CHAPTER- 5. Basic principles of disease prevention and control

Objectives

- At the end of this chapter Students should be able to:
  - Describe the methods which are applied to the control and eradication of a disease.

5.1. Definition of some terms

- **A. Control**
- Control is the reduction of the morbidity and mortality from disease, and is a general term embracing all measures intended to interfere with the unrestrained occurrence of disease, whatever its cause.
- It is an ongoing process.
- It can be achieved by:
  - treating diseased animals- which therefore reduces disease prevalence,

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- preventing disease- which therefore reduces both incidence and prevalence.

B. Eradication

- Most commonly in veterinary medicine, eradication refers to the regional extinction of an infectious agent.
- E.g. Eradication of FMD in the UK

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C. Elimination: This is reduction in the incidence of infectious disease below the level achieved by control, so that either very few or no cases occur, although the infectious agent may be allowed to persist.

D. Prevention: limit the introduction of the agent in to a specific area

5.2. Strategies of control and eradication

A. Doing nothing

- Indicates that-
  - the incidence of disease may be reduced by natural changes in host/parasite relationships without the intervention of man.

B. Quarantine

- Quarantine is the isolation of animals that are either infected or suspected of being so, or of non-infected animals that are at risk.

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- It is also used to isolate animals suspected of being infected, until infection is either **confirmed or discounted** by clinical examination or laboratory testing
- The period of quarantine depends on the:
  - incubation period of the agent,
  - the time taken for the infection to be confirmed
  - the time taken for an infected animal to become non-infectious (either with or without treatment)

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C. Slaughter

- If a disease is infectious, affected animals can be a source of infection to others.
- In such circumstances it may be **economically** and **technically** useful to slaughter the affected animals.
- In eradication campaigns, infected animals may be slaughtered to remove sources of infection.
- Apply 'test-and-removal' strategy
- **E.g**. all cloven-hoofed animals in infected herds were slaughtered during FMD epidemics(Europe).

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D. Vaccination

- Vaccines can confer immunity not only to many bacteria and viruses, but also to some helminthes.
- **Routine vaccination**
- **Strategic vaccination**:
- It may be deployed strategically to prevent incursion of disease from endemic areas, and the spread of disease when epidemics occur (**emergency vaccination**).

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- animals in an area surrounding an infected region are vaccinated to provide a circumjacent barrier against spread of infection (**ring vaccination**).

- **Natural vaccination**: When animals are exposed to a low level of challenge from agents in the environment, natural vaccination can occur.
- This mechanism has been enhanced in pigs by feeding faeces back to pregnant animals, a technique called '**feedback**'.

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E. Therapeutic and prophylactic chemotherapy

- Antibiotics, anthelmintic, other drugs and hyper-immune serum are used (therapeutically) to treat diseases, and are administered (prophylactically) at times of high risk to prevent disease and thus to increase productivity.

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F. Control of biological vectors

- Infectious diseases transmitted by biological vectors can be controlled by **removing the vectors**.
- **E.g.**
- Insect vectors can be killed with insecticides.
- The habitat of the vectors can be destroyed; for example, by draining land to remove snails that are intermediate hosts of Fasciola hepatica.
- Alternatively, an animal that competes with the vector can be introduced into the habitat

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G. Control of mechanical vectors

- Living organisms that mechanically transmit infectious agents can be controlled by destruction and disinfection.
- Biting fleas that transmit bacteria, for example, can be destroyed by insecticides.
- People can also act as mechanical vectors; thus the veterinarian must impose a strict procedure for personal disinfection when dealing with outbreaks of highly contagious infectious diseases such as FMD.

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H. Disinfection of fomites

- Fomites can be disinfected to prevent the transmission of infectious agents. **Fomites include**
- Farm equipment, vehicles, surgical instruments and sometimes drugs themselves,- iatrogenic transmission.
- Food is heat-treated (e.g., the pasteurization of milk) to destroy microbes and their heat-sensitive toxins, to prevent food-borne infection.

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I. Movement of hosts

- Animals can be removed from 'high risk' areas where infections are endemic.
- This control strategy is implemented in tropical countries where hosts are seasonally migrated from areas in which biological vectors are active.
- E.g. horses may be moved to indoors at night, to prevent infection with African horse sickness virus, which is transmitted by night-flying vectors of the genus Culicoides

J. Improvement in environment, husbandry and feeding and Sanitation

Cont…

K. Biosecurity

- 'Biosecurity' is the application of management practices that reduce the opportunities for infectious agents to gain access to, or spread within, a food animal production unit.
- Biosecurity encompasses cleanliness, disinfection, reduction of exposure (e.g., maintenance of perimeter fencing, testing of animals before inclusion into a herd, isolation of new additions and diseased animals, and waste management), management of personnel (limiting visitors, adequate training of staff), and ensuring that animals can be traced.

5.3. Important factors in control and eradication programmes

- The level of knowledge about the cause of the disease and, if infectious, also about its transmission and maintenance, including host range and the nature of the host/parasite relationship;
- Veterinary infrastructure;
- Diagnostic feasibility;
- Adequate surveillance;
- Availability of replacement stock;
- Producers' and society's views;

Cont…

- The disease's public health significance;
- The existence of suitable legislation with provision for compensation;
- The possible ecological consequences;
- Economic costs and the availability of funds for the programme.

CHAPTER-6. Laboratory Medicine/science

- Learning objectives
- At the end of this module you will be able to:
- Explain the proper collection, transportation and processing of specimens.
- **Specimen types**

I. Respiratory

- Bronchoalveolar lavage (BAL)
- Bronchial wash/brush
- Transtracheal aspirate

II. Non-respiratory

- **tissue**

body fluids

- **blood**
- **faeces**
- gastric lavage
- **urine**

6.1. Sample Collection, Processing and Storage

- Sample Collection, such as handling, labeling, processing, aliquoting, storage, and transportation, may affect the results of the study.
- So proper collection, transpiration and processing of a sample is essential

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- **Diagnosing** of a disease in the laboratory is necessary to treat the animal by the best drug
- Specimens are submitted to the laboratory to help determine what might be causing illness in the field or to determine the extent of infection in animals in the field.

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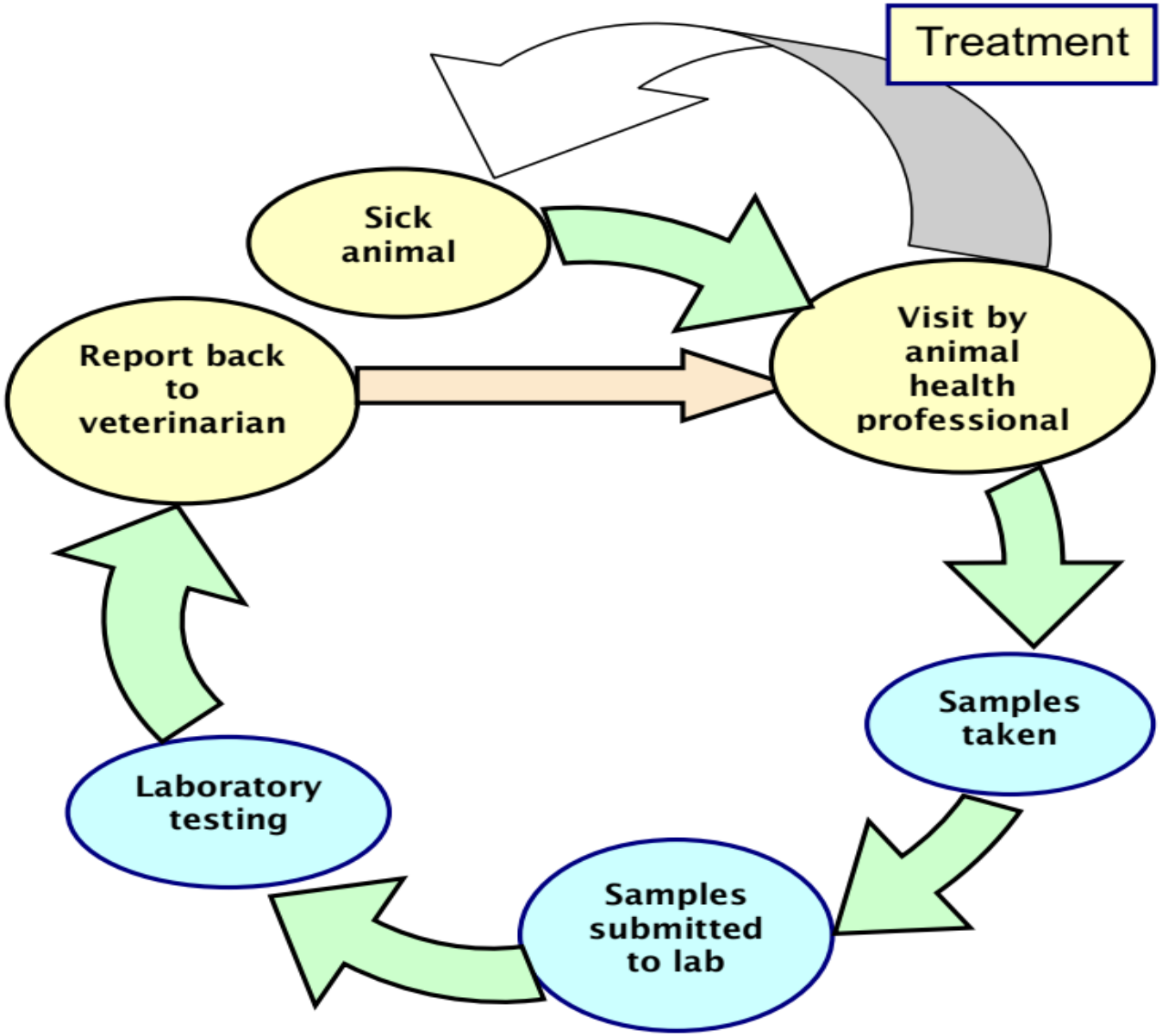
- Samples should be delivered to the laboratory without any delay.
- When samples cannot be processed on the day of collection, they must be stored in the refrigerator
- If refrigeration is not available, use of preservatives should be considered.



Process of a laboratory confirmation

Collection of specimens

- **Urine:** External genitalia should be washed before specimen collection.
- A single early-morning urine specimen (approx. 200 ml) should be collected.
- Specimens should be refrigerated or transported immediately to the laboratory.

- **Blood**: The jugular vein is the preferred l ocation for small ruminants and horses
- **Feces:** Preferably, fecal samples should be taken directly from the rectum or just after defecation.
- **Larger external parasites:** can simply be picked off and placed into a container. Ticks and fleas should be submitted for identification or stored in 70% alcohol.

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- **For smaller parasites**, such as skin mites, scrape with a razor blade to be sure you go deep enough to get the parasite
- Put the collected material onto a slide with some mineral oil. Then you can put the slide under a microscope to see the mites.
- **Impression smears:** Take the tissue and touch gently to a glass slide. Allow to air dry

Taking environmental & feed samples

- In cases when a toxin or mineral deficiency is suspected in the environment or in the feed, samples can be collected for laboratory analysis.
- Wear personal protective equipment - gloves, apron, and boots.

How To Preserve Specimens

- Keep the tissues cool
- Samples should be kept moist
- For swabs, immerse the swab in sterile saline or sterile water and keep at 4°C until it can be sent to the laboratory.
- ***For external parasites***, mites, fleas, and ticks can all be kept in 70% alcohol indefinitely.
- ***For fecal samples***, keep them cool until they can be sent to the laboratory. Nematode eggs usually survive well at 4°C but can be destroyed by freezing, so DO NOT FREEZE.

Transportation/shipping

- Package should be well labeled
- Keep the samples cool on the way to the laboratory
- Use packaging that will prevent leakage and crushing
- Be sure that all your samples are well-labeled
- Be sure that appropriate paperwork is included with all of the samples
- Alert the laboratory

- Sample shipping requirements depends on the time, distance, climate, season, method of transport, applicable regulations, type of specimen and markers to be assayed.
- Protect specimen from contamination

Tests Done In The Laboratory

- Histopathology
- Virology: cell culture, ELISA, CFT….
- Bacteriology: Culture, ELISA, PCR….
- Mycology
- Parasitology: consistency
- Toxicology

- ***Fecal flotation is the best method for nematodes***

- ***Direct Smear:*** *Giardia*, trichomonads, and amoebae.
- ***Fecal Sedimentation:*** **eggs of** flukes, tapeworms

Mites

- Skin scrapings smeared in mineral oil are the most common technique used to diagnose mites such as **Sarcoptes** and **Demodex**.
- When submitting/shipping mites to the diagnostic laboratory, these should be stored in 70% alcohol.
- However, scabs from chronic infections, particularly from Psoroptes ovis and P. cuniculi can be also submitted. These are digested in 10% sodium hydroxide before microscopic evaluation.

Protozoans

- Blood protozoans are best visualized in blood smears stained with Giemsa or Wright's stains.

Assignment and Home study #3, from Chapter-5 and 6and from the given reference (20-Point)

Q1. Mention and discus about the main strategies for disease control and eradication?

Q2. Choose three farm animal diseases of your interest and identify the proper sample taken, show the sample collection and processing procedures for the three of the disease you selected to discus?

THANK YOU