing micro-organisms. They must therefore be handled carefully and stored properly. Improper handling and storage may cause them to lose their effect or make them dangerous agents. They should be refrigerated but not frozen. If there is no refrigerator, ice can be used in a cooler box.

The following are some of the factors that affect the effectiveness of a vaccine:

- Sick animals respond less
- Improper dosage
- Heat stress
- Improper handling of the vaccine
- Improper administration

The table below gives a list of common vaccines of livestock and poultry.

Common vaccines of livestock and poultry

Type of vaccine	Animal species	Mode of administration	Duration of protection
Anthrax	Cattle	Subcutaneous	One year
Blackleg	Cattle	Subcutaneous	One year
CBPP	Cattle	Subcutaneous	One year
FMD	Cattle	Subcutaneous	Lifelong
Newcastle	Poultry	Oral, intramuscularly	One year
Pasterellosis bovine	Cattle	Subcutaneous	One year
Pasterellosis ovine	Sheep	Subcutaneous	One year
Sheep pox	Sheep	Subcutaneous	Lifelasting
Rabies	Dog and cat	Subcutaneous	Six months – 3 years
Rinderpest	Cattle	Subcutaneous	Lifelasting

DEWORMING

Deworming means removing parasite worms from the digestive system, particularly from the stomach, intestine and liver.

Deworming makes the animal grow fast, perform better and produce more milk. It makes the animal more resistant to disease.

The following are the guidelines for avoiding or reducing worm infestation:

- Deworm animals regularly
- Improve grazing management, especially for young animals. Although grazing is essential for the growth of young animals, there is a chance of worm infestation
- Wet, humid and swampy areas are good breeding places for parasites.
- Avoid grazing animals in such an area if possible
- Deworm animals twice per year—one at the beginning of the rainy season and one at the end of the rainy season

When grass has been grazed shortly before by older animals, there should always be three weeks between the last grazing in a paddock and the start of grazing calves in the same paddock. During these three weeks, the eggs laid by the worms will have hatched. But the young worms will die when there is no animal to pick them. These worms will climb on the grass and wait to be swallowed by cattle. Therefore three weeks without grazing the area is necessary to make the grass safe to graze again.

DISINFESTING

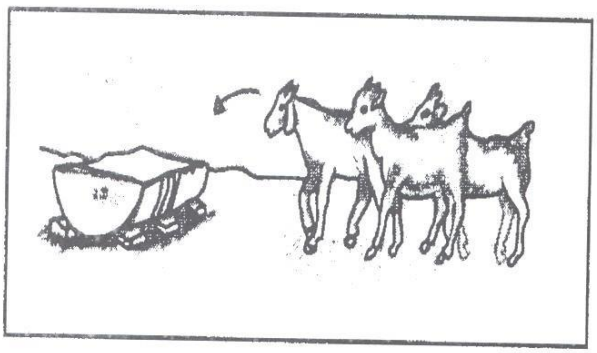
Acaricides are used for disinfesting animals. These substances kill or repel ectoparasites such as ticks and lice.

Ticks and lice may be adequately controlled by the following methods:

- Dipping or spraying with acaricides at least twice a week

- Picking ticks by hand from animals and burning them
- Fencing the farm to prevent infestation from other animals
- Keeping poultry in the backyard to pick the dropped ticks—a good example of biological control

Guidelines for spraying animals

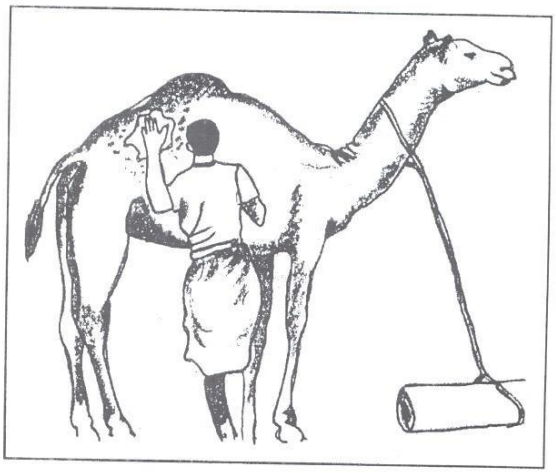


The spray chemical must be diluted according to the instruction given by the veterinarian or manufacturer.
If hand spraying is done it should be accompanied by hand dressing.
A piece of cloth or brush should be dipped and applied to the body

Spraying should be thoroughly done all over the body, particularly in the ears, under the tail and between the legs.

The following is the procedure for spraying:

- First spray the back
- Then the two sides of the body



- Next the ventral abdomen
- The extremities and between the claws
- The tail end
- Finally, the head and ears

Handling of acaricides

Most acaricides are harmful to people and animals when they enter the body through the mouth, skin or nose. Therefore necessary care should be taken. The following should be observed:

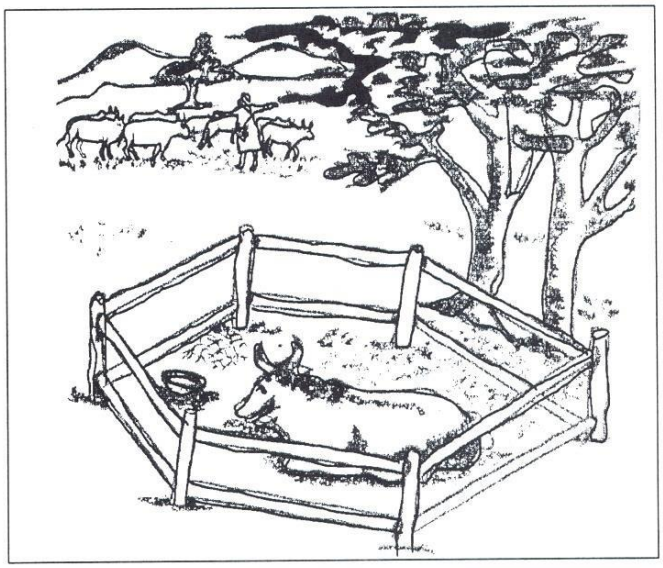
- If available, rubber gloves and protective clothing are important
- There should be no drinking, eating or smocking during the course work
- Spraying should take place in the open air and not against the wind
- All acaricides and all other forms of drugs should always be kept under lock and key, especially from reach of children
- To avoid accidental poisoning of people and animals, empty containers and unused pesticides should be carefully disposed of, by burying them in a pit far from any water source to avoid contamination
- Drugs should be kept in cool dry place; they should not be exposed to sunlight

The following are signs of pesticide poisoning:

- Swaying
- In-coordination
- Vomiting
- Sleepiness
- Frothy mouth

ISOLATION AND QUARANTINE

Any sick animal must be isolated from the rest of the herd as soon as a disease is suspected.



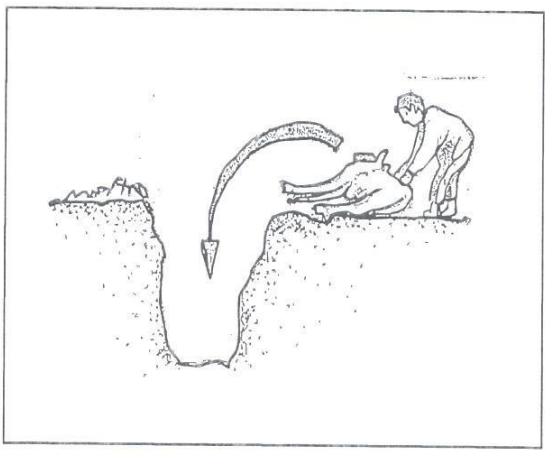
Quarantine is a governmental regulation for the prevention of the spread of infectious diseases. An animal or animals from infected areas are restricted from mixing with other animals.

Examples of diseases that require quarantine are Rinderpest and Foot and Mouth Disease (FMD).

WASTE MANAGEMENT AND DISPOSAL

Animal wastes should be disposed of properly to control disease and prevent soil, water and air contamination.

Dead animals should also be properly disposed of to prevent the spread of infectious disease.



Never open up dead animals, only veterinarians are allowed to do this, to find out the cause of death. Cover dead animals immediately, so that insects and other animals do not feed on them prior to proper disposal. Never deposit carcasses in or near streams, but bury them in a pit or burn them.

DISINFECTIONS AND STERILIZATION

Disinfectants are chemicals that kill disease-causing organisms. Disinfectants help to stop spread of disease.

Guidelines for disinfection

The following are the guidelines for disinfection:

- Pens and equipment should be disinfected after use to kill germs
- Dirty bedding and dung must be removed
- Use detergent to loosen dirt and organic matter sticking to all surfaces
- Use warm or hot water to increase the cleaning performance
- Remove drinkers and feeders if possible

- Disinfectants are harmless to humans and animals if applied topically at the right concentration. For example, external wounds may be treated
- Wash the udder using disinfectants to prevent spread of mastitis
- Apply disinfectant to the injection sites
- If possible, use gloves when handling undiluted disinfectants
- Do not expose disinfectants to sunlight
- Close the bottles tightly; otherwise the antiseptic will be of little value

Sterilization of instruments

To carry out sterilization of instruments, the following should be done:

- First wash the instruments thoroughly in clean water and detergent, then sterilize them
- This is done by boiling for 20 minutes then placing on sterilized container
- If this is not possible, wash the instruments with clean water and soap
- Soak instruments overnight in alcohol and dry them in air before use
- Syringes, needles, scissors, forceps, knifes should be sterilized after use

CHAPTER 7

SAMPLING TECHNIQUES

EQUIPMENT AND MATERIALS

The most important equipment and materials required for sampling include:

- Microscope slides and slide covers
- Disposable needles of different gauges
- Disposable syringes of different volumes
- Plastic/polythene bags
- Bijou bottles with anticoagulant (EDTA)
- Universal bottles
- Scalpel blades
- Sterile cotton swabs
- Methylated spirits
- Restraining equipment—ropes, halters, nose lead

USE OF SAMPLING EQUIPMENT

Needles

Fingers are always dirty and carry bacteria. The following should be observed when using needles:

- Needles should only be touched at the plastic part, never at the metal end, which will be inserted into the animal
- Needles should be used only once
- Never use the same needle for different animals

- Needles (if not disposable types) can be cleaned and re-sterilized after use

Bijou bottles

The kit contains 2 bottles with EDTA. These bottles are labelled with a red dot on top. EDTA is a substance that prevents blood from clotting. The kit also contains 2 bottles with no EDTA. Blood collected in a bottle without EDTA will clot and after leaving it for several hours undisturbed, the serum (yellow coloured liquid) will separate. Serum is used to test for viral diseases (FMD, Rinderpest and others) and bacterial diseases (Brucellosis, CBPP). Blood collected in a bottle with EDTA cannot clot and is used for the detection of trypanosomes, Anaplasmosis, Babesiosis, and blood cell counts; some blood can be used to make blood smears.

Plastic bags

Plastic bags are used for the collection of faecal samples either from freshly dropped faeces or directly from the rectum. Plastic bags can also be used for collection of skin scrapings or other samples.

TYPES OF SAMPLE

There are several types of sample. They include the following:

- Blood
- Urine
- Faeces
- Skin biopsy

Blood sample for serological examination is used for diagnosing brucellosis and CBPP, to be taken in universal bottle:

- Puncture the jugular vein with a needle and fill blood into a sterile tube
- Label the tube with name and species of animal and date
- Keep blood cool until examination

Blood sample with EDTA (Anticoagulants) is used for diagnosis of Trypanosomosis, to be taken in a bijou bottle with EDTA:

- Puncture the jugular vein with a needle and fill blood into a sterile tube
- Label the tube with name and species of animal, and the date
- Keep blood cool until examination

Preparation of a thick smear is used for diagnosis of blood parasites:

- Take a clean slide and put a drop of blood on it
- Stir the drop with the corner of another slide in order to destroy the red blood cells
- Label the slide on the frosted end—date, animal identification number
- Store the slides in a dry and clean (no dust) slide box and take it to a laboratory for examination

Faecal sample is used for diagnosis of gastrointestinal parasites, e.g. worms and one-cell organisms:

- Take a fresh faecal sample from the rectum or from freshly deposited dung using a plastic bag. Label it
- Take it to a laboratory for examination as early as possible

Skin scraping is used to detect mange mites, bacterial or fungal infections:

- Remove scab and skin with sharp knife or scalpel blade at the border of affected and unaffected area until light bleeding
- Dispatch unfixed, in well-sealed, clean tubes or plastic bags
- Mark name and address of owner, date sample was taken and animal name on the container and take it to a laboratory for examination

Ear-swab is used to detect ear infection with nematodes or mites:

- Take a thin wooden stick and wrap sterile cotton wool around the top end
- Insert in the ear canal carefully and remove secretions from there. Put them (with the cotton wool) into a plastic bag or other clean container
- Take them to a laboratory for examination

COLLECTION OF SAMPLES

To collect a sample from a sick animal the following steps are taken:

- If there is only one sick animal, the sample will, of necessity, be taken from that animal. If there are two or more sick animals, then the sample should be taken from any sick animal, but preferably from one in which the disease is at an advanced stage
- The samples may be collected from more than one animal, and, in this case, the samples are to be taken from animals manifesting different stages of the disease.
- If the animals are already dead, the samples are to be collected from those animals which have died more recently, and must not be already decomposing

- Safety precautions must be taken so that the samples do not contaminate the environment, and thus help spread the disease. The samples themselves must not be contaminated, otherwise the results of laboratory tests will be false

LABORATORY TESTS

When a paravet cannot reach a definite conclusion as to the causative agent of a disease, he/she should attempt to send a sample to the veterinary laboratory. Detection of the causative agent of a disease enables the paravet to prescribe the proper treatment.

Before the samples are sent to the laboratory the following precautions must be taken into considerations:

- Preserving agents must not be added because these agents will kill the microbes. The exception is the sample intended for microscopical examination.
- The samples must be delivered to the laboratory the same day they have been collected. Delay will lead to decomposition of the samples. If delay is unavoidable, the samples should be kept at as low a temperature as possible.

CHAPTER 8

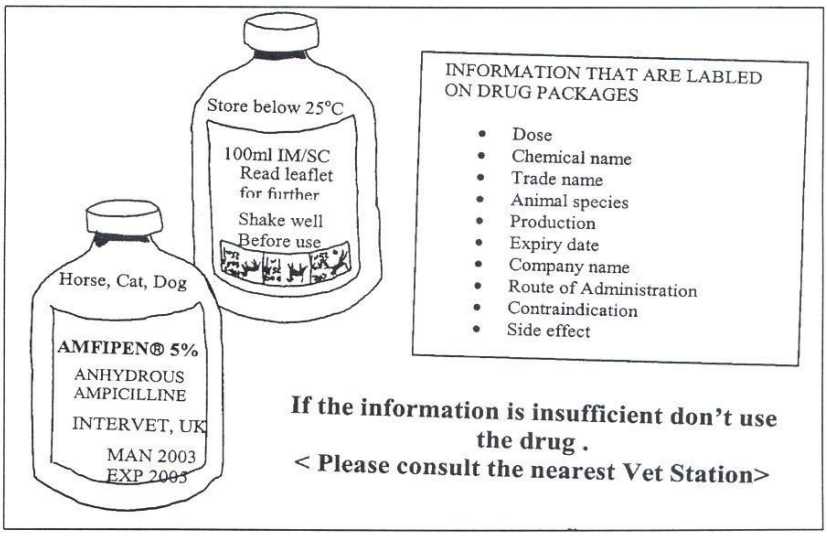
HANDLING OF DRUGS AND THEIR ADMINISRATION

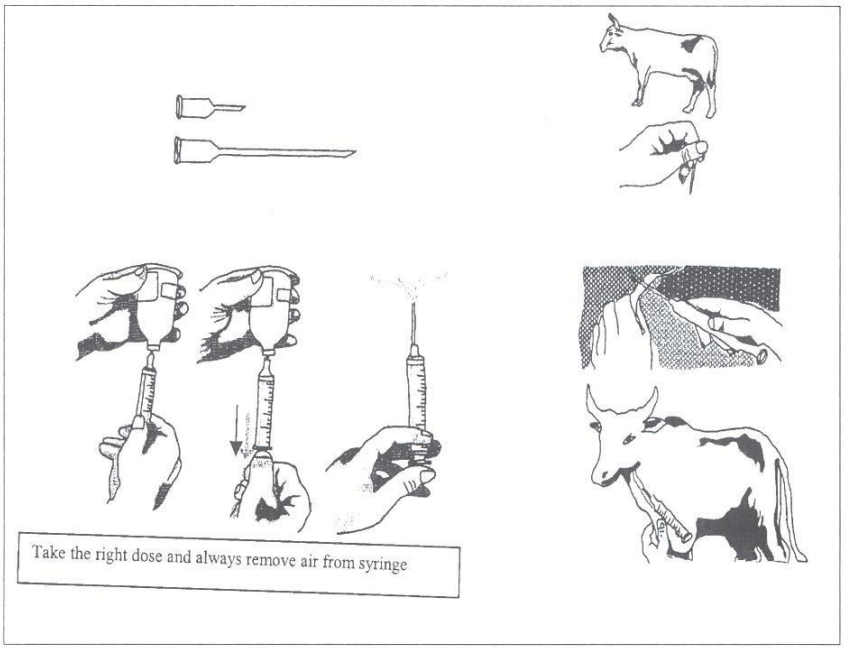
PARENTERAL DOSAGE FORMS

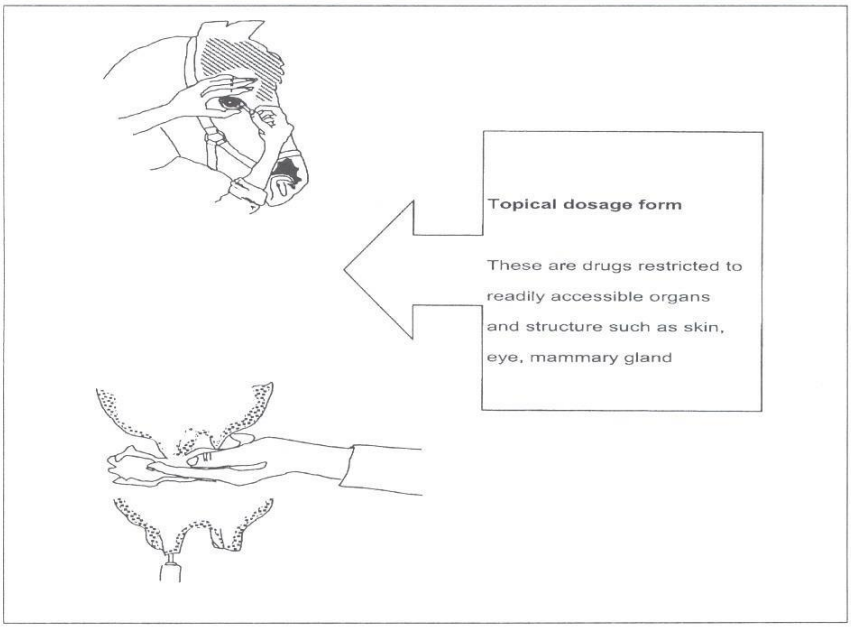
Parenteral dosages are usually in the form of solutions. They can be given intramuscularly either in the thigh or neck region. They can also be given subcutaneous, beneath the skin, or intravenously.

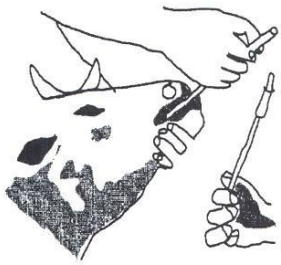
The following should be observed:

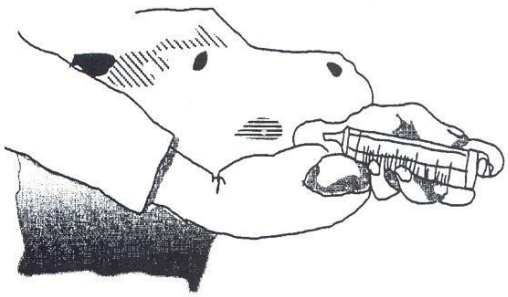
- Sterile syringes and needles should always be used for injection. If syringes are not sterilized, disease may be transmitted from one animal to another.
- Disinfect the site of injection
- Do not touch the tip of the needle by hand
- Do not let the syringe fall on the ground

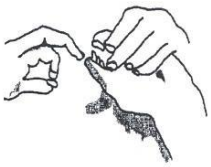



Take the right dose and always remove air from syringe


Topical dosage form
These are drugs restricted to readily accessible organs and structure such as skin, eye, mammary gland





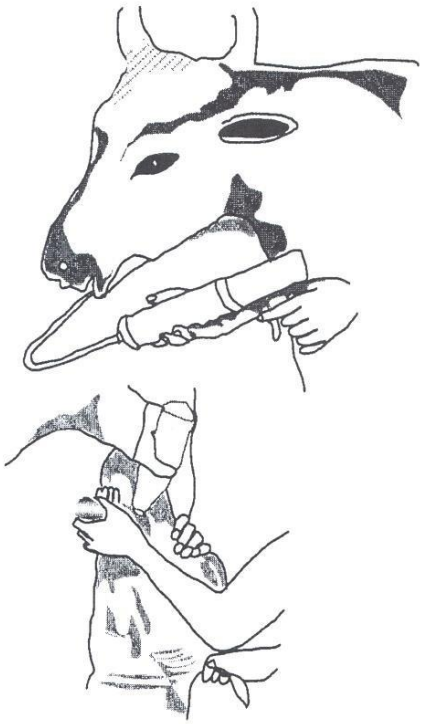


COMMON ORAL DOSAGE FORMS

Tablets, capsules, boluses, powders, solutions and pastes can be given orally directly into the mouth by mixing with feed or water, using a drenching gun, or probing.

The following should be observed:

- If a bottle is used, it must be strong and unlikely to break and hurt the animal
- For smaller animals, use a syringe without a needle to administer a solution
- When drenching, restrain the animal by tying it to a tree or a poll



- Do not raise the head too high as this may interfere with swallowing
- Drench the medicines slowly
- Do not pour the liquid too quickly into the animals' throat
- Do not pull the tongue out of the mouth; it is needed for swallowing
- Lower the head if the animal starts coughing

GUIDELINES FOR ADMINISTERING A DRUG

The following are the guidelines for administering drugs:

- Administer one drug at a time if possible
- Give the appropriate amount; do not give excess or low doses, otherwise it is either harmful or useless respectively
- Always follow the veterinarian's recommendation
- Do not treat animals without proper diagnosis
- Use sterile syringes for injection
- Do not give a drug with which you are not familiar

STORAGE OF DRUGS

Safe storage

There are three main things to note in safe storage of drugs:

- Always store/keep drugs in a place that cannot be reached by children
- The place should be dry, clean, not too hot and away from direct sunlight
- The best would be a cupboard that can be locked

Expiry dates

It is important to observe two things:

- Always read the label of a container; you will find two dates indicated there—manufacturing date and expiry date
- Never use drugs that have already expired; they may harm the animal

Proper dosage

To increase the chances of healing, several things must be done:

- Always read and follow the instructions for use the producer has given for the drug
- Drugs are usually given according to body weight
- Measure the weight of the animal with your weighing band
- Calculate the amount of drug needed using proportional mathematics (arithmetic)

Withdrawal periods for drugs

There are several points to take note of here:

- Every drug you give to an animal stays in the animal for a certain time in order to help the animal to recover
- The body needs a different period of time for the elimination of different drugs. This period, after which animal products are fit for human consumption, is called the withdrawal time
- The producer of a drug usually indicates the withdrawal period on the medicament
- Residues are remainders of any substance (drug) in the body
- If people eat and/or drink animal products (meat, milk and eggs) immediately after an animal has been treated, they will take up the drug into their bodies. This may not always be directly harmful, but substances may accumulate in human bodies over the years and may show a negative effect later. The constant uptake of little amounts of drugs with animal products over the years may also cause allergies or development of resistance to drugs used in both man and animals. As an example, DDT is a pesticide which has shown some negative effects after accumulation in food chains and finally in the fatty tissue of the human body
- The ability of an organism to survive after the administration and in the presence of a certain antibiotic is called resistance. Resistance can develop if bacteria get used to drugs and are challenged in small doses. This can happen if animals are under-dosed (using a lower dose than that recommended) with especially antibiotics.

CHAPTER 9

SOME COMMON DISEASES

LIVESTOCK DISEASES

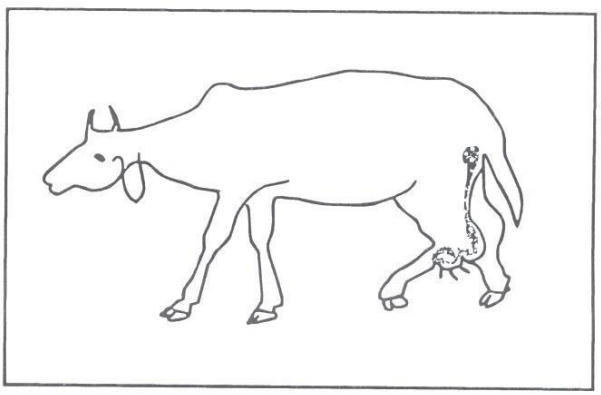
Black leg

Animals affected:
Cattle

Clinical signs:
Sudden onset, a few cattle die without sign, acute lameness, depression, and swelling of the heap, shoulder, chest, back and neck. If the swelling is palpated, a crepitating sound is heard

Treatment:
Penicillin

Control:
Vaccine



Dermatophylosis (Streptotrichosis)

Animals affected:
Cattle, sheep and goats

Clinical signs:
Hairs matted together as paintbrush, crust or scab formation, and accumulation of cutaneous keratinized material

Treatment:
Penstrept

Control:
Since ticks spread the disease, acaricide spray is recommended

Contagious caprine pleuro-pneumonia

Animals affected:
Goat and sheep

Clinical signs:
Fever, abnormal respiration, coughing

Treatment:
Tetracycline

Control:
Vaccination

Keratoconjunctivitis

Animals affected:
Sheep, Goat, Cattle

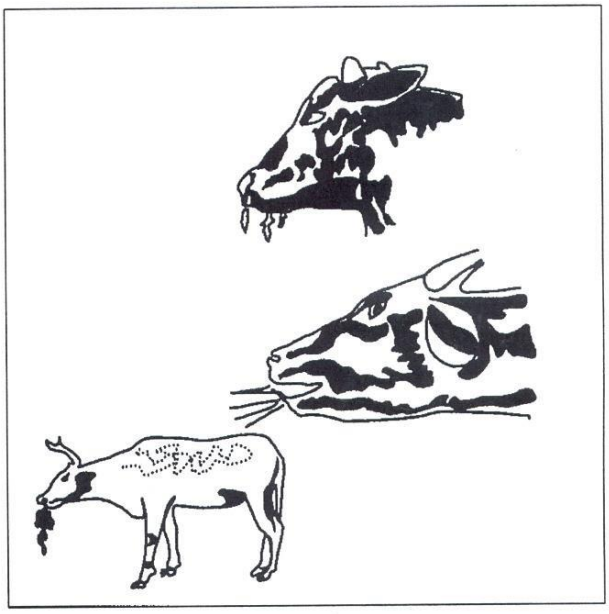
Clinical signs:
Eye discharge, opacity, photophobia, blepharospasm and blindness

Treatment:
Eye ointment

Control:
Fly control

Contagious bovine pleuro-pneumonia (CBPP)

Animal affected:
Cattle

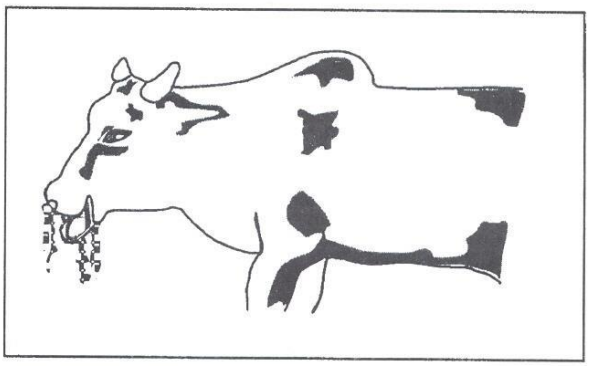


Clinical signs:
Fever, abnormal respiration, coughing, nasal discharge

Treatment:
Streptomycin or tetracycline

Control:
Vaccination

Pasterellosis



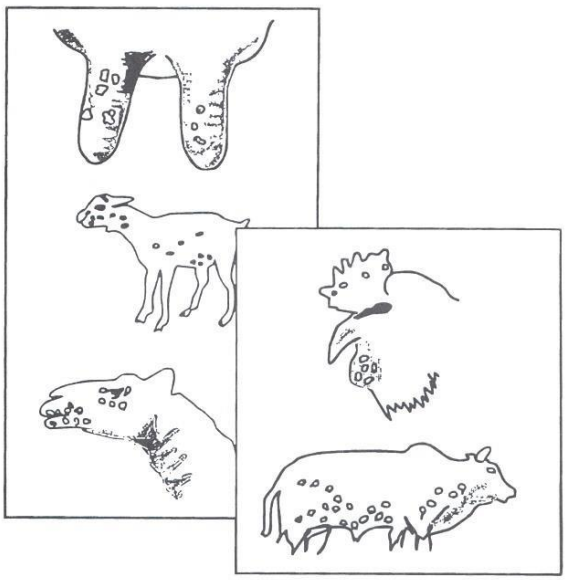
Animals affected:
Cattle, sheep and goats

Clinical signs:
Rapid difficult breathing, coughing, and nasal discharge

Treatment:
Tetracycline

Control:
Vaccination

Pox



Animals affected:
Sheep, goat, cattle, camel, and chicken

Clinical signs:
Eyelids become swollen, mucopurulent discharge from the nose, and widespread skin lesion: papules, vesicles pustule then scab formation

Treatment:
None

Control:
Vaccination

Foot and Mouth (Aphtha)

Animals affected:
Cattle, sheep, goats, and wild animals

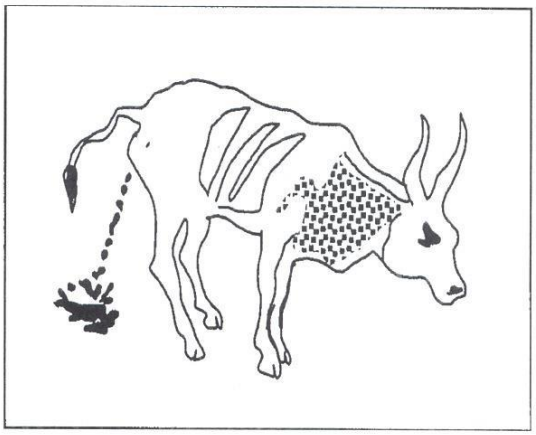
Clinical signs:
Drooling of saliva, vesicles on snare, buccal cavity and between claws, smacking of lips, and lameness

Treatment:
There is no treatment but antibiotics may be administered to protect from secondary bacterial infection

Control:
Vaccination

Rinderpest (Cattle plague)

Animals affected:
Cattle



Clinical signs:
Fever, anorexia, oclonasal discharge, erosion in gum and tongue, watery diarrhea, with mucus and blood, and high mortality

Treatment:
None

Control:
Vaccination

Babesiosis (Red water)

Animals affected:
Cattle, Camels, Equine, dogs

Clinical signs:
Anemia, red coloured urine, weight loss, and difficult breathing

Treatment:
Berenil or Acaprin

Control:
Because the disease is tick borne, acaricide spraying is recommended

Trypanosomosis

Animals affected:
Cattle, Camels, equine, and man

Clinical signs:
Swelling of lymph nodes, Anemia, reduction in milk production, and fever

Treatment:
Trypamydium, Ethidium, Berenil, and Suramin

Control:
Control of tsetse and other flies by tsetse traps, pour on and spot on drugs.

Coccidiosis

Animals affected:
Poultry, sheep, goats, and calves

Clinical signs:
Bloody diarrhea, emaciation, and anemia

Treatment:
Sulfa drugs

Control:
No vaccine. Observation of hygiene and avoiding humid floors

Haemorrhagic septicaemia

Animals affected:
Cattle and buffaloes

Clinical signs:
Fever, salivation, nasal discharge, swelling around laryngeal region, swelling and protrusion of tongue, and respiratory distress

Treatment:
Antibiotic

Control:
Vaccination, good management, isolation of sick animals

African Horse Sickness (Equine plague)

Animals affected:
Horses, zebras, donkeys, and mules

Clinical signs:
Fever, salivation, nasal discharge, swelling around laryngeal region, swelling and protrusion of tongue, and respiratory distress

Treatment:
None

Control:
Vaccination

Summary of some common diseases and their treatment

Name of disease In English and local language (Ask trainees)	Clinical signs	Traditional treatment (Ask trainees)	Modern treatment
Helminths (Worms)	Stomach and gut worms: -Loss of body condition -Diarrhoea -Pot belly, bottle jaw -Rough hair coat Eye worms: -Lacrimation Lung worms: -Foul smell in breath of affected calves -Gasping cough Ear worms: -Itching of ears -Pus discharge and very bad smell from the ear		Strategic deworming should be done 2-3 times a year at the end of the dry season Dewormers (liquid and Boluses) e.g. Warmcid plus Nilizan,-Deworming plus Zanil
East Coast Fever (E.C.F)	-Fever (40-42C) -Swollen Lymphnodes esp. under ear and at shoulder -Tears -Salivation -Petechiation (red little dots as sign of bleeding on mucous membranes		-Oxytetracy-cline HCl -Terit -Butalex -Clexon
Trypanosomosis	-Intermittent fever not exceeding 40C -Swollen superficial lymphnodes -Rough coat -Weakness -Loss of body condition -Pale mucous membranes		-Berenil -Veriben -Ethidium/Novidium

Name of disease In English and local language (Ask trainees)	Clinical signs	Traditional treatment (Ask trainees)	Modern treatment
Anaplasmosis	-Fever (40-41^{0}C) -Hard faeces -Frequent defecation -Dry muzzle -Yellow urine		Oxytetracycline HCl Imizol
Diarrhoea	-Watery faeces sometimes with blood		Treatment depends on the cause: -Worms, use dewormers -Bacteria, use Sulphadimidine or Furaxol withKaolin -In any case supply animal with a lot of clean water or cook black tea with a bit of sugar and salt for rehydration
Ear infection	-Teeth grinding -Head tilted towards affected ear -Drooping eye -Reduced feeding -Pus discharge from ear -Bad smell -Drooping ears		Iodine tincture or other antiseptic like Dettol is used to thoroughly clean the ear, repeat if necessary
3 day sickness	-Paralysis starting with 2 legs, both involved -Planting -Dry muzzle -Bloat		-Supportive treatment with multivitamins and antibiotics (Oxytetracycline HCl) -Warm water treatment of muscles
Pneumonia	-Coughing -Difficult breathing -Discharge from nose		-Pen/Strep -Oxytetracycline HCl

Name of disease In English and local language (Ask trainees)	Clinical signs	Traditional treatment (Ask trainees)	Modern treatment
Foot rot	-Long, overgrown hooves -Lameness -Foul smell in between the hooves -Lameness (walking on three feet) -Grazing on carpus		-Dry and clean the boma -Trim the hooves regularly -Clean the feet and apply coppersulphate -Severe cases inject with pen/strep Control: Use coppersulphate footbath (10%) at the entrance of the boma
Mastitis	-Udder swollen, hot, painful when touched and red -Milk becomes curdled		-Milk cow several times per day -Empty the udder completely and use intra-mammaries, e.g., Multimast
Ringworm	-Hair loss in round spots of grey colour		Fungicides per mouth: Griseofulvin and washing of animal with fungicidal drugs or iodine solution, immunity develops naturally after infection
Eye infections	-Eyes are red, swollen and painful -Tears flow		-Antibiotic Eye ointment or eye powder
Injuries/wounds	-Swollen areas (bruises) -Bleeding after cuts and abrasions		-Cleaning the wound with antiseptic: Dettol or iodine -Application of wound spray

ZOONOTIC DISEASES

Whether a town dweller or a farmer, man lives in contact with one or the other of the various species of animals. The degree of that contact certainly differs in accordance with the customs and traditions of the society in which he lives. Because there is, as far as is known, no society that does not enjoy some sort of contact with animals, it is important that everyone knows something about diseases which are transmissible between animals and man.

Diseases that are transmitted from an animal to man and vice versa are called zoonotic. Transmission may be through direct contact or by biting (e.g. rabies), through consumption of meat (e.g. tapeworm), or through an intermediate host (e.g. bilharsiasis)

BACTERIAL DISEASES

Bacterial diseases include:

- Tuberculosis
- Contagious abortion (Brucellosis)
- Salmonellosis
- Anthrax
- Leptospirosis
- Q fever

Tuberculosis

Tuberculosis is transmitted to man through contaminated milk which has not been boiled, and from the products of that milk (e.g. cheese, butter). It is also transmitted through the consumption of

contaminated meat if not well-cooked, through inhalation of the organism, and through skin wounds.

Contagious abortion (Brucellosis)

In man the disease is characterized by undulating fever, pain, and weakness. It is contracted by the consumption of contaminated milk and its products (cheese, butter), contact with contaminated objects, e.g fetuses and fetal membranes, and vaginal discharges of infected animals. The disease is also transmitted through inhalation.

Salmonellosis

This is also known as typhoid. The disease is contracted by consumption of contaminated foods: eggs, meat, milk, fish, vegetables, and animal feeds. The best method of control is to cook food well, and to wash vegetables thoroughly.

Anthrax

This is transmitted through direct contact between infected and healthy animals. Any infected material, which contains spores, can act as a source of infection.

This disease occurs in man in three forms: cutaneous, pulmonary, and gastrointestinal.

Animals which die suddenly must always be suspected of anthrax.

The disease must, in this case, be excluded first before handling the animal. The cutaneous form is Malignant pustule.

Leptospirosis

This is contracted by man from water contaminated with the urine of infected animals. The pathogens enter through the skin or mucosa of the mouth and nose. In man the disease is characterized by fever, headache, nausea, and myalgia (pain in muscles).

Q fever

This disease is caused by Rickettsia. Animals which may carry the infection include almost all species of domestic and wild animals. Cattle, sheep, goat, and ticks may all carry the infection.

The disease is transmitted to man by infected ticks, through inhalation, and contamination of skin wounds or scratches.

VIRAL DISEASES

Viral disases include:

- Rabies
- Foot and Mouth disease
- Yellow fever
- Rift valley fever
- Cowpox

Rabies

The disease occurs in all domestic and wild mammals. In the wild the principal hosts are the carnivorous animals (foxes, hyenas), and in urban areas, the dogs and cats. Rabies causes the death of the affected animals, including man. Transmission is through the saliva of the affected animal, when the saliva contaminates wounds, or mucous membranes. The most common transmission is through biting. The virus travels from the site of the bite to the central nervous system by way of the peripheral nerves.

In dogs, there are two clinical forms of rabies: furious form and paralytic (dumb) form. The furious form is characterized by abnormal behavior, starting as excitability and developing into aggressiveness in which the dog bites any animal or object in its path.

The second form is characterized by paralysis. Domestic livestock such as cows, sheep, goats and horses develop the paralytic form. Equines, however, usually die in the furious form.

The most important step in the control of rabies is to eliminate all stray dogs and to vaccinate all other dogs, man and other animals exposed to the virus. Post-exposure first aid treatment includes cleaning the wound (at the site of the bite) with soap and water, and applying alcohol or tincture of iodine.

Rift-valley fever

This disease affects ruminants, and may be contracted by man. It is caused by a virus which is transmitted by mosquitoes. In animals it is characterized by rise of body temperature, abortion, and sudden death of the newborn. In man the clinical signs are a rise of body

temperature, exhaustion, nausea, and vertigo. Control of the disease consists of vaccination of susceptible animals, and the control of mosquitoes.

Parasitic diseases

These include:

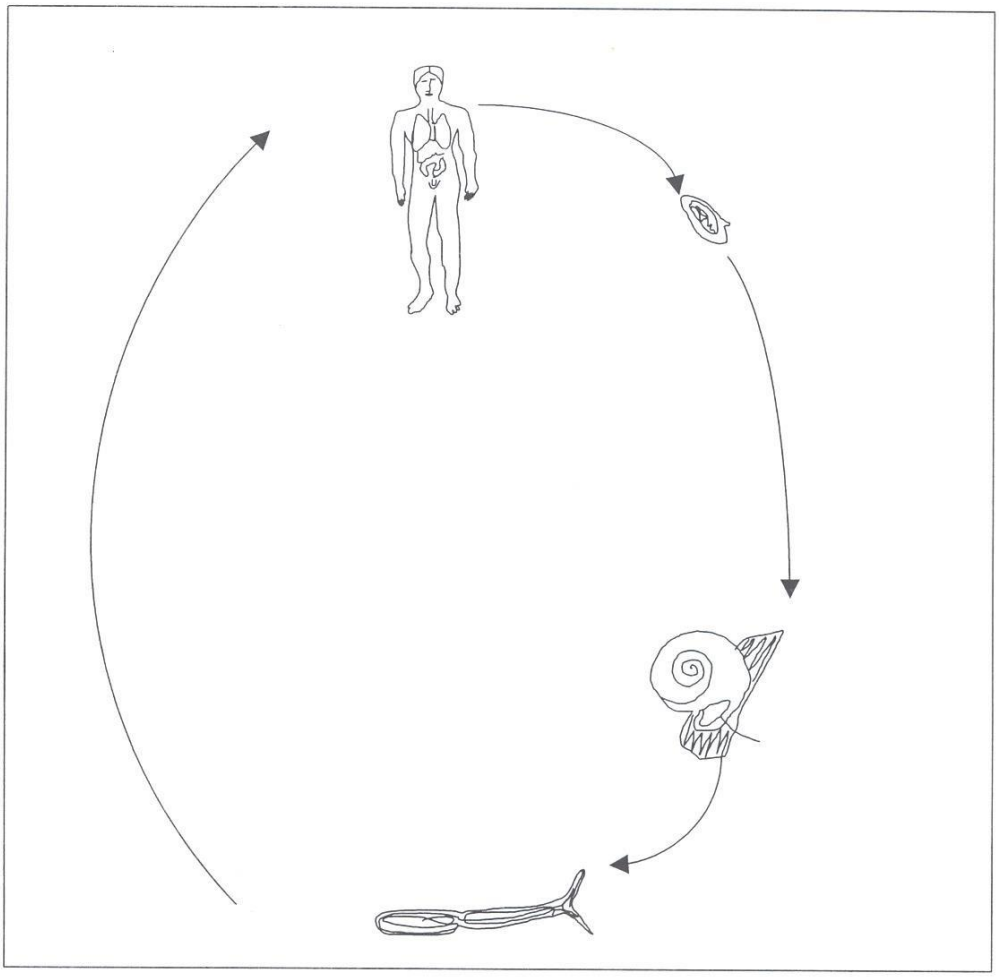
- Bilharzia
- Hydatidosis
- Tapeworms
- African trypanosomosis (sleeping sickness)
- Leishmaniasis
- Toxoplasmosis
- Fungal diseases

Bilharziasis (Schisostomiasis)

It affects the digestive and urinary systems. Conditions most amenable to the development of the parasite are fresh water, and the right snails for the growth of the miracidia.

Affections of the urinary organs lead to the inflammation and enlargement of the urinary bladder, and the presence of blood in the urine. In the digestive system, the disease affects the large intestine mainly, causing anemia, spleenomegaly; when chronic, the disease causes liver cirrhosis.

Control depends on the use of chemicals against snails, precautions against the contamination of water by urine or faeces and the medical treatment of infected man or animal.



Life cycle of Schistosoma mansoni

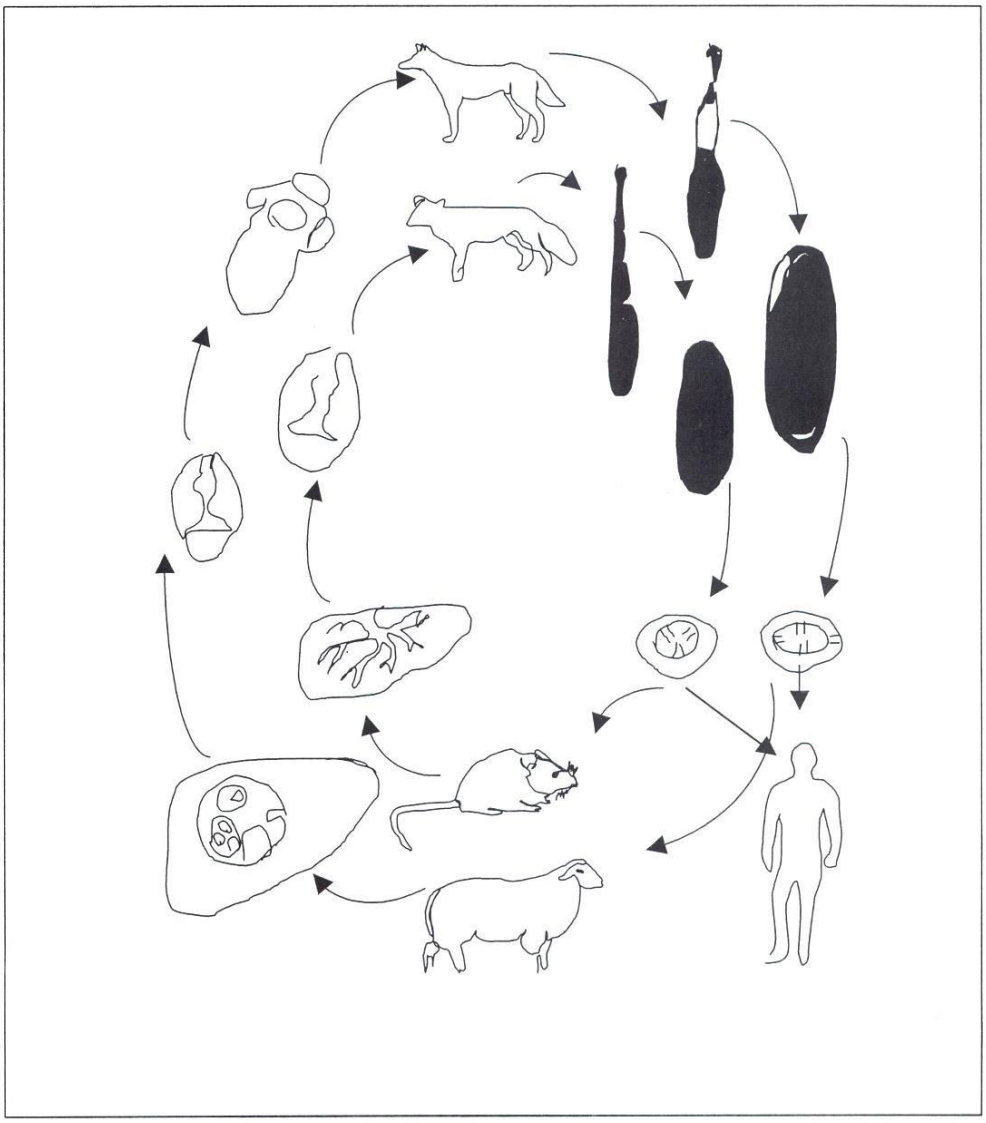
Hydatidosis (Echinococcosis)

This is an important parasitic disease transmitted from animal to man. It is caused by a tapeworm of dog Eggs of the parasite are passed out with the faeces of the dog. Cattle, sheep goats, equines, and camels are infected when they graze on pasture contaminated with dog's faeces. Man is infected through handling infected dogs, as by petting (dirty hands disease). Children are thus more susceptible than adults. Man may also be infected through drinking water contaminated with the faeces of infected dogs.

Eggs develop cysts, containing the heads of the parasite, in the liver, lung, kidney, brain, heart, and other organs. The lifecycle of the parasite is completed when dogs devour these cysts in infected meat. The tapeworm develops in the dogs intestines.

Control consists of:

- Treatment of infected dogs
- Preventing dogs from devouring infected meat
- Destruction of infected viscera and organs of infected animals intended for human consumption
- Personal hygiene (e.g. washing the hands after touching, or petting, dogs).

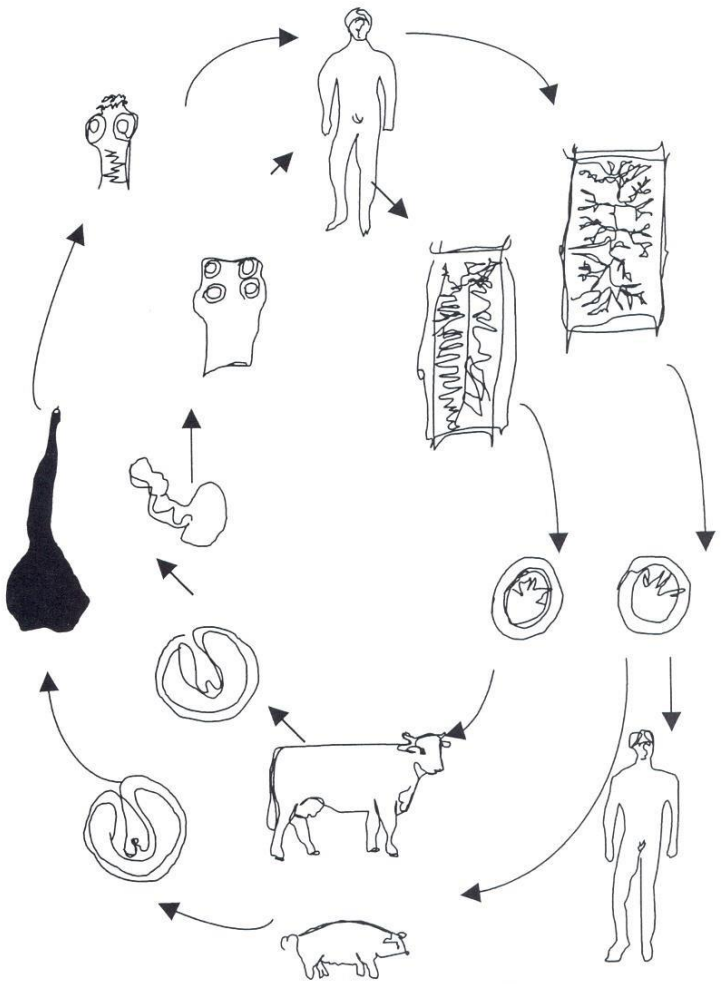


Life cycle of **Echinococcus granulosus** and E.multilocularis

Tapeworm infection (Taeniasis in man; Cysticercosis in cattle)

The tapeworm develops in the small intestine of man. In cattle the larvae are found in the muscles (meat). Man acquires infection by consuming uncooked beef, or other infected organs of cattle. The tapeworm in man may live for up to ten years. The life cycle of the tapeworm begins when cattle graze pastures contaminated with human faeces containing the eggs. Larvae of the tapeworm develop in the muscles, tongue, heart, liver, and other organs of cattle. Consumption of infected meat, whether raw or undercooked leads to the development of the adult tapeworm in the small intestine.

In man, the symptoms consist of flatulence, abdominal pain, loss of weight, and presence in the faeces of segments of the tapeworm. The control of the disease is effected by treatment of infected persons, prevention of contamination of pasture, and cooking meat well before consumption. At postmortem examination of slaughtered cattle, all organs containing the cysts must be condemned.



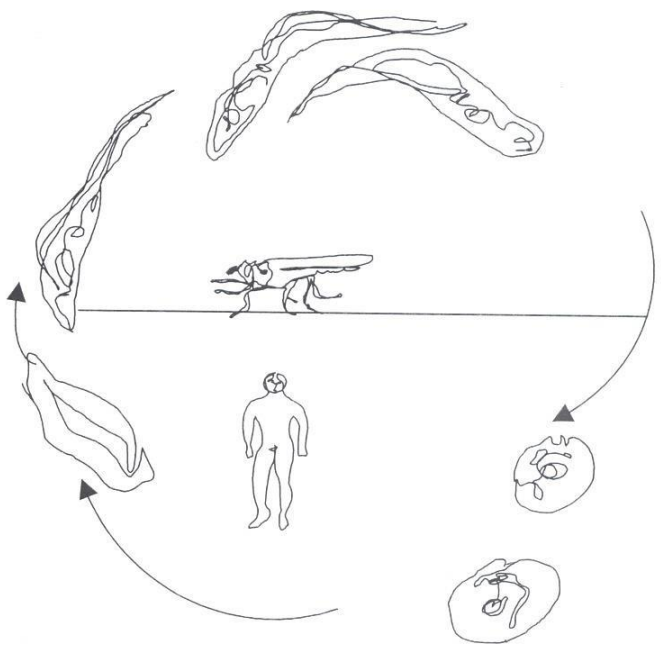
Life cycles of Taenia solium and T.saginata

African trypanosomosis (Sleeping sickness)

This is transmitted by tsetse fly. Symptoms are: fever, headache, enlargement of lymph nodes, especially in the neck. These are followed by anemia and lethargy. The parasite is found in the blood corpuscles and, later, in lymph, and, later still, in the cerebrospinal fluid.

The disease affects man, cattle, camels, and other animals, but the strains of the parasite that affects these various species are different.

Control of the disease consists of treatment of affected animals and man with drugs, the management of movement of nomads, and the use of insecticides against tsetse flies.



Life cycles of Trypanosomes

Toxoplasmosis

This is a parasitic disease of man and animals. In man the symptoms are: fever weakness, and muscle pain. But these symptoms may not be seen except occasionally. The importance of the disease is that a pregnant woman, if affected, may pass the infection to the foetus. This may lead to abortion.

Toxoplasmosis also affects cattle, sheep, dogs, cats, and rodents. In animals the parasite is found in many organs, such as brain, heart muscle, lymph nodes, lung, uterus, ovary, placenta. The parasite is also found in blood, milk, saliva, and vaginal discharges. The disease is transmitted to man through consumption of meat or milk of the affected animal, or from contaminated materials.

CHAPTER 10

POULTRY DISEASES AND HYGIENE

SANITATION

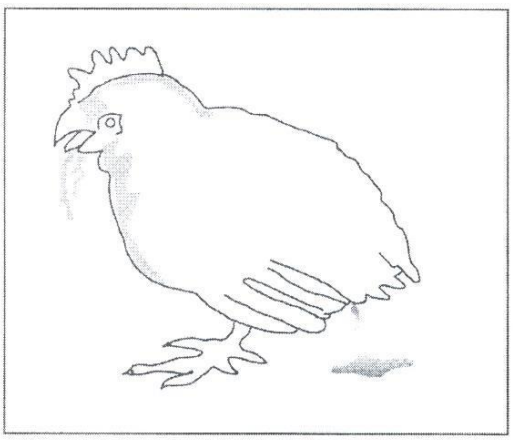
For a successful poultry production certain sanitary measures must be undertaken:

- Poultry houses are built on high ground, to make easy drainage possible. The houses must be well ventilated, and made of material that can be cleaned and disinfected
- Separate houses are constructed at reasonable distances from each other to prevent the spread of diseases
- After each lot has been removed, the house is left unoccupied for a week, and must be cleaned and disinfected before a new lot is introduced
- If a disease is detected all sick birds must be removed from the flock and placed in a separate building
- Dead birds must be burned and buried
- Vaccination
- Feeders and waterers must be of sufficient number, and cleaned regularly

POULTRY DISEASES

Many diseases affect poultry. The causative agents of these diseases may be viral, bacterial, parasitic, fungal, or nutritional. Below are some of these diseases.

Newcastle



The causative agent is a virus. Transmission is through the respiratory system (inhalation).

Symptoms:

Sudden death is the first indication. Important symptoms are lethargy, diarrhoea, swelling of head, and nervous symptoms. Mortality may reach 100%. Symptoms that may appear early are: laying of eggs without, or with brittle, shells, and cessation of laying. Nervous symptoms include distortions of the neck, incoordination, and drooping of the wings. Respiratory symptoms may appear (coughing and sneezing). There is no treatment, but prevention is possible through vaccination of four weeks old birds, and the dose is repeated at four months of age.

Measures that should be taken in case of an outbreak:

- Notification of the authorities of the outbreak, or the mere suspicion of an outbreak.
- Cleaning and disinfection of the pens, farms, incubators, nests.
- Wild birds must not be allowed entry into poultry houses.

Salmonella pullorum disease (White diarrhoea)

The causative agent is a bacterium, *Salmonella pullorum*. The disease is transmitted by inhalation and by eating and drinking contaminated feed and water. The infection may also reach the embryo from the mother (through the egg), or the eggs may be contaminated in the incubator, the chicks picking up the infection at hatching.

Symptoms:
One of the chief symptoms in chicks is high mortality, the chicks dying within one or two days of hatching. In chicks which are three weeks, or less, old, the symptoms include lethargy, huddling in one corner, loss of appetite, and whitish droppings.

In layers symptoms may be absent, but sometimes there is a decrease in egg production and in fertility. On rare occasions the disease may appear in an acute form and in this case the symptoms include lethargy, loss of appetite, and diarrhoea; the birds die a few days after the appearance of the first symptoms. In broilers the disease is chronic, and the chief symptoms are lameness, retardation of growth and feather formation.

Treatment:
Antibiotics

Coccidiosis

The causative agent is a protozoan (*Eimeria avium*), which affects the lining cells of the intestine. Transmission is through the digestive system, when the bird ingests a contaminated feed. Insects (flies, cockroaches) may help spread the disease.

Symptoms:
Sudden drop in egg production, and in growth rate, increase in death rate, ruffled feathers, loss of appetite, and droppings streaked with blood.

Treatment:
Some drug compounds are available for the treatment of the disease. Among these drugs the most important are sulpha compounds and some antibiotics. These are mixed with the feed in suitable remounts.

External parasite

These parasites are discussed below.

- Insects: important because they are vectors for many diseases; In addition to that, insects are a nuisance; by mere irritation they distract the birds from feeding. Ants are hosts to many worms (so are other insects, such as beetles and cockroaches)
- Ticks: These transmit many diseases, and, in addition to that, they feed on the blood of the host, causing anaemia, and annoy the birds by distracting them from feeding. Soft ticks are parasitic; they transmit Spirochetosis

Calcium deficiency

Calcium is necessary for the formation of the skeleton, and for the egg shell. Symptoms are rickets; in layers the eggs have soft shells, or no shells at all, and bones become soft.

Treatment:
Addition of calcium-rich sources to the feed.

Programme for vaccination

Chicks are vaccinated against many diseases. The most important of these diseases are Newcastle, fowl pox and Gumboro.

Vaccination is carried out according to the following schedule

Age in weeks	Vaccine	Route of administration
4	Newcastle	One drop in nasal cavity or eye
6	Gumboro	One drop in eye or drinking water
12	Fowl pox	A little of the vaccine is introduced into a break made in the skin of a leg
16	Newcastle	The second, or booster, dose

CHAPTER 11

MEAT INSPECTION

The purpose of meat inspection is to ensure that the consumers buy meat which is wholesome and free of disease. Meat inspection is also a method of control of infectious diseases of animal, and diseases, such as rabies and tetanus, which have no visible lesions.

Before being slaughtered, animals are rested for 12-24 hours, provided with drinking water, and fasted for at least, twelve hours.

Antemortem examination will allow the inspector to decide whether the animal:

- is apparently healthy and is allowed to be slaughtered
- should be slaughtered under certain conditions
- is not allowed to be slaughtered. For example: productive females, animals which show signs of any of the notifiable diseases (cattle plague, Foot and Mouth disease, Black quarter, Anthrax, Haemorrhagic Septicaemia) are not slaughtered. Also not allowed to be slaughtered are those animals which show fever and those which are emaciated

SLAUGHTER

The object of slaughter is to bleed the animal thoroughly. Two points should be taken into consideration before slaughter is carried out.

- The method of slaughter must not cause excessive pain to the animal.

- Animals are slaughtered while conscious.

Skinning is started when bleeding is completed. Evisceration must be performed as quickly as possible.

The abdomen is opened just behind the breast, and the stomach, spleen, intestines, and liver are removed (evisceration). The kidneys are left in situ. Care must be taken lest the contents of the intestines and stomach should contaminate the carcass. The heart and lungs are removed from the thoracic cavity in the large ruminants only.

POST-MORTEM INSPECTION

The carcass is visually examined for:

- state of nutrition
- evidence of bruising or discoloration
- efficiency of bleeding
- abnormalities or swellings

Then follows the examination of the head, lungs, liver, stomach, intestines, spleen, and the carcass

Examination of the head

The lips, gums, and tongue are examined for ulcerations or vesicular inflammation as in Foot and Mouth disease, and Rinderpest. Incisions are made into the masticatory muscles, the medial and lateral jaw muscles to examine for cysts of tapeworms. The tongue is incised longitudinally to examine for cysts of tapeworms.

Examination of the trachea and lungs

The lungs are examined visually, by palpation, and by making incisions for tuberculosis, pneumonia, pleurisy, parasites, abscesses, hydatid cysts, and discoloration. The mucous membranes of the trachea and bronchi, the lymph nodes of the trachea and lungs are also examined.

Examination of the heart

Visual examination is made; the pericardium is incised to examine for fluid, adhesions, or pus. The heart is incised for presence of cysts of tapeworms, hydatid cysts, or any pathological changes.

Examination of the liver

Examine for any abnormal appearance such as discoloration, or change of structure, abscesses and swellings, tapeworm cysts, haydatid cysts, inflammation, necrosis. Incise to examine for liver flukes inside bile ducts.

Examination of spleen

The spleen is examined for enlargement, swelling, cysts or abscesses.

Examination of stomach and intestines

The interior of the stomach and intestines is examined for gastritis, enteritis, parasites, swellings or abscesses. The lymph nodes along the intestines are examined after being incised.

Examination of the carcass

All parts of the carcass: (thorax, abdoment, limbs) are inspected, and incised to examine for cysts of tapeworms. All lymph nodes of the carcass are incised and examined for tuberulosis. Changes which can be detected in lymph nodes are as follows:

- Enlargement
- Congestion or pyaemia
- Necrosis

CONDEMNATION

Rejection of a carcass or any part of it, as unfit for human consumption, is called condemnation. Condemnation may, therefore, be either partial or total.

Partial condemnation

This is the rejection of part (or parts) of the carcass, and the removal of the lymph nodes draining that part, or parts. The part (or parts) is removed because the pathological changes in it do not impair the suitability of the remaining parts of the carcass for human consumption. The following conditions require partial condemnation:

- localized tuberculosis
- localized parasitic infestation
- localized wounds and abscesses
- localized inflammation
- chronic contagious bovine pleuropeumonia
- malformation
- acute gastroenteritis

Total condemnation

This is the rejection of the whole carcass because it shows a condition which renders the meat unsuitable for human consumption. The following are the conditions that would lead to total condemnation:

- anthrax
- generalized tuberculosis
- acute cases of contagious bovine pleuropneumonia
- jaundice
- acute metritis
- Blackquarter
- Multiple tumours (generalized)
- Widespread cysts
- Acute nephritis
- Acute, septic mastitis
- Trypanosomiasis associated with emaciation
- Acute Foot and Mouth disease
- Caseous lymphadenitis associated with emaciation
- Discoloration and abnormal odours

CHAPTER 12

WOUND TREATMENT AND MINOR SURGICAL PROCEDURES

TREATMENT OF WOUNDS

To treat wounds, first restrain the animal properly. Bleeding should be stopped. Pressing slightly with the hand will stop bleeding. If bleeding continues, pack the wound with a clean cloth. Clean the wound with clean water and soap to remove dirt, hair and debris.

If the wound is old, remove the necrotic tissue and pus using forceps. Apply an antiseptic or an antibiotic cream or spray. If the wound is extensive, give systemic antibiotics.

Abscesses

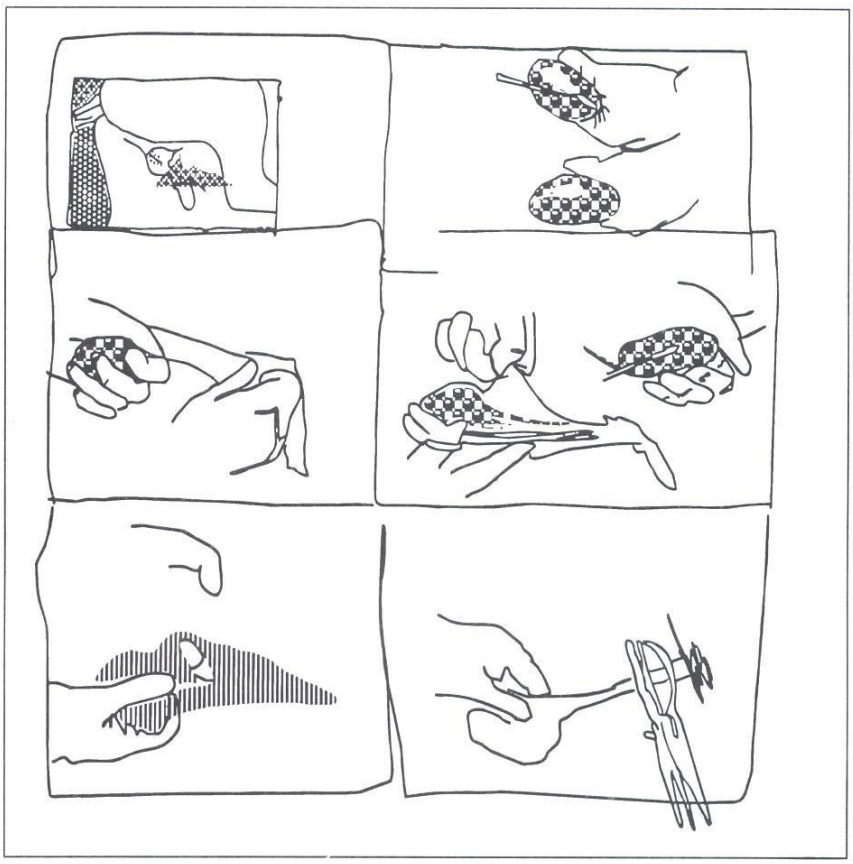
An abscess is pus enclosed in a bag-like structure. In order to treat an abscess, the following procedure should be observed:

- Wash the skin, and shave the hair (or wool), around the abscess
- Open the abscess to drain the contained pus
- Clean the site of the abscess thoroughly
- With a curette, remove the lining membrane of the abscess (the membrane is the source of formation of pus)
- A tampon is soaked in tincture of iodine, dusted with Terramycin powder, and left inside the abscess for 48 hours. At the same time the animal receives injections of antibiotics

CASTRATION

Castration is the process of rendering the male reproductive system functionless

Castration improves the quality of meat, makes the animal more docile, prevents undesirable breeding, and aids growth and fattening.



Good breeding animals should not be castrated.

If castration is done by knife (open castration), it should be done by trained stockmen

Bull calves are usually castrated at 18 months. Young animals are easier to handle as wounds bleed less and heal faster.

A burdizo crushes the blood vessels and cords, which go to the testes, and is used in older animals. In applying this technique, care should be taken not to crush the penis.

DE-BUDDING

The following steps are taken in de-budding:

- Put copper of dehorning iron into fire and allow to heat up
- Choose the calves: De-bud as soon as the horns can be felt
- Restrain calf well
- Burn around the horn, then level it off
- Use an antibiotic spray or ointment afterwards
- The wound should be protected against insects
- Check calves for bleeding again when you are through

HOOF CUTTING

Regular control of hooves helps to prevent bacterial infections in small ruminants. Especially the inter-digital space should be checked for tick bites. Trimming of overgrown horns should be done regularly. This is important during the rainy season when the horn of the hooves is very soft and growth is faster than utilisation. First, pockets may develop and thriving of bacteria within the humid anaerobic

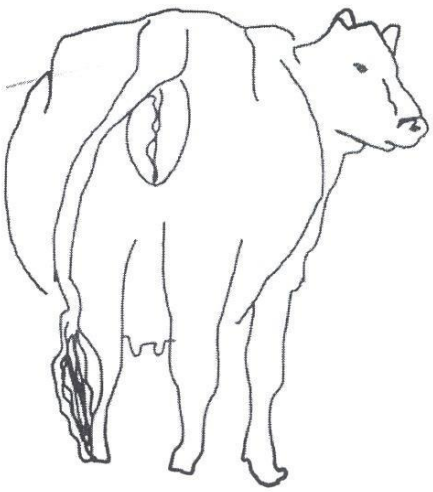
conditions would prepare the grounds for severe inflammations. Secondly, overgrown hooves often lead to problems with walking and lameness, even to deformation of bones, especially in horses and housed animals.

CARE OF PREGNANT ANIMALS AND NEWBORN

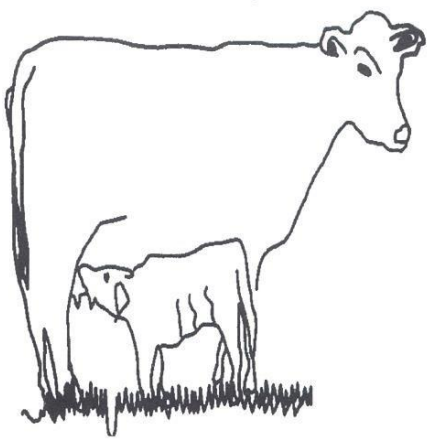
Pregnant animals

A cow gives birth after 270 days or 9 months after last service. When calving is near, the following signs are seen:

- The udder swells
- The vulva swells
- Thick mucous starts coming out of the vulva



Pulling should be done if a cow has difficulty. The placenta should come out 12 hours after birth. If this does not happen a veterinarian should be consulted.



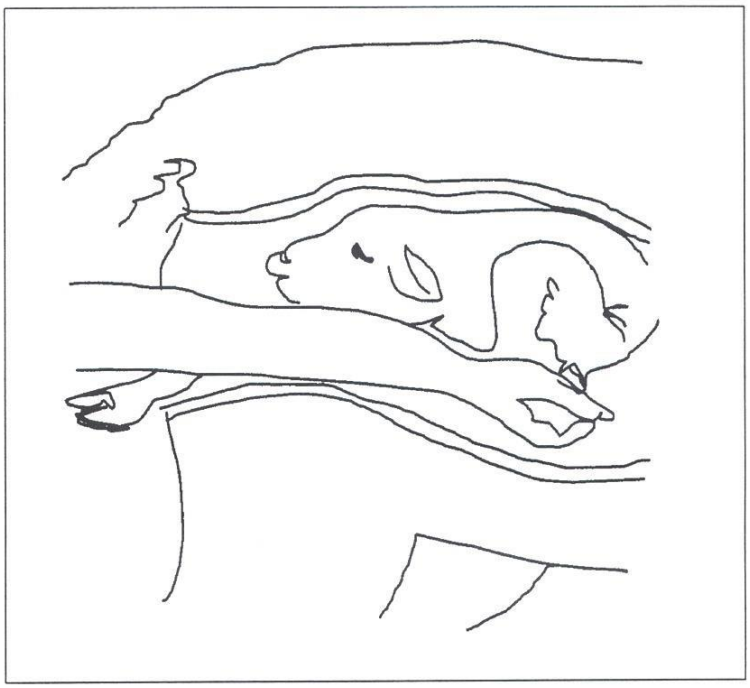
Newborn

During the first few days after calving, a cow

produces special milk called colostrum. Colostrum contains antibodies, which fight disease. It protects the young against disease. Colostrum should be given immediately after birth.

In order to prevent newborn infection:

- Disinfect the navel with diluted iodine
- Clean the mouth of the newborn by removing the mucus with the hand
- Slap or gently massage the ribs



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DRYLAND HUSBANDRY PROJECT (DHP)
ETHIOPIA, KENYA, SUDAN and UGANDA

The Dryland Husbandry Project (DHP) is an effort to bring together a variety of stakeholders in pastoral development to identify and develop strategies for addressing the crisis of African drylands in the twenties. A network approach will be used to raise issues of mutual concern to researchers, practitioners and, above all, pastoralists, with particular emphasis on sustainable service provision and water management.

On the International level, four networks are involved: The Organisation for Social Science Research in Eastern and Southern Africa (OSSREA), based in Addis Abeba, Ethiopia; The Pastoral Information Network (PINEP), based in Nairobi, Kenya; The research programme on Environmental Policy and Society (EPOS), based at Linköping University in Sweden; and The Inter-Governmental Authority on Development (IGAD), based in Djibouti.

On the national level, a variety of research institutions, governmental departments and non-governmental organisations will co-operate in training and action-research. The activities come together at the local level through the involvement of the pastoralists' institutions, extensionists and researchers in their joint effort for service provision and field trials.

The countries that participate in the Dryland Husbandry Project are Ethiopia, Kenya, Sudan and Uganda. The national focal institutions in these countries are Faculty of Dryland Agriculture and Natural Resources, Mekelle University, Ethiopia; The Department of Range Management, University of Nairobi, Kenya; The Institute of Environmental Studies, University of Khartoum, Sudan and The Faculty of Agriculture, Makerere University, Uganda. DHP has been operating since 1995.

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