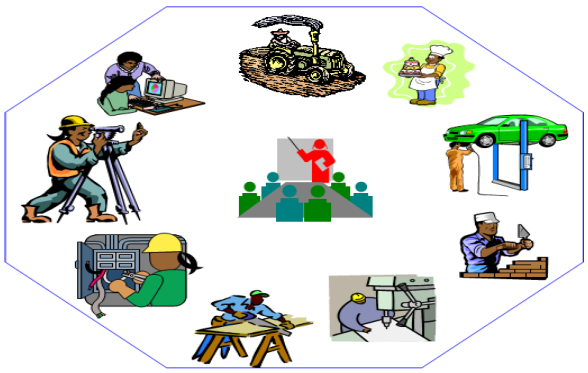
ETHIOPIAN TVET PROGRAM
ANIMAL HEALTH CARE SERVICE LEVEL –III
BASED ON VERSION 3 MARCH 2018 OS

Unit of Competence: Handle Parasitic Animal Diseases



Module Title: Handling parasitic Animal Diseases
LG Code: AGR AHC3 M15 LO (1-3) LG (59 -61)

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LG #59	**LO #1- Develop knowledge of basic concepts in parasitology**

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Describing taxonomic classification of parasites
- Identifying causative agents of parasites
- Identifying Internal and external parasite
- Assessing and describing Parasitic diseases
- Describing Samples for the diagnosis of parasitic infestation
- Describing Principles in clinical and laboratory diagnosis
- Prescribing and administering animal treatments

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to:

- Describe taxonomic classification of parasites
- Identify causative agents
- Identify Internal and external parasite
- Assess and describe Parasitic diseases
- Describe Samples for the diagnosis
- Describe Principles in clinical and laboratory diagnosis
- Prescribe and administer animal treatments.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

1.1. Terminologies for taxonomic classification of parasites

Parasitology:- is the study of parasites.

Veterinary Parasitology is a composite of three distinct disciplines, each with its own set of host–parasite interactions, clinical considerations and vocabulary. The three topics that make up the bulk of Veterinary Parasitology are:

- **Veterinary entomology**: the study of parasitic arthropods, including insects, ticks and mites;
- **Veterinary protozoology**: a subject that embraces the wide range of single-celled eukaryotic organisms that comprise the parasitic protozoa.
- **Veterinary helminthology**: which covers three main groups of parasitic worms like trematodes (flukes), cestodes (tapeworms) and nematodes (roundworms).

Helminthology:- is the scientific study of helminth parasites.

Classification:- is orderly arrangement of any object.

Taxonomy: - The science of classification of living object. It is the branch of biology which deals with the arrangement and classification of animals and plant is known as taxonomy. Taxas means Law and namos means name).

Parasite:- is an organism baring food and shelter temporarily or permanent and living in or on another organism.

Facultative parasite:- parasites able to live both free living and parasite living e.g. Strongyloides species.

Obligate parasite:- parasite living permanently in a host and cannot live without a host e.g. Trichomonas species.

Parasitism:- organism depend upon another for living, one is living at the expense of the other and harmful, called Parasite, the other organism harmed is called Host.

Helminthes:-are a division of eukaryotic parasites that live inside their host. They are worm-like organisms that live and feed off living hosts, receiving nourishment and protection while disrupting their hosts' nutrient absorption, causing weakness and disease

The general groups used in the classification of animal parasites are follows:

Kingdom

Phylum

Sub phylum

Class

Sub class

Order

Sub order

Super family

Family

Sub family

Genus

Generally**,** animal parasites are classified according to international code taxonomy – Each parasite belongs to a:

i) Protozoa

- Intestinal: e.g. Eimeria, giardia and *Cryptosporidium*
- Blood and tissue: E.g.Toxoplasma, Trypanosoma, Leishmania, babesia and Anaplasma.
- Urogenital tract E.g. Trichononas

ii) Helminthes

- Cestodes
- Trematodes
- Nematodes

1.2. Classification of major parasitic helminthes

Classification of major parasitic helminthes of livestock and pet animals is as follows:

I. Phylum Nemathelminthes (round worms)

They are commonly called round worms because of their appearance in cross section (round shaped) and are also further divided in to:

a) Class: Nematoda

b) Order: Strongylida, Ascaridida, Oxyurida, Spiruida and Enoplida

c) Family: Trichostrongylidae**,** Ascarididae **,** Oxyuridae, Spiruidae and Enoplidae

d) Genus: *Trichostrongylus, Haemonchus, Ostertagia, Ascaris. Strongylus,Thelesia, Cooperia, Nematodirus etc.*

e) Species:For example for *Trichostrongylus:*

- *Trichostrongylus axei*
- *Trichostrongylus colubriformis*
- *Trichostrongylus vitrinus* and *Trichostrongylus capricola*
- *Trichostrongylus tenuis*

II. Phylum Platyhelminthes (flatworms)

Phylum Platyhelminthes are flat shaped helminthes.

Class: Trematoda (flukes) and Cestoda (tapeworms)

Some examples of Trematoda are Fasciola, Paraphistomum and Schistosoma (Bilharzia). However parasites such as Taenia, Echinococcus, Diphylobotrium, and Syngamus are Cestoda (tapeworms).

Self-Check -1	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (16 points).

Test I: Fill the blank space (4 points)

1. _____ organism depend upon another for living, one is living at the expense of the other and harmful, called Parasite, the other organism harmed is called Host (2 points).
2. _____ is the branch of biology which deals with the arrangement and classification of animals and plant is known as taxonomy (2 points).

Test II: Short Answer Questions

1. Write down the general groups used in the classification of animal parasites (4 points).

2. Write the two classifications of major parasitic helminthes of livestock and pet animals (4points).

3. Write at least two examples of Trematoda (4points).

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -8 points** **Unsatisfactory - below 8 points**

Information Sheet 2- Identifying causative agents of parasitic animal diseases

2.1. Introduction to causative agents of parasitic animal diseases

Parasites and their hosts have evolved together over many millions of years. Every host is vulnerable to infection by several, if not many, parasitic species. Thus, there are many more parasitic species on this planet than host species. It is not surprising; therefore, that a great diversity of host–parasite relationships exists. Parasitic animal diseases are diseases caused by internal parasites, external parasites, hemoparasites, and zoonotic parasites. There are many species of these parasites. Each species may cause one or more than one disease. Zoonotic parasites that cause Parasitic animal diseases are: Taenia and cisticerca, Echinococcus and Hydatid cyst, Trichinella, Toxoplasma and Diphylobothrium. However mites, lices, fleas and flies are external parasites that cause Parasitic animal diseases.

2.2. Major internal parasites with their corresponding diseases

Animal trematodes are internal parasites that cause different parasitic animal diseases. Fasciola is a leaf shaped trematode parasite that inhabits the liver and cause fasciolosis in ruminants. *Fasciola hepatica* and *Fasciola gigantica* are the two species of the liver flukes. Paraphistomum cervi and Paraphistomum microbothrium also are trematodes of veterinary importance that colonize rumen, reticulum and cause duodenal infection in ruminants, camels, equines, pigs and rabbits. Schistosoma (Bilharzia) cause Schistosomiasis.

- *Schistosoma bovin*- ruminants in Africa
- *Schistosoma mattheei*- ruminants and occasionally man in Africa
- *Schistosoma japonicum*- man and most domestic animals in far east
- *Schistosoma mansoni*- man and wild animals in Africa

Parasitic cestodes of animals like Taenia (cisticerca), Echinococcus and Hydatid cyst affect animals of different species. *Taenia saginata* and *Taenia solium* cause Taeniasis in man, *Cysticircus bovis* and *Cysticircus cellulosae* cause Cysticercosis in cattle and in

pigs respectively. Adult Echinococcus and larval Hydatid cyst are cestodes in which *Echinococcus granulosis* cause Echinococcosis in dogs, and Hydatid cyst is found in muscles of ruminants.

Many of parasitic animal diseases are caused by nematodes. Different species of Ostertagia cause ostertagiosis in: cattle (*Ostertagia ostertagi*), sheep and goats (*Ostertagia* circumcincita and *Ostertagia* trifurcate). Haemonchosis is caused by *Haemonchus placei* in cattle and *Haemonchus* contortus sheep and goats. Other lung parasite (Dictyocaulos) causes Dictyocaulosis in cattle (*Dictyocaulos viviparous*), sheep and goats (*Dictyocaulos filaria*) and in horses and donkey (*Dictyocaulos arnifieldi)*. Strongylus is another nematode parasite that causes Strongylosis in equines. The three species of Strongylus are:

- *Strongylus vulgaris*
- *Strongylus equinus*
- *Strongylus edentatus*

2.3. Common hemoparasitic animal diseases with their corresponding causes

Trypanosomiasis

Trypanosomiasis is caused by is caused by different Trypanosoma species like: *Trypanosoma congolensis, Trypanosoma brucei, Trypanosoma vivaxi, Trypanosoma evansi,Trypanosome brucei ghambiensi, Trypanosoma brucei rhodiensi,* and *Trypanosoma equiperdum. Babesiosis* is caused by is caused by *Babesia bigemina* and *Babesia divergens*. Anaplasmosis is hblood parasite caused by *Anaplasma marginale* and *Anaplasma centrale.* Schistosomia is trematode that inhabits blood and cause Schistosomosis.

2.4. Mechanisms of occurrence of parasitic animal diseases

For the establishment of parasitic diseases the interaction of host, agent (parasites) and environment plays a vital role. Absence of one of these three things, mean that no disease occurrence. For example: Presence of snail population (intermediate host) and history of animals grazing from marshy swampy area (environment) by ruminants (definitive host) cause Fasciolosis (Disease).

A parasite must be able to overcome host defences and evade immunological attack. Mechanisms must also be in place to ensure transfer of infection, both geographically from host to host ('horizontal transmission') and temporally from generation to generation ('vertical transmission'). This often entails an intricate integration of the life-cycle of the parasite with that of its host.

Hosts

Some parasites require just one host to complete their developmental cycle and produce progeny. Others utilize two or more animals. Hosts can be exploited in different ways and the following terminology is used to differentiate between these:

Final (or definitive) host:- is a term used to identify the host in which sexual reproduction of the parasite takes place.

Intermediate host:- this is a host in which only immature stages grow and develop. Asexual replication may occur (but not sexual reproduction).

Transport and **paratenic hosts:**-host with no parasitic development of any Kind takes place in these and they are not a necessary part of the life-cycle. The parasite takes advantage of another animal by using it as a vehicle to increase its chances of reaching its next essential host. The word 'paratenic' implies an intimate relationship in which the Parasite becomes embedded within the tissues of its host. Reservoir host: as the name suggests, this depicts a host population that acts as a source of infection for other animals.

Vector:- this is a vague term for an insect, tick or other creature that carries (transmits) a disease-causing organism from one host to another.

Environment:- serves as shelter for survival of parasites as well as for the host animals. Animals get their feed and water from environment. The parasites also need environment, moisture and temprature to hatch and develop.

Self-Check -2	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions (8 points)

1. Write two examples for each of the following questions:

a) Parasitic animal diseases caused by internal parasites (2 points).

b) Parasitic animal diseases caused by external parasites (2 points).

c) Parasitic animal diseases caused by zoonotic parasites (2 points).

d) Parasitic animal diseases caused by hemo parasites (2 points).

2. What are the three important mechanisms for the occurrence of parasitic animal diseases? (2 points)

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -5 points** **Unsatisfactory - below 5 points**

Information Sheet 3- Identifying Internal and external parasites

3.1. Introduction

Hosts rarely gain any benefit from the presence of parasites and are often harmed by them. Defence mechanisms have therefore evolved which, if totally effective, would have extinguished parasitism as a lifestyle. But the continued existence of an abundance of parasites indicates that successful counter-strategies have arisen through natural selection.

Parasitism is part of a spectrum of intimate zoological relationships between unrelated organisms which includes:

- Commensalism: two species living together for the benefit of one or both, but without detriment to either party, and without any metabolic dependence. In this type of relationship; one organism is benefited and the other is neither benefited nor harmed.
- Symbiosis: two species living together, each dependent on the other for their mutual wellbeing and survival (e.g. cellulose-digesting organisms in the caecum of a horse).
- Parasitism: two species living together, where one of the pair (the parasite) is living at the expense of the other (the host).

Parasites: - are organisms that lives in or on the living tissues of a host organism and takes its nourishment from that host organism. They can't live independently because they are poor friends that live at the expense of others. Parasites are classified in to two according to the site present or location on or body and tissues. These are:

- Internal parasites(Endoparasite)
- External parasites(ectoparasites)

3.2. Internal parasites and external parasites

3.2.1 Internal parasites (Endoparasite)

Internal parasites are those parasites of animals that live in the body, organs and tissues of the host and will produce infection in that host. Trematodes, Cestodes and Nematodes are examples of Endoparasites.

The major (common) internal parasites of animals

Fasciola, Paraphistomum and Schistosoma (Bilharzia) are trematodes of animals with different peridelication site where an adult form of parasites exist.The other group of internal parasites are Cestodes of the genus Taenia, Echinococcus and Moniezia.

Nematodes are round shaped internal parasites different species of animals.there are many species of nematodes of veterinary importance.Examples of nematodes are: Ostertagia, Haemonchus, Dictyocaulos, Strongylus:, Trichostrongylus, Thelazia(eye worm), Ascaris, Toxocara, Oxyuris ,Cooperia and Nematodirus.

3.2.2. External parasites (ectoparasite)

External parasites are found externally on surfaces of animals and cause infestation. External parasites such as lice, flies, ticks, cattle grubs, and mites are a serious problem to livestock breeders. They comprise a variety of pests, including stable flies, house flies, horn flies, face flies, mosquitoes, horse flies, deer flies, cattle grubs, and lice. These pests are most prevalent during the spring and summer months; however, Florida's warm climate permits many pests to live year-round.

The major (common) external parasites of animals

Flies

The major external parasites that can infest animals are insects. Flies are characterized by having one pair of wings. They have complete metamorphosis with egg, larva, pupa, and adult stages in their life history. About 20 families of flies are of veterinary importance. One of the most challenging characteristics of flies is their behavior of being in contact with livestock for only short periods of time. Adequate control can sometimes be difficult because measures must applied at precisely the right time.

Tsetse flies

Although confined to the central belt of Africa, the tsetse fly (Glossina spp.) plays a devastating role in human and animal welfare as it is the principal vector of the protozoan parasites responsible for sleeping sickness in people aswell as the several forms of animal trypanosomosis. Tsetse flies are easily recognised. They are narrow, brown, medium-sized flies that rest with wings overlapping like closed scissors. To confirm identification, should there be any doubt, the wing venation has a characteristic closed 'butcher's cleaver cell'.

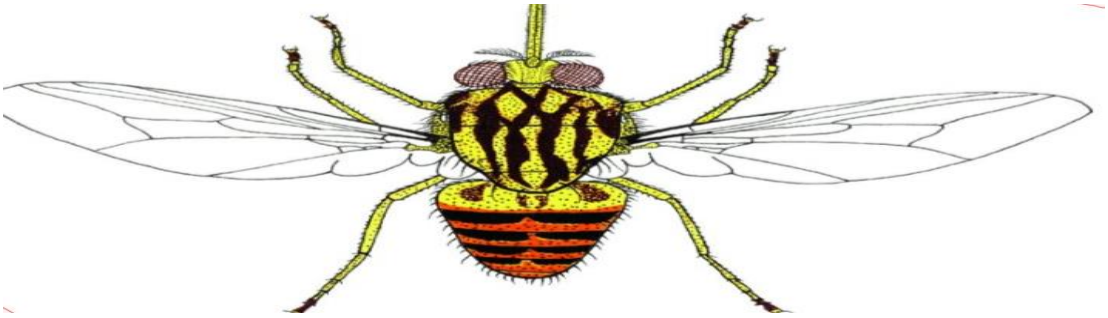

Figure 1: Tsetse fly

Stable Flies (Stomoxys calcitrans)

These flies are probably the most important pests of animals. Stable flies closely resemble common house flies but have bayonet-like piercing type mouthparts that project from the front of their heads. Both sexes are blood suckers. They feed head up and low on the animal around the hocks or flanks. Stable flies have a painful bite, and animal under attack will stamp or kick trying to rid them- selves of this aggravation.

House Flies (Musca domestica)

House flies pose a major threat on animals because of their potential to transmit disease organisms. These insects' active behavior and omnivorous feeding habits make it possible for them to carry disease organisms from materials such as manure and garbage directly into the milk room, milking parlor, or human dwellings. The result can be contaminated milking equipment, milk, or other foods.

Figure 2: House Flies

Horn Flies (Haematobia irritans)

Small, gray-black, blood-sucking flies about one-half the size of house flies, horn flies are primarily cattle pests. Horn flies usually are resting on shoulders or backs of the cattle. However, during extremely hot weather or rainy periods, they will move to the under- side of the animal. When feeding, horn flies characteristically orient themselves with their heads pointing toward the ground and with their wings held at a 45 ° angle. They stay close to the host animal, leaving only to lay eggs or to fly to another animal.

Horse flies

Horse flies also called Tabanids, are insects that are usually strong fliers. As with mosquitoes, only females bite. They are usually daytime feeders and are vicious biters. Their attacks often account for lowered weight gains and lowered milk production. Because of their painful bites and frequent attacks, horse flies produce frenzied behavior in their hosts, sometimes causing them to run long distances in an effort to escape. Tabanids introduce an anticoagulant into the wound when they bite that causes blood to ooze. These wounds are excellent sites for secondary invasion of other insects and diseases, and also cause more blood loss. Being intermittent feeders, they can be important mechanical transmitters of diseases such as anthrax and anaplasmosis.

Figure 3: Horse flies

Sand Flies and Biting Midges

Sand flies are small biting flies, also known as punkies, no-see-ums, or biting midges. All these flies breed in wet or aquatic habitats and are a difficult, almost impossible, pest to control. These flies are predominately a source of annoyance and irritation, but may also cause suffocation because of large numbers. One species is a known vector of bluetongue virus in cattle and some are intermediate hosts of helminths. Little is known of the life cycle of those attacking livestock.

Figure 4: Sand flies

Lice

Most lice are permanent ectoparasites, spending their entire lives on the host. Both immature and adult stages are parasitic; therefore, they must remain on their hosts to survive. Feeding lice irritate host animals, and infestations may be recognized by animal behavior. Sucking lice pierce the host's skin, draw blood and feed off body fluids (blood –suckers). Biting lice have chewing mouthparts and feed on particles of hair, scab, and skin exudations. The irritation from louse-feeding causes animals to rub and scratch, producing raw areas on the skin or loss of hair. Weight loss may occur as a result of nervousness and improper nutrition. The host often is listless. In severe cases, blood loss to sucking lice can lead to anemia and may produce abortion.

Figure 5: Lice

Mites

Mites have the abdomen broadly joined to the thorax with little or no evidence of segmentation. Adults and nymphs generally have 8 legs, and the larval stage has 6. The life cycle of many species requires less than 4 weeks and in some it is as short as 8 days. All but a few species of mites are minute and barely visible to the naked eye.

Itch (Figure 12) and mange mites (Psoroptes, Sarcoptes, and Chorioptes) feed on the surface or burrow just beneath the skin, making very slender, winding tunnels from 0.1 to 1 inch long. The fluid discharged at the tunnel openings dries to form nodules. A toxin is also secreted that causes intense irritation and itching. Infested animals rub and scratch continuously, often producing inflamed areas with only scattered hairs remaining. The infection may spread over the entire body, forming large, cracked scabs on the thickened skin. Infestations are contagious and treatment of all animals in a herd is essential in preventing spread.

Examples of mites are:

- **Psoroptes,sarcoptes and chorioptes:**- on epidermis,cause itching and rubbing to the object
- **Demodex**: - deep in dermis, not cause itching, but cause alopecia.

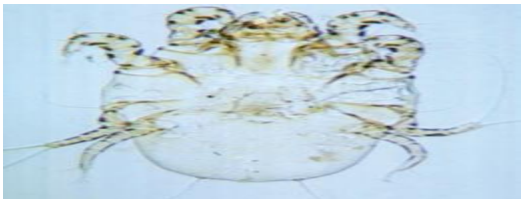

Figure 6: Mites

Mosquitoes

Mosquitoes are small insects with piercing sucking mouthparts, and scales on their wings. Female mosquitoes suck blood but do not always need blood to lay the first batch of eggs. Several species of mosquitoes attack livestock causing painful bites, unthriftiness, and occasionally death by suffocation or heavy blood loss. In addition, their attacks can cause loss of weight and decreased milk production.

Figure 7: Mosquitoes

Ticks

Ticks are blood-sucking ectoparasites of worldwide veterinary significance. Although some are found in dry habitats, ticks are particularly important in warmer, wetter regions where they can be a serious constraint on agricultural production if not adequately controlled. Ticks are easily distinguished from insects, since the body is not definitely divided and the strong fusion of the thorax and abdomen produces a sac-like, leathery appearance. A distinct head is lacking, but there is a head-like structure that bears recurved teeth that are inserted into the wound, allowing the tick to hold on strongly. Tick genera fall into two categories:

a. Ixodidae (hard ticks): which have a chitinous dorsal plate (the 'scutum') and visible mouthparts.

b. Argasidae (soft ticks): which do not have a scutum. Their mouthparts are hidden from view beneath the body.

Tick is classified based on numbers of hosts involved in life cycles.

I) One- host ticks- life cycle occurs only in one host.

II) Two-host ticks- life cycle occurs in two different hosts.

III) Three-host ticks- life cycle occurs in three different hosts. It is the most common one.

Examples of ticks are:

- **Boophilus**:- blue and soft,cause babesia and Anaplasma marginale in animals.
- **Ambyloma**:- Ornate (band of color on legs and back), cause heart water or cowdriosis.
- **Hyaloma**:- in ornate, Cause tick paralysis and babesia.
- **Rhipicephalus**:- cause East Coast Fever,babesia bigemina and Nairobi sheep disease(viral).

Figure 8: Ticks

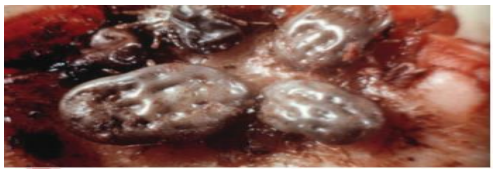

Figure 9: Ear ticks

Fleas

- Common in pets (dogs and cats) also in man especially at the summer season.

3.3. Common parasites versus their animal species

Table1: Parasites Vs Hosts Vs Ecology

Parasites	Definitive hosts	Ecology /Distribution	Intermediate hosts
Fasciolosis	cattle,buffaloes,camels,equines, sheep, goats, pigs and rabbits	Worldwide, higher altitude and cooler areas (muddy or swampy) areas	Snail
Paraphistomum	Ruminants	Worldwide (muddy or swampy) areas	water Snails
Schistosoma	All domestic mammals specially sheep and cattle	Worldwide (muddy or swampy) areas	water Snails, Bulinus and Physopsis species
Ostertagia	Ruminants	Temperate areas of the world	-
Haemonchus	Ruminants	Worldwide Tropical areas	-
Strongylus	Horses and donkeys	Worldwide especially where Equines reared	-
Dictyocaulosis	Ruminants, horses and donkeys	Worldwide	-
Trichostrongylus	ruminants, horses, pigs, and fowl	Worldwide	-
Thelezia	cattle and other domestic animals	Worldwide	Muscid flies
Ascaris	Pig	Cosmopolitan	-
Taenia saginata	Man	Cosmopolitan	Cattle
Taenia sollium	Man	Cosmopolitan	Pig
Echnococcus granulosis	Dogs	Worldwide	Domestic and wild ruminants, man, pig,and eqines

Self-Check -3	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (20 points).

Test I: Choose the best answers (2 points each)

1. Types of parasites lives in the body, organs and tissues of the host and will produce infection in that host is

A. Obligate parasite B. Facultative C. Internal parasites D. External parasite

2. Dictyocaulos is grouped under:

A. Internal, cestode B. External, nematode

C. Internal,Nematode C. Internal, Trematode

Test II: Write the short answers (16 points)

1. What is the criterion used to classify parasites into internal and external? (2 points)
2. List four examples for each of:

i) External parasites (4 points)

ii) Internal parasites (4 points)

3. What makes internal parasites different from external parasites? (3 points)
4. Write ecology, Definitive host and Intermediate hosts of paraphistomum repectively (3 points)

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Information Sheet 4- Assessing and describing parasitic diseases

4.1. Introduction to parasitic animal diseases

Knowledge of the relationship between parasites often allows similarities in life-cycle, epidemiology, pathogenesis and drug susceptibility to be predicted. Parasitism implies nutritional dependence on the host for at least part of the life-cycle. It also involves a high degree of specialised adaptation as the animal body is not a passive ecological niche (like a rotten tree-trunk harbouring beetles, for example) but is responsive and hostile to foreign invasion.Parasitic diseases are diseases caused by parasites and those that commonly cause parasitic or zoonotic disease, welfare problems or economic losses. They affect all the domesticated and wild animals including fish and honey bee. These diseases are caused by:

- internal parasites
- external parasites
- Hemoparasites
- ZoonoticParasites

4.2. Common parasitic animal diseases caused by internal parasites

4.2.1. Parasitic animal diseases caused by Trematodes

Trematodes are flattened oval or worm-like animals, usually no more than a few centimeters in length, although species as small as 1 millimeter and as large as 7 meters are known. Their most distinctive external feature is the presence of two suckers, one close to the mouth, and the other on the underside of the animal. They are small, non-segmented, leaf-shaped and have" suckers "to attach themselves to the:

- Alimentary tract eg. Paraphistomum
- Liver eg. Fasciola and
- Vascular system/blood stream eg. Schistosoma or Bilharzia

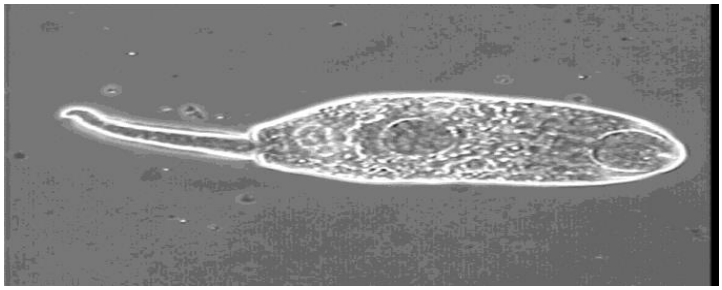

Figure 10: Morphology of adult flukes

Fasciolosis

Fasciolosis is caused by a leaf shaped parasites (liver fukes) in most mammals. They are wide spread morbidity and mortality in sheep and cattle characterized by weight loss, anemia/pale mucous membrane of the eye concurrently with Bacillary hemoglobinuria and hypoproteinemia/bottle jaw. Fasciola hepatica and Fasciola gigantica are the most important species. Fasciola gigantica is larger than Fasciola hepatica.

Hosts:-Most mammals (cattle, buffaloes, camels, equines, sheep, goats, pigs and rabbits), but cattle and sheep are the most important.

Intermediate hosts:-Snails of the genus Lymnaca truncatula is the most common amphibious snail.

Predelication site: - Liver (adult or mature in bile ducts and immature in liver parenchyma)

Distribution: - worldwide and prefers higher altitude and cooler areas (muddy or swampy) areas where environments are favorable for snail production

Clinical signs:- some animals die before producing sign, pale mucous membrane of eye, stop eating, swelling under the jaw/bottle jaw or submandibular oedema due to hypoproteinemia,diarrhea together with other GIT parasites like ostertagia.

Figure 11: Sheep with submandibular oedema (‘bottle jaw’)

Necropsy/postmortem examination:- leaf shaped flukes in liver. It is a” golden standard” for investigation of Fasciola.

Life cycles adult hermoprodite lays eggs in the bile ducts expelled to the intestines with bile

- Eggs are passed to outside with hosts feace
- The eggs hatch to miracidium which penetrate the first intermediate host (snail)
- The parasites reproduce asexually with in the snail and cercaria are produced
- Cercaria “encysts” on vegetation resulting in metacercaria(infective or invasive stage)
- Definitive hosts infected when it ingests metacercaria that are on vegetation
- Metacercaria “excysts” in the small intestine and the immature worm burrows through the intestinal tract
- Finally the worm migrates through the peritoneal cavity in to the liver bile duct.

Diagnosis: - based on clinical sign, history (when animals came from muddy/swampy areas where snail populations are high), postmortem examination and coprological examination (sedimentation) technique for confirmation.Egg is oval,operculate,yellow and large(twice as large as nematode eggs).

Treatment:-Flukicidal drugs like:

- Triclabendazole/fascinex- is effective drug for treatment of fasciolosis since it kills all stages(immature and mature parasites)
- Rafoxanide,closantel,brotianide and oxyclozanide removes flukes over 4 weeks old.

- Albendazole only for adults and repeated after 15 days.

Control:-Reduction of snail populations (intermediate hosts) by

- Drainage where snail habitat is widespread
- Fencing to deny access of animals to that area
- Application of mulluscides to ground or mud e.g. $CuSO_4$
- Use of prophylactic flukicide

Paraphistomum

Hosts:-Ruminants

Intermediate hosts:-water Snails

Site: -Adults in rumen and reticulum but immature in duodenum

Species:- Paraphistomum cervi and Paraphistomum microbothrium

Life cycles;- Similar to fasciola but development in the final host occurs entirely in the alimentary tract

Cinical signs:-In heavy duodenal infection, diarrhea followed by anorexia and intense thirst, rectal hemorrhage and straining, and severe enteritis

Diagnosis: - based on clinical sign, history of grazing around snail habitat, postmortem examination (recovery of small flukes from duodenum and coprological examination (sedimentation) technique for confirmation. Egg is oval, operculate, clear rather than yellow and large (twice as large as nematode eggs).

Treatment:- Rafoxanide(For immature), oxyclozanide and Albendazole only for adults

Schistosomiasis (Bilharzia)

Hosts:- All domestic mammals specially sheep and cattle

Intermediate hosts:-water Snails, Bulinus and Physopsis species

Site: -Vascular or blood stream in mesenteric veins

Species:

- Schistosoma bovin- ruminants in Africa
- Schistosoma mattheei- ruminants and occasionally man in Africa
- Schistosoma japonicum- man and most domestic animals in far east
- Schistosoma mansoni- man and wild animals in Africa

Morphology: - Dioecies(separate sexes)

Egg: large and non-operculated

Life cycles;-

- Adult female lays eggs in mesenteric veins
- Eggs are passed to outside with hosts feace
- The eggs hatch in minutes in water to miracidium which penetrate the first intermediate host (snail)
- Development in to cercarial stage occurs,but no metacercarial stage
- Definitive hosts infected when it drinks contaminated water source by cercaria and via skin penetration by cercaria i.e. cercaria is infective stage
- Finally the worm reached the final site (mesenteric veins) via blood stream through heart and lungs to systemic circulation.

Cinical signs:- diarrhea sometimes blood stained and contain mucus , anorexia ,thirst, anemia and emaciation

Diagnosis: - based on clinical sign (blood stained diarrhea), history of access to natural water sources,and demonstration of eggs in feaces

Treatment:- Praziquantel and Albendazole

Control:- similar to fasciolosis

4.2.2. Parasitic animal diseases caused Nematodes

Nematodes are slender, worm-like animals, typically less than 2.5 millimeters long. The smallest nematodes are microscopic, while free-living species can reach as much as 5 centimeters and some parasitic species are larger still. Nematodes are diocios but few are monoecious.Males are smaller than females. Nematode egg has a great range of size and shape. It may be round, ovoid shaped, one or both sides may be flattened.Colour of most nematodes are clear rather than yellow.

Terminologies

Larva:- is immature form of helminthes (L_1-L_5)

Life cycle:- is the development of a parasite through its various life stages.

Every parasite has at least one definitive host and may have one or more intermediate hosts

- Direct life cycle:- only one host is involved, no intermediate host
- Indirect life cycle:- larval development takes place in one or more intermediate hosts and involves one definitive hosts.

Final/definitive host: - animal in which the adult reproducing stage of the parasite occurs.

Intermediate host:- animal in which part of the immature phase of the life cycle is spent.

Prepatent period:- the time elapses between the entry of the infective stage in to the final host and demonstration of the presence of the parasite with in the host.

Monocious/hermaphrodites: - sex organs are in the same individual.

Diocious: - sex organs are in separate animals.

Life cycle of nematodes

- involves complete life cycle (egg, larvae and adult)
- In the complete life cycle of nematodes there are 4 moults i.e. L_1--L_2---L_3----L_4-----L_5 (Immature adult).

The time required for hatching and moulting to take place is conditioned by the external environment and the two most important binimic factors are temperature and moisture/humidity.

There are two developments:

- **Pre- parasitic development:**- involves development of egg to infective/invasive stage outside the host i.e. L_1----L_2-----L_3
- **Parasitic phase of development:**-initiated after entry of the infective larvae(L_3) in the host i.e. L3-------L4--------L5 (Immature adult)

After entry the larva may be migratory or non-migratory.

- **non-migratory:**- as in the case of GIT parasites , development takes place either entirely in the gut lumen or with only limited movement in to the mucosa
- **migratory:-** the larva travel considerable distances through the body before settling in their final/predelication site.

Ostertagiosis

It is the major cause of parasitic gastritis in temperate areas of the world.

Hosts:-Ruminants

Site: -Abomasum

Species:- *Ostertagia ostertagi* (cattle), O.circumcincita (sheep and goats) and O.trifurcata (sheep and goats)

Life cycles;- is direct, L_3 is infective stage when ingested with feed and non-migratory

Clinical signs:- profuse watery diarrhea(green) anorexia ,thirst, high morbidity, weight loss and submandibular edema

Diagnosis: - based on clinical sign, postmortem examination (worm in abomasum) and coprological examination (floatation) technique for confirmation.

Treatment:- Using anthelmintic like Albendazole, Fenbendazole, Levamizole and ivermectine.

Control:- Deworming specially during summer and winter

Haemonchosis

It is blood sucking abomasal nematode that is responsible for losses in sheep and cattle, especially in tropical areas. It is the most prevalent parasite in sheep and goat.

Hosts:-Ruminants

Site: -Abomasum

Species:- *Haemonchus placei* (cattle), H.contourtus (sheep and goats)

Life cycles;- is direct, L_3 is infective stage, route of infection is ingestion of contaminated feed with L_3 and non-migratory

Clinical signs:- dark coloured feace but no diarrhea ,sudden death especially in sheep due to hemorrhagic gastritis, hemorrhagic anemia due to blood sucking habit of the worms ,progressive weight loss and submandibular edema

Diagnosis: - based on History, clinical sign, postmortem examination (specific location of adults in abomasum), small hemorrhagic lesions on abomasum and coprological examination (floatation) technique for confirmation.

Treatment:- Using anthelmintic like Albendazole,fenbendazole,Levamizole and ivermectine.

Control:- Deworming(chemo prophylaxis) specially during summer and winter

Dictyocaulosis (Verminous pneumonia)

It is the only lung worm of cattle. It lives in bronchi of cattle, sheep, horses and donkeys and causes parasitic bronchitis in these animals.

Hosts:-Ruminants, horses and donkeys

Site: -Trachea, bronchi particularly of the diaphragmatic lobes

Species:- Dictyocaulos viviparous (cattle), D.filaria (sheep and goats) and D.arnifieldi (horses and donkey)

Life cycles;- Female worms are usually ovo-viviparous(producing egg containing fully developed larvae)

- The L_1 migrates (couphed) up the trachea, swallowed and passed with feaces and immediately hatch to L_3.
- The larva is unique in that they are present in fresh feces
- After ingestion L3 penetrates the intestinal mucosa and pass to mesenteric Lymph nodes where they moult to L_4
- L_4 traver via the lymph and blood to the lungs and break out of the cappilaries in about one week after infection
- The final moult occurs in bronchioles a few days later and the adults then move up to the bronchi and matures.

Clinical signs:- Coughing ,tachypnea(more than 60 resp./min.

Diagnosis: - based on History, clinical sign, postmortem examination (larva or adults in air passages), small hemorrhagic lesions on abomasum and coprological examination (modified barman technique from fresh feces) for confirmation.

Treatment:- Using anthelmintic like Albendazole,fenbendazole,Levamizole and ivermectine.

Control:- Deworming(chemo prophylaxis)

Strongylosis

- Are nematodes that are parasitic in large intestine of equines.
- It causes “colic” in horses.

Hosts:- Horses and donkeys

Site: - Caecum and ventral colon

Species:- Strongylus vulgaris, Strongylus edentatus and Strongylus equinus

Distribution:- Worldwide

Life cycles;- Adult parasite lives in Caecum and colon, eggs passed in the feces and development to L_3 under optimum condition takes about 2 weeks, and infection is by ingestion of L_3.

Clinical signs:- Anemia, diarrhea,colic especially S. vulgaris

Diagnosis: - based on History, clinical sign and feacal examination and white or red worms in feces.

Treatment and control:-Broad spectrum antihelmintics and ivermectine.

Trichostrongylosis

Host: ruminants, horses, pigs, and fowl

Site: small intestine except T. axei

Species:

- *Trichostrongylus axei:* – Abomassum(ruminant), stomach in horses and pigs.
- *Trichostrongylus colubriformis:* – ruminants.
- *Trichostrongylus vitrinus* and *Trichostrongylus* capricola: – sheep and goats.
- *Trichostrongylus tenuis*: – small intestine and game birds.

Distribution: – worldwide

Lifecycle

- is direct, Developments from eggs to infective stage(L_3) occur 1-2 weeks.
- Parasitic phase is non-migratory.

Clinical signs

- Heavy infection – rapid body weight loss and diarrhoea.
- Lower infection – inappetence, poor growth rate, soft faeces.

Diagnosis

- Based on clinical signs, seasonal occurrence of the disease.
- Feacal egg counts aid the diagnosis.
- Feacal culture – also help in generic (genus) identification.

Treatment and control

- Like Haemonchus

Keratitis by Thelazia (eye worm)

It is a nematode found in or around the eyes of mammals and can be responsible for keratitis.

Definitive hosts: - cattle and other domestic animals.

Intermediate Host:- Muscid flies

Predelication site: - ocular region especially conjuctival sac and lachrymal duct

Species

- Thelazia rhodesi, T.gulosa, T.skarjabini occur worldwide in cattle
- T. lacrymalis- mainly equines in Europe
- T.californiensis- dog,cat and occasionally sheep in N. America

Life cycles;- The worms are viviparous i.e. produces active larva(L_1)

- L_1 passed by the female worm in to lachrymal secretion is ingested by the fly I.H (Musca) as it feeds and develops in to L_3 in flies.
- L_3 migrates to mouth parts of the fly and transferred to the final host when the fly feeds,no further migration

Clinical signs:- Lacrimation ,photophobia, flies cluster around the eye because of excessive secretion and cornea can be opaque.

Diagnosis: - based on History, clinical sign and observation of parasites in conjunctival sacs.

Treatment and Control:- Mannual removal Using anthelmintic likeLevamizole and ivermectine.

Ascariasis

Morphology of ascaris*:*

Figure 12: Adult Ascaris in small intestine egg*:*

Host: pig

Site : small intestine

Species : Ascaris suum

Distribution:- worldwide

Life cycle:

- it is direct
- Preparasitic phase –(moult) lasts 3 weeks
- Parasitic phase: - after ingestion of egg containing L_2, egg hatch in small intestine, travel to the liver where it moults L_3 then passes to the lungs and then to the small intestine via the trachea.

Clinical signs

- Adult worms cause diminished weight gain
- signs of intestinal or biliary obstruction in piglet under 4 month old
- larvae migrating within the lung cause pneumonia which is transient, rapidly resolving .

Diagnosis : - is based on clinical signs

Treatment - Benzimidazoles, Dichlorvos or Tetramisole.

Oxyuris infection

Hosts: Horses and donkeys

Site: caecum, colon and rectum

Species: Oxyuris equi (called Horse pin worm)

Distribution: world wide

Clinical signs: - intense purities around the anus cause the animal to rub resulting in broken hair, and inflammation of the skin over the rump and tail head. Parasites in the intestine cause no clinical sign.

Diagnosis: – based on clinical signs of anal prurities. Eggs are rarely found an faecal examination.

Treatment – using broad spectrum anthelmintics

Control – using routine chemotherapy using anthelmintics and maintain a high standard of stable hygiene

4.2.3. Parasitic animal diseases caused by Cestodes

Tapeworms are ribbon-shaped multi-segmented flatworms that dwell as adults entirely in the human small intestine. The larval forms lodge in skin, liver, muscles, the central nervous system, or any of various other organs. Cestodes have a tape like body. The body is segmented and each segment contains one and sometimes two sets of male and female reproductive organs.

Life cycle: - It is indirect when eggs passed in the faeces of final host is ingested by the intermediate host

Family:- Taeniidae

Genus:- Taenia

Table 2: Final and Intermediate hosts of Taenia species

Adult tapeworm	Final host	Larva	Intermediate host	Larval site
Taenia saginata	Man	Cysticercus bovis	Cattle	Muscle
T. hydatigena	Dog	Cysticercus tenuicollis	Sheep, cattle, pig	Peritoneum
Taenia solium	Man	Cysticercus cellulosae	Pig, man	Muscle
Taenia ovis	Dog	Cysticercus ovis	Sheep	Muscle
Taenia multiceps	Dog	Coenurus cerebralis	Sheep, cattle	CNS

Taenia saginata and bovine cysticercosis

Distribution: worldwide

Identification (Morphology)*:* Adult is divided into three parts:

A -head: round and small. It has four suction disks

B - Neck: A small, slender neck, about an inch long

C - Number of segments.

Adult tape worms are found only in man and can grow up to 25 meters in the lumen of the intestine, but are usually closer to 5 meters in length.

Larvae (*Cysticircus bovis*): - the mature cyst is greyish white about 1 cm in diameter, it may occur anywhere in the striated muscles of cattle (usual sites include heart , tongue , masseter and intercostals muscles)

Egg present in feces

Life cycle

- From infected human eggs pass either free in the faeces or as in tact segments and contaminate pasture .
- After ingestion by a susceptible bovine the oncosphere travels via the blood to striated muscle .
- It became infective to man after 12 weeks when it reached its full size of 1 cm
- Man becomes infected by ingesting raw meat or inadequately cooked meat.

Clinical signs:

- Naturally cysticerci in the muscles of cattle do not produce clinical signs.
- In man the adult tapeworm may produce diarrhoea and hunger pains

Diagnosis

- Inspection of carcasses including the masseter muscles, tongue, heart, inter costal muscle, diaphragm and triceps muscle (may be incised and examined).

Treatment:

- No drug available which destroy the cysticerci in cattle

Control

a) High standard of human sanitation is needed eg. using toilet

b) The practice of cooking meat thoroughly (thermal death point is 57^0c)

c) Compulsory meat inspection

- Infected carcasses are frozen at -10^0c for at least 10 days kills the cysticerci.
- Destroy the carcass if more than 25 cysticerci are detected.

d) Education of communities

Taenia solium and swine cysticercosis

Distribution: Most prevalent in Latin America, Africa, India and parts of the Far East.

Identification

The adult parasite is found only in man and cysticircus in cattle.

Life cycle: Similar with that of *Taenia saginata* with the difference that man, the final host, may also infected by the final host with the cysticerci. This may occur either from the accidental ingestion of Taenia solium eggs

Clinical signs: Clinical signs are inapparent in pig infected with cycticerci and generally insignificant in humans with adult parasite. However, infection in man with cysticerci may result various clinical signs depending on the location of the cyst.

Treatment:No drug available which destroy the cysticerci

Genus Echinococcus and hyadatidosis

Is one of smallest cestodes of domestic animals .The larval stage (Hydatid cyst) develops in many intermediate hosts including man.

Host: - dogs and wild canidae

Intermediate host: Domestic and wild ruminants, man, pig, horse and donkey

Site: - Adult parasite - in small intestine

Larval stage (hydatid cyst)- most frequently in liver and lungs.

Life cycle:

- The tapeworm in the small intestine sheds only one gravid segment per week.
- After ingestion of the oncospheres by the intermediate host, it penetrates the gut wall and travel in blood to the liver or in the lymph to the lungs.
- Occasionally the larva develops in other organs and tissues.
- Mature hydatid cyst develops in 6-12 months.
- The cysts may reach up to 20 cm in diameter.

- In sheep 70% of the hydatid cyst occurs in the lungs, 25% in the liver the remaining in other organs.
- In horses and cattle more than 90% of cysts are found in the liver.

Pathogenesis and clinical signs

- The adult tapeworm is not pathogenic for dogs

✓ In domestic animals:

- The cyst in the liver or lungs is usually tolerated without any clinical signs; and the majority of the infections are observed only during postmortem examination in the abattoirs.
- Hydatid cyst in kidney, pancreas, CNS, lung or bones, pressure of the growing cyst produces a variety of clinical signs.
- Hydatid cyst in pulmonary or hepatic site is often pathogenic which may cause respiratory systems distress when present in the lung and gross abdominal distension when present in liver
- Rupture of cyst results (a risk of) death from anaphylaxis.

Diagnosis: In dogs - finding of small segments (difficult) and postmortem examination.

Treatment:

In dogs: - praziquantel, quarantine of dogs for 48 hrs after treatment

In man: - excise the hydatid cyst surgically and albendazole, mebendazole and praziquantel

Control

- Regular treatment of dogs
- Exclude dogs from diets of animal material containg hydatid cyst:
  - ✓ By denying dogs access to abattoirs
  - ✓ By proper disposal of offals
- Destruction of stray dogs

Tick paralysis: Is caused by Hyaloma tick.

Mange mites:- caused by Psoroptes,sarcoptes, chorioptes and Demodex.

Damage to skin and hide: - Is due to tick, lice, mites and fleas.

Flea Allergic Dermatitis (FAD):- is common skin disease of pets animals (dogs and cats) that is characterize by allergy and dermatitis.

4.2.4. Common Hemoparasitic diseases

Hemoparasitic diseases are caused by parasites that are common inhabitants of blood circulation (blood parasites) and use blood as part of nourishment.

Examples of Hemoparasitic diseases are:

- Babesiosis
- Anaplasmosis
- Trypanosomiasis
- Theileriosis
- Schistosomosis

Babesiosis

Is an acute disease that strikes either:

a) After a nonimmune animal has been bitten by an infected tick or

b) If a chronically infected animal becomes stressed.

Clinical sign

- After an incubation period of up to two weeks, animals develop fever followed by inappetence, depression and weakness.
- Signs of anaemia and jaundice become increasingly apparent.
- The heartbeat may be audible and the respiratory rate increased.
- The urine turns reddish-brown (haemoglobinuria) and there may be diarrhoea.
- In Babesia divergens infections, spasm of the anal sphincter results in the production of 'pipe stem faeces'.
- Severely affected animals lose weight rapidly and may become comatose and die.
- Pregnant cattle may abort.

Diagnosis

- Parasitized cells are most easily found in capillary blood (obtained by pricking the skin of the inner side of the tail or ear).
- Thick smears on glass slides are examined microscopically after staining with Giemsa.

- The degree of parasitaemia correlates only poorly with the level of anaemia as measured by haematology.

Trypanosomiasis

Trypanosomiasis that is spread by tsetse flies only happens in Africa south of the Sahara. Tsetse flies get infected when they bite infected animals; some animals carry the infection for years without becoming sick .Clinical signs of Trypanosomiasis are: Weakens, Loss weight and become thin, Lacrimation, Some times they eyes are cloudy. The animals have a fever that comes and goes abortion. Horse, mules and donkeys may have swollen legs and swelling under the abdomen.

Theileriosis

There are different forms of theileriosis in the Mediterranean region, Asia and Africa. The disease in Africa is known as East Coast Fever, Clinical cases are infrequent while herd immunity levels are high but any disturbance in epidemiological stability can lead to an outbreak. Morbidity is greatest in nonnative breeds. Signs include enlarged local lymph nodes (especially the parotid as the tick vector feeds in the ear), followed by pyrexia and loss of condition. This can progress to anorexia, emaciation, recumbency and death within three weeks. Biopsy smears from enlarged lymph nodes, stained with Giemsa, will reveal parasites within the cytoplasm of lymphoid cells. Parasitised erythrocytes appear in peripheral blood during the later stages of infection. Treatment is difficult and prognosis poor. An integrated approach to control is advised which places emphasis on the management of risk factors rather than attempting to eradicate the tick vector. Attempts have been made to induce immunity by infecting animals with a low virulence strain and terminating subsequent parasitic development by chemotherapy.

Schistosomiasis

Schistosomiasis is widespread in tropical regions where animals have access to water courses that provide a habitat for aquatic snail intermediate hosts. As treatment is often uneconomic, control is focused on reducing the number of snails or restricting grazing to safer pastures. Clinical signs are mostly attributable to the entrapment of schistosome eggs within capillary beds in the intestine, liver, urinary bladder or nasal

passages (depending upon the Schistosoma species). A massive invasion of cercariae may provoke acute disease but schistosomosis is primarily a chronic condition with diarrhoea, anorexia, emaciation and anaemia as the main signs. As these signs are nonpathognomonic, diagnosis is based on grazing history and demonstration of characteristic eggs in faeces or other appropriate excretion. Autopsy will reveal adult worms within blood vessels, e.g. the mesenteric veins in the case of *Schistosoma bovis.*

4.2.5. Major parasitic zoonotic diseases

are parasitic diseases that can be transmitted from animal to human beings and vice versa.

Taenia saginata/ beef tapeworm/ Bovine cysticercosis

Taeniasis is a parasitic (tapeworm) disease of the small intestine of man due to Taenia saginata(adult stage). Cysticercosis is the tissue infection of cattle due to larval stage or cystic stage of *Taenia saginata* called *Cysticercus bovis* (beef tapeworm). Taeniasis and cysticercosis are common where beef meat is eaten raw or imperfectly cooked.

The cystic stage (Cysticercus bovis) or the 'beef measle' is at first is pin-head sized ,surrounded by a capsule of connective tissue, oval-shaped, pinkish and through the delicate translucent capsule of the cyst becomes thickened, opaque and greyish-white and the head can no longer be seen. Later the cysticercus begins to degenerate (die) under the influence of tissue fluids and become caseous and eventually calcified. In general, *Cysticircus bovis* cysts are usually encountered singly, or in small numbers at meat inspection. Most are degenerated forms; relatively few viable cysts are encountered from the total.

Taenia solium (pork tapeworm/ Swine cysticercosis):

Taeniasis due to *Taenia solium* is an infection of the small intestine of man with the adult stage of the pork tapeworm. Cysticercosis is the tissue reaction with its larval or cystic stage (*Cysticercus cellulosae* / 'pork measles'), which occurs most commonly in the musculature of the pig.

Predilection sites for *Cysticercus cellulosae* (cysticercosis) are heart, diaphragm, and internal masseter, tongue, neck, shoulder, intercostals and abdominal muscles. The liver, lungs, kidneys, eye and brain are less often affected. The deep muscles of the thigh are often involved so that absence of infection of the usual sites does not necessarily indicate the absence of cysts in the carcass musculature.

Taenia hydatigena (Cysticercus tenicollis)

The adult tapeworms live in the small intestine of dog and other wild carnivores and the intermediate stage (*Cysticercus tenicollis*) in cattle, sheep, goats and pigs.

The bladder worm is fairly large (diameter up to 5-6 cm), has a characteristic long neck and is therefore called *Cysticercus tenicollis.* The larval cyst occurs under the peritoneum covering the liver, the momentum or mesentery.

Taenia ovis

It is an armed tapeworm which lives in the small intestine of dog and wild carnivores. The intermediate hosts are sheep and goats. The bladder worm is called *Cysticercus ovis*.

Echinococus granulosus (Hydatid cyst)

Hydatidosis due to *Echinococus granulosus* is a serious zoonosis in which man is accidental intermediate host. *Echinococus granulosus* is one of the smallest armed tapeworm which lives in the small intestine of dog. The adult worm is 0.5-2cm. long and consists of only three or four segments. The cystic stage is a hydatid cyst.

The size of hydatid cysts in animals varies from that of a marble to a small football; they contain a clear watery fluid in which brood capsules may be floating around (so called hydatid sand). They are surrounded by a reactive connective tissue capsule. Sometimes the cyst degenerate becomes smaller with the fluid being replaced by caseous material, which may calcify. Hydatidosis in man is a serious and sometimes fatal disease. In order to break the life cycle of the parasite it is imperative that all organs or tissues containing cysts should be condemned and effectively destroyed.

Trichinella spirallis (Trichinella cyst)

It is a parasite of great public health importance in which the adult worm is found in the small intestine of man, pigs, rats, dogs, cat, and other mammals. The larvae enclosed in oval cysts (lemon-shaped) with their long axis parallel to the muscle fiber. The cysts measure about 0.5 by 0.25mm. Even though the cyst can remain alive for many years it tends to become calcified. Infection results from the consumption of raw or undercooked flesh of animals containing viable encysted larvae.

Diphylobotrium latum

Is zoonotic and man may acquire the infection by eating infected raw or undercooked meat of fish.

4.2.6. Major Protozoal zoonotic disease

Zoonotic parasites are typically grouped based on their mode of transmission into 4 groupings:

- Direct-zoonotic:- infect humans directly from animals (Entamoeba histolytica)
- Meta-zoonotic:- can infect humans from invertebrate intermediate hosts (Babesia bovis, Fasciola hepatica).
- Cyclozoonotic:- have vertebrate intermediate hosts (Taenia multiceps, Echinococcus granulosus)
- Sapro-zoonotic parasites: – are transmitted from soil or water (Cryptosporidium).

Cryptosporidiosis

It is caused by Cryptosporidium species. *Cryptosporidia parvum* and *Cryptosporidia hominis.* The predominant species associated with bovine and human infection. The Host cell/tissue affected is small intestine epithelium of the duodenum and jejunum and routes of transmission is contact to faeces and contaminated water

Toxoplasmosis

The disease is caused by *Toxoplasma gondii. Toxoplasma gondii is* a multi-host obligate intracellular protozoan parasite, causing zoonotic infections throughout the world. Toxoplasmosis is the most frequently occurring disease with drastic

consequences to the host including abortion in both human and various animal species. Host species become infected following ingestion of *Toxoplasma gondii* oocysts from cat faeces or contaminated soil, water, or foodstuffs e.g. greens and the consumption of infected undercooked meat. *Toxoplasma gondii* can pass vertically via the placenta to the foetus causing encephalitis, mental retardation, loss of vision in humans and stillbirth and abortions in cattle and other livestock animals. Host cell/tissue- any nucleated cells. Routes of transmission-contact to faeces and contaminated water

Self-Check -4	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (20 points).

Test I: Short Answer Questions (20 points)

1. Is the following statements are true? Put your justification (2 points for each):
   1.1. Predelication site for Fasciola is lung.
   1.2. Schistosomiasis is protozoal disease caused by hemoparasite.
   1.3. Hamonchosis is zoonotic parasitic disease.
   1.4. Trypanosoma is hemoparasite of ruminants transmitted by tsetse flies.

2. Write Invasive stage of the following parasites (1point for each):
   2.1. Dictyocalus
   2.2. Fascola
   2.3. Taenia (cysticercus)

3. Write at least three parasitic diseases of zoonotic importance (3 points).
4. Put four examples of parasitic diseases caused by hemoparasites (2 points).
5. Put down the life cycle for Fasciola and ostertagia (2 points).
6. Write the common clinical signs of Trypanosomiasis (2 points).

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

5.1. Types of samples for diagnosis of parasites

Samples needed for identification of parasites include:

- Feces
- blood,
- skin scrapping
- tissue/organ

Table 3: Samples needed for parasitological examinations

Conditions / diseases	**Samples and method of sampling**
Mange mites	Skin scrapping/Discharges/hair
Haemoparasites	Blood with anticoagulants
	Blood films e.g. thin smear
Trichomonosis	Vaginal/ preputial washing
GIT or Respiratory parasites	Faecal sample
Small Ectoparasites (Lice, fleas, etc)	Take parasites (Lice, fleas, etc) by Fine forceps, inverted glass/tubes
Large insects e.g.flies	Collect insects by wide mouthed collecting net/Traps
Ship ked	Shearing wool
Ticks	Careful removal using foreceps / manually

5.2. Sites of sample collection for diagnosis of parasite or parasite eggs

Sites for faecal sample: - feacal sample is collected either directly from rectum or from freshly deposited faeces on the ground.

Sites for blood sample collection

Blood sample is collected by puncture of vein from live animals or from left ventricle or other organs of dead animals. It is possible to find blood parasites just after the animal is died. In laboratory, if the blood sample is only to make a smear, it is advisable to take

a small amount of blood from the ear vein of horses, cattle, sheep, goats, pigs, rabbits, cats and dogs, in chicken it is better to take from the wing vein.

Table 4: Part of the body from which blood sample can be collected

Animal	Blood to be taken from.
Mice	Tail vein.
Chicken	Wing vein
Rabbits	Ear vein
Equine	Jugular vein
Pig	Ear vein
Cattle	Jugular or ear vein
Sheep and goat	Jugular or ear vein.
Dog and cat	Femoral vein

Ticks sample collection site – it is taken from animal surface.

Site of sample for Skin scrapings- Skin scrapings are part of the basic database for all skin diseases. There are 2 types of skin scrapings, superficial and deep:

- Superficial scrapings do not cause capillary bleeding and provide information from the surface of the epidermis.
- Deep skin scrapings collect material from within the hair follicle; capillary bleeding indicates that the sampling was deep enough.

5.3. Collection of sample for diagnosis of parasite or parasite eggs

Faecal Sample collection

Materials used for Faecal Sample collection include: Gloves, Lubricant, Labeling paper, Universal bottle, Restraining device, Preservatives (if necessary).

Procedures for Faecal Sample collection

- Restrain the animals.
- Wear arm length protective gloves (cut Sharp nails and remove rings before using gloves).
- Lubricate the gloved hand with lubricant.

- Make the hand in conical shape.
- Insert the hand directly to the rectum.
- Then, finally collect the fecal sample and place to the universal bottle (use preservative if necessary).

Blood Sample collection

Blood sample collection materials include: Slides, Cotton, Syringes, Sample tube, Scalpel blades, Needle holder, Disinfectants, Wire or plastic loop, Ice box with ice packs, Hypodermic needles, puncturing needles and sterilized lancet.

Procedures for Blood Sample collection:

- Restrain the animal.
- Locate the vein (bind if necessary).
- Shave the area.
- Wash it with water and soap.
- Disinfect with 70 % Alcohol.
- Leave the skin to dry for some minutes.
- Puncture with needle and syringe.
- Extract 5ml of blood, withdraw the needle and pass the blood to a tube containing any anticoagulant agent.
- Mix inverting turning upside down the tube (5-7 times), till homogenizing the blood.
- Make duplicate smear if necessary.
- Identify and send the blood sample, use refrigerator if more than 2 hours elapse to take the sample to laboratory

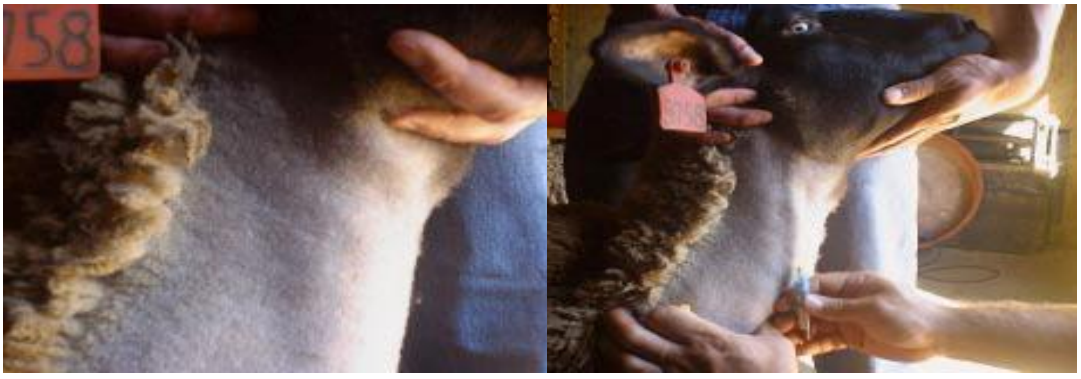

Figure 14: Photo for preparing animal and locating site for blood sample collection

Ticks sample collection

Materials needed are: Container sample and 70% alcohol.

Procedures of Ticks sample collection:

- Sample is taken from the body of infested animals with pointing finger and thumbs trying to take the nails deep to the end where the ticks are fixed.
- Exert light force and small movements in all aspects till the tick is detached from the body of the animal.
- Put the collected ticks in a container containing 70% alcohol.

Skin scraping collection

Materials include: Petridish or test tube, Scalpel blade with handle, Disinfectants (Alcohol or Savlon), Cotton and paraffin oil.

Procedure of Skin scraping collection and preservation:

- Clean the lesion with 70% alcohol.
- Immerse the blade in a drop of paraffin oil.
- Scrap the lesion with a scalpel blade till blood oozes. The scraping will adhere to the blade.
- Put the scraping material into a test tube/petridish.
- Finally identify the sample and send to the laboratory

Self-Check -5	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (20 points).

Test I: Choose the correct answer (4 Points)

1. Representative sample for Haemoparasites is:

A. Urine B. Feces C. Saliva D. Blood E. Skin scraping

2. Possible site for blood collection from the sheep is:

A. Jugular vein B. Ear vein C. Rectum D. A and B

Test I: Short Answer Questions (16points)

1. Write samples needed for identification of parasites (4 Points).

2. Write site of blood sample collection for the following animals (1 Point each):

2.1. Horse
2.2. Chicken
2.3. Cattle
2.4. Dog

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

Information Sheet 6- Describing Principles in clinical and laboratory diagnosis of parasites

6.1. The basic clinical and laboratory diagnosis of animal parasites

Clinical diagnosis:- is the type of diagnosis of parasites based on clinical sign and performing clinical examination. Clinical diagnosis of animals can be done by: taking history and symptoms of the animal from the owner, visual observation (inspection), palpation, percussion, auscultation and Physical body parameters.

Laboratory diagnosis:- is when the adult and eggs of different species of parasites are identified accurately with in the laboratory.

The following are basic techniques used for confirmatory diagnosis of parasites.

Fecal examination

Hematological techniques

Ectoparasite examination

6.1.1. Fecal examination

Fecal examination is used for identification of internal parasite eggs and larvae. Fecal examination is divided into two. These are:

Gross/macroscopic examination

Microscopic examination

Gross examination of feces

It is done by naked eye. During gross (macroscopic) examination consistency of the feces, odour and color can be noted. Presence or absence of adult / immature parasites is also examined. Most cestodes of veterinary interest pass their proglottids in the feces. Diagnosis can therefore be made at this level. Hand glass can be used if necessary.

Microscopic examination

Microscopic examination is performed with the aid of microscope. It includes: qualitative technique and quantitative technique.

Qualitative fecal examination

Used to know whether an animal is infected or not / presence or absence of infection. It is not expressed with number. Used to separating, concentrating and demonstrating eggs, oocysts and larvae in fecal samples. The following methods are described for qualitative fecal examination:

- Direct fecal smear
- Concentration methods (Simple floatation method and Sedimentation method)

Direct fecal smear examination method

Most eggs and larvae can be detected. It is simple, fast and used at inadequate facility of laboratory materials. It is fails to diagnose low-grade infections. Disadvantage of the direct smear procedure is the small amount of faeces used, which greatly reduces the chance of finding parasite eggs or larvae or protozoan cysts. Materials used for direct fecal smear examination method are: Microscope, Balance, Hand gloves, Petri dish or sample container, Slide, Pipette, Cover slip, Mortar and pestle, Beaker, Glass rod or wire or plastic loop and Tea spoon.

Procedures of direct fecal smear

- A small amount of faeces is emulsified on a slide with a few drops of water/saline.
- Spread the emulsified material thinly over the slide.
- Cover with a cover slip and examine directly under low objectives (4-40X).

Result: eggs of parasite for positive result

Concentration methods of fecal examination

It is used to concentrate parasitic material from a larger fecal sample into a smaller volume, which may be examined microscopically. There are two primary types of concentration methods used in veterinary practice:

- Simple flotation technique
- Sedimentation technique.

Simple floatation technique

This method is the qualitative test for the detection of nematode and cestode eggs and coccidia oocysts in the feces. It is based on the separating of eggs from fecal material

and concentrating them by means of a flotation fluid with an appropriate specific gravity. The method is quick and cheap but doesn't collect the heavy eggs of trematodes, and immature ascaris eggs. Eggs of most nematodes, oocysts and cestodes float in saturated solutions with a specific gravity of 1.1-1.2. The specific gravity of floatation fluids is higher than that of the eggs so that the eggs float up at the top of the test tube. The floatation fluids used for floatation techniques are:

- saturated salt/sodium chloride solution,
- sugar solution
- Zink sulphate
- magnizium sulphate

Materials used for Microscope Simple floatation technique, Balance, Hand gloves, Petri dish or sample container, Slide , Sieve, Measuring cylinder, Test tube rack, Cover slip, Mortar and pestle, Beaker, Glass rod or wire or plastic loop, Teaspoon and floatation fluids.

Procedures for floatation techniques:

- Take approximately 3 gm of fecal sample
- If the feces are pelleted grind it using pistle and mortar.
- Add saturated floatation fluid (30-50 ml) and mix thoroughly.
- Pour the fecal suspension through a tea strainer (sieve) to remove large fecal debris (you can use double layers of gauze).
- Pour the suspension into a test tube until a convex meniscus is formed.
- Cover with a cover slip/slide. Avoid trapping air bubbles.
- Allow it to stand 10-15 minutes
- The cover slip is removed, by lifting it vertically with a deliberate movement and placed on a microscope slide or one drop is taken using a loop from the supernatant of the centrifuge and spread over the slid.
- Examine under microscope

Result: egg of nematode or cestode or oocyst for positive result.

Sedimentation technique

It is qualitative method for detecting trematode eggs (Fasciola and Paramphistomum) in the feces. Most trematode eggs are relatively large and heavy compared to nematode eggs. This technique concentrates them in sediment by using water. Egg of parasite concentrated at the bottom of the test tube in the sediment because specific gravity of the egg is higher than that of the water.

Materials for floatation techniques *are:* Microscope, Centrifuge**,** Balance**,** Hand gloves**,** Petri dish or sample container**,** Slide, Sieve**,** Measuring cylinder**,** Test tube rack**,** Cover slip**,** Mortar and pestle**,** Beaker**,** Centrifuge tube**,** Glass rod or wire or plastic loop *and* Teaspoon.

Procedures of sedimentation technique:

- Take 3 gm of fecal sample and grind it using pistle and mortar
- Mix with 40-50 ml of tap water in a beaker.
- Pour the mixture through a tea strainer and discard the material in the strainer in to another beaker.
- Pour the filtered material into a test tube.
- Allow it to sediment for 5-10 minutes and then decant approximately 70% of the supernatant and refill the tube/beaker with fresh water. Be careful while decanting the supernatant.
- Repeat this step until the supernatant is clear.
- A drop of methylene blue may be added to separate the egg of fasciola from that of paraphistomum
- Examine the sediment under a microscope
- If a centrifuge is available, the mixture in the test tube can be centrifuged at 1500 rpm for 3 minutes only.
- A drop of methylene blue may be added to facilitate visualization of parasite eggs such as Trematodes.
- Examine under microscope with 10×40 magnification.

Result: Large, operculate and yellowish eggs for fasciola, but large, operculate and blue coloured eggs for paraphistomum.

Quantitative fecal examination

The quantitative examination of feces is used to determine the degree of parasitism based on the number of fecal egg count per gram of feces (epg) and number of nematode larvae. Examples of quantitative fecal examination are: Mc Master egg counting method, Fecal culture and baermann technique.

Mc Master egg counting method

It is the simplest and most effective method for determining the degree of parasitism by counting the numbers of nematode eggs or oocysts per gram of feces. This procedure is good if a lot of sample is to be processed. It determines degree/severity of infection by nematode parasites in animals. Accordingly degree of infection is divided in to three:

- Low infection
- Moderate infection
- High infection

Materials are**:** Microscope**,** Centrifuge**,** Balance**,** Hand gloves**,** Petri dish or sample container**,** Slide**,** Sieve**,** Cover slip**,** Mortar and pestle**,** Beaker**,** Centrifuge tube**,** Glass rod or wire or plastic loop and Teaspoon.

Procedures of Mc Master egg counting method

- Mix directly 4 gm of feces with 56 ml of flotation fluid in beaker 1 with stirring device.
- Filter the fecal suspension through a tea strainer or a double-layer of cheesecloth into Container 2.
- Take a sub-sample with a Pasteur pipette.and fill both sides of the Mc Master slide.
- Allow the counting chamber to stand for 5 minutes is important as it allows time for eggs to float in the chamber.
- Examine the sub-sample of the filtrate under a microscope at 10 x 10 magnifications.
- Count all eggs and coccidia oocytes within the engraved area of both chambers.

The number of eggs per gram of feces can be calculated as follows:

Add the egg counts of the two chambers together and multiply the total by 50. This gives the epg of feces.

Example: 13 eggs seen in chamber 1 and 16 eggs seen in chamber 2 = (13 + 16) x 50 = 1450 e.p.g. or count the total numbers of eggs in one chamber and multiply by 100 to get the epg of feces.

Result: eggs of nematode on either one or both chambers of mc master for positive result obtained.

- Low infection when 2 to 10 eggs are found on a field
- Moderate infection when 10 to 20 eggs are found on a field
- High infection when more than 20 eggs are found on a field

Fecal culture

Principle of fecal culture is that, since many nematode eggs are alike and species such as Haemonchus, Mecistocirrus, Ostertagia, Trichstrongylus, Cooperia, Bunostomum, and Oesophagostomum cannot be clearly differentiated from the eggs in fecal samples. For these parasites, differentiation can be achieved by the use of fecal cultures. Fecal cultures provide a suitable environment for the hatching and development of helminth eggs into the infective stage (L_3).

Procedures of fecal culture

- Break up collected feces finely using a stirring device.
- Feces should be moist and crumbly. If feces are too dry, add water. If feces are too wet, add charcoal (or sterile bovine feces) until the correct consistency is obtained.
- Transfer the mixture to containers or petridish.
- Leave the culture at room temperature for 14-21 days, by which time all larvae should have reached the infective stage.
- If an incubator is available, the culture can be placed at 27°C and left for 7 to 10 days.
- Add water to cultures regularly (every 1-2 days).
- Larvae are recovered using the Baermann technique.

Baermann technique

The Baermann technique is used to isolate lungworm larvae/dictyocaulos from fresh fecal samples and infective larvae from fecal cultures. It is based on the active migration of larvae from faeces suspended in water and their subsequent collection and identification.

Materials used include: Microscope, Stove 40^0C or water bath, Glass funnel, Gauze, Pipette , Petri dish, Sieve, Stirring rod, Beaker and Teaspoon.

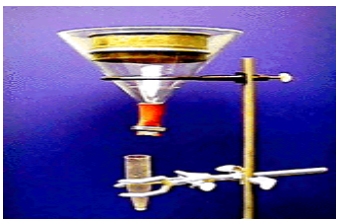

Figure 15 Baermann apparatus

Procedures of Baermann Technique

- Fit a short piece of tubing which is closed at one end with a clamp or spring clip, to the stem of a funnel of appropriate size.
- Support the funnel by a stand.
- Weigh or measure about 5-10 g of fecal culture/feces and place it on a piece of double-layer cheesecloth.
- Form the cheesecloth around the feces as a "pouch".
- Close the pouch with a rubber band.
- Place the pouch containing fecal culture material or feces in the funnel.
- Fill the funnel with warm water, covering the fecal material.
- Put another beaker under the funnel
- Leave the apparatus in place for 24 hours, during which time larvae actively move out of feces and ultimately collect by gravitation in the stem of the funnel to the beaker.
- Take the supernatant from the beaker by pippete, put on the slide, cover with coverslip and examine under stereomicroscope.

Result: larvae of nematode or cestode or oocyst for positive result.

6.1.2. Hemaotological techniques (Blood and organs examination)

Different Protozoans are affecting the animal, such as, Trypanosomes, Babesias, Anaplasmas and Theileria. In this country the most important haemoparasite is the Trypanosoma. Clinical diagnosis of Trypanosomes is carried out on suspected animals. In the laboratory there are different methods for the microscopic observation of the blood cells, different types of parasites, and the concentration of hemoglobin. Since there are not specific pathognomonic signs of Trypanosomiasis, which is especially in chronic forms resembles any other parasitic or infectious conditions causing physiological stress, anemia, edema, lymphoid hypertrophy etc. Mean that the confirmatory diagnosis is made by examination of the blood from the suspected animal.

These are the common methods of blood examination for hemoparasites:

- Wet blood preparation
- Thin blood smear examination
- Thick blood smear preparation
- Buffy coat technique
- Packed cell volume

Wet blood preparation

This technique is used to determine the movement of the parasite in the blood. We can detect the movement of the parasite, but the morphology of the parasite cannot see.

Procedures of Wet blood preparation:

- Take a drop of fresh blood on a clean slide.
- Cover with cover slip.
- Examine immediately under microscope under high dry magnification power (40X).

Result:

- The flickering parasite movement will be observed for positive result.

Thin blood smears examination

This method is used to detect blood parasite and to study about the morphology of erythrocytes and it is the most effective method, but when the animal has a low parasitaemia the infections cannot be detected.

Procedures of Thin blood smears examination:

- Take a small drop of blood sample.

- Put it on the one end of a clean slide (If the slide is frosted placed the blood on the smooth glass near to the frosted end).
- The slide should be hold firmly.
- Take another clean slide placing on the first slide at 45^{o}, behind on the drop of blood.
- Move the angled slide along the first slide with a steady movement to forward direction. A quicker movement results a good smear.
- Dry it in air.
- Fix by methanol not less than 5 minutes or ethanol-ether (1:1) not less than 10 minutes, or ethanol not less than 15 minutes.
- Allow to be dry the slide.
- Stain with Giemsa solution for 30 minutes.
- Wash with tap water.
- Allow to be dry the slide.
- Examine with oil immersion under high magnification power.

Result:

- Positive -The morphology parasite will be observed, if it is present.

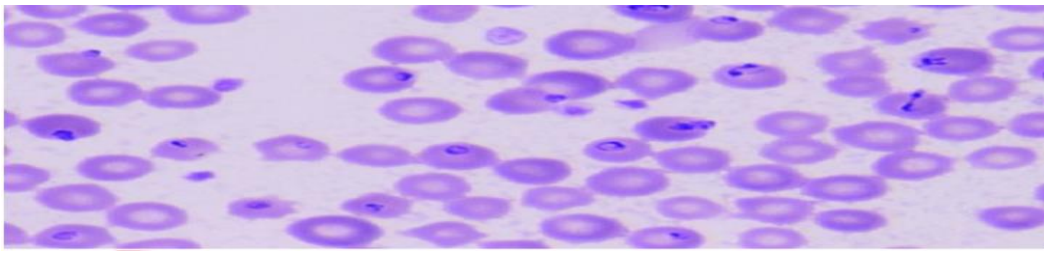

Figure 16: Babesia divergens within RBC in a blood smear.

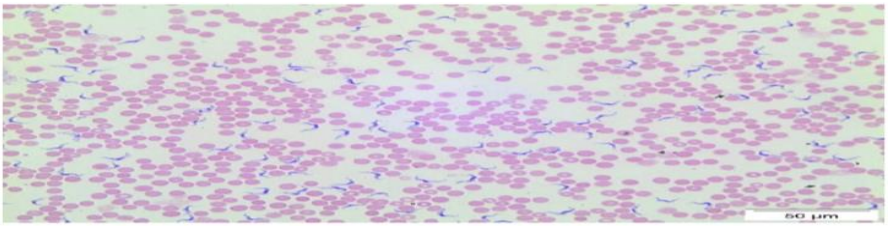

Figure17: Trypanosomes in blood smears

Thick blood smears preparation

This technique is used when the animal has a low infection. If thin blood smears difficult to detect, we can use thick blood smear.

Procedures for Thick blood smear preparation:

- Put a drop of blood at the centre of the clean slide.
- Smear it using the sterilized wire or plastic loop.
- Dry it in air.
- Fix by methanol alcohol for 3-5 minutes.
- Allow to be dry the slide.
- Stain with Giemsa solution for 20-30 minutes.
- Wash with tap water.
- Allow to be dry the slide.
- Examine with oil immersion under high magnification power.

Microhematocrit technique (Buffy coat)

Principle: This method can be used in low level of infection; it is easier to detect trypanosomes when they are concentrated. They can be concentrated by centrifugation of a given volume of blood.

Procedures of microhematocrit technique (Buffy coat):

- Take the blood sample in a Microhematocrit tube (fill ¾ of the tube).
- Plug the tube at one end with sealant after wipe the outside of the tube.
- Place the tube into the Microhematocrit centrifuge with plugged end outward and centrifuge at 10,000rpm for 5minutes.

- Remove the capillary tube from a centrifuge and examine the sample directly in the capillary tube under microscope using 40 magnification powers or cut the tube at the middle.
- Put it on the slide and cover with cover slip.
- Finally examine under microscope.

Note. Since the tubes are too small to be marked, it is essential to note the number of the slot for respective tubes.

Results:

- Positive: presence of the parasite will be observed.
- Negative: the parasite will not be observed.

Note: It would be necessary to revise at least 3 fields for accurate results and to conclude that the result is positive. For a negative diagnosis instead it is required to revise the whole preparation.

Pack Cell Volume

Principle: This technique is used for determine the percentage of red blood cells in a given volume of whole blood and it is expressed as percentage or as a decimal fraction.

Procedures of Pack Cell Volume technique:

- Mix the blood collected with anticoagulant by inversion of tube about 5-7 times
- Fill ¾ of Microhematocrit capillary tube.
- Wipe blood tip of capillary and seal the vacant end of the tube with sealant.
- Place the tubes on the head in slots with the open ends toward the center and sealed ends outwards.
- Centrifuge for 5 minutes at 10,000 rpm.
- Take out the capillary tube from the centrifuge and read on Microhematocrit reader.

6.1.3. Identification of external parasites

Most of the time external parasites are visually examined and skin scraping.

Self-Check -6	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (20 points).

Test I: Choose the correct answer (2 Points each)

1. Which one of the following method is concentration technique for diagnosis of Haemoparasites

A. Buffy coat B. Wet smear C. Giemsa stain D. Thin and thick smear

2. For examination of feces by baermann tecknique the result will be:

A. egg B. Larva C. Adult parasite D. All

Test II: Match the following (2 Points each)

A	B
1. Sedimentation	A. Enumerate larva of Nematodes
2. Floatation	B. Used for identification of Trematodes
3. Fecal culture	C. Movement of Hemoparasites
4. baerman technique	E. Hatching of egg to larvae
5. Wet fim	F. Cestodes eggs identification

Test III: Short Answer Questions (6points)

1. Write the common methods of blood examination for hemoparasites (2 Points).

2. Write at least three floatation fluids used for floatation techniques (2 Points)

3. Write at least four materials used for thin smear preparation (2 Points).

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -10 points** **Unsatisfactory - below 10 points**

Information Sheet 7- Prescribing and administering animal treatments

7.1. Prescribing animal treatments

The prescription writing is an instruction from a prescriber to a dispenser. It is the link between the prescriber, the dug dispenser and the patient. Appropriate prescription should give relevant information instruction and warning to the patient. A prescriber should depend on the result of diagnosis to prescribe the drug. It should include the following:

- Date of prescription
- Generic name of the drug, form and strength of the drug.
- Formulation of the drug (tablet,oral,feed additive,ointment) Strength of the drug
- Dose,route of administration and frequency should also stated.

Frequency should be stated according to the following table

- amp. = ampule
- a.d. = right ear
- a.s. = left ear
- a.u. = both ears
- c. = with
- cap. = capsule
- disp. = dispense
- gtt(s). = drop(s)
- IM = intramuscular injection
- IN = intranasal
- IP = intraperitoneal (within abdominal cavity)
- IV = intravenous injection
- o.d. = right eye
- o.s. = left eye
- o.u. = both eyes
- a.c. = before meals
- p.c. = after meals
- h. = hour
- h.s. = at bedtime
- q = every (as in q 8 hours)
- SID = every day (q day or q 24 hours)
- BID = twice a day (q 12 hours)
- TID = three times a day (q 8 hours)
- QID = four times a day (q 6 hours)
- QOD = every other day
- PRN = as needed
- Sig.: = directions to patient
- stat = immediately

- PO = per os, meaning given by mouth or orally
- q.s. = a sufficient quantity
- SubQ, SQ or SC = subcutaneous injection
- susp. = suspension
- tab = tablet
- Ut dict. = as directed

7.2. Treatment of parasitic diseases

Treatment is act of using different drugs for infected (diseased) animals to cure, suppress and control a disease.

7.2.1. Drugs used for treatment of parasitic diseases

I) Anthelmintics

They are antiparasitic agents that kill helminth parasites (cestodes trematodes and nematodes), which inhabit the alimentary tract and associated structures and organs such as liver, lungs and the blood circulation. Common Preparations (formulations) of anthelmintics available include:- drench (as suspensions), paste, bolus, syringes, topical preparations (pour on or spot on), and in feed preparations. The Modes of action of antihelmintics is to inhibit energy and cause neuromuscular block and paralysis of parasite. There are 7 important classes of anthelmintics. These include:

- Benzimidazoles
- Imidazothiazole
- Avermectins
- Tetrahydropyrimids Salicylanilides
- Piperazines and
- Praziquantel

Benzimidazoles: -represents a large family of broadspectrum agents, poorly soluble and therefore are generally given by mouth. They are more effective in horses and cattle. This class includes: albendazole, Fenbendazole, Mebendazole, triclabendazole etc.

Albendazole (valbazen)- It is potent broad-spectrum anthelmintics in ruminants against gastro intestinal nematodes , lungworms, inhibits ostertagia larvae , moneizia, and Horse lungworms. Warning (Toxicity): - Albendazole is teratogenic in ewe and embryo

toxic in cow, causes abortion so avoid using in early pregnancy (45 days) in this species.

Fenbendazole (Panacur)- a broad spectrum Anthelimitics. It is active against GIT and lung nematodes, cestodes in cattle, sheep, goat & horse.

Mebendazole (Mebenvet, vermox) - it is effective against round worms, tapeworms and tapeworm larvae.including:

- In ruminants' major GIT nematodes, lungworms and moniezia.
- In Horse: Ascarids& lung worms
- Pig: lung worms
- dog and cat : Ascarids, tape worms (Taenia , echinococcus)
- poultry: tape worms.

Triclabendazole- is narrow spectrum & the most effective anthelmintics against all stages of fasciola.

Imidazothiazoles: - this derivative includes levamizole and Tetramizole.

Tetramizole Hydrochloride: - It is effective against the major GIT worms of cattle, sheep and goats. It is given by PO or injection.

- In cattle& shoats: major GIT worms and lung worms
- Pig - ascaris, oesophagostomum

Levamisole:- is antinematode and immunostimulant. It causes spastic paralysis of worms. Anthelmintic spectrum of levamizole in cattle and sheep is:

- major GIT nematodes, respiratory nematodes (Dictyocaulus), eye worm (theilazia),
- In dog and cats: ascarids and hook worms

.Avermectins includes:

ivermectins (Ivermectins) is highly effective at low doses, is safe, and provides broad-spectrum activity against nematodes and ectoparasites of animals. Ivermectin is also called endectocidal drug because it is active against endoparasites (nematodes) and ectoparasites.. Warning : - Avoid injection in horse. They are contraindicated for use in cow and goats being milked for human consumption.

Tetrahydropyrinlidines:- it includes salts of morantel and Pyrantel.

Pyrantel;- It is a broad spectrum against GI nematodes in ruminant and horse. Warning:- avoid using with piperazine and levamisole is contraindicated to use in emaciated animals.

Morantel- It has similar action to that of pyrantel. It is safer and rapidly absorbed from the gut. It is highly effective against nematod in ruminants.

Salicylanilides: - include cloxanide, closantel ,niclosamides, oxyclozanide and rafoxanide.

Cloxanide :- It is highly effective against mature fasciola hepatica of sheep and calf.

Closantel :- It is effective against Haemonchus, bunostomum adult and juvenil (immature stages) fasciola flukes . Also against ticks mites & fly larva.

Niclosamide :- It is highly effective against tape worms (moniezia) , and immature Paramphistomum of ruminants , dog and cat. ova of tape worms are not affected.

Oxyclozanide:- It is highly effective against mature fasciola hepatica of ruminants.

Rafoxanide:- It is effective against adult and juvenile (6-10weeks) fasciola flukes Haemonchus and bunostomum round worms Others Nasal bots and fly maggots.

Piperazines; - this group includes piperazine and diethylcarbamazine citrate.

Diethyl carbamazine citrate:- It is used for life time prophylaxis against heart worm microfilaria of dog and for the treatment of paralytic tracheobronchitis of dog and dictyocaulus infection of ruminants.

Piperazine: - It is highly effective against ascarids in all animals and nodular worms / Oesophagostomum) of ruminants and pigs. It is quite a safe drug

Praziquantel: It is highly effective against tapeworms and flukes of man and animals.

II) Acaricides

Acaricides are drugs which kill acarines. There are six classes of acaricides. These are:

- Organophosphates
- organo chlorines,
- pyrethrins and pyrethroids ,
- diamidines
- ivermectin, and
- carbamates

Organophosphates: - is Indicated against flies, lice, ticks, mange mites , *oestrus ovis* and *gastrophilus larvae* , sheep keds in horse, cattle , sheep , goat , cat , pig , chicken and dogs. These include: Diazinon, Cumaphos, Cythioate, *Diclorphone, fenthion , Malathion ronnel.* Organo phosphorous compounds are applied in various

ways. External application is used in the form of dipping, spray, dust. It is used mainly for the control of tick, mange ked, lice, and fleas and fly larva. Systemic application is applied as pour on method, feed additive and by stomach tube to horses. The disadvantage of thse drugs is that all organophospate compounds are toxic to man and animals. When applying preparations rubber gloves and other protected clothing should be worn and inhalation of spray and skin contamination avoided. Avoid pasture contamination.

Organo chlorines - These are chlorinated hydrocarbons that include: Diclophane (DDT), Lindane, Methoxychlor, and Toxaphene. This group is becoming less popular because of their persistence in the environment. However some compounds including Lindane and Methoxychlor are still used for topical application and have excellent activity and apparent safety. They are indicated for the treatment of flies, lice, ked, ticks, and mites. Organochlorines are applied externally dipping, spray, and dust cream. It should not be applied to the animals in cold stormy weather or sick or very young (than three months of age) animals.

III. Antiprotozoal drugs

These are drugs used for the treatment and prevention of protozoal diseases such as Coccidiosis, Babesiosis, Trypanosomosis, Theileriosis and others. They include: Anticoccidials, Antitrypanosomial and Antibabesials.

Anticoccidial drugs

They are used for prevention and treatment of coccidiosis caused by Eimeria species in ruminants, birds and rabbits, and Isospora spp in pig and dog. E.g.Amprollium

Antitrypanosomial drugs

Chemotherapy and chemoprophylaxis are essential in the control of trypanosomosis, particularly in view of lack of effective vaccines and the problems associated with vector control. Quinapyramine-methylsulfate (Trypacide) is a curative drug for cattle and small ruminants and given subcutanous. Homidium bromide (Ethidium) and homidium chloride (Novidium)- is given to cattle in 1 or 2.5% solution at the rate 1mg/kg. Basically used as a curative drug with some prophylactic properties. Novidium is a mixture of homidium chloride and bromide has the same actions as Ethidium and used in the

same way. Pyrithidium bromide (prothidium) basically used for prophylaxis in cattle, and both as a curative and prophylactic drug for horse, donkey and dogs. Diaminazine aceturate (berenil) is very active, stable with very low toxicity effective against trypanosomes resistant to other drugs and very effective against piroplasmosis due to babesia bigemina. Suramin sodium (Naganol) is used more than 50 years ago for sleeping sickness as a prophylactic drug in man. It is not very effective against T.vivax and T.congolense of cattle.

Antibabesial drugs

These are drugs used to treat babesioisis. Diminazinene aceturate is trypanocide and babesicide.

Materials for treatment of Parasitc diseases:

- Treatment Syringe with needle
- bulling gun,
- drenching gun,
- stomach tube,
- drugs
- sprayer
- needle holder

Self-Check -7	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions (10points)

1. Write the information included in the prescription writing (3 Points).

3. Write at least three anthelmintic drugs with their route of adminstations (3 Points).

4. Write at least four materials used for treatments of parasite positive animals (4 Points).

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -5 points** **Unsatisfactory - below 5 points**

Operation Sheet 1– Blood Sample collection

PURPOSE: To collect blood sample for hematological examinations

Materials required Slides: Cotton , Syringes, Sample tube , Scalpel blades , Needle holder, Disinfectants, Wire or plastic loop, Ice box with ice packs, Hypodermic needles, puncturing needles , sterilized lancet

.

Procedures for Blood Sample collection:

- Restrain the animal.
- Locate the vein (bind if necessary).
- Shave the area.
- Wash it with water and soap.
- Disinfect with 70 % Alcohol.
- Leave the skin to dry for some minutes.
- Puncture with needle and syringe.
- Extract 5ml of blood, withdraw the needle and pass the blood to a tube containing any anticoagulant agent.
- Mix inverting turning upside down the tube (5-7 times), till homogenizing the blood.
- Make duplicate smear if necessary.
- Identify and send the blood sample, use refrigerator if more than 2 hours elapse to take the sample to laboratory.

Operation Sheet 2– Conducting sedimentation technique

PURPOSE: To get identify Trematodes

Materials required: pistle and mortar, two beakers, water, tea strainer, test tube, methylene blue, centrifuge, microscope, microscopic sle and cver slip.

Procedure sedimentation technique:

- Take 3 gm of fecal sample and grind it using pistle and mortar
- Mix with 40-50 ml of tap water in a beaker.
- Pour the mixture through a tea strainer and discard the material in the strainer in to another beaker.
- Pour the filtered material into a test tube.
- Allow it to sediment for 5-10 minutes and then decant approximately 70% of the supernatant and refill the tube/beaker with fresh water. Be careful while decanting the supernatant.
- Repeat this step until the supernatant is clear.
- A drop of methylene blue may be added to separate the egg of fasciola from that of paraphistomum
- Examine the sediment under a microscope
- If a centrifuge is available, the mixture in the test tube can be centrifuged at 1500 rpm for 3 minutes only.
- A drop of methylene blue may be added to facilitate visualization of parasite eggs such as Trematodes.
- Examine under microscope with 10×40 magnification.

LAP TESTS	Performance Test

Name…… ID……

Date……

Time started: _____ Time finished: _____

Instructions: Given necessary tools and materials you are required to perform the following tasks within 2 hours. The project is expected from each student to do it.

Task-1: Collect blood sample from sheep

Task-2: Conduct sedimentation technique

LG #60	**LO #2- Implement prevention and control of parasitic diseases**

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Following and implementing principles and methods to the prevention and control of parasitic animal diseases
- Implementing preventative actions and treatment strategies
- Discussing measures
  - Prevent recurrence
  - Minimise risk of contagious diseases
- Identifying and advising public and economic importance of diseases.

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Follow and implement principles and Methods to the prevention and control of parasitic animal diseases
- Implement preventative actions and treatment strategies
- Discuss measures
  - Prevent recurrence
  - Minimise risk of contagious diseases
- Identify and advise public and economic importance of diseases.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Following and implementing principles and methods to prevent and control parasitic animal diseases

1.1. Methods to prevent and control parasitic animal diseases

Control is the reduction of the morbidity and mortality from diseases, and is a general term embracing all measures intended to interfere with the unrestrained occurrence of disease, whatever its cause. The following methods are followed and implemented to prevent and control parasitic animal diseases: giving curative and prophylactic treatments (anthelmintic chemotherapy and prophylaxis), advising the owner, quarantine and or isolation, culling of unresponsive animal, deworming, destroy the habitat of vector and intermediate host, maintain a high standard of stable hygiene, control of vector (intermediate host), use of resistant breed of animals for Breeding, Ground and aerial insecticide spraying ,Sterile Insect Technique(SIT), Chemicals (Ectoparasitecides) spray, dips, pour-on, spot-on and injection, and control access of animal to infected water, grazing land and abattoirs.

1.1.1. Chemotherapy and Chemoprophylaxy

Conventional methods of controlling parasites use synthetic chemotherapeutic drugs (anthelmintics). Chemotherapy is the use of drugs in the treatment of disease after occurrence of disease. It is treatment of infected and/or diseased animals by curative drugs like anthelmintics and antiprotozoals. Prophylactic treatments (Chemoprophylaxy) are the use of drugs in the prevention and treatment of disease. Commonly used parasitic Chemoprophylaxies are: Albendazole, Fenbendazole, Mebendazole, and Tetraclozan for internal parasites; Diazinon and Deltametrine 1% for external parasites; Ivermectine for both internal and external parasites, and Isomethamidium, Homidium bromide and Homidium chloride for Hemoparasites.

1.1.2. Giving advice to the owner

- Giving advice to the owner (to the public) to prevent and control parasitic diseases may be possible by:
- Education of communities (creation of awareness) on major parasitic and zoonotic diseases, source of infection, mode of transmission , prevention and control means to the public and other animals
- By digital medias like Television, Radio, Youtube,etc and

- Printing Medias: magazine, newspaper, poster…
-

1.1.3. Quarantine and or isolation

Quarantine: - It is the isolation of animals that are either infected or suspected of being or non-infected animals that are at risk. Quarantine is used to isolate animals when they are imported from countries where exotic diseases are endemic. In this case suspected animals are isolated until infection is either confirmed or discounted.

1.1.4. Culling of unresponsive animal

Euthanasia, and slaughter and test policy are grouped under this method.

1.1.5. Deworming animal

It is the use of anthelminthic drugs for total destruction of worms (immature and adults). Deworming is applied at least once at the start of dry season because of moisture and appropriate temperature which is conducive for egg to be laid and hatching to its invasive stage of larva. De-means destruction, and worm means parasites.

1.1.6. Destroy the habitat (Ecology) of vector and/ or intermediate host

- Management of pasture and herds
- Burning pasture and clearing vegetation(bush cleaning)
- Ploughing of pasture and cultivation of fodders
- Rotational and zero grazing
- Drainage of swamps low-lying watery areas
- Cleaning around animal houses

1.1.7. Maintain a high standard of stable hygiene

- High standard of human sanitation eg. using toilet
- The practice of cooking meat thoroughly (thermal death point is 57^0c) and freezing carcasses
- Compulsory meat inspection
- Cleaning around animal houses and washing animals
- Providing hygienic feed and water for animals
- Washing, disinfecting and sterilizing materials used for animals as Federer and waterer.

1.1.8. Control of vector and/or intermediate host

Vectors are contributory factors for disease occurrence. They are prevented from invading or eliminating by the application of suitable control measures. For vector control you can use insecticide or acaricide. Destroy their habitat, fency to deny access of animals from infected areas to cut life cycle.

1.1.9. Control access of animal to infected water, grazing land and abattoirs

- By denying animals like dogs access to abattoirs, swampy areas etc
- By proper disposal of offals
- exclusion from infected areas

1.1.10. Use of resistant breed of animals for Breeding e.g. N'dama

1.1.11. Chemicals (Ectoparasitecides) spray,dips,pour-on,spot-on and injection

- Organochlorines:- DDT, lindane,Dieldrin and Aldrin in form of spray
- Organophosphates- Diazinon(acramic), Malathion, Dichlorvos , Cumaphos and Deltamethrin
- Ivermectine injection

1.1.12. Ground and aerial insecticide spraying

- Economical and need expertise particularly for tsetse control.

1.1.13. Sterile Insect Technique (SIT)

- Highly effective and beneign method of insect pest suppression and eradication.
- It is tsetsefly control method for Prvention and control of Trypanosomiasis.

Self-Check -1	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (12points).

Test I: Short Answer Questions (10points)

1. List at least ten methods to prevent and control parasitic animal diseases (10 points).

2. Separating or isolating sick and suspected animals from other groups is_____ (2 Points).

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -6 points** **Unsatisfactory - below 6 points**

Information Sheet 2- Implementing preventative actions and treatment strategies

2.1. Prevention and treatment strategies of parasitic animal diseases

Prevention and treatment strategies of parasitic animal diseases are:

- deworming
- stable hygiene practices
- quarantine procedures
- rotational grazing
- exclusion from infected areas
- prophylaxis and treatment with drugs

Implementation (application) of these techniques is summarized in the table blow

Table 1: Prevention and treatment strategies of parasitic animal diseases

No	Strategies	Application approach (method)	Materials needed for application
1	Deworming	Giving anthelmintics used for deworming (Benzimidazoles and ivermectine) at appropriate time	Anthelmintics Treatment kits
2	stable hygiene practices	Maintaining a high standard of stable hygiene	Detergents Disinfectants Antiseptics
3	quarantine procedures	Selecting and animals for quarantine and isolating	well-equipped quarantine area
4	Pasture management	Rotational grazing	Pasture/grazing land
5	Exclusion from infected areas	Restriction of area by constructing fence	-
7	prophylaxis and treatment with drugs	Using chemotherapy and chemoprophylaxy	Drugs used for parasites Treatment kits

Self-Check -2	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions (10 points)

1. Write the prevention and treatment strategies of parasitic animal diseases (7 points).

2. Write at least three anthelmintics used for deworming as prevention strategies (3 points).

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -5 points** **Unsatisfactory - below 5 points**

Information Sheet 3- Discussing measures to prevent recurrence and minimise risk of contagious diseases

3.1. Introduction

Contagious disease is those diseases that spread from one animal to the other by direct contact or indirect contact through other agents. Direct contact transmission: in direct contact transmissions the agent is conveyed between hosts through direct physical contact. In case of indirect contact the agent is normally contained in the excretions, secretions or exhalations of the infected host i.e in the faeces, urine, milk, saliva, placenta or droplets in the breath. Susceptible hosts contact the infection either by direct exposure to these or through exposure to materials contaminated by them.

Probability of contagious disease transmission is high in:

- Highly confined animals
- overcrowded animals
- animals housed in poor ventilated areas
- animals sharing common Federer's and waterers
- animals grazing common grazing lands
- Animals at market…

3.2. Measures to prevent recurrence and minimise risk of contagious diseases

The farmers or owner of animals, who rear animals for different purposes, should know measures used to prevent recurrence and minimise risk of contagious events.

These measures include:

- Using animals which have a natural resistance (parasite resistant animals) for breeding.
- Isolation of diseased animals from healthy animals
- culling of unresponsive animal

Using parasite resistant animals

Some breeds of animals are very sensitive to the disease, however others are resistant. So, highly parasite resistant breeds are selected. For example: *Bos indicus* are parasite resistant than *Bos taurus*.

Isolation of diseased animals from healthy animals

Isolation of animals is important if:

- infected
- suspected of being or non-infected animals that are at risk
- imported from countries where exotic diseases are endemic
- introduced to the groups for the first time
- bought from the market

Culling of unresponsive animal

Unresponsive animals are animals with poor prognosis, no chance of recovered from the disease after treatment. The farmers should cull unresponsive animals.

Self-Check -3	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions (10 points)

1. Write measures to prevent recurrence and minimise risk of contagious diseases (5 points)

2. Write the important of isolation of sick animal from groups (5 points)

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -5 points** **Unsatisfactory – below 5 points**

Information Sheet 4- Identifying and advising public and economic importance of diseases

4.1. The public importance of the diseases

The public importance of the disease is directly related to zoonotic diseases. Zoonotic diseases are diseases of animal origin that transmitted to humans. However, diseases of human origin that transmitted to animals are called reverse zoonosis.

4.2. The general effects of parasites on animals and humans

Transmit diseases

- Animal to human and vice versa (Zoonotic importance)
- Animal to animal

Loss of production performance

- Affect skin and hide quality- alopecia
- Reduce meat, egg, wool and milk production

Cost of treatment and control

- cause economic problems in chronic diseases
- expensive drugs for treatment
- expensiveness of methods and materials for control and prevention

High animal mortality

- Parasitic diseases with poor prognosis
- Parasitic diseases with high mortality rates

Suppress immunity and cause secondary bacterial complication

- In immunocompromized animals due to previous treatment for other diseases
- In animals affected by other viral diseases
- International trade ban

International trade ban

- Only healthy animals are allowed to be exported, otherwise parasitic animals are banned.

4.3. Prevention and control programs to solve public and economic importance of diseases

These are appropriate programs applied to prevent, control and eradicate parasitic diseases:

- Routineanthelmintic chemotherapy andprophylaxis
- Giving advice to the owner
- Quarantine and or isolation
- Culling of unresponsive animal
- Deworming animal at least once at the start of dry season
- Rotational grazing/ paddock rotation system
- Maintain a high standard of stable hygiene
- Control of vector, intermediate host
- Destroy the habitat of vector and intermediate host
- Control access of animal to infected water and grazing land
- Breeding resistant breed of animals

Self-Check -4	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions (10 points)

1. What are the general effects of parasites on animals and humans (5 points)

2. Write the programs applied to prevent, control and eradicate parasitic diseases (5 points)

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -5 points** **Unsatisfactory – below 5 points**

LG #61	**LO #3- Record data and clean up on completion of work**

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Recording animal history and veterinary service efficiency. • Cleaning and maintaining work area • Returning equipment and hand tools to storage • Cleaning and returning Materials and equipment • Disposing of wastes. This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • record animal history and veterinary service efficiency • clean and maintain work area • return equipment & hand tools to storage • clean and return materials and equipment • dispose of wastes
Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

Information Sheet 1- Recording animal history and veterinary service efficiency

Record keeping

Record keeping is an essential part of good livestock and farm business management. Recording can be done most easily if animals have some form of identification. Thus, animal recording and identification are inseparable.

Why keep records?
Good records maintain and transmit accurate information about the animal collection so that the information:
• documents a complete history of each animal owned by or kept at your facility. The inclusion of identification numbers at former and subsequent institutions links your specimen records to those of other institutions, expanding the known history of that specimen.

Reporting information

When maintained, the records included within the animal's record, or can be linked and available to the record. All records should be well organized, analyzed, interpreted, compiled together and finally reported to concerned bodies.

Veterinary service efficiency records includes:

Animal history

- Owner's data
- Patient data
- Present history
- Past history
- Environmental and management history

Animal diseases diagnosis

- Clinical diagnosis
- Tentative diagnosis
- Differential Diagnosis
- Confirmatory diagnosis

Treatment data

- Generic name of drug
- Route of administration of drug
- Dose of administration of drug
- Duration of drug
- Post treatment advice

Disease outbreak

- morbidity of animals in a specified area(numbers of affected animals)
- Mortality rate (sum of the total number of death)
- response rate of the animals due to immunity
- Number of recovered animals from sickness after proper diagnosis and treatment.

The Clinical Case Record Book for history taking, diagnosis and treatment of animal diseases can be organized according to the following format as example.

NAME OF TVET COLLEGE

DEPARTEMENT OF ANIMAL HEALTH

CLINICAL CASE RECORD BOOK

Case no._____

Date: ____/____/_____

I. Owner /client personal data:

Owner name_____Address_____Kebele_____

mobile no._____Resident phone_____house no._____

II. Patient Identification data:

Species_____Breed_____Age_____Sex__

color_____unique identification/tag_____

History/Anaminesis

Present_____

Past_____

Enviromental history_____

Clinical findings_____

Vital signs/parameters

Body Temprature_____ Pulse/heart rate_____ Respiratory rate_____

Tentative Diagnosis_____

Differential Diagnosis_____

Sample taken_____

Laboratory technique employed_____

Laboratory Result_____

Confirmatory Diagnosis_____

Treatment:

No.	Drug generic name	Route of drug	Dose	Duration of treatment
1.				
2.				

Post-operativecare: _____

Examined by: _____ signature: _____

Self-Check -1	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (6points).

Test I: Short Answer Questions (6 points)

1. Write down the Veterinary service efficiency records

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -3 points** **Unsatisfactory – below 3 points**

Information Sheet 2- Cleaning and maintaining work area

2.1. Cleaning of work area (work places)

Cleaning work area **after accomplishment of the tasks** includes:

- dry cleaning
- Washing work area by water and detergents
- disinfecting work area and
- drying the cleaned area
- Always clean out the work area before and after use.
- Work surfaces must be decontaminated after any spill of potentially dangerous material and at the end of the working day
- Keeping floors clean.

2.2. Maintaining work area

Maintaining work area is:

- keeping the work area generally hygienic and
- free of contamination condition

Self-Check -2	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions (5 points)

1. Cleaning work area includes

A. Dry cleaning B. disinfecting C. Wash with water and detergents D. All

Test II: Fill the blank space (5 points)

1. _____ keeping the work area generally hygienic and free of contamination condition.

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -5 points** **Unsatisfactory - below 5points**

Information Sheet 3- Returning equipment and hand tools to storage area

3.1. Returning equipment to storage area

Equipment and hand tools used for handling parasitic Animal Diseases should be returned to storage area after:

- cleaning
- checking for future service ability(healthy functioning), and
- Carrying out basic preventative maintenance.

These materials include:

- diagnostic kits,
- sample collection materials
- preservation materials
- transportation materials
- sample storage materials
- materials for conducting basic laboratory
- treatment materials

.

Cleaning of work places and equipments after accomplishment of the tasks

- Always clean out the flow bench and other materials before and after use.
- All contaminated materials, specimens and cultures must be decontaminated before disposal or cleaning for reuse.
- Cleaning and proper storage of materials.
- Storing chemicals in proper places (cupboards, stores).
- Always sterilize materials before and after each procedure using a flame.
- Remember in sterile procedure: everything you use must be sterile.
- Leave the microscope clean and cover it with plastic cover.

Self-Check -3	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (10 points).

Test I: Short Answer Questions (10 points)

1. Write equipment and hand tools used for handling parasitic Animal Diseases Parasitic diseases.

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -5 points** **Unsatisfactory - below 5 points**

Information Sheet 4- Cleaning and returning Materials and equipment to be reused

4.1. Cleaning Materials and equipment to be reused

Materials and equipment to be reused for handling parasitic Animal Diseases should be returned to safe, appropriate place and their original place after:

- Cleaning
- checking for future service ability

These materials include:

Healthy functioning and frequently used materials like:

- Thermometer
- Stetoscope
- Treatment syringes and needles
- Scissors
- Materials for husbandry practices etc.

Different techniques used for cleaning Materials and equipment

- Sterilization
  - ✓ Is the total destruction of organisms from Materials and equipments by physical (fire and electric) and chemical means.
- Washing
  - ✓ By water and detergents
- Dry cleaning
  - ✓ Without water, detergents, disinfectants, chemical,and
- disinfecting
  - ✓ Is an act of cleaning inanimate objects by disinfectants

Materials for sterilization and disinfection of materials

- Autoclave
- hot air oven
- water bath
- Bunsen burner
- electrical sterilizer/boiler or stove
- disinfectants

Self-Check -4	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (8points).

Test I: Short Answer Questions (8 points)

1. List different techniques used for cleaning Materials and equipment

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -4 points** **Unsatisfactory - below 4 points**

5.1. Disposing of wastes

A **"waste"** is any solid, liquid, or contained gaseous material that is discarded by being disposed of, burned or incinerated, or recycled (There are some exceptions for recycled materials.) It can be the materials left from a work area that is being disposed of. Even materials that are recyclable or can be reused in some way (such as burning used oil for fuel) may be considered waste. Wastes are listed as hazardous because they are known to be harmful to human health and the environment when not managed properly. Animal faeces and hay from the larger animals is stored in the refuse pit or other suitable areas until the completion of the quarantine period for that consignment of animals. Needles and syringes and other disposable items are to be temporarily stored in designated bins. When the bins are full they are to be destroyed at an approved facility.

Sources of wastes during handling parasitic Animal Diseases include:

- Animal it self
- Human (owner or professional health workers and others)
- Environment
- Others

Wastes from animals include:

- animal bodies/parts removed
- discharges(feces, urine, blood, saliva) and fomites from animals
- dead carcass(accidentally at work area)

Wastes from Environment include:

- pollution
- rain or flooding

Other sources of wastes are:

- gloves
- packing materials
- discarded materials after use
- disposable syringe

Hazardous Materials Handling Procedure Summary/waste disposal

It is recommended that any substance that is harmful to life and health including wastes should be disposed of through the College Hazardous Waste Program.

The proper handling of all hazardous materials is the responsibility of all college employees. The detailed handling procedures are summarized below. A copy of this procedure summary should be posted near the collection point in each work area.

- All chemicals and other hazardous materials produced in the work area must be collected for proper disposal.
- No material can be dumped down the sanitary sewer drain or thrown in the dumpsters without prior approval of the EH&S Department.
- All materials are to be stored in chemically compatible containers.
- Wastes should be segregated according to the type of waste.
- A log sheet is required of all materials placed in the container. The pre-numbered log sheet identifies the material name, quantity, solvent and approximate concentration (if applicable) of each material added to the container.
- A label identifying the name or description of the material, the location, the log sheet number, the name of the responsible person and date shall be attached to each container.
- When the container is full, or otherwise needs disposal, complete a Hazardous Material Pick-up and Disposal Request form. The form must be complete and accurate.

Self-Check -5	Written Test

Directions: Answer all the questions listed below and write your answers on space provided on the next page (8points).

Test I: Short Answer Questions (4 points each)

1. List sources of wastes during handling parasitic Animal Diseases
2. Write Waste disposal methods during handling parasitic Animal Diseases

You can ask your teacher for the copy of the correct answers.

Note: **Satisfactory rating -4 points** **Unsatisfactory - below 4 points**

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