

INTRODUCTION TO ANIMAL DISEASES

Only Study Guide for
AWD1501

University of South Africa, Pretoria

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PREFACE

WHAT'S INTRODUCTION TO ANIMAL DISEASES ALL ABOUT?

By the time you register for this module you probably already have some knowledge and experience of animals and animal welfare. You may have been in contact with sick animals before and you may even have cared for them. If you have a keen interest in the topic, you probably read about animal diseases in books or on the internet.

To be a good animal welfare assistant you need the ability to recognise when an animal is sick and needs medical attention. Some knowledge of the most commonly encountered animal diseases enables you to distinguish between disease conditions that require only basic, primary care, and diseases that need urgent veterinary care or a definitive veterinary diagnosis and must be referred to a registered veterinarian. You'll be able to recognise diseases that are contagious and pose a threat to other animals or even humans in the immediate vicinity, and diseases that are preventable in future. Knowledge about animal diseases also enables you to teach the communities to take good care of their animals and to take measures to prevent certain diseases and disease outbreaks.

This module looks at the animal diseases you, an animal welfare assistant, are most likely to come across in companion animals and horses in South Africa. After completing this module you should be able to identify and describe common pathological conditions in companion animals and horses. You should be able to apply this knowledge in evaluating conditions and treating sick animals you see in the course of your welfare work in communities.

HOW IS THIS MODULE TAUGHT?

This module, like most of the other modules in this course, teaches through active learning. If you read and learn **actively**, you understand and remember what you have learned. Then you can apply your knowledge and skills effectively in the real world. it is not enough to read the information passively. The learning material contains many activities and you should complete them all to engage with the contents. Complete these activities to the best of your ability to ensure that you grasp the contents and start developing the practical skills you need.

HOW CAN I MANAGE MY LEARNING FOR THIS MODULE?

This module is packed with very interesting information. Not all the information needs to be memorised, because certain details are only provided to give you a better picture and understanding of the disease. Each study unit contains a list of the learning outcomes students must achieve. The activities provided to

guide your learning will also help you prepare for your final examination. (You do not need to study the 'Interesting facts' provided in the text for examination purposes.)

Students also receive tutorial letters during the course of the year to assist and guide your learning. These letters give more information about general arrangements and contain details about assignments and assignment questions.

A general guideline is that you should spend a total of **120 hours** on this module. Draw up a study timetable to help you achieve the module outcomes in the time you have available. Note that not all the themes and study units for the themes will take the same amount of time to master. Take into account the learning outcomes, the amount of information provided in the text and the activities you need to complete when you estimate how many hours you need to study a specific unit. Skim through the study guide before you draw up the timetable.

Your study timetable should be realistic. Adapt it as needed if you realise that more or less time is needed for a specific study unit. Once you have drawn up your timetable and have a rough idea of the work that needs to be done, you can start working through the material in earnest.

Consider the following:

- **Read each section thoroughly and carefully**. Make sure you give the work your full attention. Read a paragraph or concept again if you do not grasp it the first time. Return to a section if you realise you do not fully understand it or if you struggle to remember its contents while you are doing the activities. Remember, repetition is the mother of learning.

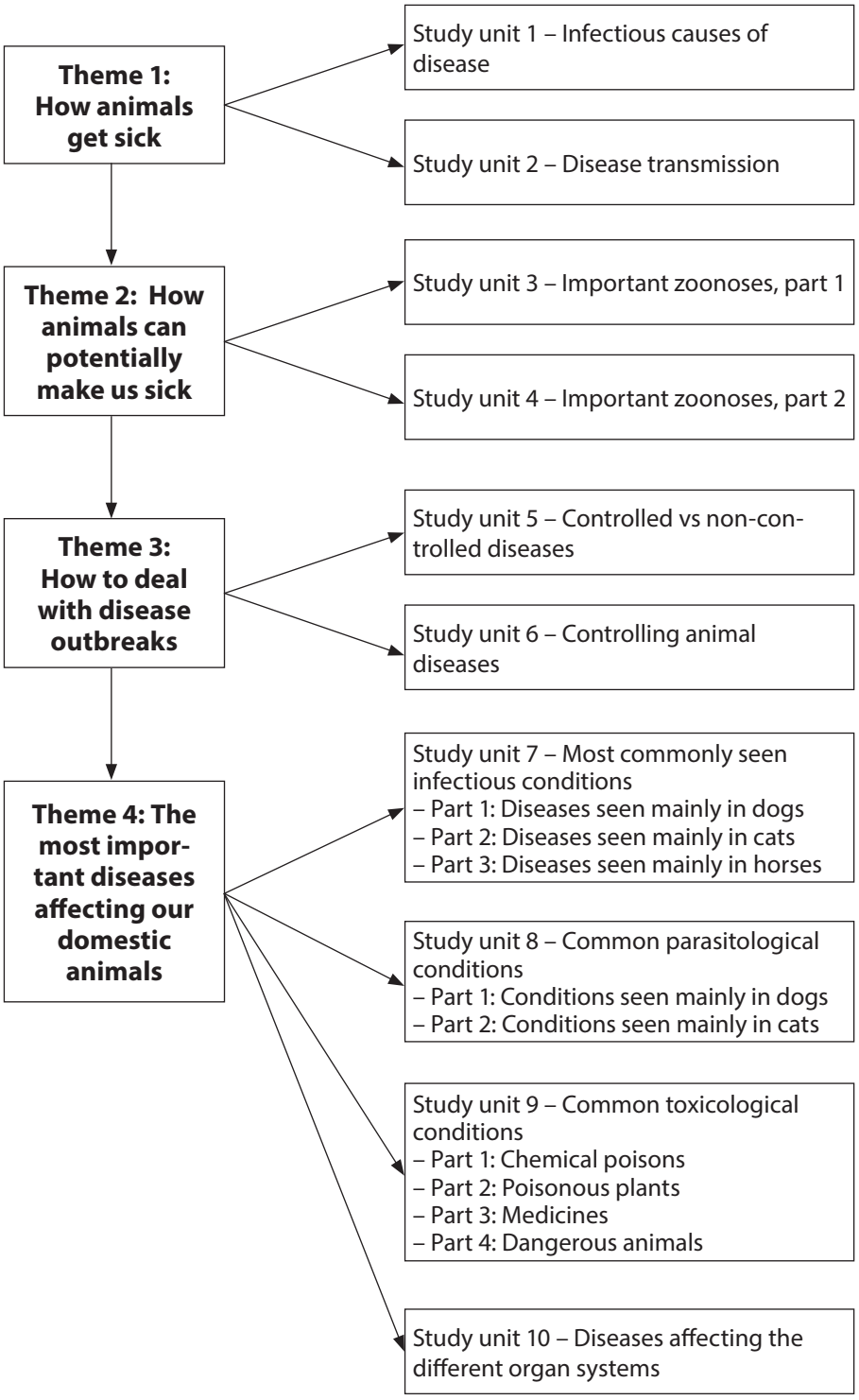
***Useful tip**: If English is your second language keep a dictionary handy and look up the words you do not understand.*

- **Complete all the activities**. Many of the activities require you to summarise information. These summaries will help you when you are studying for the examination. Although summaries take a lot of time if they are done properly, they will save you even more time later.
- **Compile a glossary** with all the new terminologies or concepts you come across in the study material. Some words and phrases in the text are printed in bold. These words are key terms you should understand. Include them in your glossary.
- **Add your own revisions questions** as you work through a unit.

HOW IS THIS STUDY GUIDE STRUCTURED?

The module is divided into four broad themes. Each of these themes is unpacked and explained in separate, manageable study units.

The diagram below gives an overview of the structure of the study guide.



- In Theme 1 we investigate, at microbial level, the various infectious agents (microbes) that cause disease. We also investigate how these agents are transmitted between animals and sometimes from animals to humans.
- In Theme 2 we look in detail at diseases transmitted between animals and humans. They are called zoonoses.

- In Theme 3 we investigate lawful procedures aimed at controlling diseases and the role an animal welfare assistant plays in reporting such diseases. Study unit 6 mainly consists of a published article that clearly illustrates the principals you need to understand.
- Lastly, Theme 4 looks at the various pathological conditions that can affect the health of domesticated animals negatively. This theme is very long; it consists of four study units (study units 7 to 10) that are further divided into sections.

WHAT ARE THE MAIN FEATURES OF THE STUDY GUIDE?

The main features of this study guide are the following:

- Each study unit begins with the **learning outcomes** for that study unit. The outcomes are like a checklist of the things you should be able to do once you have completed the study unit. In other words, they show you the purpose learning that particular study unit. When you are reviewing the module, you should look back at the outcomes and check whether you have achieved them all. In this way they will help to give you an overview of the knowledge and skills you should have acquired in the module.
- Each study unit consists of an **introduction**, the **main body of information** and a **summary**.
- There are also various **activities** in each study unit. These activities will help you understand and apply the information.
- At the end of each theme there is a list of **revision questions**. Use these questions for self-assessment. If you cannot answer a question correctly and in detail, you have not yet mastered the section and you should re-visit the text and activities.
- Where possible we include **pictures** of the various symptoms or conditions. Study these pictures carefully. They will help you to remember the work and to recognise the conditions when you come across them in your work.
- At times we recommend that you do **further reading** and visit relevant **websites** (**internet resources**). This is not compulsory, but it could improve your understanding of the work. Remember, you must evaluate information on websites critically, because all you read may not be true. The internet is a rich source of images. We recommend that you develop your own picture library.
- A feature called **interesting facts** appears at certain points in the text. These **interesting facts** contain interesting additional knowledge, but you do not need to study them for examination purposes.

We trust you will enjoy this module as you learn more about the vast amount of disease conditions that can affect animal and human.

ACKNOWLEDGEMENTS

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The following people, publications or websites are acknowledged as the original sources of graphic material:

Figure	Source
1.1	http://www.m2c3.com/chemistry/VLI/M2_Topic4/M2_Topic4_print.htm
3.1	www.wikimedia.org/wikipedia/commons/7/76/Sheep_with_orf.jpg
3.2	www.wikimedia.org/wikipedia/commons/a/a2/Orf_virus_infection_on_thumb.jpg
3.3	http://science.howstuffworks.com/anthrax1.htm
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7.2	www.wikipedia.org/wiki/Ticks_of_domestic_animals
7.3	www.wikipedia.org/wiki/Feline_viral_rhinotracheitis
7.4	http://commons.wikimedia.org/wiki/File:Culicoides-imicola-bloodfeeding.jpg

8.1	www.wikipedia.org/wiki/Toxocara_canis
8.2	www.wikipedia.org/wiki/Toxascaris_leonina
8.3	www.wikipedia.org/wiki/Hookworms
8.4	www.wikipedia.org/wiki/Hookworm
8.5	www.wikipedia.org/wiki/Dipylidium_caninum
8.6	www.wikipedia.org/wiki/Botfly
8.7	https://commons.wikimedia.org/wiki/File:Ixodes.ricinus.searching.jpg
8.8	http://commons.wikimedia.org/wiki/File:Dog-ticks5.jpg
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10.2	http://en.wikipedia.org/wiki/Otitis_externa_in_animals#mediaviewer/File:Ear_infection_in_cocker_spaniel.JPG
10.3	http://en.wikipedia.org/wiki/Corneal_ulcers_in_animals
10.4	http://en.wikipedia.org/wiki/Cherry_eye
10.5	http://en.wikipedia.org/wiki/Lick_granuloma
10.6	http://www.dog-health-problems-online.com/skin-cancer-in-dogs.html
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10.8	http://healthsciencedegree.info/umbilical-hernia-dog/
10.9	www.wikipedia.org/wiki/Gastric_dilatation_volvulus
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THEME 1

How animals get sick

INTRODUCTION TO THEME 1

As an animal welfare assistant you will frequently encounter sick animals. It is important that you must understand the illnesses we see most often. You must know what they are and how the animals contract them so that you can decide what actions to take that will be best for the animal. In this theme we broadly look at how animals can get sick. We look closely at infectious causes of disease and how animals get exposed to them.

STUDY UNIT 1

Infectious causes of disease

LEARNING OUTCOMES

By the end of this study unit you should be able to do the following:

- Explain the differences between viruses, bacteria, protozoa and fungi.
- Briefly describe how each of the above infectious agents is treated.

1.1 INTRODUCTION

Activity 1.1

Think about the following:

(1) Have you ever suffered from a cold or the common flu?
(2) How did it make you feel?
(3) Why do you think you got sick?
(4) How did you treat your illness? What did a doctor prescribe to make you feel better?
(5) What can you do to protect yourself from getting the flu again?

Many of you probably answered question 2 above saying that you caught germs or were infected by a virus. Disease can be caused by a variety of different factors, including **infectious agents** like viruses, bacteria, fungi and protozoa. The common flu (Influenza) is an example of a viral infection. Ordinary people often call infectious agents "germs" They are too small to see with the naked eye and are collectively called **microbes** or **micro-organisms**. Not all microbes are pathogenic (causing disease).

In this study unit we focus on infectious agents. During the course of this module you are also introduced to other causes of disease. These include parasites like worms, ticks and mites; toxic agents like rat poison and insecticides; and diseases caused by trauma, genetic predisposition, incorrect diets and allergies. We also discuss specific examples of infectious agents and the diseases they cause.

Activity 1.2

Use the resources available to you, for example the internet or library books, to complete the following table. The table illustrates some of the differences between a virus, a bacterium, a fungus and a protozoan.

	VIRUS	BACTERIUM	PROTOZOAN	FUNGUS
SIZE				
STRUCTURE:				
Body				
Wall and/or membrane				
Organelles				
Genetic material				

Study tip: A table is useful for structuring information and allows you to compare facts. You may find it beneficial to compile your own tables when you go through the other study units to help you improve your understanding and learning.

You have now seen that these microbes differ in both size and structure. Size determines if and how we can see them in a sample taken from infected tissue or material. The following picture demonstrates this:

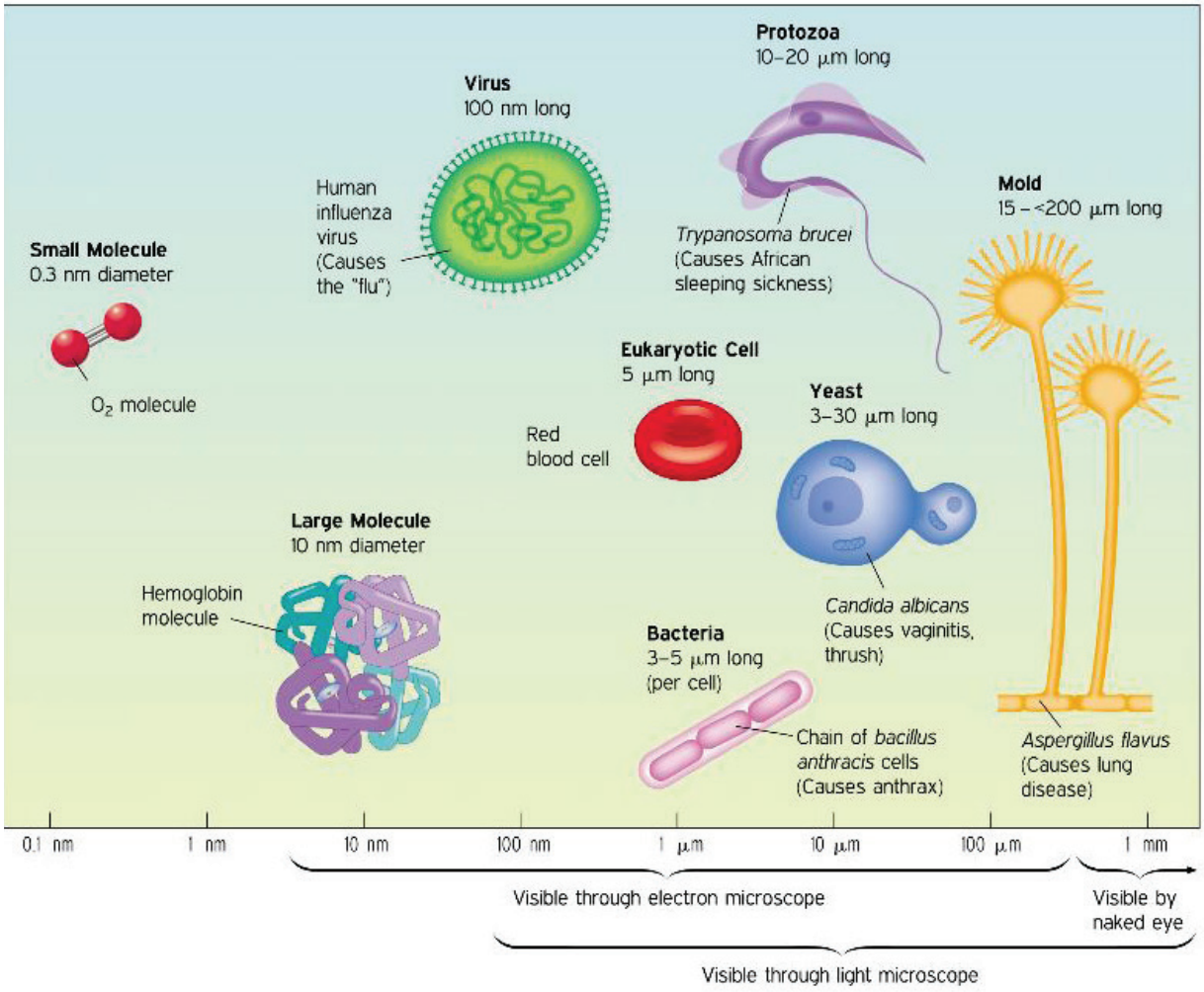


FIGURE 1.1

Relative sizes of microbes

Source: http://www.m2c3.com/chemistry/VLI/M2_Topic4/M2_Topic4_print.html

Apart from size and basic structure, the way in which these microbes are transferred to animals, how they cause disease and how we go about treating them also differ.

Let us now look in more detail at microbes. We first examine viruses and then look at bacteria, protozoa and fungi.

1.2 MICROBES

1.2.1 Viruses

A virus is a simple infective agent that typically consists of genetic material in a protein coat. The genetic material is a nucleic acid molecule, either DNA or RNA, depending on the specific virus. Viruses are acellular organisms, which means they do not consist of cells. They can only multiply within a living host cell. We call them **obligated intracellular** organisms.

Most viruses are too small to be seen with a normal microscope or light microscopy. However, they can be seen with an **electronmicroscope**. There are also other diagnostic tests enabling us to determine whether an animal is infected with viruses or not.

Viral infections in animals are common. These infections typically cause more than 60% of disease outbreaks. Unfortunately there are not many effective antiviral treatment options available. Antiviral drugs are also expensive and often cause unpleasant side effects. They usually only work well early in the course of disease.

How are viral infections treated?

First and foremost, prevention is better than cure. Throughout the years many good **vaccines** have been developed to inoculate animals against the most common viral diseases. A vaccine helps a healthy animal's immune system to recognise a virus when the animal exposed to it, and enables the animal to get rid of the virus.

We then also treat animals **symptomatically**. This means that we treat the symptoms caused by the virus to help the animal feel better and recover quicker. For example, if the animal is in pain, we give it painkillers, if the animal is dehydrated, we give it intravenous fluids, and so on.

Interesting fact: The first virus was discovered in 1892 by Dimitri Ivanovsky in diseased tobacco plants. Today, only 130 years later, more than 5 000 different viruses are described.

1.2.2 Bacteria

Bacteria (singular: bacterium) are a large group of unicellular (one-celled) microbes. They have cell walls, but do not have organelles or an organised nucleus. They are widely found in soil, water and air, and also on or in plants and animals. Some bacteria can cause disease.

Bacteria are divided into two groups, namely **Gram positive** and **Gram negative** bacteria, depending on how they stain with the so-called Gram stain. Gram positive bacteria have very thick cell walls. Gram negative bacteria have very thin cell walls, which affect how they soak up and hold the stain. The difference in bacterium walls causes Gram positive bacteria to stain purple and Gram negative bacteria to stain pink. Bacteria can be seen with a light microscopes.

A bacterial disease can be a **primary disease** and we typically seeit in animals with compromised (weakened or diseased) immune systems. These animals include patients with immunodeficiency viruses, patients suffering from cancer and very old patients. A bacterial disease can also be a **secondary disease**, which means it follows a primary viral infection.

Bacterial infections are treated with **antibiotics**, which are antibacterial drugs. There are various classes of antibiotics that target either Gram positive or Gram negative bacteria. There are also broad spectrum antibiotics that are effective against many different types of bacteria.

Bacteria can be cultured from infected tissue samples in a laboratory and an antibiogram can then be done. An antibiogram is a test to see what antibiotic will work the best against the specific bacteria. Unfortunately, the random use of antibiotics over the years has caused bacteria to become **resistant** to antibacterial drugs. This phenomenon is now causing global concern. (Antibacterial resistance is the ability of bacteria and other microorganisms to resist the effects of an antibiotic that would once have destroyed them.)

Interesting fact: Not all bacteria are pathogens. Healthy animals typically have normal bacteria in their gut and on their skin. These normal bacteria are called "commensal bacteria". The bacteria living in and on the body of an average healthy adult human probably outnumber human cells 10 to one.

Activity 1.3

(1) Explain how viruses differ from bacteria. Refer to the above text.

(1.1) HIV/aids is a viral disease that causes immunodeficiency in humans. A similar disease is found in some animal species. HIV/aids is treated with ARVs. Are ARVs a vaccine, a way of treating HIV/aids symptomatically, or something else? Give reasons for your answer.

(1.2) A person with HIV/aids develops tuberculosis (TB), a bacterial respiratory disease. Is the TB a primary or secondary infection in this case? Explain your answer.

(1.3) TB is treated with antibiotics. Name the three main classifications of antibiotics and explain the differences among them.

(1.4) A doctor prescribes antibiotics to a patient suffering from TB, but the antibiotics are not effective and the disease is not cured. What could the reason for this be?

ARVs are antiviral drugs, while antibiotics are used to treat tuberculosis. *Mycobacterium tuberculosis* (the scientific name of the bacterium causing TB) is interesting because it is an atypical bacterium – it is neither Gram positive nor Gram negative. This, together with the presence of resistance, makes tuberculosis difficult to treat. TB is a common secondary infection in people suffering from HIV/aids, because such patients have compromised immune systems.

1.2.3 Protozoa

Protozoa are a diverse group of unicellular eukaryotic organisms. This means their genetic material is contained in a membrane-bound structure, called the nucleus, similar to those of mammalian cells. Many protozoa are motile, which means they can move. They have organelles with functions similar to the organs of higher animals. They are free-living in the environment.

During its life cycle, a protozoan generally passes through several stages that differ in structure and activity. **Cysts** are stages when protozoa are protected

by a membrane or a thickened wall that enables them to survive outside the host for long periods of time and in harsh environments. Tissue infections caused by protozoa are often spread when animals swallow these cysts or when cysts are carried to an animal by insects (called insect vectors). These infections are treated with antiprotozoal drugs.

Interesting fact: The malaria parasite Plasmodium, one of the deadliest creatures on earth, belongs to this class.

1.2.4 Fungi

Fungi (singular: fungus) can be single-celled or multicellular organisms. They belong to a large group of eukaryotic organisms that includes microorganisms such as yeasts and molds. Fungi feed on organic material and produce spores. They can be true pathogens that cause infections in healthy animals, or they can be opportunistic pathogens that do not often cause infections in healthy individuals, but often cause infections in animals with weak immune systems (said to be immunocompromised).

Fungal infections can be **topical**, affecting only the skin, or **systemic**, affecting one or more of the internal organs. Systemic infections are more serious and more difficult to treat. Their outcome is not always favourable for the animal; we call this a "poor **prognosis**".

Various antifungal drugs are available, including ointments for skin infections. Long-term treatment is usually needed to get rid of fungal infections. Systemic drugs often have many side effects and must be used with care.

Interesting fact: Fungi are also used in the development of certain drugs. The best-known example is probably penicillin, a substance excreted by certain fungi to enable them to compete with vast dividing bacteria for valuable resources. During World War II penicillin was mass produced. Today it is still one of the most commonly used antibiotic worldwide.

Activity 1.4

(1) Explain how fungi differ from protozoa. Refer to the above text.
(2) Look at the following two examples. Are the organisms in 2.1 and 2.2 fungi or protozoa?
    (2.1) Coccidia is small cyst-forming organisms that live in the intestinal tracts of dogs and cats and can cause cause diarrhoea.
    (2.2) Ringworm is a skin infection usually seen in immuno-compromised individuals. Treatment is often needed for many weeks before resolution.

(Ringworm and coccidiosis are further discussed in study units 3 and 8 respectively.)

1.3 CONCLUSION

Pathogenic microorganisms include species from viruses, bacteria, fungi and protozoa. Although these organisms differ greatly from one another, they all have the potential to cause mild to life-threatening disease in animals. Drugs used to control these organisms are called antiviral drugs, antibacterial drugs or antibiotics, antiprotozoal drugs and antifungal drugs. Apart from targeting the disease-causing organism during treatment, symptomatic treatment is also very important.

1.4 REVISION QUESTIONS

Answer the following questions and then return to the text to see if your answers are correct:

(1) There are different ways to diagnose disease. One very specific way is to identify the infectious agent visually. Can we see viruses with the naked eye? If not, how are we able to see them?
(2) How can we medically prevent viral infections in animals?
(3) What does "secondary bacterial infection" mean?
(4) What is antibacterial resistance?
(5) What is an opportunistic pathogen?
(6) Now revise the table you have compiled in activity 1.2. Add any additional features of the different microbes you have studied, including how they are treated.

STUDY UNIT 2

Disease transmission

LEARNING OUTCOME

By the end of this study unit you should be able to identify and describe how these infectious agents are transmitted to animals.

2.1 INTRODUCTION

The pathogenic infectious agents discussed in study unit 1 can spread from animal to animal or from animal to human through a variety of **transmission modes**. If we understand these transmission routes we can act to prevent infectious diseases.

Activity 2.1

(1) Study the following three examples. How was the disease transmitted in each case, do you think?

(1.1) Two dogs live in adjoining enclosures in a kennel. They are sociable and often sit close to each other on either side of the bars. One contracts kennel cough, a respiratory infection caused by bacteria or viruses, and coughs all day in the close vicinity of the other dog. Four days later, the second dog starts coughing too.

(1.2) A veterinary assistant treats a cat for a respiratory disease caused by feline calicivirus. He is tired and decides to take a coffee break. He leaves his medical gloves on the counter, intending to dispose of them later. In the meantime, another assistant puts on the gloves and uses them to treat an open wound in another cat. Some time later, the second cat has the same respiratory disease.

(1.3) A 2-month-old Rottweiler puppy suffers from parvovirus infection. It has bloody diarrhoea and is vomiting. The owner fails to take the puppy to the veterinarian for treatment and it dies. The owner immediately acquires a second puppy. A week later this puppy also starts vomiting.

(2) Now give examples of two more ways in which diseases can be transmitted from an infected animal to a healthy animal.

2.2 MODES OF DISEASE TRANSMISSION

Below we discuss the different modes of disease transmission according to the World Health Organization. Check your answers to the questions while you are reading about these different modes.

2.2.1 Direct contact transmission

Animals can come in direct contact with a pathogenic organism from an infected animal or in the environment. The pathogen can then enter the animal's body through an open wound, abraded skin or mucous membranes. Transmission can also occur through bites and scratches. A pathogen can usually not penetrate skin directly.

2.2.2 Reproductive transmission

Direct contact transmission can occur through contact with the tissues or fluids of an infected dam (mother) during the delivery of new-born animals. Some infectious diseases can also spread during breeding or during pregnancy or gestation (from dam to offspring).

2.2.3 Aerosol transmission

Aerosol transmission happens for example when an animal sneezes and little droplets of saliva or mucus from the infected animal travel through the air and are inhaled by a healthy animal. Pathogenic agents from an infected individual are then transferred to another in the droplets coming from secretions from the mouth and/or upper respiratory tract. Most pathogens do not survive for long in aerosol droplets, therefore infected and susceptible animals must be close to each other for aerosol disease transmission to occur.

2.2.4 Oral transmission

Pathogenic agents can live in contaminated food or water and in contaminated objects in the environment. They are then transmitted when animals eat, drink, lick or chew the contaminated food, water or objects. Feed and water contaminated with faeces or urine frequently cause oral transmission of disease agents.

2.2.5 Fomite transmission

Fomites are inanimate objects like blankets, cages, food bowls, collars and clippers that are contaminated by an infected animal. The pathogens then move indirectly from one animal to another, or to a human who has contact with the fomite. The pathogen enters the host through the mouth or the direct contact route of transmission.

2.2.6 Vector-borne transmission

Vector-borne transmission is very important in production animals like cattle and sheep. Diseases are transferred by **arthropod or insect vectors** like mosquitoes, biting flies, lice, ticks and fleas. These vectors got a pathogen from an infected animal and then spread it to another. Vector-borne transmission can occur biologically or mechanically:

- **Biological** transmission occurs when the disease pathogen replicates or develops further within the vector before it is transferred to a susceptible animal. This transfer takes place when the pathogen is injected (inserted) into the animal, for example when a mosquito bites the animal, or when the pathogen is regurgitated.
- **Mechanical** transmission involves the simple transport of a pathogen by a vector from one animal to another, without any replication or transformation of the pathogen in the vector.

2.2.7 Environmental transmission

Some disease agents can survive for a long time in soil or in the environment. They can then be picked up by an animal through inhalation (aerosol), oral consumption, direct contact or fomites. Environmental transmission therefore requires a second transmission step.

Activity 2.2

(1) Compile a table summarising the different modes of disease transmission. See if you can include an example of each mode in the table.
(2) Now that you know more about the ways infectious agents are transmitted, list at least two things you must do during a disease outbreak to prevent transmission. Give reasons for your answers.

When we deal with infectious diseases it is very important that we must do all we can to prevent the spread of the disease. Good procedure includes the following:

- **isolating** sick animals
- diagnosing the disease
- immediately starting with the **correct treatment** of the patient
- giving **prophylactic** (preventative) treatment to other animals close to the infected animal (e.g. through vaccination)
- **sterilising** all equipment and bedding used for the infected animal

You will learn more about dealing with disease outbreaks in theme 3 of this module.

2.3 SUMMARY

An infectious agent can infect an animal if the agent has been transferred to that animal from an infected source. Transmission occurs via one of the following routes: direct contact transmission, reproductive transmission, aerosol transmission, oral transmission, fomite transmission, vector-borne transmission

or environmental transmission. The mode of transmission depends on the specific pathogen.

2.4 REVISION QUESTIONS

Now that you know how animals can be exposed to disease, answer the following questions. Return to the text to see if your answers are correct.

(1) Explain two ways that disease transmission can occur during reproduction.
(2) What is the most important criterion for aerosol transmission to occur?
(3) Define "fomite".
(4) How can you, an animal welfare assistant, make sure that you do not transmit a disease from one animal to another?
(5) List 4 common vectors of disease.
(6) Why is it important to isolate sick animals during a disease outbreak?
(7) Start compiling your own glossary of new terms you encounter in the study guide. Write down each new term and a simple explanation of the terms. Some of the terms you must include in your glossary are "vector" and "fomite".

Study tip: Add more revision questions as you work through each study unit. This will be useful self-testing before the final examination.

THEME 2

How animals can potentially make us sick

INTRODUCTION TO THEME 2

Study units 1 and 2 introduced you to infectious agents that can cause disease. These infectious agents can be transferred from animal to animal, but also from animal to human (and sometimes human to animal). As an animal welfare assistant you are at risk of contracting disease from infected animals. It is important that you must be able to recognise such diseases. You must know how to avoid getting sick. It is also your duty to educate communities about the prevention of diseases that can be transferred from animals to humans.

In study unit 3 we focus on zoonoses caused by viruses and bacteria. In study unit 4 we investigate zoonoses caused by other disease agents.

STUDY UNIT 3

Important zoonoses (part 1)

LEARNING OUTCOMES

By the end of this study unit you should be able to do the following:

- Explain the concept "zoonosis" correctly.
- Describe and identify the significance, aetiology (cause of the disease) and symptoms of the zoonoses discussed in this study unit.
- Describe how important zoonoses must be managed. Refer to measures like quarantine, protective clothing and referral to veterinarians for further assessment and treatment.
- Give animal owners effective advice on the management of zoonotic disease.

3.1 INTRODUCTION

A **zoonosis** is any infectious disease that can be transmitted from wild or domestic animals to humans. These are diseases that generally affect animals, but can also affect humans. Many serious diseases fall in this category. In this study unit we discuss the most commonly encountered zoonoses in South Africa.

In some instances it is possible for a disease that usually affects humans to affect animals. This is called **reverse zoonosis**. Sometimes a vector is involved in the transmission proses of the disease (see theme 1, study unit 2).

It is important to note right at the beginning of this study unit that each named species of living things, for example bacteria, is always referred to by its genus name and it species name. The genus name is capitalised and both names are written in italics, for example *Escherichia coli*.

We first look at important zoonoses caused by viruses and then at zoonoses caused by bacteria.

Interesting fact: In 2014 about 75% of emerging infectious diseases that affected humans were diseases of animal origin. Approximately 60% of all human pathogens are zoonotic, according to the CDC.

3.2 ZOONOSES CAUSED BY VIRUSES

3.2.1 Rabies (*hondsdolheid*)

Activity 3.1

Read the newspaper article below about a woman that was bitten by a puppy with rabies and then answer the questions that follow:



Rabid pup bites woman

Rianette Jansen
Van Vuren

ELSPETH Gagiano's kind heartedness cost her dearly when she tried to save a puppy's life in Westmead recently.

On her way to the office, driving on Stockville Road in Westmead, Gagiano spotted a puppy frantically making its way through traffic.

She stopped and saved the puppy and took it back to her office and gave it water.

It was then that Gagiano realised something was wrong.

"When we gave the dog water, it kicked the bowl away," she said. The dog then bit her.

"I didn't know the dog was rabid. We're all so soft to puppies, but we don't realise how dangerous it is to save or take them in.

"I took the pup to the SPCA, who then confirmed it had rabies," she added.

Gagiano has just finished treatment to prevent her from getting rabies. Another colleague was also put on treatment.

eThekwini Municipality's Health Unit has intensified its vaccination and educational campaign to combat the spread of rabies in the eThekwini region.

A mass immunisation campaign was planned and is currently being carried out in the entire eThekwini District and will continue until November.

This will be accompanied by intensive health education which also involves councillors, community leaders and community-based caregivers.

Rabies is a contagious and deadly viral disease causing damage to the brain and spinal cord.

It is transmitted to humans and animals through contact with saliva or tissue of infected animals - bites, scratches, licks on broken skin and mucous membranes.

Some of the most common and widespread signs and symptoms to look out for include signs of weakness, confusion, loss of appetite, blank stares, profuse salivation, hydrophobia (fear of water), mental disorder, difficulty in swallowing, muscle pain, headache, fever and lethargy.

The municipality has urged anyone who has been bitten by an unvaccinated animal, or an unfamiliar animal, to seek immediate treatment at a local clinic directly after being bitten.

There is no cure once a person or an animal contracts this disease but it can be prevented.

Source: Jansen van Vuren, R. 2012. Rabid pup bites woman. *Highway Mail,* 22 June:1.

(1) What causes rabies?
(2) How is rabies transmitted?
(3) Name 5 clinical signs that can be observed in animals that suffer from rabies (rabid animals).
(4) How can rabies be prevented?

What is rabies?

Rabies is a serious, life-threatening disease found throughout the world. It is an **acute**, fast developing viral disease that causes the inflammation of brain tissue. (Acute means immediate, brief and often severe.) When an animal contracts the virus and the clinical signs of rabies appear, the disease is usually **fatal** (deadly).

Rabies primarily affects carnivores and bats, although it can affect any mammal. People can be infected with rabies when an animal with rabies (a **rabid** animal) bites them. The rabies animal welfare assistants are most likely to see is **canine rabies**, a disease usually transmitted from dog to dog.

How is rabies contracted?

The virus causing rabies is usually transmitted through **saliva** when an infected animal bites another. The virus can also penetrate an open wound or mucous membranes (e.g. the mouth or eye). Under normal circumstances it does not spread through blood or airborne droplets. The **incubation period** is the time it takes from exposure to the virus to the onset of the clinical signs. This period varies and can be very long. Most rabies cases in dogs develop within 3 weeks to 3 months after infection with the virus.

What are the clinical signs of rabies?

Clinical signs are the signs or symptoms shown by an animal infected with a virus or another infectious agent. The clinical signs of rabies are not exclusive to this disease. In other words, they are non-specific. They can therefore be confused with the clinical signs of other diseases. The clinical signs of rabies differ slightly from species to species, but all affected animals show signs of central nervous system (CNS) disturbances that lead to **behavioural changes**.

Affected animals usually become **anorexic**. (That means they stop eating.) They normally find it difficult to swallow, and appear nervous and irritable. Their **salivation increases**. An affected animal often goes off by itself and may also appear to be off balance (**ataxic**). A **change in the animal's temperament** is usually obvious, for example a very tame animal may suddenly become very aggressive, a wild animal may lose its fear of humans and animals that are usually active at night (**nocturnal**) may suddenly be seen wandering around during the daytime. These behavioural changes usually last a few days, after which **paralysis** and eventually death set in. (Paralysis means losing the ability to move.)

• • • • • • • • • • • • •

Interesting (and very serious) fact: Almost all persons infected by rabid animals will die if they are not treated appropriately. Dogs are responsible for most human

rabies deaths worldwide, but the public health threat of canine rabies has been virtually eliminated in First World countries.

How can rabies be prevented?

The most important way to prevent a rabies outbreak and exposure of humans to this deadly disease is the **annual vaccination** of dogs and cats. Humans with a high risk of exposure, for example animal welfare assistants, must also be vaccinated.

How is rabies treated?

The National Institute of Communicable Diseases explains that the nearest state veterinarian must be notified immediately when we suspect a case of rabies. This is because rabies is a **controlled disease** (see theme 3).

Care must be taken to retain the suspected animal without exposing yourself or anyone else to the risk of being exposed to the virus. If a human has potentially been exposed through a dog bite or had contact with the saliva of a rabid animal, the following must be done as soon as possible:

- Clean the wound properly,
- Vaccinate the person against rabies.

These actions can prevent the onset of rabies in virtually 100% of cases.

Proper wound management is critical. The bite wound must be flushed thoroughly with soap and water for at least 5 to 10 minutes. If no soap is available, flush with water alone. Then apply disinfectant, if available. A 70% alcohol or iodine solution can be used as disinfectant. The patient must then be taken to a doctor or hospital for the rabies vaccines and a tetanus booster (see section 7 of this study unit). The doctor may also prescribe antibiotics to prevent secondary bacterial infection of the bite wound.

Activity 3.2

Compile a table (like the one in activity 1.2) and summarise the most important aspects of each disease introduced in this module. Draw the table with the headings (a) to (g) as follows:

(a) Name of the zoonosis
(b) Causative agent of the disease
(c) Animal(s) usually affected by the disease
(d) Main clinical signs/syndrome seen in animals affected by the disease
(e) Main clinical signs/syndrome seen in humans affected by the disease
(f) Preventative measures against the disease in animals
(g) Preventative measures against the disease in humans

Fill in the relevant details of each disease.

When you have compiled the table, return to the text to ensure the information is correct. Make corrections as needed. Use the completed table when you study the zoonoses.

3.2.2 Rift Valley fever (*slenkdalkoors*)

Activity 3.3

The following is part of a report released in the early stages of the 2011 South African Rift Valley Fever outbreak. The report was compiled by the Outbreak Response Unit of the National Institute for Communicable Diseases (NICD), in collaboration with the South African Department of Health and Department of Agriculture, Forestry and Fisheries (DAFF)

Rift Valley Fever Outbreak

INTERIM REPORT ON THE 2011 RIFT VALLEY FEVER (RFV) OUTBREAK IN SOUTH AFRICA

Case summary

Sporadic human RVF infections have been detected in recent weeks (figure 1) and we continue to encourage clinicians to collect specimens and complete a case investigation form (available on the NICD Website) for all cases meeting the suspected RVF case definition.

From 1 January to 20 May 2011, we have identified a total of 32 laboratory-confirmed human RVF infections, with zero fatalities. The table and map (figure 2) below provide an indication of the current geographical distribution of human infections. Most cases work regularly with animals within the farming (n=24, 75%), veterinary (n=4, 13%) or hunting (n=2, 6%) sectors. Prior to onset of illness, 81% (n=26) of cases report direct contact with infected animal tissue and/or body fluids, 59% (n=19) report mosquito bites, 22% (n=7) report acquisition and handling of meat not sourced from a retail outlet (i.e. informal slaughter), and 15% (n=5) report consuming unpasteurised milk.

Answer the following questions based on the case summary above:

(1) Name 4 ways in which a human can contract RVF (in other words, 4 potential routes of transmission).
(2) How can you as an animal welfare assistant protect yourself from being infected with this virus?

What is Rift Valley fever?

Rift Valley fever (RVF) is an acute, **mosquito-borne** disease of domestic and wild **ruminants**. (Ruminants are even-toed ungulate mammals that chew the cud regurgitated from their rumen, e.g. cattle and sheep.) The virus causing the disease is **endemic** or native to certain countries, including African countries. The disease is usually only confirmed when a veterinarian does a **post mortem** of a suspected victim and laboratory tests confirms the diagnosis.

How is Rift Valley fever contracted?

Outbreaks of the disease usually go hand in hand with very **heavy rainfall** and localised flooding, because the mosquito population increases during such times. The virus can stay **dormant** or inactive in the eggs of mosquitos during drier times. Although mosquitos are the most important vector for this disease, mechanical transmission by other biting insects can also occur.

Humans can also be exposed to the virus when they handle infected livestock. Usually infected people only develop **mild flu-like symptoms** that are self-limiting, which means they disappear without needing treatment. However, a small percentage of people get a more severe form of the fever, which may even be fatal.

The incubation period of RVF is short and infected animals typically become feverish shortly after exposure. Their temperature can reach up to 42 °C. (If you are registered for the module ANH1501, refer to that study guide for normal temperatures of our domestic animals. Otherwise consult a textbook or the internet to get this information.)

What are the clinical signs of Rift Valley fever?

In animals the RFV virus primarily targets the **liver**. Typical clinical signs of the disease in livestock are **abortions** in pregnant animals and **deaths among young** animals. (Abortion means the pregnant animal loses the foetus before it is born.) Lambs are very susceptible to the disease and their **mortality** (death rate) following infection can be up to 100%.

How can an RVF outbreak be prevented?

Appropriate protective measures must always be taken when investigating cases of abortion or when handling animals that are possibly infected. Always wear **protective clothing**, especially gloves and eye goggles, when you handle blood, body fluids or other tissues. Also protect yourself against **mosquitoes** and other bloodsucking insects by using mosquito repellents, sleeping under mosquito nets, and so on.

It is very important that farmers must **vaccinate** their livestock against RVF. Vaccinations protected the animals during the rainy seasons and prevent outbreaks of RFV, massive economic losses and human infections.

3.2.3 Foot and mouth disease (*bek-en-klouseer*)

What is foot and mouth disease?

Foot and mouth disease (FMD) is a highly infectious viral disease of **cloven-hoofed animal species**. It is an economically important disease and also a controlled disease. The presence of FMD negatively affects a country's ability to export animal products to other countries.

What are the clinical signs of foot and mouth disease?

FMD is characterised by fever and blisters in the mouth and on the muzzle, teats, and feet. In young, susceptible populations almost 100% of the exposed

animals will get sick. (The rate at which animals get sick is called the **morbidity**.) The disease is however rarely fatal, except on occasion in young animals.

How can foot and mouth disease be prevented?

Many FMD-free countries have the policy to slaughter all affected and in-contact, susceptible animals. These countries also enforce restrictions on the movement of animals and vehicles around infected premises.

Although individual cases of people contracting FMD have been reported in history, it can be considered a **rare zoonosis**. All documented cases were the result of close animal contact or the consumption of unpasteurised milk. Since 1921, about 40 cases of FMD in humans have been reported. As such the disease is not considered a public health concern.

3.2.4 Orf *(vuilbek)*

What is orf?

Orf is an infectious skin condition caused by a virus. In other words, it is an **infectious dermatitis**. It is sometimes called "sore mouth".

Orf mainly affects **sheep and goats**, in particular young animals. The virus is very resistant in the environment and can survive on premises for many years, even in harsh conditions. Fortunately animals that recover from infection develop a strong immunity and usually only get sick once.

What are the clinical signs of orf?

Orf lesions are mainly seen on the lips, inside the mouth and on the feet of infected animals. Occasionally lesions can also be seen on adult ewes' udders when nursing affected lambs. Lesions usually progress from **nodules** to **pustules** (like pimples) to **crusty lesions**.



FIGURE 3.1

Crusty Orf-lesions on the mouth and nose of a sheep

Source: www.wikimedia.org/wikipedia/commons/7/76/Sheep_with_orf.jpg

The disease usually lasts only a few weeks and eventually the scabs drop off and the tissues heal without scarring. Sometimes antibiotics may be needed

if secondary bacterial infections develop. Lambs that are severely affected sometimes fail to eat normally and lose condition. Extensive lesions on the feet may also cause temporary lameness. Mastitis is inflammation of the udder and can sometimes be severe in ewes with lesions on their teats.

How can infections with orf be prevented?

People are occasionally infected through direct contact with the lesions of affected animals. Lesions usually develop to the hands and face, and if it is severe, can be very distressing. Veterinarians, animal health technicians and sheep handlers should take precaution and wear disposable gloves when handling animals infected with orf.



FIGURE 3.2

Early stage orf lesions on a man's finger

Source: www.wikimedia.org/wikipedia/commons/a/a2/Orf_virus_infection_on_thumb.jpg

If there is a significant problem on a sheep farm, the farmer must discuss the option of vaccinating against orf with a veterinarian. Be careful not to introduce the virus with a **live vaccine** to a farm with no history of orf. (A live vaccine contains a weakened live virus.)

3.3 ZOONOSES CAUSED BY BACTERIA

3.3.1 Tuberculosis

Activity 3.4

Consider the following set of key factors about bovine TB as stated by the *OIE* World Organisation for Animal Health:

Key Facts

- In 1881 Robert Koch discovered the tubercle bacillus as the cause of tuberculosis, and in 1898 M. bovis was identified.
- Pasteurisation of milk from infected animals largely eliminated the spread of Bovine TB in people.
- The campaign to eliminate Bovine TB was a major incentive for the establishment and growth of veterinary services in many countries.
- Although the infection has been controlled in most developed countries, the complete elimination is complicated by persistent infection of wild animals such as badgers in the United Kingdom, white tailed deer in parts of the United States and brush-tail possum in New Zealand.
- Bovine TB remains a serious problem for animal and human health in many developing countries.

Human TB is mainly transmitted from one individual to another through aerosol. What can you conclude from the above synopsis as one of the main routes of transmission for Bovine TB from infected cattle to humans?

What is tuberculosis (TB)?

Tuberculosis is an infectious disease caused by bacteria of the genus **Mycobacterium**. The disease is usually chronic and **debilitating**, which means it weakens sufferers.

There are various different Mycobacterium species that affect different species of animals and birds. Human tuberculosis, for example, is caused by *M. tuberculosis* and avian tuberculosis is caused by *M. avium*. Cattle or bovine tuberculosis is caused by *M. bovis*. Bovine TB in particular is a very significant zoonosis in many parts of the world.

Bovine tuberculosis is common in less developed countries and it causes severe economic losses in these countries.

How is tuberculosis contracted?

Contamination of pastures, water troughs and licks with infected particles or saliva from cattle with bovine tuberculosis, can cause infection to spread to other animals.

Predators can also pick up the infection when they feed on infected carcasses.

The spread of TB from cattle to humans typically occurs when human inhale droplets expelled from the lungs of cattle, or when they drink unpasteurised milk from an affected cow. (Was this your answer in activity 3.4?)

What are the clinical signs of TB?

The clinical signs of TB depend on where the bacteria cause **lesions** (wounds) and how severe the lesions are. Most infected cattle show no clinical symptoms. In cases of chronic and widespread infection, the following clinical signs may be seen:

- **Losing weight**
- **A dull hair coat**
- **Poor appetite**
- **A chronic, intermittent, moist cough and eventually breathing problems if lung lesions are severe**
- **Mastitis and lower fertility**
- **Continuous bloating (of the rumen)**
- **Enlarged lymph nodes**

How can tuberculosis be prevented?

Developed countries implement **eradication programmes.** Animals are tested for TB and slaughtered if they are infected. These programmes, have reduced tuberculosis in cattle significantly, and humans are nowadays rarely infected with Bovine TB.

Reservoirs of the infection are populations of animals which are chronically infested with the causative agent and can act as a source of infection to other animals. When there are reservoirs of infection among wildlife, complete eradication is difficult.

The **intradermal tuberculin test** is widely performed by veterinarians to diagnose TB in large animals. Infected cattle are branded with a letter T. The South African government is following a **slaughtering out** policy for infected cattle in an attempt to eradicate the disease in South Africa.

The **pasteurisation** of milk for human consumption is also compulsory in South Africa to prevent the spread of bovine tuberculosis and other zoonotic diseases to humans. (Pasteurisation means to treat milk using high temperatures to kill pathogens.)

Tuberculosis-infected animals may further not be moved from one property to another.

3.3.2 Brucellosis

What is brucellosis?

Brucellosis, together with bovine TB, is a disease that is closely controlled. Brucellosis is caused by bacteria of the genus Brucella.

In South Africa, bovine brucellosis is the most important type of brucellosis seen, followed by brucellosis in goats. Other species could be affected too. Dog and pig brucellosis have fortunately not yet been diagnosed in South Africa.

How is brucellosis contracted?

Humans are usually infected through **contaminated milk** or unpasteurised milk products.

When brucellosis leads to an abortion in cattle or goats, the aborted foetus and the membranes and fluids secreted during labour contaminate grazing areas with bacteria. These areas then become a source of infection to other cows and animals.

What are the clinical signs of brucellosis?

The most common sign of brucellosis in animals is **abortion**, usually during late gestation. This can cause massive production losses. Brucellosis can also make male animals **infertile**.

The signs of brucellosis in people are similar to flu and include clinical signs like:

- **Fever**
- **Night sweats**
- **Sore muscle and joints**
- **Severe headaches**
- **Weight loss**
- **Weakness**

The disease could have a long course of many months or years and can be very depressing. Worldwide *Brucella melitensis*, from goat and sheep, is the species that most often causes human brucellosis.

How can brucellosis be prevented?

So how can you avoid getting brucellosis? Any aborted foetal material must always be examined by an animal health technician or state veterinarian, and samples must be sent to a veterinary laboratory to rule out the presence of brucellosis on a farm. Always wear gloves when foetal material is handled. Infected cattle are branded with a letter C.

There is no treatment for brucellosis in animals. Infected animals will stay a source of infection to other animals for the rest of their lives and must be **culled** (slaughtered). **The treatment of affected humans is long and expensive.**

Specific vaccine protocols are available to prevent brucellosis in animals and must be discussed with a veterinarian.

3.3.3 Anthrax

Activity 3.5

Study the following illustration of a typical life cycle of the bacterium causing anthrax.

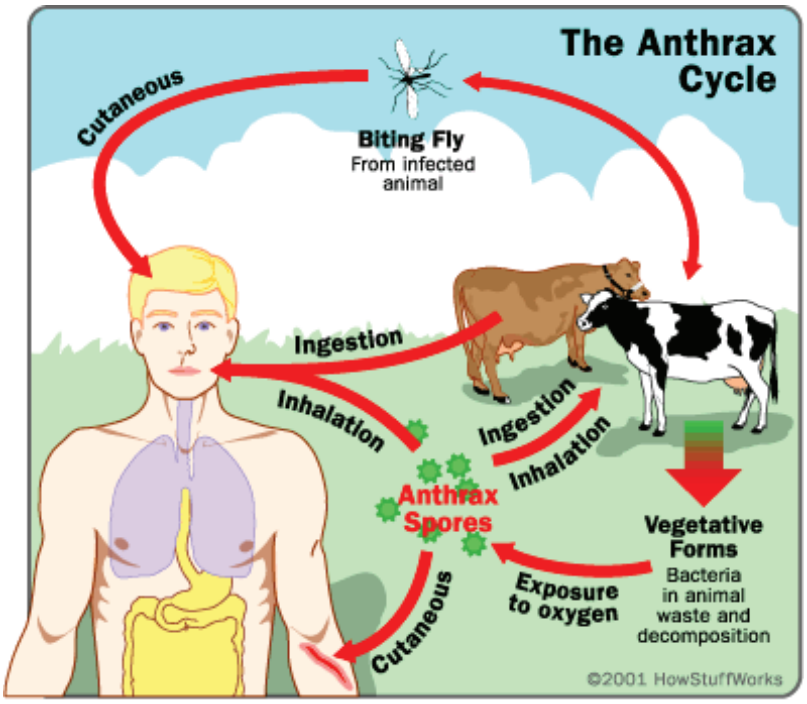


FIGURE 3.3

Routes of anthrax infection

Source: http://science.howstuffworks.com/anthrax1.htm

(1) The diagram illustrates the various ways in which humans can become infected with anthrax. Name all these routes.
(2) What is the prerequisite for anthrax to form spores?

What is anthrax?

Anthrax is a zoonotic disease caused by the spore-forming bacterium ***Bacillus anthracis***. It is highly fatal. The disease is most commonly seen in wild and domestic herbivores, for example cattle, sheep, goats and other antelopes.

How is anthrax contracted?

The bacteria that cause anthrax form spores when they are exposed to oxygen, for example when an infected carcass are opened. These **spores** are then easily transmitted to other animals or to humans. They can also survive in the environment for a long time. (Was this your answer to question 2?)

Humans can be infected when they are exposed to tissue from infected animals, contaminated animal products or directly to the bacterial spores.

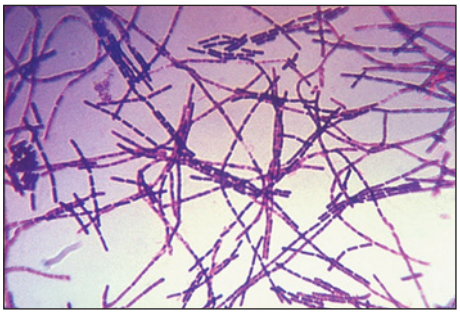


FIGURE 3.4

Typical Bacillus anthracis bacteria as seen after a Gram stain of infected tissue

Source: www.wikimedia.org/wikipedia/commons/thumb/a/a1/Bacillus_anthracis_Gram.jpg/320px-Bacillus_anthracis_Gram.jpg

The bacilli spores can remain infective in soil for many years and are a potential risk for grazing livestock. Besides this, **biting flies** can also transmit the disease mechanically from one animal to another by carrying the spores. Carnivores eating infected carcasses may also contract the disease.

What are the clinical signs of anthrax?

Anthrax can present in several different ways. In herbivores it typically causes **sudden death**. In humans it can cause infections of the skin, lungs and blood, and lead to death if it is not treated immediately.

How can anthrax be prevented?

Anthrax is controlled through compulsory **vaccination programmes**. There are laws that demand that these vaccination programmes must be followed.

Anthrax is a controlled disease (see theme 3) and any expected cases must immediately be reported to the nearest state veterinarian so that prompt action can be taken to prevent the spreading of the disease. Confirmed infected **carcasses must be burned or buried** in a specific way to avoid the spreading of the spores.

It is very important to never open the carcass of an animal that died suddenly of an unknown condition and to cook meat properly before eating it.

Interesting fact: *B. anthracis* was the first bacterium ever proven to cause a disease.

3.3.4 Tetanus from bite wounds

Activity 3.6

Have you ever been bitten by an animal? Have you ever stepped onto a rusty nail or have you been injured by rusty wire? Apart from general wound care, what did the doctor give you?

What is tetanus?

Tetanus is a disease caused by the toxin produced by the bacterium ***Clostridium tetani***. The bacterium causes **toxaemia** (blood poisoning) when it infects an animal or person. Almost all mammals are susceptible to **toxaemia**, but horses and lambs seem to be the most sensitive.

How is tetanus contracted?

The *Clostridium* bacterium is usually present in soil in the form of spores. These spores can enter animals through wounds that are deep enough to have low oxygen levels, which is the type of environment that favours clostridial bacteria. (These bacteria are **anaerobic**.)

Tetanus can also result from certain farming procedures like tail docking or castration.

What are the clinical signs of tetanus?

The toxaemia caused by *Clostridium tetani* toxins leads to initial **stiffness** that becomes more and more severe. The stiffness later develops into spasm-like contractions of the skeletal muscles. Eventually the diaphragm is also affected and the animal can no longer breathe. This is called **respiratory failure**. Treatment is needed promptly after the appearance of clinical signs or the animal will die.

How can tetanus be prevented?

It is of critical importance to **vaccinate** animals at risk against clostridial diseases to protect them from these toxins, because they can be fatal. Humans that have been bitten by an animal or obtained a deep penetrating wound must also be vaccinated against tetanus. (Was this your answer in activity 3.6?)

3.3.5 Salmonellosis

What is salmonellosis?

Salmonellosis is a disease caused by a rod-shaped Gram-negative bacterium (see study unit 1). *Salmonella* infections in food-producing animals are a serious public health concern, because the food products can cause human infections.

How is salmonellosis contracted?

There are various types of *Salmonella*, but salmonellosis in warm-blooded animals is usually caused by **serovars** of *Salmonella enterica* sp. (Serovars are distinct variations in a species of bacterium or virus.)

What are the clinical signs of salmonella infection?

Infection with *Salmonella* usually causes a **carrier state**, which means the infected animals carry the pathogen for a certain time without showing any clinical signs. Various symptoms are possible following infection, but when clinical disease is present it is usually one of two main syndromes:

- Systemic **septicaemia** (blood infection, also called **typhoid**)
- **Enteritis** (inflammation of the intestines, causing diarrhoea)

Salmonellosis from reptiles

The most common zoonosis associated with reptiles is salmonellosis. Subclinical infections of reptiles are common and *Salmonella* spp. can often be isolated from their faeces, although these are not always pathogenic (causing disease).

Infected reptiles shed *Salmonella* organisms in the faeces only intermittently, which means we do not always pick it up when the faeces are tested. All reptiles must therefore be considered potentially positive. **Pregnant women, young children and persons with weakened immune systems must avoid contact with reptiles and their cages.**

Proper hygienic measures must be taken around reptiles at all times in order to reduce exposure to the organisms in the faeces of infected animals.

3.3.6 Psittacosis/chlamydiosis

Activity 3.7

You have an aviary full of parakeets. Another friend with an aviary wants to give some of his birds to you. You do not know if his birds are healthy. How can you make sure that his birds do not carry any diseases to the birds in your aviary if you accept his offer?

What is psittacosis/chlamydiosis?

Psittacosis in humans is caused by the same bacterium that causes **avian chlamydiosis**, namely *Chlamydia psittaci*. Avian chlamydiosis can range from unnoticed to acute to chronic disease in various bird species.

How is psittacosis/chlamydiosis contracted?

People usually get exposed to the disease through the organisms in the air that have been shed from the gastrointestinal or respiratory tracts (lungs) of infected live or dead birds. They can also be infected through direct contact with infected birds or tissues, even if they are only briefly exposed. Pregnant woman and immunocompromised people are in particular prone to contracting psittacosis.

What are the clinical signs of psittacosis/chlamydiosis?

The *Chlamydia* bacteria affect various organs. The disease in people can range from just flu-like symptoms to pneumonia to severe endocarditis and encephalitis (inflammation of the lungs, heart and brain, respectively). Precautions should

therefore be taken when examining live or dead infected birds to avoid exposure (e.g. dust mask and plastic face shield or goggles, gloves and detergent disinfectant to wet feathers).

How can psittacosis/chlamydiosis be prevented?

Appropriate **biosecurity practices** are necessary to control the introduction and spread of infectious diseases, including chlamydiosis, in an avian (bird) population. Biosecurity practices are procedures or measures designed to protect the population against harmful substances. Such practices include the following:

- The **quarantine** of all new birds introduced into an aviary. That means they must be kept isolated until it is known that the birds are healthy.
- New birds must be thoroughly examined for any signs of disease.
- Domestic birds must never be exposed to wild birds, because wild birds are often reservoirs of disease.
- Sick or exposed birds must be isolated and treated.
- It is very important to clean and disinfect the places where birds are kept and equipment they come into contact with.
- Always remove organic matter, like faeces and nest material, before disinfection.
- It is a good principle to have an **all-in-all-out system** in an aviary or poultry house. This means all cages are emptied on a particular day, and the accommodation is cleaned, disinfected and then refilled on another day.
- Chlamydia is killed by temperatures above 56 °C within 5 minutes and also by most disinfectants, for example bleach and 70% alcohol solutions.

How is psittacosis/chlamydiosis treated?

Human and avian chlamydiosis is a **reportable disease** and the nearest state veterinarian must be informed of suspected or confirmed cases. Affected birds are treated with long-term tetracycline antibiotics. This is given in feed when flocks of birds are affected. There is no vaccine to prevent the infection in birds.

3.3.7 Cat scratch disease

What is cat scratch disease?

Cat scratch disease (CSD), also known as cat scratch fever, is caused by the transmission of a bacterium called ***Bartonella henselae*** from cats to humans.

How is cat scratch disease contracted?

The bacterium that causes the disease is usually transmitted when an infected cat scratches or bites a human. Cats carrying the bacterium is **asymptomatic**, in other words, they do not show any clinical signs that they are infected. Fleas are believed to transmit the bacterium between cats. Kittens younger than 12 months are far more likely to transmit the disease than adult cats.

What are the clinical signs of cat scratch disease?

When the bacterium has been transmitted to a host, the infection starts with the formation of a small nodule at the site of the scratch, followed by swelling of the lymph nodes draining the area. In most patients the disease causes only **minimal discomfort**. However, a small percentage of patients may develop severe systemic

disease. Infection of immunocompromised patients with the same organism leads to a very different and serious disease.

How can cat scratch disease be prevented?

Teaching children how to handle pets gently and if needed, make cats wear silicone nail caps, may help prevent the occurrence of CSD. The animal that transmitted the disease is only infectious (able to transmit the disease) for a very short period of time, so removing the pet from the home is not needed. **Flea control** to prevent the spread of the bacteria between cats is essential (see study unit 7).

How is cat scratch disease treated?

In most patients, the disease causes minimal discomfort and the patient will recover without treatment within 2 to 4 months. Long-term immunity develops after one episode of cat scratch fever. You are therefore likely to get this disease only once in your life.

Activity 3.8

Cat scratch disease is generally a mild disease, but it can affect immunocompromised patients severely. Can you make a list of all the other diseases mentioned so far in this study unit where this is the case?

It is very important that you, as an animal health assistant, point this out to communities. Teach them basic pet care and hygiene principles in order to protect individuals with weakened immune systems.

3.4 CONCLUSION

In this study unit we discussed the importance of recognising zoonoses and taking all the necessary steps to prevent infection with these diseases. We focused specifically on zoonoses caused by viral and bacterial agents. In the study unit that follows, we explore zoonoses caused by other disease agents.

3.5 REVISION QUESTIONS

(1) The table you started to compile in activity 3.2 should now be complete. Revise the table and make sure that all the facts you wrote down are correct. This table is a valuable study tool. You should be able to fill in key words on a blank table after you have studied the diseases.
(2) Make a list of all the zoonoses we discussed that can be prevented if animals are vaccinated correctly.
(3) Define "incubation period".
(4) Explain what a state eradication programme is. Which diseases are controlled in this way?
(5) Biosecurity is a very important way of preventing the introduction of diseases into a herd or flock of animals. Explain what an all-in all-out system is.

STUDY UNIT 4

Important zoonoses (part 2)

LEARNING OUTCOMES

By the end of this study unit you should be able to do the following:

- Describe and identify the significance, aetiology (the cause of the disease) and symptoms of the zoonoses discussed in this study unit.
- Describe how important zoonoses must be managed and explain measures like quarantine, protective clothing and referral to veterinarian for further assessment and treatment.
- Give effective advice to animal owners about the management of zoonotic disease.

4.1 INTRODUCTION

In this study unit we continue our study of important zoonoses that can potentially affect you as veterinary welfare assistant. In the previous study unit we looked at diseases caused by viruses and bacteria. In this study unit we focus on diseases caused by other organisms, namely protozoa, skin fungi and mites, and worms and their larvae.

Activity 4.1

Turn back to activity 3.2 and read the instructions for that activity. As you work through this study unit, draw up a similar table for the various diseases discussed here.

4.2 ZOONOSES CAUSED BY PROTOZOA

4.2.1 Toxoplasmosis

What is toxoplasmosis?

Toxoplasmosis is caused by a protozoan parasite that can potentially infect most mammals and birds, namely ***Toxoplasma gondii***.

How is toxoplasmosis contracted?

All species of wild and domestic cats are the **definitive hosts** and the main reservoir of infection. This means they are the primary hosts or the hosts in which the parasite reaches maturity and reproduces. However, after the first exposure cats usually develops a strong immunity and they therefore only shed oocytes once. *T. gondii* is transmitted by the ingestion of infectious oocysts in cat faeces, consumption of tissue cysts in infected meat, or through the placenta from mother to foetus.

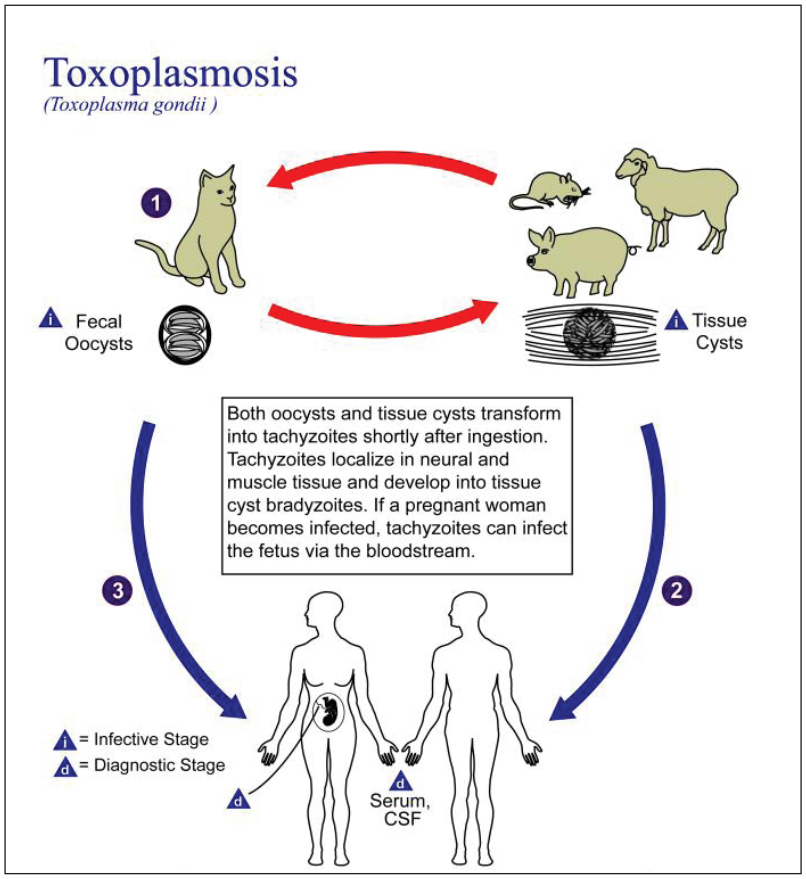


FIGURE 4.1

Schematic representation of the life cycle of Toxoplasma gondii's

(Source: http://commons.wikimedia.org/wiki/File:Toxoplasma_gondii_Life_cycle_PHIL_3421_lores.jpg)

What are the clinical signs of toxoplasmosis?

The **tachyzoites** are a rapidly dividing stage in the life-cycle of *T. gondii*. Tachyzoites infect tissues throughout the body. They replicate within cells until the cells burst and therefore cause massive **tissue damage**. Depending on the organ affected, various clinical signs could be observed and they are very non-specific.

Young and immunocompromised animals may die, but older animals are likely to mount a strong immune response causing these damage-causing tachyzoites to rather form **tissue cysts**, particularly in nervous tissue (neurons). This is

called the bradyzoite stage of *T gondii*. These cysts may stay in a host for the rest of his or her life without being noticed. Furthermore *T. gondii* can cause **abortions and stillbirth** in sheep, goats and pigs.

Many people are unknowingly **persistently infected** with *T. gondii*. That means the parasites remain in the body although it causes no disease in the individual. However, toxoplasmosis is a major concern for people with compromised immune systems. In these individuals the disease can be serious and cause infection of the brain and its surrounding membranes.

Toxoplasmosis is also a concern for **pregnant women** as the tachyzoites can travel transplacentally to the foetus, causing **birth defects**.

- **How can toxoplasmosis be prevented? Cook meat properly** and work hygienically in the kitchen. **Freezing** meat also kills tissue cysts.
- Always wash your hands properly with soap and warm water after handling meat or after working with soil. Wear **gloves** when doing the latter because soil can be contaminated with cat faeces.
- Pet cats should not be fed raw meat, because, if the meat is infected, it will allow the parasite to complete its life cycle.
- Vegetables coming from the ground should be washed thoroughly before eating.

Activity 4.2

A lady in the community has recently fallen pregnant. She owns three cats. She hears from a friend that she could contract a disease from the cats that could be harmful to her unborn child and now she wants to give the cats away. Do you think that this is necessary?

Toxoplasmosis is generally not a concern to a pregnant woman who has been exposed to the parasite previously in their lives, as is very likely if she has had regular contact with cats. There are various ways in which you can come into contact with toxoplasma cysts. If the lady's cats are infected, she has most likely been exposed to the parasite before she has fallen pregnant, therefore it is not necessary for her to give the cats away. However, good hygiene must always be practised and it is better that pregnant women avoid all contact with cat litter, soil and raw meat.

4.2.2 Giardiasis

What is giardiasis?

Giardiasis is a chronic infection of the intestines caused by protozoa of the genus *Giardia*. Several species of *Giardia* are seen worldwide. They can infect most domestic and wild mammals, many birds and people. The prevalence (presence) of these parasites is the highest in younger animals.

As with all protozoa, *Giardia* go through various stages during its life cycle. The flagellate protozoa, called **trophozoites**, live in the inner mucosal surfaces of the small intestines where they attach, multiply and absorb nutrients from food consumed by the host.

Activity 4.3

You have now been introduced to *Giardia* and how this parasite interacts with its host. What clinical signs do you think will a human infected with *Giardia* shows?

What are the clinical signs of giardiasis?

Giardia trophozoites decrease the amount of nutrients that the infected host can absorb, therefore animals with *Giardia* typically have **chronic diarrhoea**. Their stools are soft and pale, appear fatty and are covered with mucus. Affected animals often lose weight. To diagnose giardiasis, a veterinarian looks at faeces under a microscope and/or does other tests to distinguish *Giardia* from other parasites that cause diarrhoea.

How is giardiasis contracted?

The trophozoites eventually form cysts that are passed intermittently in the infected animal's faeces. These cysts can survive for several weeks in the environment. Transmission of these cysts to a new host occurs via the oral route, directly, or through a contaminated environment.



FIGURE 4.2

Giardia trophozoites

Source: www.wikimedia.org/wikipedia/commons/2/26/Giardia_intestinalis_(259_17).jpg

How can giardiasis be prevented?

- Animals diagnosed with *Giardia* must firstly be treated with the correct drugs.
- Secondly, it is important to bath infected animals regularly to remove cysts from their coats.
- Since high numbers of these cysts are shed by infected animals, you must also focus on treating the environment. Faeces must be removed at least daily and disposed of with municipal waste. The kennels and sleeping areas of animals must be washed thoroughly with disinfectants. Ensure thorough disinfecting by leaving solutions for at least 15 minutes on contaminated surfaces before rinsing them off. Cysts are killed by drying them out and therefore the areas must be allowed to dry completely after cleaning. Steam

and boiling water can also be used to inactivate the cysts. It is impossible to disinfect yards with grass or runs, these areas should be considered contaminated for at least a month after infected dogs had last been there. During this time the areas must be avoided.

- Lastly, animals must not be kept in overcrowded conditions, because this promotes the transmission of *Giardia*.

Always wear protective gloves when working with infected animals and handling animal faeces. Wash your hands thoroughly afterwards.

4.3 ZOONOSIS CAUSED BY SKIN FUNGI AND MITES

4.3.1 Ringworm

Activity 4.4

Study the lesions on a boy's arm below and describe what you see.



FIGURE 4.3

Ringworm lesion on a person's arm

Source: http://en.wikipedia.org/wiki/Skin_infections_and_wrestling

Do these lesions look familiar to you? Have you, a friend or a family member been affected by ringworm? If so, make a few notes of your current knowledge and perceptions of the disease and compare the notes with the information that follows here.

What is ringworm?

Ringworm is also called **dermatophytosis**. It is a skin condition, but it is not caused by a worm, as the name suggests, but by a family of fungi called the dermatophytes.

How is ringworm contracted?

Dermatophytes produce spores that are transmitted from one affected individual to another (animal or human), mainly by skin-to-skin contact. It can also be spread by contaminated fomites such as bedding, grooming tools, or tack (see study unit 2).

What are the clinical signs of ringworm?

The fungi that cause ringworm penetrate the hair on the skin and weaken it. This leads to patchy hair loss. The characteristic **circular**, **hairless** area is often reddened by inflammation and can be flaky or have raised edges. The lesions may be itchy.

As the inflammation and the host's immunity develop, further spread of the infection is usually inhibited and the infection is self-limiting, but this can take several weeks.

How can ringworm be prevented?

Just being exposed to dermatophytes does not necessarily mean you will get an infection, but the following precautions must be taken:

- Bath all pets in an affected household with a medicated shampoo.
- Wash the infected animals' bedding and toys with a disinfectant that kills ringworm spores.
- Discard items that are impossible to disinfect properly .
- Vacuum the house frequently to rid the house of infected hair and skin cells.

How is ringworm treated?

In young, sick and immunocompromised animals, as well as in longhaired domestic cats, infection can be widespread, persistent and difficult to treat. It is important to have any suspicious lesions diagnosed by a veterinarian so that treatment could be prescribed to prevent further spread. Treatment depends on the seriousness of the lesions. Topical ointments and medicated shampoos might be sufficient. Sometimes systemic oral drugs, prescribed by a veterinarian, are needed.

4.3.2 Scabies

Activity 4.5

Study this picture of a stray dog severely affected by canine scabies.



FIGURE 4.4

Dog affected by scabies

Source: www.wikimedia.org/wikipedia/commons/d/dc/Street_dog-Gianyar_Bali-2009.jpeg

(1) Describe what you see.
(2) Scabies is a disease of the skin. How do you think is it transmitted from one infected dog to another?
(3) How would you protect yourself from contracting the disease when handling this dog?

What is scabies?

Mange is a highly contagious skin infection caused by mites (see study unit 7). Sarcoptic mange or **canine scabies** is an infection of dogs that can also infect humans that come into contact with an infested dog.



FIGURE 4.5

Adult mites of Sarcoptes scabiei var. canis

Source: www.wikimedia.org/wikipedia/commons/f/fc/Canine_scabies_mite.JPG

How is scabies contracted?

Scabies is mainly transmitted between dogs by direct contact.

What are the clinical signs of scabies?

The mite spends its entire lifespan (+/- 3 weeks) on the dog. Females burrow tunnels in the skin to lay their eggs. Scabies is a very itchy (**pruritic**) condition and the little nodules the mite causes eventually develop into thick crusts. These are the result of self-trauma (scratching) by the affected individual. The skin can even become thickened, and secondary bacterial and yeast infections can occur. Dogs can become so severely affected that they become emaciated (thin and weak) and die.

The mite can be identified under a microscope (light microscopy) from skin tissue collected with a deep skin scraping, but sometimes finding the mite in such sample can be difficult and an affected animal will be treated based on its history and clinical signs.

How can canine scabies be prevented?

There are various topical dips on the market to treat dogs with mange. Several weekly dips are needed until the condition has cleared. Specific shampoos to remove scabs can also be beneficial. Systemic drugs, called macrocyclic lactones, can also be prescribed by a veterinarian. Gloves must be worn when working with a dog infected with mange and when using topical dips. (Was this your answer to question 3?)

4.4 ZOONOSIS CAUSED BY WORMS AND THEIR LARVAE

4.4.1 Cutaneous larva migrans (*Ancylostoma*)

What is cutaneous larva migrans?

Hookworm (*Ancylostoma*) in dogs and cats is discussed in detail in theme 4, study unit 7, but it is important to note that hookworm poses a zoonotic risk to humans.

The **infective larvae** of canine hookworms can penetrate the skin of people and wander around under the skin. This is called cutaneous larva migrans, or **creeping eruption**, or plumber's itch.

What are the clinical signs of cutaneous larva migrans?

The infection causes a red and very itchy eruption, which can become very painful. If it is scratched, a secondary bacterial infection may develop. Cutaneous larva migrans usually heals spontaneously, but it can take up to a year to heal completely. Proper medical treatment can kill the larvae and relieve the associated itching within 48 hours.



FIGURE 4.6

The tracts cause by hookworm larvae under the skin of a boy

Source: www.wikimedia.org/wikipedia/commons/7/73/Larva_Migrans_Cutanea.jpg

How can cutaneous larva migrans be prevented?

It is very important to regularly deworm dogs, in particular puppies, and to remove and dispose of dog faeces often. Dogs should not be allowed to defecate in sand pits where children play.

4.4.2 Visceral larva migrans (*Toxocara*)

What is visceral larva migrans ?

The infective larvae of the common roundworm species found in dogs and cats, *Toxocara*, can cause visceral larva migrans. (The viscera are the internal organs.)

How is visceral larva migrans contracted?

The larvae that cause this condition typically infect children that have swallowed the eggs of this worm, for example when they eat soil. After the eggs are swallowed, the larvae hatch in the small intestines. They penetrate trough the tissues to the liver and eventually enter the blood system. From the blood stream they can spread to virtually any or every organ. The larvae are often deposited in the liver, lungs, eyes, heart and brain.

What are the clinical signs of visceral larva migrans?

The clinical symptoms depend on the organ affected and the degree of inflammation and damage cause by the larvae. The parasite cannot complete its life cycle in humans and will eventually die. However, this may lead to more problems, like the forming of abscesses.

We cannot emphasise the importance of deworming pets enough.

Activity 4.6

Owners are often scared that their children will contract diseases from their pets. Cutaneous and visceral larva migrans are zoonoses that pose a degree of risk to children. Think about what you have learned in this study unit. Now compile a short list of precautions that you can teach pet owners to take in order to prevent these diseases from affecting their children.

How can cutaneous and visceral larva migrans be prevented?

Teach pet owners in the community the following about parasite control in pets:

- All pets must be dewormed regularly.
- Puppies must be dewormed monthly. As they get older, four times a year should be enough, unless otherwise advised by a veterinarian.
- Children must always wash their hands after they have played with pets.
- Children may never eat soil, nor play barefoot in it.
- Pet faeces must be removed on a daily basis, in particular from areas where kids play.

4.4.3 Hydatid cysts (*Echinococcus* tapeworm)

What are hydatid cysts?

Hyatid cysts result when the eggs of *Echinococcus granulosus* (a tapeworm) are swallowed by animals or people. These eggs then hatch in the intestine of an intermediate host. Then so-called oncospheres enter the bloodstream and travel to various organs, in particular the liver and lungs, where they lodge and develop into hydatid cysts. The following figure illustrates this:

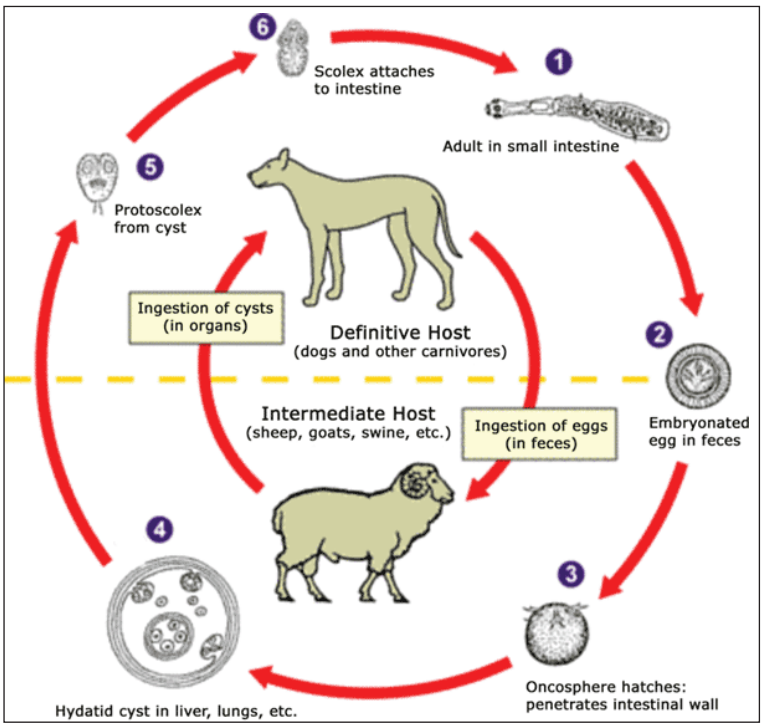


FIGURE 4.7

The life-cycle of Echinococcus tapeworm

Source: www.wikimedia.org/wikipedia/commons/1/19/Echinococcus_Life_Cycle.png

How are hydatid cysts contracted?

Echinococcus granulosus is a tapeworm found in the small intestine of canines, the definitive host (see study unit 7). The tapeworm's eggs, which are shed in faeces on pastures, can be swallowed by wild and domestic herbivores, who act as intermediate hosts.

People can also serve as **intermediate hosts**. Humans can be exposed to the *Echinococcus* eggs through hand-to-mouth transfer after working or playing with infected dogs, as the eggs can be stuck on dogs' fur. Humans can also be exposed indirectly by ingesting food, water or soil contaminated with stool from infected dogs.

Study tip: It is often easier to study a sequence of events by drawing an illustrative diagram of the events.

How can hydatid cysts be prevented?

It is very important to never allow dogs to eat raw meat from potential intermediate hosts so that the tapeworm cannot complete its life-cycle.

What are the clinical signs of hydatid cysts?

Fortunately rare in people, hydatid cysts can lodge in the central nervous system and produce symptoms similar to those of a brain tumour. Surgical intervention is then required to remove the cysts.

4.5 CONCLUSION

In this theme you have learned about 18 zoonotic diseases. These are disease of animals or birds that can also be transmitted to humans. Some of these diseases are mild and others very severe. All these diseases can be prevented if proper primary health care is provided to animals and if the necessary precautions is taken by humans who work with or own animals. It is your duty as animal welfare assistant to know about these diseases. You must recognise them in animals you work with and arrange for proper diagnoses and care for these animals. It is also your duty to educate communities about the prevention of disease. This will ensure that there is a happy and healthy relationship between animal and human.

4.6 REVISION QUESTIONS

(1) The table you started to compile in response to activity 4.1 should now be complete. Revise the table and make sure all the facts you wrote down are correct. This table can be a valuable study tool. You must be able to fill in key words on a blank table after you have studied the diseases.
(2) Make a list of all the zoonoses in this study unit that can be prevented if animals are vaccinated appropriately.
(3) Make a list of general precautions, apart from vaccination, that pet owners and veterinary staff must take to prevent infection with zoonoses.
(4) Remember to extend your glossary as you work through this study guide. Terms that you should have added to your glossary include: incubation period, anorexic, ataxis, endemic, dormant, debilitating, reservoir, pasteurisation, toxaemia, serovar, enteritis, biosecurity, asymptomatic and prevalence.

THEME 3

How to deal with disease outbreaks

INTRODUCTION TO THEME 3

A disease can affect a single or multiple animals. A disease outbreak is when the occurrence of cases of disease is in excess of what would normally be expected in a defined community, geographical area or season. The extent of outbreaks differs; they can occur only in a restricted geographical area or throughout several countries. Disease outbreaks can last for a few days or weeks, or even for several years. Disease outbreaks can have devastating consequences, in particular financially.

STUDY UNIT 5

Controlled vs non-controlled diseases

LEARNING OUTCOMES

By the end of this study unit you should be able to do the following:

- Distinguish accurately between controlled and non-controlled diseases.
- Name the most important controlled animal diseases in South Africa.

5.1 INTRODUCTION

Activity 5.1

What do you think is the difference between a **controlled** animal disease and a **notifiable** animal disease?

The Animal Disease Act defines a **controlled animal disease** as any animal disease in respect of which any general or particular control measure has been prescribed, and any animal disease which is not indigenous or native to South Africa.

A **notifiable disease** is any disease that must by law be reported to government authorities when it occurs.

Diseases that are not officially controlled by the government are not recorded and there are no laws that describe how they should be dealt with.

Let us now look at controlled animal diseases in South Africa.

5.2 IMPORTANT CONTROLLED DISEASES IN SOUTH AFRICA

Diseases are classified as non-controlled, notifiable or controlled. The latest list of controlled diseases was released by the Department of Agriculture, Forestry and Fisheries (DAFF) in 2010. A copy of the directive is provided.

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18 June 2010

LIST OF CONTROLLED AND NOTIFIABLE ANIMAL DISEASES (ACT 35 OF 1984)

Controlled Animal Diseases (in terms of the Animal Diseases Act, Act 35 of 1984)

- Any animal disease or infectious agent that is not known to occur in South Africa
- African horse sickness (AHS)
- African swine fever (ASF)
- Anthrax
- Aujeszky's disease
- Bacterial kidney disease (in fish)
- Bovine contagious pleuropneumonia (CBPP)
- Bovine spongiform encephalopathy (BSE)
- Brucellosis (in all animal species)
- Classical swine fever (CSF)
- Contagious equine metritis (CEM)
- Contagious haemopoeitic necrosis (in fish)
- Contagious pancreatic necrosis (in fish)
- Corridor or Buffalo disease (Theilerioses)
- Dourine
- East coast fever
- Equine infectious anaemia (EIA)
- Equine influenza (EI)
- Equine viral arteritis (EVA)
- Foot and mouth disease (FMD)
- Glanders
- Haemorrhagic septicaemia (in fish)
- Johne's disease (in sheep, cattle and goats)
- Nagana (Trypanosomiasis)
- Newcastle disease
- Notifiable avian influenza (NAI)
- Porcine reproductive and respiratory syndrome (PRRS)
- Psittacosis
- Rabies
- Rinderpest
- Salmonella Enteriditis
- Salmonella Gallinarum (Fowl typhoid)
- Salmonella Pullorum (Bacillary white diarrhoea)
- Scrapie
- Sheep scab
- Skin conditions in sheep
- Swine vesicular disease
- Tuberculosis (in all animal species)

Notifiable Animal Diseases (in terms of the Animal Diseases Act, Act 35 of 1984)

- Bovine malignant catarrhal fever (Snotsiekte)
- Bluetongue
- Lumpy skin disease
- Rift valley fever
- Strangels
- Swine erysipelas

DR DF KEET
ACTING DIRECTOR: ANIMAL HEALTH

The majority of controlled and notifiable diseases are diseases of cattle, pigs, sheep and poultry (production animals). Some of these diseases, like lumpy skin (cattle), bluetongue (sheep), sheep scab (sheep), Newcastle disease (poultry) and brucellosis (cattle), frequently occur in South Africa and farmers must take precautionary measures to prevent an outbreak on their farms.

The following diseases on the list are the ones we are likely to see in **horses**:

- **African horse sickness**
- **contagious equine metritis**
- **dourine**
- **equine influenza**
- **strangels**

Amongst the listed diseases the one most likely to be seen in **dogs** is:

- **rabies**

Activity 5.2

Make a list of all the controlled and notifiable diseases that are zoonoses. (See study unit 3.)

Note: Rinderpest has officially been declared eradicated worldwide by the OIE General Session in May 2011. This historic declaration followed decades of concerted international efforts to eradicate the disease. However, the world still remains vulnerable to rinderpest as the virus is kept in a few key laboratories around the world.

5.3 CONCLUSION

This study unit gave an overview of controlled and notifiable diseases in South Africa. In the next study unit we discuss how disease outbreaks are controlled.

5.4 REVISION QUESTIONS

(1) Explain the differences between non-controlled, controlled and notifiable diseases.
(2) Name at least 5 diseases of horses that you must report to a veterinarian or state veterinarian when you suspect a horse is affected by them.
(3) Name the best-known controlled disease that affects canines.

STUDY UNIT 6

Controlling animal diseases

LEARNING OUTCOMES

By the end of this study unit you should be able to do the following:

- Describe the main procedures that must be followed when there is an outbreak of a controlled disease.
- Explain the responsibility of the animal welfare assistant when there is an outbreak of a controlled disease.

6.1 INTRODUCTION

It is extremely important that every country must have measures in place to control certain diseases. As animal welfare assistant you will not be directly responsible for disease control. That is the responsibility of state veterinarians and the animal health technicians who work with them. However, you need to know what needs to be done to control disease outbreaks in case you are ever involved in an outbreak of a controlled or notifiable disease.

6.2 FOLLOWING LAWFUL PROCEDURES

Activity 6.1

Carefully read the article in annexure 1 to this study guide. This article on disease control was written by Dr Modisane, a former Deputy Director-General of Disaster Management and Veterinary Services, and published in 2009 in the *Onderstepoort Journal of Veterinary Research* (76:115–121). Then answer the following questions:

(1) Why is it critically important that a country must control animal diseases?
(2) Which international body gives guidance on disease prevention and outbreak management, and sets international standards for disease outbreak management?
(3) Would you describe a country's disease control management protocols as static or dynamic? And what does this mean?
(4) List 5 factors that influence a country's success in managing disease.

(5) What is considered the first step in controlling the spread of disease?
(6) List 4 traditional methods of disease control.
(7) List 3 new concepts of disease and trade control.
(8) Explain how the foot and mouth disease outbreak in Camperdown (2000) was handled.
(9) Explain why the Middelburg foot and mouth disease outbreak occurred.
(10) Discuss the economic impact of the NAI outbreak in the Eastern and Western Cape provinces in 2004.
(11) Explain how a classic swine fever outbreak is usually controlled.
(12) Why is a strong veterinary service component essential for effective surveillance strategies and an effective response to outbreaks?
(13) What do you think would be your role in disease surveillance and control?

The article you have read should give you some insight into the following:

- **the impact disease outbreaks**
- **the necessity for disease control**
- **the various strategies for controlling disease**

The strategy followed to control a specific animal disease depends on the epidemiology of the specific disease. Control strategies often used include the following:

– **movement control and quarantine (temporary isolation)** (see the previous study units)
– **vaccination**
– **treatment**
– **mass slaughtering**

Implementing disease control strategies is the duty of Government Veterinary Services.

When you suspect that an animal or group of animals is suffering from any one of the diseases listed as controlled or notifiable, you must **contact the nearest state veterinary office** as a matter of urgency (see http://www.nda.agric.za/vetweb/).

No animals suspected to suffer from any of the mentioned diseases may be treated by their owners, nor may the animals be moved from the premises before the arrival of the veterinary services.

It is important that you, an animal welfare assistant, must explain to an affected community why it is very important to confirm a controlled or notifiable disease and why its spread must be prevented. Owners are often scared of reporting the disease because they do not want to lose their animals. However, if they do not report it, it can have serious implications for both human wealth and health and animal welfare.

6.3 CONCLUSION

There are several strategies in place to control animal diseases that can have a serious economic impact on a country or poses a serious risk to public health. These strategies are controlled by the government and are therefore law.

Now that you have completed this study unit you are aware of the dangers of controlled and notifiable diseases. You know about the important role played by government officials who deal with disease outbreaks. If the need ever arises, you must be prepared to support them in this role.

6.4 REVISION QUESTIONS

(1) Explain the most important control strategies that are implemented when there is an outbreak of a controlled disease.
(2) Explain the responsibility of the animal welfare assistant with regard to controlled and notifiable diseases.

THEME 4

The most important diseases affecting our domestic animals

INTRODUCTION TO THEME 4

The previous three themes introduced you to various causes of disease in animals and humans. In this theme we look at some diseases in a bit more detail.

As an animal welfare assistant you must be able to recognise that an animal is sick. Then you must be able to decide what the correct action is to take. You may be able to offer primary treatment and care yourself if the condition is easily diagnosable and treatment options are available to you. You can refer the animal to a veterinarian for a definitive diagnoses and treatment, particularly if you are unsure of the condition you are dealing with, if the condition is severe or is a zoonosis (see theme 2). Remember, you may also need to contact the state veterinarian in the area to report the disease (see theme 3).

The diseases or abnormal conditions we look at in this theme are discussed under the following headings:

(i) Most commonly seen infectious conditions (study unit 7)
(ii) Most commonly seen parasitological conditions (study unit 8)
(iii) Most commonly seen toxicological conditions (study unit 9)
(iv) Disease affecting the different organ systems (study unit 10)

LEARNING OUTCOMES FOR STUDY UNITS 7 TO 10

By the end of this theme (study units 7 to 10) you should be able to do the following for each disease or abnormal condition discussed:

- Describe the **aetiology** of the disease (how the disease is caused).
- Name the characteristic **symptoms or clinical signs** of a particular disease or condition.
- Identify the most disease or condition involved when the symptoms are described or seen.

STUDY UNIT 7

Most commonly seen infectious conditions

LEARNING OUTCOMES

See the section entitled "Learning outcomes for study units 7 to 10" on page 51.

7.1 INTRODUCTION

By now you are familiar with infectious agents causing disease. These infectious agents can cause mild to life-threatening or fatal diseases. In many cases infectious agents are transferrable between animals (contagious).

As mentioned there is often no specific treatment for infections, particularly infections caused by viruses. The treatment given in such cases is symptomatic treatment aimed at relieving clinical signs (symptoms). For these diseases prevention is most definitely better than cure. It is your duty as animal welfare assistant to educate communities about disease prevention in their pets.

Let us now look at some specific conditions. We first look at infectious diseases mainly seen in dogs, and then proceed to discuss diseases mainly seen in cats and diseases mainly seen in horses.

Activity 7.1

Skim through the study unit and draw your own diagram to show which diseases are discussed in each of the three sections in this study unit. In other words, draw your own overview of the study unit in the form of a diagram.

7.2 INFECTIOUS DISEASES MAINLY SEEN IN DOGS

7.2.1 Distemper (*hondesiekte*)

Canine distemper is a highly **contagious, systemic, viral disease** of dogs. The disease has been reported worldwide. The domestic dog is the reservoir host, but outbreaks of the disease have been seen in some other species, like foxes.

What are the clinical signs of distemper?

Distemper can range from a mild to a very serious disease, depending on the clinical signs present in a particular animal. When the animal is infected with the virus there is usually a **fever** that lasts a few days and a decrease in circulating white blood cells (**neutropenia**). At this stage you may not realise that the animal is sick, although it could be anorexic. (**Note:** Anorexia is often the first sign of illness in animals.) The fever then generally subsides for several days before a second fever occurs. This second fever is called a biphasic fever and it is accompanied by one or more of the following symptoms:

- **a watery nasal discharge**
- **an ocular discharge containing pus and mucous (mucopurulent)**
- **lethargy**
- **anorexia**
- **gastrointestinal abnormalities like vomiting and diarrhoea**
- **respiratory abnormalities**

Distemper therefore initially presents with **abnormalities of the respiratory system and GIT.**

A few more serious complications could also occur.

If the animal survives this acute stage of the infection, you will often see changes to the skin, for example a thickening on the animal's footpads and on the skin of the nasal planum (black tip of the nose). When the animal had distemper as a puppy, you may see erosion of teeth that have not yet erupted when it was ill.

Do you remember the meaning of the term "acute"? I explained it when we discussed rabies in theme 2.

In cases where the disease has a longer course, the animals may display abnormal **neurological signs.** These signs may even present a few months after the acute illness has subsided. At this stage you may see abnormal central nervous system (CNS) signs like circling, a head tilt, rapid movement of the eyes, lameness or paralysis and seizuring. Remember, these signs are non-specific and can also be caused by other diseases.

A classic sign of distemper is the twitching of muscles groups, in particular the jaw muscles, causing **involuntary chewing movements**.

How is distemper transmitted?

Distemper is mainly transmitted by airborne viral particles that are inhaled. Dogs in recovery may continue to shed the virus for several weeks after symptoms disappear, but they no longer shed the virus once they have fully recovered.

There is a syndrome called chronic distemper encephalitis, or **old dog encephalitis**. This condition also causes neurological abnormalities. It is typically seen in adult dogs that have been fully vaccinated and never had distemper as a puppy. Old dog encephalitis is probably caused by the inflammation of brain tissue as the result of the persistence of the distemper virus in the brain tissue. Unlike distemper, this condition is not contagious.

How is distemper treated?

There is no specific treatment for this virus, therefore treatments are **symptomatic** and supportive. The aim of treatment is to control the clinical signs. Fluids and **good nursing care** are offered. If affected dogs are treated promptly and properly, they may recover completely. However, **neurological signs sometimes persist**. If the neurologic signs get worse, even after all the other clinical signs have resolved, the prognosis or possible outcome is poor. In such cases the affected dogs are often euthanised.

How can distemper be prevented and controlled?

There is a variety of vaccines that offer protection against the distemper virus in dogs. The vaccine chosen should be used according to the manufacturers' directions. Puppies are typically vaccinated with a **modified-live virus (MLV) vaccine**, starting when they are 6 weeks old, followed by two boosters at 3 to 4 week intervals. Hereafter adult dogs are typically vaccinated annually, although the immunity or protection given by MLV distemper vaccines should protect them for at least 3 years.

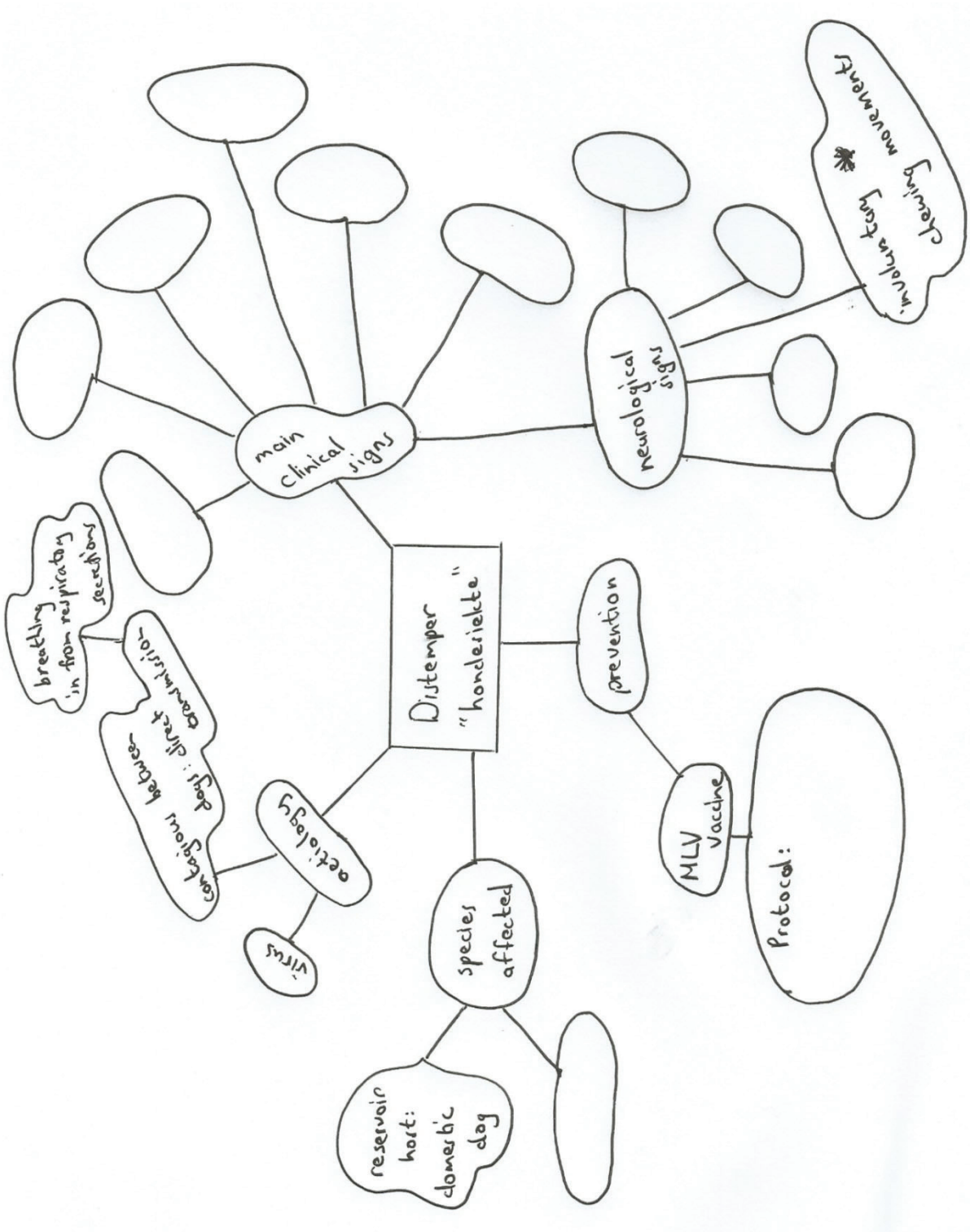
Activity 7.2

In theme 2 you summarised all the zoonotic diseases in a table. Another way to present information in a summarised form to make learning easy, is to draw a mind map.

Below is an example of a mind map. Complete it by filling in more key facts about canine distemper virus.

As you continue reading the study unit, draw a similar mind map for every disease discussed. You may use different colours for each set of facts.

If you prefer using tables to summarise information, you may choose to draw tables instead of mind maps. Draw a table for each disease and include the key facts about the disease in the table. Of course you may also draw a mind map for each one of the zoonotic diseases in theme 2 instead of the tables I suggested.


Distemper
"hondeziekte"
main Clinical signs
neurological signs
chewing
muscle twitching
prevention
MLV vaccine
Protocol:
species affected
reservoir host: domestic dog
aetiology
virus
breathing in from respiratory secretions
contact between dogs: direct or indirect

7.2.2 Canine parvovirus (CPV) (*katgriep*)

Canine parvovirus (CPV) is **very contagious**. It is a common cause of an acute, **gastrointestinal illness** in young dogs. The disease is called **CPV enteritis**. It is common in less affluent areas where puppies are often not vaccinated. As the name suggests, the disease is caused by a virus.

Puppies that are younger than 6 months and not fully vaccinated are most susceptible to infection. It seems that certain breeds of dogs, for example Rottweilers, American pit bull terriers and German shepherd dogs are at an increased risk of contracting the disease.

If a bitch is immune to the disease, she will carry this immunity over to her offspring through colostrum. (Colostrum is the mother's first milk and contains protective **maternal antibodies.**) It protects the puppies in their first few weeks of life. By 6 weeks of age puppies are usually no longer protected by maternal antibodies. They are then susceptible to infection and must be vaccinated promptly.

What are the clinical signs of CPV?

CPV destroys the cells of the small intestine, lymphopoietic tissue and bone marrow. Within a week of getting infected, puppies become feverish, depressed and anorexic. The symptoms rapidly progress to **projectile vomiting and haemorrhagic (bloody) diarrhoea**, which could be very severe. Without proper treatment these puppies rapidly dehydrate. They may even **collapse** or go into septic shock. They typically suffer from abdominal pain and have compromised immune systems. Most parvo puppies are very sick dogs.

Certain factors, for example stress and the presence of intestinal parasites, can increase the severity of the disease.

CPV enteritis should be suspected in any young, unvaccinated or incompletely vaccinated dog with the clinical signs mentioned above.

There are various laboratory tests available to confirm a diagnosis. Due to the potential severity and rapid progression of clinical signs in infected puppies, they are best treated in hospital. Even with the best treatment the prognosis is still considered unpredictable. However, with appropriate care up to 90% of infected dogs can survive. Dogs that recover from infection develop a strong immunity against CPV and they should not get infected again later in their life.

How is CPV prevented and controlled?

As with canine distemper, vaccination with an MLV vaccine is recommended at 6 to 8, 10 to 12, and 14 to16 weeks of age. This must be followed by a booster administered 1 year later and thereafter every 1 to 3 years. Many of the vaccines available on the market give dogs protection against both distemper and the canine parvovirus.

CPV is resistant to many common detergents and disinfectants. It and can **remain alive for long periods in the environment**. At room temperature it can survive for up to 2 months. In dark, moist conditions it can stay alive outdoors

for up to 5 months. This persistency contributes to the high incidence of the disease.

The virus is shed in the **faeces** of infected dogs after a short incubation period of 4 to 5 days. It is often shed before clinical signs develop, but shedding continues right through the illness and for up to 2 weeks after the infected dog has recovered clinically.

Dogs acquire the infection either through direct contact with the virus-containing faeces, or indirectly through contact with virus-contaminated fomites. For this reason it is **extremely important to disinfect your hands and any instruments used properly after you had contact with a suspected parvo-infected puppy.** This principal is of course always true when you work with sick animals.

Dogs that have CPV enteritis or are suspected of having it, must be **isolated**. This is done to limit **environmental contamination** and to protect other animals against the illness All surfaces the dog had touched must be cleaned with a suitable disinfectant, for example diluted bleach (1 part bleach to 3 parts water).

Activity 7.3

A family recently lost a puppy to CPV enteritis. The children are devastated and the father immediately wants to buy them another puppy.

Considering your newly acquired knowledge about the disease, what would your advice be to this family?

The following would be good advice:

(a) Care should be taken to decontaminate the environment where the previous puppy was kept as best as possible, using appropriate disinfectants and sunlight.
(b) The father should only consider buying a puppy that is fully vaccinated. That means the puppy must have received the 6, 9 and 12 week vaccines.
(c) If a puppy had CPV enteritis but survived, the family should wait at least 1 month after the clinical signs have disappeared before they get a new puppy.

Interesting fact: CPV is one of the smallest viruses known to man. Parvo is the Latin word for small. As many as 300 000 virus particles will fit onto a millimetre!

7.2.3 Infectious canine hepatitis

Infectious canine hepatitis (ICH) is a **contagious viral disease** of dogs. It is found worldwide, but is relatively uncommon in current times. Routine vaccination has caused a decrease in the prevalence of the disease, but we still see occasional outbreaks.

Most canine species can become infected with ICH, although in many it is subclinical. This means it is not serious enough to present with clinical signs and goes by unnoticed.

What are the clinical signs of ICH?

ICH can range from being a very mild disease, presenting only as fever, to being fatal. However, usually only very young dogs die as the result of ICH.

The clinical signs of ICH are very similar to the clinical signs of acute canine distemper, but with the addition of **clotting problems** that lead to bleeding. **Haemorrhaging** (bleeding) is usually first noted around deciduous teeth (milk teeth/baby teeth). **Haematomas** are solid swellings of clotted blood in the tissues and are also a sign of haemorrhaging. Then bleeding is noted in various other parts of the body. In addition the cornea of the eye often becomes cloudy.

How can ICH be prevented and controlled?

Dogs contract ICH mainly because they take in urine, faeces or saliva of infected dogs. Dogs shed the virus in their urine for months after they have recovered. The ICH virus can survive outside the host for weeks or months, but fortunately diluted household bleach (1 part bleach to 3 parts water) kills the virus.

MLV injectable vaccines are available to protect dogs against ICH. The ICH vaccine is usually combined with vaccines against canine distemper and parvovirus, therefore it is given at the same intervals as previously described.

Have you memorised the vaccination protocol mentioned in sections 2.1 and 2.2? As an animal welfare assistant you will be involved in vaccination campaigns.

7.2.4 Babesiosis (biliary fever/*galkoors*)

Babesiosis is a very serious disease in many countries and in particular in African countries. It is caused by blood parasites of the genus *Babesia*. Different species of the parasite affect dogs, cats, cattle, horses and various other domestic and wild animals, and on occasion even people.

Although babesiosis in cattle is of extreme importance in Africa because it leads to substantial financial losses annually, we focus on babesiosis in dogs because that is the infection you are most likely to encounter. If your career takes you to the coastal regions of South Africa, you may also see this disease in cats, as *Babesia felis* is prevalent there. The disease presents slightly differently in different species.



FIGURE 7.1

A blood smear from a dog showing Babesia canis in a red blood cell

Source: www.wikipedia.org/wiki/Babesiose_des_Hundes

How is babesiosis transmitted?

The *Babesia* parasite is transmitted to a dog through a **tick bite** because the *Babesia* parasite uses the tick to reach host mammals. Dogs that spend a lot of time outdoors, especially in areas with tall grass and veld, run a greater risk to be bitten by ticks and to contract the parasite. Infections mostly occur during the summer months (September to April) when tick populations are the largest.

Activity 7.4

Compare the three pictures below:

A



Source: http://blog.timesunion.com/petsandvets/216/dogs-need-to-chew/

B



Source: http://www.petplace.com/dogs/anemia-in-dogs/page1.aspx

C



Source: http://www.askjpc.org/wsco/do_slideshow2.php?pic_series=100704&cYear=2010&initImage=858

(1) Which one of the three dogs (A, B or C) has healthy gums? (**Note**: The gums of the dog in picture A are a glossy pink, those in picture B are much paler and those in picture C are a yellowish colour.)
(2) Describe the abnormality in the gums of dog B and dog C.
(3) Do you know the correct terminology for the symptom present in dog B and dog C?

What are the clinical signs of babesiosis?

The incubation period of the *Babesia* parasite is about two weeks. Clinical signs vary from mild to severe. In some cases life-threatening complications can occur. **Without treatment the infection could be fatal**.

Clinically babesiosis typically presents with one of more of the following symptoms:

- **high fever (typically above 40 °C)**
- **lack of energy**
- **lack of appetite**
- **pale gums (anaemic, due to a decrease in red blood cells, like the dog in picture B)**
- **coloured urine (reddish/brown)**
- **yellow staining of the mucous membranes and skin (icteric, like the dog in picture C)**
- **discoloured stool**

Diagnosing babesiosis is relatively easy, because the parasite is visible in a blood smear examined under a light microscope (see figure 7.1). If any dog shows the above clinical signs, you must suspect that it has babesiosis. Infected dogs require prompt veterinary treatment.

How is babesiosis treated?

Most patients suffering from babesiosis can be treated as outpatients. Severely ill patients that need fluid therapy or blood transfusions, or patients with complications, should be hospitalised.

Two drugs (babesicides) can be used to treat the infection. Their active ingredients are **diminazene** or imidocarb, and in South Africa they are available under different brand names. Both of these drugs are extremely dangerous. They may only be administered by a veterinarian and only when a blood smear has confirmed the diagnosis.

How can babesiosis be prevented and controlled?

Not all ticks carries the parasite, but the best precaution against babesiosis is to keep dogs free of ticks. Check dogs daily for the presence of ticks and remove any ticks immediately. An infected tick needs to feed on a dog for at least 48 hours to transmit the parasite.

Various **pesticides** that control ticks are available commercially. These products are toxic. Use them only for the animal species for which it has been registered. It is also very important to use them strictly according to the manufacturer's instructions.

A vaccine against canine babesiosis is available. This vaccine does not completely protect dogs against contracting the disease, but it could decrease the severity of the clinical signs and lower the risk that complications may develop. The immunity given by the vaccine is short-lived, therefore it should be given every 6 months. The vaccine is a good option for high risk dogs, for example hunting and farm dogs.

7.2.5 Canine erlichiosis

Canine ehrlichiosis is a worldwide disease of domestic dogs and other wild canids. It is also called tropical canine pancytopenia or canine haemorrhagic

fever. As with *Babesia*, there are multiple strains of *Ehrlichia* that affect different species of animals and they are transmitted by **ticks**.

What are the clinical signs of canine erhlichiosis?

Ehrlichiosis is a relatively complicated disease and can have three phases. These three phases are the following:

(i) **Acute phase**: This phase usually develops within 3 weeks after the bite of the infected tick and generally lasts 2 to 4 weeks. During this time dogs can be:

- **anaemic**
- **feverish**
- **depressed**
- **lethargic**
- **anorexic**

This phase of the disease could easily be confused with babesiosis. A dog can suffer from babesiosis and erhlichiosis at the same time. This can happen when the dog has been bitten by a tick infected with the two different blood parasites. Such a tick can transmit both parasites to a dog.

Other common symptoms are shortness of breath, **joint pain** and **stiffness**. The dog may also have **unexplained bruises** as the result of a low platelet count. (Platelets are the cells that help blood to clot.)

Many dogs recover during the acute phase. Dogs that do not recover in this phase enter the subclinical phase.

(ii) **Subclinical phase**: During this phase the animal may **appear normal** or just have a mild anaemia. The phase can last very long, even for years. Eventually the dog will eliminate the parasite from its body, or the infection may progress to the chronic phase.

(Do you remember what anaemia means?)

(iii) **Chronic phase**: During this phase the symptoms of the disease can range from very mild to very severe. Affected animals typically:

- **lose weight**
- **are anaemic**
- **have swollen lymph nodes**

Infected dogs can show abnormal **neurological signs** like being off balance or becoming paralysed. A decrease in blood platelets lead to **bleeding tendencies.** Low platelet counts are a symptom of the disease in all the phases. Dogs may have abnormal fluid accumulation, especially on the hind legs (oedema). They may have a fever. Other complications, for example arthritis or kidney disease, may also develop.

Clinical signs of the disease may come and go during the chronic phase. They often re-appear during periods of stress.

During its different phases ehrlichiosis can easily be confused with other canine diseases. A veterinarian uses special blood tests to diagnose ehrlichiosis.

During the acute phase of the disease the parasite is present in the bloodstream and visible on a blood smear. In the next phases the parasite moves to other lymphoid tissues, such as the spleen.

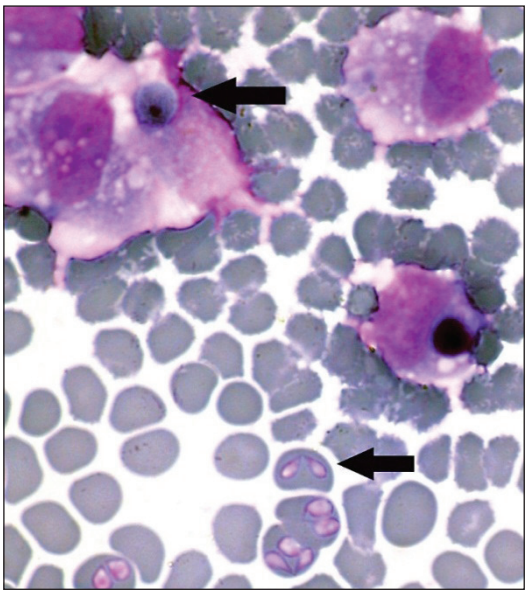


FIGURE 7.2

The upper black arrow points to an inclusion in a white blood cell; this is an Ehrlichia morula

(Do you recognise the parasite to which the lower black arrow points?)

Source: www.wikipedia.org/wiki/Ticks_of_domestic_animals

How can ehrlichiosis be prevented and controlled?

When dogs in the acute phase of the disease are treated with long-term antibiotics (doxycycline) the prognosis is good. Dogs that progress to the **chronic phase have a poorer prognosis.**

As with babesiosis, **tick control** is the main way to prevent ehrlichiosis. One crucial difference is that *Ehrlichia* parasites are transmitted within hours after a tick has started feeding on its host.

There is no vaccine available against ehrlichiosis.

Activity 7.5

(1) Explain the difference between the terms "acute" and "chronic". Use canine ehrlichiosis as an example.
(2) Compare the symptoms of ehrlichiosis with the symptoms of distemper and babesiosis.

7.2.6 Kennel cough

Kennel cough, as it is commonly known, is **canine infectious tracheobronchitis.** This disease is an inflammation of the trachea and bronchi or upper airways. It is usually a **mild, self-limiting disease**, but it may progress to a bronchopneumonia (lung involvement) in puppies, or become chronic in compromised adults or very old dogs.

The disease is very **contagious** and can spread rapidly among susceptible dogs housed in close confinement, for example boarding kennels or in a veterinary hospital.

Various different viruses cause kennel cough. Often a bacterium called *Bordetella bronchiseptica* is involved. In addition, other bacteria may cause secondary infections in the respiratory tract. Various different pathogens can be involved simultaneously during a kennel cough episode.

What are the clinical signs of kennel cough?

The main clinical sign of kennel cough is spasms of **harsh, dry coughing**, which may be followed by retching and gagging. The cough is easily induced by gently touching the larynx or trachea. Apart from a slight decrease in appetite, affected dogs usually show no other symptoms.

If more severe signs are seen, it usually indicates a complicating systemic infection. Dogs with severe signs need urgent medical attention.

Kennel cough symptoms usually starts 5 to 10 days after contact with other affected dogs. Coughing is typically the worst during the first few days and then gradually decreases, but could persist for up to 3 weeks. Extreme environmental circumstances like extreme ventilation, temperature or humidity could worsen the clinical signs.

How can kennel cough be prevented and controlled?

Combination MLV vaccines usually give protection against the viruses that cause upper respiratory disease in dogs. These vaccines are called 5-in-1 or DHPP vaccines, because it protects the dog against five diseases: distemper, hepatitis and denovirus cough (adenovirus type 2), parainfluenza and the parvovirus.

The risk of contracting kennel cough may rise due to a dog's circumstances, for example when the dog is boarded for some time. Such dogs must be given an intranasal or injectable *B. bronchiseptica* vaccine.

Activity 7.6

(1) Revise study unit 2. Each of the four diseases you have studied so far has a **mode of transmission**. A dog becomes infected because the disease has been transmitted to it. Identify the mode of transmission of each disease.

(2) Read the following and then name disease that may cause the symptoms seen in the particular dog.

  (a) A four-year-old uncastrated, unvaccinated dog from an informal settlement is severely emaciated and has visibly enlarged lymph nodes.

(b) A young dog presents with a complaint of lethargy and anorexia the past two days. On examination you see its gums and the conjunctiva of its eyes appear pale. It is covered in ticks. The dog's rectal temperature is 40,5 °C.
(c) A 5-month-old puppy is suffering from severe bloody diarrhoea. It is not eating and has vomited several times. It received only one vaccine at 6 weeks and no boosters after that.

7.3 INFECTIOUS DISEASES MAINLY SEEN IN CATS

7.3.1 Feline immunodeficiency virus

Activity 7.7

In this module we often refer to the immune system. What do the following terms mean?

(a) Immunodeficiency
(b) Immunocompromised
(c) Immunocompetent

Do you know of any immunodeficiency diseases in humans?

The following definition appears in the online dictionary www.dictionary.reference.com:

Immunodeficiency

[im-yuh-noh-di-fish-uh n-see, ih-myoo-]

noun, plural immunodeficiencies.

1. impairment of the immune response, predisposing to infection and certain malignancies.

In adult animals, **immunodeficiencies** are often the result of virus infections, but they may also be caused by malnutrition (a poor diet), stress or certain toxins. Animals suffering from an immunodeficiency are **immunocompromised**, while animals with a healthy immune system are **immunocompetent**.

The most important cause of immunodeficiency in cats is the feline immunodeficiency virus (FIV). The virus has been identified in domestic and wild cat species worldwide. It is similar in some ways to the human immunodeficiency virus (HIV) and is often called **feline aids**.

The virus is shed through the saliva of an infected cat. **Bite wounds** are the main mode of transmission. Owing to this mechanism of transfer, free-roaming, male cats are at greatest risk of becoming infected.

What are the clinical signs of infection with the feline immunodeficiency virus?

A cat that has contracted the feline immunodeficiency virus usually shows the following symptoms:

- **transient fever**
- **lymphadenopathy** (abnormalities in the lymph nodes, often swollen)
- **neutropenia** (a decrease in circulating white blood cells)

Most cats recover temporarily and appear to be clinically normal for many months and even years. However, the infection generally leads to **immunodeficiency**.

Cats with acquired immunodeficiency caused by FIV typically start to develop **frequent infections** of the respiratory system, the gastrointestinal tract (or GIT, often the mouth), the urinary tract and the skin. These infections may become very serious. FIV-infected cats often develop certain types of **cancer and blood disorder**. Cats that have FIV but no other disorders can lead completely normal and healthy lives for many years (like humans with HIV) if they are promptly treated when they develop an infection.

How can infection with FIV be treated?

There is **no cure** for FIV. Cats with FIV are treated symptomatically as secondary ailments arise. For example, if the cat has a secondary bacterial infection, it is treated with antibiotics. There are drugs available to strengthen and support the immune system, and these are often recommended by veterinarians.

It is important to protect cat populations against FIV. A vaccine against FIV is available, but its use is somewhat controversial and should be discussed with a veterinarian. Practices that could decrease the spread of FIV include the following:

- **having cats spayed or neutered (to decrease roaming and fighting)**
- **preventing cats from roaming freely without supervision**
- **testing cats for FIV before introducing them to a new household**

7.3.2 Feline leukaemia virus

Despite the widespread use of vaccines, feline leukaemia virus (FeLV) remains a leading cause of illness and death in cats worldwide. The virus is found in domestic cats and some wild cat species. The **virus causes several disorders**, including:

- **neoplasia (cancer)**
- **severe immunosuppression**
- **profound anaemia**

Like feline infectious peritonitis (see below), the incidence of FeLV infection is highest in catteries and households with multiple cats, especially when the cats are allowed to go outdoors. Affected cats shed large amounts of the virus in saliva. Lesser amounts of the virus is shed in faeces, urine and other bodily fluids. Transmission of the virus therefore occurs when **cats share litter trays, eat out of the same bowls and groom one another**. **Bites** are also an effective mode of transmission.

Young kittens are much more susceptible than adults. The kittens of infected dams may be born infected or become infected when suckling milk.

However, FeLV is a fragile virus. It does not remain infective in the environment for long and **transmission between cats usually requires prolonged intimate contact**.

What are the clinical signs of FeLV infection?

During the first few weeks following infection the virus circulates in the body. It usually remains undetected or cause only very mild illness. During this time the majority of healthy adult cats mount an immune response against the virus and successfully eliminate it from the body. However, they do shed the virus for a few weeks and can therefore infect other cats.

A small percentage (up to 30%) of cats that contract FeLV become **persistently viraemic**. These persistently infected cats **ultimately develop one of numerous related fatal diseases**, for example leukaemia (blood cancer). FeLV suppresses the immune system in a similar way as FIV and therefore infected cats often suffer from secondary infections. Reproduction problems are very common in cats with the virus and infected queens often abort their litters.

How can FeLV infection be prevented and controlled?

FeLV-positive cats can live without major diseases for several years. Stress and sources of secondary infection should be avoided, and infected cats should preferably remain indoors. If the cat becomes ill, it should get immediate veterinary attention. The prognosis for a FeLV-positive cat depends on the specific disorder involved.

Vaccines against FeLV are available, but even a healthy, vaccinated cat can still be infected if it is constantly in contact with FeLV-positive cats.

7.3.3 Feline infectious peritonitis (FIP)

Feline infectious peritonitis (FIP) is an **immune-mediated disease.** This means the symptoms or the disease are caused by the body's own immune system. FIP is triggered by infection with a feline coronavirus. The disease occurs worldwide and it affects as many domestic cats as wild cats.

Many cats are carriers of the coronavirus, especially in multi-cat households, but only a small percentage of infected cats will develop FIP. Cats carrying the coronavirus can shed the virus in their faeces for months and therefore remain a source of infection to other cats.

Various factors possibly trigger the occurrence of FIP, including:

- **the load and strain of virus**
- **age (usually seen in cats younger than 1 year)**
- **breed** (amongst others, higher prevalence in Bengals, Ragdolls and Abyssinians)
- **stress**
- **immune status when infected**

FIP is a complicated disease and veterinarians sometimes find it difficult to diagnose. Unfortunately, **treatment is rarely successful and the prognosis is poor**. Consider euthanasia for cats that do not show improvement after 72 hours of aggressive medical treatment.

What are the clinical signs of FIP?

Cats infected with the coronavirus might show mild signs like transient diarrhoea and weight loss, but the infection often goes unnoticed. However, FIP is a more serious disease.

FIP should be considered when a young cat is just generally ill and does not thrive.

Some of the common signs of FIP include:

- **discomfort and illness that worsen progressively**
- **fluctuating fever**
- **anorexia**
- **weight loss**

Other clinical signs depend on the specific organ affected. It could be the liver, kidneys, lungs, central nervous system (CNS) and eyes. Cats suffering from FIP often have **lesions on their eyes**. Abdominal distension is a common physical sign of the disease. We should always suspect FIP when fluid builds up in the cat's abdomen. This accumulation of fluids is known as **ascites**.

How can FIP be prevented and controlled?

Carrier cats shed the coronavirus in their faeces. Cats that have not previously been affected by the virus, are called naïve cats. These naïve cats are most often infected because they **share litter boxes with carrier cats.**

The virus can also be transmitted by other bodily fluids, but that does not happen very often.

Feline coronavirus is a relatively fragile virus and it can be killed by most household disinfectants and detergents. However, it may survive for up to 2 months under ideal circumstances. Indirect fomite transmission (transmission via cushions, blankets, etc.) is also possible for short periods of time.

When a cat in a household develops FIP, all the other cats in the household have already been exposed to the same coronavirus. However, all the cats will not necessarily develop FIP. As all the other cats have already been exposed to the virus and possible infected, it is not necessary to remove the sick cat from them. However, do not introduce a naive cat to such household.

If an owner had a cat that died from FIP, he or she should wait at least 2 months before introducing a new cat to the house. Can you explain why this waiting period is necessary?

There are many viewpoints and little agreement about **the effectiveness of vaccines** against FIP. Cat owners should discuss the matter with a veterinarian.

New cat owners can take certain measures to prevent the infection of kittens taken home from a cattery. Early weaning is one of these preventive measures. It is best to consult a veterinarian to discuss these strategies in detail.

Good husbandry practices must be followed and facilities at kennels must be disinfected regularly to minimise the spreading of the virus. Despite these measures, it is almost impossible to prevent FIP in households with many cats or in catteries.

Activity 7.8

(1) Read the following two scenarios. Which one of the three feline viral disease discussed above is the possible cause of the symptoms described in each case? Explain your answer.

(a) A 9-month-old kitten appears generally ill. It is not very responsive, just lies on its bed all day and is not interested in food.
(b) A 7-year-old uncastrated male cat has been diagnosed with a chronic bladder infection. Its gums are also inflamed and it has now developed a purulent discharge from the nose.

(2) Viral diseases in cats are all contagious. There are also several other similarities between FIV, FeLV and FIP. It is often difficult to distinguish between these diseases without laboratory testing.

Identify the similarities between FIV, FeLV and FIP. Refer to cats that are typically affected, the mode of transmission, clinical signs and preventative measures. (**Note**: Focus on cats that are typically affected by the different diseases.)

When you compare similar things like the diseases above, you improve your brain's ability to remember the facts.

7.3.4 Feline snuffles (URTI)

Feline snuffles is also known as feline flu or feline upper respiratory syndrome. Its medical name is **feline infectious rhinotracheitis** (FVR). The disease can be caused by more than one virus, but the most important one is **feline herpesvirus**. Do you remember the symptoms caused by the canine herpesvirus?

How are the viruses that cause feline snuffles (URTI) transmitted?

As with most upper respiratory infections, feline snuffles is caused by viruses transmitted via **aerosol droplets** or **fomites**. Cats that have clinically recovered from feline snuffles may still carry the virus for many months, shed it intermittently and become sick again during times of stress.

Activity 7.9

Make a list of all the clinical signs or symptoms you experience when you have the flu or a common cold. Compare your list with the clinical signs listed below.

What are the clinical signs of feline snuffles?

The clinical signs in cats suffering from snuffles include:

- **initial fever that may fluctuate**
- **frequent sneezing**
- **conjunctivitis**
- **rhinitis (inflammation of the nasal passages)**
- **salivation**
- **a nasal and ocular discharge that is watery at first but becomes mucopurulent**
- **depression**
- **anorexia that may lead to weight loss in cases of a long illness**
- **ulcers in the mouths or on the eyes of severely affected cats**

Clinical signs may persist for a few days only and resolve without treatment. However, is serious cases, the clinical signs may persist for weeks. **Mortality is usually low and the prognosis good.** Young kittens and aged cats tend to become sicker. Feline snuffles is often complicated by **secondary bacterial infections** and antibiotic therapy may therefore be necessary.



FIGURE 7.3

A kitten severely affected by FVR

(Note the mucopurulent discharge at the eyes and nose.)

Source: www.wikipedia.org/wiki/Feline_viral_rhinotracheitis

How can feline snuffles be prevented and controlled?

Kittens typically get a **3-in-1 MLV vaccination** at 8 weeks of age. A booster vaccine is given a month later and a re-vaccination once a year thereafter. The 3-in-1 vaccine protects cats against feline viral rhinotracheitis, feline calicivirus and panleukopenia.

Upper respiratory disease in cats can be avoided if we ensure that households and catteries are not overcrowded. Feline snuffles can be avoided if healthy cats are kept away from sick cats and stress is minimised.

Activity 7.10

Tell a friend or a relative who owns a cat about the vaccination protocol for cats. Explain the importance of vaccination to your friend or relative.

7.4 INFECTIOUS DISEASES MAINLY SEEN IN HORSES

7.4.1 African horse sickness (AHS)

African horse sickness (AHS) is a viral disease that affects animals from the horse family (equids). The disease is endemic to Africa and **causes many deaths among horses every year**.

AHS can present as either acute or subacute. If a disease is subacute, it means it develops more slowly than when it is acute. Animals with AHS show symptoms relating to the **respiratory and circulatory system**. The disease is **vector borne** and *Culicoides* spp. midgets are the main vectors. There are different serotypes of AHS virus, which makes immunisation or vaccine protection difficult.

Outbreaks of AHS are mainly seen during warm, rainy seasons when the carrier midget populations are high. If naïve populations are not properly vaccinated, up to 90% of the horses that contract AHS die. In the past hundreds of thousands of horses died during AHS outbreaks.

Although AHS is a disease primarily ofhorses and or other equids, the disease is sometimes also seen in dogs that have eaten the meat of horses that died from AHS.

Interesting fact: Camels can also contract AHS.



FIGURE 7.4

A Culicoides imicola female that can transmit the AHS virus, after a meal of blood

Source: http://commons.wikimedia.org/wiki/File:Culicoides-imicola-bloodfeeding.jpg

What are the clinical signs or AHS?

AHS can take up one of three forms:

(i) Animals with the lung (***dunkop***) or acute form of AHS show the following symptoms:

- **very high fever (up to 41 degrees)**
- **breathing difficulty, with mouth open and head hanging down**
- **in some cases frothy discharge from the nose**
- **sudden onset of death**

Horses seldom recover from this form of AHS. **The death rate is up to 90%.**

(ii) Animals with the heart (***dikkop***) form of AHS show the following symptoms:

- **fever, followed by swelling of the head and eyes**
- **in severe cases, the entire head swells, which explains the Afrikaans name *dikkop***
- **loss of ability to swallow and possible colic symptoms**
- **pinpoint bleeding in membranes of the mouth and eyes**

This form has a slower onset of death, because animals usually dies 4 to 8 days after the fever has started. The death rate is also lower, with **up to 50% of horses actually recovering**.

(iii) Animals with the **mixed** form of AHS show symptoms of both the *dunkop* and the *dikkop* forms of the disease.

Activity 7.11

If you have access to the internet, visit the following website. Its contains pictures of horses suffering from AHS:

http://www.pinterest.com/ahschallenge/what-african-horse-sickness-looks-like/

How can AHS be prevented and controlled?

There is no specific treatment for animals with AHS apart from **rest and good nursing care**.

The AHS virus is not contagious and can only be spread via the bites of infected *Culicoides* spp. Therefore **vector control** during times of high risk is essential. This includes **stabling at night and using insect repellents.**

Vaccines are available to help control outbreak of AHS. These vaccines must be administered by a veterinarian. A very strict and specific regime must be followed.

Activity 7.12

AHS is a controlled disease in South Africa (see theme 3). What must you do immediately when you see a horse with symptoms such as those mentioned above?

When you suspect that a horse has AHS, laboratory tests must be done and a veterinarian must make a diagnosis based on these tests. Contact the state veterinarian immediately.

Movement control is very important. There are strict rules for moving horses from an AHS region into an AHS-free region. Contact the state veterinarian for guidelines when you need to transport horses between provinces or across borders.

7.4.2 Tetanus

Activity 7.13

Revise the section on tetanus in theme 2, study unit 3. Then answer the following questions:

(1) What causes tetanus?
(2) How does an animal typically become infected with tetanus?
(3) Which animal species are most sensitive to developing tetanus?
(4) What is the characteristic clinical sign of tetanus?

How can tetanus be prevented and controlled?

All horses should be vaccinated against tetanus annually, or as recommended by a veterinarian. People who work with horses must ensure that the horses in their care are vaccinated in accordance with recommendations. The spores of *C. tetani* are commonly found in soil and can easily enter wounds, therefore those who care for horses must take proper care of any open cuts or wounds and the umbilicus of foals.

7.4.3 Equine influenza

Equine influenza is a **highly contagious viral disease** of horses, donkeys and zebras. It has been reported in many countries around the world.

What are the clinical signs of equine influenza?

Horses may show different symptoms after they have been exposed to the influenza virus. The symptoms depend on a horse's immune status. The clinical disease can be a mild infection that goes by unnoticed or a serious disease in weaker animals. The disease is **often fatal in donkeys, zebras and weakened horses**. Like many other viruses that lead to respiratory infections, the equine influenza virus is caught when an animal breathes in respiratory secretions.

The incubation period of influenza is short, normally 1 to 3 days. Clinical signs begin suddenly and are similar to in the symptoms shown by humans with the flu. This similarity has been discussed in activities 1.1 and 7.7. The symptoms are as follows:

- **high fever**
- **watery nasal discharge**
- **swollen submandibular lymph nodes**
- **dry, harsh cough**

Affected animals are often depressed, anorexic and weak. In uncomplicated cases the clinical signs usually only last a few days, but the cough can persist for 2 to 3 weeks. The nasal discharge sometimes becomes mucopurulent due to a secondary bacterial infection. Seriously ill horses may take a few months to recover completely.

How is equine influenza treated?

Activity 7.14

The virus that causes equine influenza damages the epithelial cells of the respiratory tract. This leads to inflammation and the symptoms listed above. How do you feel when you have the flu? What do you think is the appropriate treatment for horses with equine influenza? What precautions must be taken when horses have this disease?

There is no specific treatment for equine influenza. We mainly treat the symptoms and offer **good nursing care**. When a horse suffers from equine influenza, its respiratory tract is weakened. In such cases any **tiring physical activity and exercise must be avoided**. Good stable hygiene, minimising dust and providing **proper ventilation** are also very important.

How can equine influenza be prevented and controlled?

There are many vaccines available against equine influenza. Most of these vaccines are **inactivated vaccines**. They differ from the MLV vaccines we have previously discussed, which are live vaccines.

The available vaccines offer only a short period of protection. Adult horses at risk of infection must therefore get booster vaccines every 6 months. Horses that do not have regular contact with horses from other stables can be vaccinated annually. Foals must get a series of vaccines, like the vaccines for puppies discussed previously. Note that the first vaccine for foals is given when they are 6 months of age, because maternal antibodies protect them for the first few months of their lives.

Like AHS, equine influenza is a **state-controlled animal disease** in South Africa.

Activity 7.15

By now you must have 13 mind maps. Make sure the information on these mind maps is correct, short and to the point. Remember, the mind maps show only key facts and are excellent summaries you can use when you study for the examination.

7.5 CONCLUSION

Infectious agents are a common cause of disease in dogs, cats and horses, particularly in the African climate. Several of the infectious diseases discussed here are very serious and can even be fatal. However, the majority can be prevented by appropriate vector control and vaccination programmes.

7.6 REVISION QUESTIONS

(1) Make a list of all the vector-borne diseases you have learned about in study unit 7. Identify the vector for each disease.
(2) Why is tick control in dogs important?
(3) What are the symptoms shown by an animal suffering from kennel cough?
(4) What is the layman's term for feline infectious rhinotracheitis? What are the symptoms shown by a kitten suffering from the disease?
(5) Name two infectious feline conditions that are most often seen in multi-cat households or catteries.
(6) How can we prevent the spreading of diseases like FIV?
(7) Explain the difference between the *dunkop* and *dikkop* forms of AHS.
(8) Name two state-controlled equine diseases.

STUDY UNIT 8

Common parasitological conditions

LEARNING OUTCOMES

See the section entitled "Learning outcomes for study units 7 to 10" on page 51.

8.1 INTRODUCTION

Various parasites affect domestic animals species. Parasites can be **internal**, like worms living in the GIT, or **external**, like fleas living on the skin.

Parasites usually cause the host animal a degree of "parasite worry". This means they cause discomfort in the host. In serious cases parasite worry can lead to depression and anorexia. Some parasites can also cause direct conditions and symptoms in the host, such as abscesses caused by the long mouth parts of certain ticks, or anaemia caused by bloodsucking worms. In many cases parasites can also transmit diseases to the host. They therefore act as vectors of disease.

If, when and how to treat parasites depend on many factors, but we only discuss some of these factors in this study unit. Sometimes management policies can be used to control parasite infestation, but usually pesticides are also needed. Such pesticides must be used responsibly. They are toxins that can poison the applicator, the pasient and the environment if they are not used correctly. They can also lead to widespread resistance against the chemical. Pesticides must be used strictly according to the instructions of the manufacturer. Appropriate parasite control programmes must be discussed with a veterinarian.

Activity 8.1

(1) Skim through the study unit and draw your own diagram to show which diseases are discussed in the two main sections. In other words, draw your own overview of the study unit in the form of a diagram.
(2) Make a rough sketch of each of the following parasites and then compare your sketches with the pictures provided in the text.

- **roundworm**
- **hookworm**
- **tapeworm**

- **bots**
- **ticks**
- **fleas**
- **mange mites**

8.2 INTERNAL PARASITES

8.2.1 Roundworm

What are roundworms?

Roundworms are also called **nematodes**. They are a diverse group of animals that can live in a wide variety of environments. The roundworms that infect our domestic animals typically live in the intestines of these animals.

What does a typical roundworm look like?



FIGURE 8.1

Toxocara canis, a common roundworm in dogs

Source: www.wikipedia.org/wiki/Toxocara_canis

How do animals become infected with roundworms?

Animals become infected with roundworm when they swallow roundworm eggs. Infected animals secrete the eggs in their faeces. Young animals can also contract the parasite during the pregnancy, or by drinking the milk of an infected dam.

What clinical signs are typically caused by roundworms in a host?

The symptoms shown by a host depend on the degree of worm infestation. Mild infections, especially in adult animals, can be **asymptomatic**. In puppies infections can be more serious and cause impactions in the intestines. The clinical signs can include the following:

- **abdominal distension**
- **abnormal faeces**
- **stomach ache**
- **vomiting**
- **anorexia**

- **lethargy**
- **coughing (when the roundworm larvae migrate through the animal's lungs)**

How is a roundworm infestation diagnosed?

We diagnose roundworms by identifying their eggs in a **faecal flotation** under a microscope. A faecal flotation is an in-house diagnostic test performed at veterinary clinics to diagnose parasitism in animals.

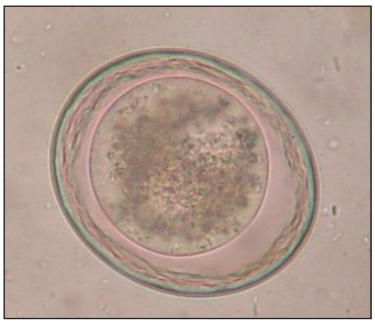


FIGURE 8.2

A Toxocara egg seen under a light microscope

Source: www.wikipedia.org/wiki/Toxascaris_leonina

How is a roundworm infestation treated?

We treat roundworm with an appropriate **deworming** agent. Young animals must be dewormed regularly. Adult animals must be dewormed at least four times a year, unless otherwise advised by a veterinarian. Always deworm pregnant animals before parturition (giving birth).

8.2.2 Hookworm

What are hookworms?

Hookworms are parasitic nematodes or roundworms that live in the intestines of the host. This nematode has hook-like mouthparts and attaches itself to the wall of the host's intestines with these hooks. They puncture the blood vessels and feed on the blood.

What does a typical hookworm look like?



FIGURE 8.3

Ancylostoma, a common hookworm genus in dogs and cats, seen in the intestines during a necropsy

Source: www.wikipedia.org/wiki/Hookworms

How do animals become infected with hookworms?

Animals typically become infected with hookworms by swallowing the **infective larvae**. The larvae can also penetrate skin. Infected animals pass eggs in their faeces. These eggs incubate in the soil. When the conditions in the environment are right, the eggs release the larvae that develop into infective larvae within a few days. Young animals can also contract the parasite during the pregnancy, or by drinking the milk of an infected dam.

What clinical signs are typically caused by hookworms in a host?

The host's symptoms depend on the degree of worm infestation and can include:

- **bloody diarrhoea**
- **pale mucous membranes caused by anaemia (owing to blood loss)**
- **weight loss and emaciation**
- **progressive weakness**

How is a hookworm infestation diagnosed?

We diagnose a hookworm infestation by identifying their eggs in a faecal flotation.

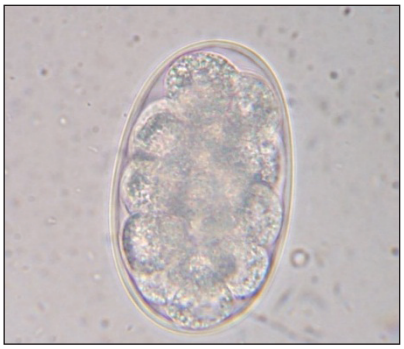


FIGURE 8.4

An Ancylostoma egg seen under a light microscope

Source: www.wikipedia.org/wiki/Hookworm

How is a hookworm infestation treated?

Most broad-spectrum commercial de-wormers contain an active ingredient that kills roundworms, including hookworm.

8.2.3 Tapeworm

What are tapeworms?

Tapeworms belong to the group of worms called **cestodes**. Tapeworms are long, flat, segmented worms that live in the small intestines of animals. Some of the tapeworm species in horses also live in the caecum.

What does a typical tapeworm look like?



FIGURE 8.5

Dipylidium caninum, a common tapeworm in dogs

Source: www.wikipedia.org/wiki/Dipylidium_caninum

How do animals become infected with tapeworms?

Tapeworm species usually have an intermediate host during their life cycle. The intermediate host gets infected by eating the eggs of the worm which are secreted in the faeces of definitive hosts. The intermediate host is the host that harbours the immature stage of the parasite for a short period during its life cycle and asexual replication finds place in this host.

The definitive host (dog, cat or horse) is infected by the worms when it swallows the intermediate host (see the *Echinococcus* tapeworm in study unit 3). This host is the host that harbours the mature stage of the parasite for reproduction to take place (usually producing eggs). Dogs and cats can get *Dipylidium* spp. tapeworm by swallowing fleas. Cats that eat infected mice and rats can get *Taenia* spp. tapeworms.

What clinical signs are typically caused by tapeworms in a host?

Tapeworms generally do not cause serious disease in the host. In dogs and cats they can cause anal irritation. Infected animals are often seen rubbing their bottoms on the ground (**scooting**).

Heavy tapeworm infestation in puppies can be more serious. It may cause a lack of growth, anaemia and intestinal blockages.

In horses tapeworms can lead to colic signs and GIT ulceration.

How is a tapeworm infestation diagnosed?

Tapeworms secrete segments of their body, called, proglottids which contain egg parcels. These proglottids can be seen macroscopically in an animal's faeces. Secretion is intermittent and therefore proglottids cannot always be seen in one faecal examination. In dogs and cats these proglottids typically resemble **grains of rice** and can be seen moving around the anus or in the faeces. Occasionally the head of the tapeworm detaches from the intestinal wall and the entire adult tapeworm is then passed in the faeces or vomited up.

How is a tapeworm infestation treated?

Most broad-spectrum commercial de-wormers – contain active ingredients that kill tapeworms. The active ingredient praziquantel is most commonly used against tapeworms.

We can prevent tapeworm infestations by controlling the intermediate host. To keep our companion animals free from tapeworms, we need to control fleas and mites in particular.

List at least three differences between roundworms, hookworms and tapeworms.

Interesting fact: The longest tapeworm ever found inside a human was of the Diphyllobothrium latum species. It was 25 metres long.

8.2.4 Bots

What are bots?

Bots are the **larvae of certain types of flies,** in particular *Gasterophilus* spp. Bots are very common parasites and infest horses all over the world. They are found attached to the inside of the stomach wall of horses.

What do bots look like?

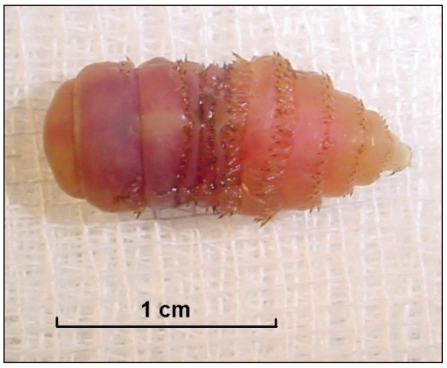


FIGURE 8.6

The larval stage (bot) of Gasterophilus intestinalis

Source: www.wikipedia.org/wiki/Botfly

How do horses become infected with bots?

The adult flies lay eggs on the hair of horses, particularly on their legs, during late summer and early autumn. When the horse licks itself, it gets some of the eggs in its mouth. From here the larvae migrate and eventually arrive in the horse's stomach, where it matures. Mature larvae release from the stomach lining and are secreted in the faeces of the horse, where they pupate into the adult fly.

What clinical signs are typically caused by bots?

Bots do not usually cause serious problems in horses, not even when they are present in large numbers. They are often found by accident. In rare cases, when there are large numbers of bots present, the infected horse may lose weight, fail to thrive and have problems emptying its stomach normally.

How are bots diagnosed?

The fly eggs are tiny (1–2 mm), but they are easily visible to the naked eye. If the eggs are seen on a horse's coat, we can assume that the horse is infested with bots. Bot larvae are sometimes also be found in the horse's manure.

How are bots treated?

Although bots do not really cause significant disease in horses, most commercial de-wormers are also effective against them.

Activity 8.2

Which internal parasite is most likely responsible for causing the following clinical symptom in a dog?

(1) Bloody diarrhoea
(2) Abdominal distension
(3) Scooting

8.3 EXTERNAL PARASITES

8.3.1 Ticks

What are ticks?

Ticks are small **arachnids**. They are ectoparasites that feed on the blood of their hosts (**haematophagic**). Various tick species are fairly host specific. They therefore prefer mammals or birds, or even reptiles or amphibians. They also prefer a certain type of habitat. Ticks are typically found in grassy or woody areas and therefore dogs that spend time outdoors are more exposed to ticks. Intermediate hosts can bring ticks into a yard.

What do ticks look like?

There are two main groups of ticks, namely soft ticks (tampans) and hard ticks.

Ticks from various species have different colourings.

Hard ticks are of primary importance in dogs, cats and horses. There are three stages in the life cycle of hard ticks, namely the larva, nymph and adult stages.

There are one-host, two-host or thee-host ticks, depending on how many hosts they need to complete the life cycle from larva to adult. Female ticks become fully engorged from their blood meals (up to 100 times their original weight) and can lay thousands of eggs before they die.



FIGURE 8.7
An un-engorged female tick



FIGURE 8.8
A typical engorged female tick
Source: http://commons.wikimedia.org/wiki/File:Dog-ticks5.jpg

How do animals become infested with ticks?

Ticks cannot jump or fly, but they can crawl and climb. They typically sit on tall grass and wait for a suitable host to walk by. When the host brushes against a tick it gets lifted of its perch onto the host. Now it can crawl to its preferred attachment site.

What are the diseases caused by ticks?

Ticks can cause **irritation** and **pruritus** (itching) around the attachment site. The bite wound can become infected by bacteria. The host sometimes becomes **anaemic** as the result of blood loss, especially if high numbers if ticks are involved.

Ticks can also transmit infectious agents to the host. The transmission of a specific pathogen is usually restricted to the species of tick and to a geographical region.

Pathogens commonly transmitted by ticks in South Africa include the following:

Dogs: *Babesia* spp. (causing canine babesiosis)

Ehrlichia spp. (causing ehrlichiosis)

Cats: *Haemobartonella felis* (causing haemobartonellosis or infectious anaemia)

Babesia felis (causing feline babesiosis)

Horses: *Babesia caballi* (equine babesiosis)

Theileria equi (equine theileriosis)

How can we get rid of ticks?

As mentioned in study unit 6, we have various **acaricides** to control ticks on pets. The onset of action and the duration of protection the acaricides give differ between products. Tick control is most important during summer when ticks are abundant.

Ticks must be removed immediately when we see them. The best way to remove a tick is by rubbing some alcohol on it and then removing it with tweezers.

8.3.2 Fleas

What are fleas?

Fleas are tiny wingless insects that live on mammals and birds. They are ectoparasites and feed on the blood of their hosts. The flea that commonly affects cats and dogs worldwide is the **cat flea**, *Ctenocephalides felis*.

What do fleas look like?



FIGURE 8.9

A cat flea seen under a light microscope

Source: http://en.wikipedia.org/wiki/Flea

Because they are so small, fleas are difficult to see with the naked eye. However, when a pet is infested with fleas we are likely to see **flea dirt** when we examine it. Flea dirt looks like dark specks of pepper scattered on the skin surface of the pet. This is actually flea faeces and consists of digested blood. If you comb some of this dirt onto a wet paper towel it will look like a small blood stain after a few minutes.

How do animals become infested with fleas?

Dogs and cats get infested with fleas through contact with other animals or contact with fleas in the environment. Fleas have strong back legs and can **jump** from host to host, or from the environment onto the host.

What are the diseases caused by fleas?

Flea bites cause **itching**. If an animal is allergic to flea bites the itching can be severe and lead to hair loss, inflammation and secondary skin infections. A sensitive pet can itch all over from a single flea bite.

Ctenocephalides felis prefers cats and dogs as hosts. When there are no cats and dogs they can bite humans in the vicinity. This typically happens when owners let pets out of the house because they have fleas. Since the hosts are then no longer in the house, the flees infest the humans.

How can we get rid of fleas?

There are a wide variety of **commercial flea-control products** on the market, including products for pets and for the premises. These products often also give protection against ticks. 90% of the flea population (eggs, larvae and pupa) is in the **environment,** so if indoor animals are affected, we must also treat the house. In the case of outdoor animals the areas where the animals stay and areas that do not get sunlight (under decks and in kennels) must also be treated. All the pet's bedding should be thoroughly washed or dry-cleaned. A good **vacuum cleaner** plays an important role in flea control, because it can remove a high percentage of flea eggs, larvae and pupa from carpets.

8.3.3 Mange mites

What is mange?

Mange is a **persistent skin condition** of mammals (including humans, horses, sheep, cattle, horses, dogs and cats) caused by infestation with parasitic mites.

What are mites?

Mites are tiny **arthropods**, usually less than 1 mm in length and therefore difficult to see with the naked eye. The effect of the mites on the animal's skin is called mange and is the most visible sign of a mite infestation.

What are the common types of mange and mange-causing mites?

(i) **Sarcoptic mange** (see section 3.2 in theme 2)

Sarcoptic mange occurs in various domestic animals species, but is most common in dogs (canine scabies). Domesticated dogs are normally infested through contact with other infested domestic or wild canids (jackals, foxes, etc.)

Lesions start to appear within 3 weeks of becoming infested. The skin becomes red and very itchy. The hair falls out. Burrowing mites cause the skin to ooze serum, which dries and forms crusty scabs. When the dog scratches, secondary bacterial infections commonly occur. Affected animals may suffer from weight loss and a lack of appetite. They often have an unpleasant smell.

If mange is left untreated, affected animals may die of exhaustion or dehydration, or as the result of a secondary infection.

(ii) **Notoedric mange**

Notoedric mange is caused by the most common mite of domestic cats, *Notoedres cati*. This mite looks similar to the canine mange mite and causes similar conditions and symptoms.



FIGURE 8.10

Notoedres cati

Source: http://www.urbancarnivores.com/notoedric-mange-a-disease-of/

(iii) **Demodectic mange**

Demodectic mange is caused by mites living in the **hair follicles** or the associated sebaceous glands of mammals. The mite affects various mammals. Each animal species has its own species of this mite. Transmission of the mites usually happens from mother to offspring during the first few days of life.



FIGURE 8.11

The long cigar shape of Demodex canis (dog demodectic mite) seen under a light microscope

Source: http://en.wikipedia.org/wiki/Demodex

Healthy animals that are infected with mites usually experience mild deterioration in skin condition. They can also asymptomatic be. Clinical signs are most commonly seen in dogs, particularly in **puppies**, or in **immunocompromised** animals. Some dog breeds are more likely than other breeds to become infected by mites. In mild infections small, reddish, bold patches (**alopecia**) appear on the face, front legs or trunk. The lesions heal without treatment. In severe cases a serious condition called **generalised demodicosis** may develop. These animals require immediate veterinary attention.

Some animals can inherit a severe sensitivity to demodex. Animals that develop the severe form of the disease should not be used for breeding.

(iv) Otodectic mange

Otodectic of ear mange is caused by the otodectic ear mite and is common in cats and dogs. This mite also infests the ears of other wild carnivores. The otodectic mite spends all its life stages in the ear canal. The feeding mites cause inflammation, swelling and itching in the outer ear canal. Infestation sometimes goes unnoticed, but it can also be very severe. It can even lead to deafness or seizuring. Infested animals **shake their heads and rub their ears** in an attempt to relieve the itching. This behaviour could lead to the development of an othematoma (see study unit 10).

How can mange be prevented and treated?

To prevent mange we must promote good health and hygiene in animals. In that way we can enhance their resistance against mites and skin diseases caused by mites. Canine mange mainly occurs in young animals that live in poor conditions, and are malnourished and infested with internal parasites. As **direct contact** is the most important method of transmission, pets with mange should be **quarantined** until the infection has been cleared.

In almost all cases of mange in domestic animals, a veterinarian should be consulted for an accurate diagnoses and treatment. We cannot confirm mange or identify the mite only by looking at an animal's symptoms. Mange is usually diagnosed when a skin scrape from the affected area is investigated under a microscope and mites are detected in the skin scrape.

A veterinarian must prescribe an appropriate topical or systemic miticide. All animals in the household should be treated. Treating the environment is also important, particularly in cases of sarcoptic mange. Pets' bedding, clothing and collars must be washed in hot, soapy water and allowed to dry in the sun. If the pet stays indoors, carpets and furniture should also be treated.

Activity 8.3

(1) Which external parasite or parasites are most likely to cause the following clinical symptom in a dog or cat?

(a) itching/pruritis
(b) hair loss
(c) abscess formation
(d) head shaking

(2) Revise the various mind maps you have made for the diseases discussed in this study unit. Make sure that they include all the necessary details.

8.4 CONCLUSION

Animals can suffer severely under the burden of internal and external parasites. Some of these parasites can transfer deadly disease pathogens to the host. One of the priorities of animal welfare assistants is to ensure that these parasites are controlled in pets and horses.

8.5 REVISION QUESTIONS

(1) Name three types of intestinal worms commonly found in dogs and cats.
(2) Distinguish between the most common clinical seen if pets are infested with the different types of worms listed in (1).
(3) A group of horse owners hear about bots in horses. Explain to them what bots are and what their significance is.
(4) Why is it wise to keep dogs, cats and horses free from ticks?
(5) A dog owner complains to you about a flea problem in her house. Explain in detail how she must deal with the infestation.
(6) Define **mange**.
(7) Which animals are most commonly affected by (i) sarcoptic mange and (ii) demodectic mange?
(8) What action would you take if you see a dog with reddish alopecic lesions all over its body and you suspect it is suffering from mange?

STUDY UNIT 9

Common toxicological conditions

LEARNING OUTCOMES

See the section entitled "Learning outcomes for study units 7 to 10" on page 51.

9.1 INTRODUCTION

Numerous substances are potentially toxic (**poisonous**). We use many of these substances daily in our lives. The degree of toxicity differs between substances and **the amount of substance needed to cause toxic effects depends on how toxic a substance is**. Certain substances are more toxic to one species of animal than to another.

The signs of toxicity (symptoms of poisoning) depend on the toxin. Toxicity can be acute, which means signs of poisoning are seen when an animal has swallowed only one dose of toxin. Toxicity can also be chronic or cumulative. This means signs of poisoning can only be seen after the animal has been in repeated contact with the poison.

In this study unit we first discuss some general principles of treating cases of poisoning or toxicity. We then look at toxicological conditions caused by the following:

- **chemical poisons**
- **poisonous plants**
- **medicines**
- **snake bites**

Activity 9.1

Skim through the study unit and draw your own diagram to show which diseases are discussed in the two main sections. In other words, draw your own overview of the study unit in the form of a diagram.

9.2 TREATING CASES OF TOXICITY

Do activity 9.2 below before you continue.

Activity 9.2

What do you think is the best course of action in the following scenarios?

(1) A lady comes home after work and discovers her dog has swallowed some of the ant poison she put out that morning.
(2) A cat owner applies a pesticide intended for dogs on his cat. A few hours later the cat appears depressed and unresponsive.

An animal can be exposed to a toxin when it swallows it (oral route) or when it comes into contact with the animal's skin (dermal route). It is important to **remove the poison** from the animal as far as possible and as soon as possible. The best way to prevent poisoning when an animal has swallowed a toxin, is to **induce vomiting**. Note that some animal species, like horses, cannot vomit.

Veterinarians use a drug called apomorphine to induce vomiting. This drug is highly effective. It is therefore very important to **take a poisoned animal to the veterinarian, because apomorphine gives it the best chance of survival**.

Some home remedies may also cause a dog to vomit. These include pressing a ball of automatic dishwasher powder down the back of the dog's throat, or squirting dishwashing liquid or a high salt solution in the back of the throat. These methods are not always easy to enforce and they do not always work. Only try them if the animal cannot be taken to a veterinarian in time. A vet may also attempt gastric lavage (flushing out the stomach).

After the animal has vomited or if you do not succeed in getting it to vomit soon enough to get rid of the stomach contents, you may give it **activated charcoal.** This may limit absorption of the poison. Activated charcoal is an adsorbent that binds substances, which are then eliminated via the faeces. Animals must be kept for observation and any signs of toxicity symptomatically treated.

A few poisons have specific **antidotes.** These are substances given to reverse the effect of the poison.

If dermal (skin) contact leads to poisoning it is best to wash the animal with cold water and a detergent like dishwashing liquid as soon as possible. Do not use warm or hot water, because it will increase the absorption of the toxin. Take care not to get into contact with the poison yourself and wear gloves. Activated charcoal can still be given orally to bind any poison that has been absorbed systemically through the skin. The animal must then be admitted to hospital for further treatment or observation.

9.3 CHEMICAL POISONS

9.3.1 Organophosphate

Organophosphates (OPs) are widely used as pesticides. They are also widely used against parasites in domestic animals, and are a major cause of animal poisoning. OPs act by oversimulating the **parasympathetic nervous system**.

Signs of OP poisoning typically include the following:

- **hyper salivation**
- **small pupil size (miosis)**
- **frequent urination**
- **diarrhoea and vomiting**
- **colic**
- **bradycardia (slow heart beat)**
- **muscle twitching**
- **weakness**
- **ataxia and seizures**
- **breathing difficulties and death owing to respiratory muscle paralysis**

A blood test is done to diagnose OP poisoning.

> When an animal has been poisoned with OPs, the first step is to give the animal a drug called **atropine**. Atopine is the antidote to OP poisoning. Treatment and observation may be needed for several days.

9.3.2 Snail bait

Sometimes animals, especially dogs, are poisoned by accident because they swallow poisons that have been put out to get rid of pests. This usually happens because pet owners put out baits carelessly.

Snail bait generally contains an ingredient called **metaldehyde**. This substance is toxic to most species. It leads to a similar clinical syndrome in all animals that take it in.

Within 3 hours after swallowing the poison, abnormal **neurological signs** appear. These include prominent muscle tremors, anxiety, ataxia, a fast heart rate and an increase in body temperature. These can rapidly progress to a more severe condition with symptoms such as depression, breathing difficulties, unresponsiveness and seizuring.

Animals must be admitted to a veterinary hospital for aggressive symptomatic treatment as soon as possible. It is possible for affected animals to make a full recovery within a few days if they receive treatment promptly.

> **Activity 9.3**
>
> Make a list of all the infectious diseases you know that also cause CNS symptoms.

9.3.3 Anti-coagulant rodenticides

The majority of rodenticides (rat poisons) are **vitamin K antagonists**. These drugs prevent the body from utilising vitamin K, which is needed for normal blood coagulation or blood clotting. Vitamin K plays an important role in the prevention of spontaneous bleeding.

Cats are very selective eaters, therefore it is mainly dogs that are affected by rat poisons. Cats do not generally suffer from secondary toxicity caused by eating poisoned rats.

Signs of toxicity can appear within 6 to 24 hours after the poison has been swallowed, ortake up to 5 days. Clinical signs relate to **abnormal bleeding** and can include tiny haemorrhages on the mucous membranes, nose bleeds and blood in the stool or urine.

If we suspect that an animal has come into contact with rat poison, we must take the animal to a veterinary clinic for assessment and appropriate treatment. The course of treatment depends on the type (generation) of rat poison, therefore owners must **take the label of the rat poison with** them to the veterinarian. The **antidote to poisoning is vitamin K** (phytomenadione).

9.3.4 Carbon monoxide

Carbon monoxide (CO) cannot be smelled or tasted. This colourless gas is found in the fumes of cars and trucks, small gasoline engines, stoves, lanterns and burning charcoal. It can kill animals if enough of it is inhaled. This can happen when **pets are left in enclosed areas with poorly ventilation while CO is being produced.**

When an animal inhales CO it is absorbed into the blood. There it combines with haemoglobin to form carboxyhemoglobin, which **reduces oxygen delivery to the body**. Signs of acute toxicity are typical of **CNS depression** (decreased brain and nervous activity) and include the following:

- **sleepiness**
- **weakness, lethargy and depression**
- **difficulty in breathing**
- **seizuring**
- **deafness**
- **uncoordinated movements**
- **coma**
- **death**

When we think an animal is suffering from CO poisoning, we must remove it from the source of the CO immediately and allow it to breathe fresh air. The animal must be taken to a veterinary hospital for emergency treatment to restore the levels of oxygen to the vital organs.

9.3.5 Ethylene glycol

Ethylene glycol is a highly poisonous substance. It is an ingredient of **antifreeze**, which is used in radiators to prevent water from freezing. Antifreeze has a sweet taste and pets will therefore happily drink it. If you suspect that an animal has drunk antifreeze, immediately take it to a veterinary hospital for emergencytreatment and kidney support, because as the poison causes **acute kidney failure**.

9.3.6 Other common household toxins

Activity 9.4

Many of the everyday products or food we have in and around the house is toxic to our pets. Do you know of any substances, apart from the poisons mentioned above, that are potentially toxic to pets?

Here follows a list of common household toxins:

- **alcohol**
- **chocolate**
- **caffeine**
- **grapes/raisins**
- **moth balls**
- **nuts (excluding peanuts, which is actually a legume)**
- **nutmeg**
- **onions and garlic**
- **paintballs (used in paintball guns)**
- **raw egg whites**
- **silica gel packets**
- **tobacco**
- **xylitol (present in many sugar-free products, including gum)**

The degree of toxicity of the substances on the list depends on the amount consumed and the size of the pet involved. The best way to prevent poisoning is to make sure that pets do not swallow any of the products on the list.

Activity 9.5

(1) Revise activity 9.2. Has your answer changed now that you know more about dealing with poisonous substances?
(2) Explain to a pet owner why rodenticides must be placed out of pets' reach. Discuss in detail the types of poison, the signs of toxicity and the treatment of an animal that has been poisoned.
(3) Draw your own mind map of the information related to chemical poisons. As you work through the rest of the study unit, also draw mind maps for the other main sections.

9.4 POISONOUS PLANTS

Various ordinary plants are poisonous to domesticated animals. These plants usually cause problems for grazing and browsing animals like ruminants and horses, but sometimes dogs, cats and other animals may also eat poisonous plants. The clinical signs of plant poisoning depend on how much of the plant is eaten and the specific species of plant. Some plants may also be a contact poison and cause irritation to the skin or mucous membranes.

Teach pet owners that they must make sure whether a plant is poisonous or not before they plant it in gardens where pets go. Horses must not be allowed to graze in veld known to have poisonous plants.

If an animal has eaten a poisonous plant, it must get emergency medical attention. Activated charcoal is usually part of the treatment regime.

Here follows a list of some of the better known garden plants that are poisonous to dogs and cats:

- **azalea**
- **cyclamen**
- **kalanchoe**
- **various types of lilies**
- **oleander**
- **daffodils**
- **sago palm**
- **tulips**
- **hyacinths**

For more information on these plants and a more complete list visit http://www.petpoisonhelpline.com/pet-owners/basics/top-10-plants-poisonous-to-pets/. Note that you do not need to study the information on the website for examination purposes.

Horses are particularly sensitive to the following plants:

- **certain *Senecio* species**
- **crofton weed**
- **hairy wild lettuce**
- **datura**
- **yellow star thistle**
- **yellow centaurea**

For more information on these plants, plant poisoning and the mycotoxicoses of importance in horses in Southern Africa visit http://jsava.co.za/index.php/jsava/article/viewFile/567/543. Note that you do not need to study the information on the website for examination purposes.

9.5 MEDICINES

9.5.1 Drugs that commonly cause toxicity: anti-inflammatories

Activity 9.6

Have you ever taken a Panado®, a Disprin®, a Neurofen® or a similar tablet?

These drugs are collectively called anti-inflammatory drugs.

Why did you take it?

Non-steroidal anti-inflammatory drugs (**NSAIDs**) is a group of drugs that is commonly used for relieving **inflammation, pain and fever** in all species. Keeping animals comfortable and pain free is a very important aspect of animal welfare. There are specific NSAIDs for use in dogs, cats and horses. These drugs must be used strictly as directed by a veterinarian. **Human NSAIDs can be highly toxic to animals and should UNDER NO CIRCUMSTANCES be given to pets.**

Cats in particular are very sensitive to paracetamol (the active ingredient found in for example Panado®), because their livers do not produce the enzyme that is needed to metabolise the drug. Dogs can also show signs of poisoning if they are given a high dosages of paracetamol or if lower dosages are given repeatedly.

Paracetamol toxicosis is characterised by **methemoglobinaemia and hepatotoxicity**. Renal injury is also possible. (Hepato refers to the liver and renal to the kidneys.) Cats develop methemoglobinaemia within a few hours after receiving paracetamol. Methemoglobinaemia is a blood disorder where the red blood cells are unable to deliver oxygen to the tissues. The cat's mucous membranes then becomes brownish in colour, and its heart rate becomes abnormal, it has breathing difficulties and it becomes weak. If the animal does not get prompt veterinary attention, it is likely to die.

Most of our conventional medicines are toxic at high doses. No medicine should be given to pets if it has not been prescribed by a veterinarian.

9.5.2 Narcotics and recreational drugs

Under no circumstances should pets have access to any narcotics or recreational drugs. These substances can, even at very low doses, cause severe toxicity and death.

A common recreational drug is *Cannabis sativa* or marijuana, also commonly known as dagga, pot or weed. Dagga alters the functioning of normal neurotransmitters in the brain. **Dogs and cats can be poisoned if they are exposed to second-hand marijuana smoke**, or if they swallow marijuana or baked foods containing marijuana.

If a dog or cat has been poisoned by marijuana, the following clinical signs can be seen within 3 hours:

- **vomiting (despite it being an antiemetic in humans)**

- **severe lethargy and depression, potentially leading to a coma**
- **unsteady gait**
- **lethargy**
- **slow heart rate and low blood pressure**
- **respiratory depression**
- **dilated pupils**
- **hyperactivity, vocalisation and seizuring**

Animals showing any of these symptoms need immediate veterinary attention.

9.6 SNAKE BITES

Snakes often bite dogs in South Africa, particularly in rural areas. Most bites occur from spring to autumn.

Interesting fact: Did you know that there are about 175 species of snakes in Southern Africa? Of these only 55 are venomous and only 14 potentially dangerous to humans and pets.

The snake's type of venom largely determines the clinical signs following a bite and the prognosis.

There are three types of venom:

- **cytotoxic** (e.g. of puff adder)
- **neurotoxic** (e.g. of non-spitting cobras and mamba)
- **coagulopathic** (e.g. of boomslang and vine snake)

Some snake species of have a combination of venom types (e.g. the spitting cobra).

The puff adder is a very common snake found throughout South Africa. This species is responsible for the most snake bites in South Africa. Puff adders have potent cytotoxic venom. When dogs approach and sniff the snake, they are typically bitten on the face, neck and forequarter. Cattle and horses are mostly bitten on their faces or lower limbs.

Cytotoxic venom causes severe **swelling** around the bite site. This can lead to tissue necrosis. If the swelling is around the face or neck, it can block the air passages and **prevent normal breathing.**

Neurotoxic venom causes progressive weakness and loss of the swallowing reflex. It can paralyse the diaphragm, which makes it impossible for the animal to breathe if it is not on ventilation.

Haemotoxic bites are rare, but when they are inflicted they can lead to fatal bleeding.

When an animal has been bitten by a snake, take the animal to a veterinary hospital immediately. If someone has seen the snake, he or she must describe

it to the veterinarian. If the veterinarian knows what kind of snake is responsible for the bite, he or she can make better decisions about treatment.

Not all snake bites result in toxicity. Sometimes dry bites occur. This means that no venom was injected into the animal that was bitten.

When symptoms appear, the main treatment is administering **antivenom.** Polyvalent antivenom (a combination of more than one type of antivenom) is effective in the treatment of most cytotoxic and neurotoxic bites. Monovalent antivenom is only effective against boomslang bites. In addition symptomatic treatment is given.

9.7 CONCLUSION

Disease in animals is not only caused by infectious agents and parasites. There are many inanimate objects in an animal's immediate environment that are potentially toxic. These things include pesticides and rat poison, common household substances, foods like chocolate and nuts, poisonous plants and medicine. Dangerous animals like snakes, scorpions and spiders also pose a potential threat to pets. It is very important to educate animal owners about these dangers and how to keep their animals safe.

9.8 REVISION QUESTIONS

(1) Revise the mind maps you have drawn for this study unit and make sure that they are correct.
(2) What is the antidote for organophosphate poisoning?
(3) A dog with severe muscle tremors is brought to the clinic. You question the owner about possible sources of poisoning and discover that the owner put out snail bait the day before. If this is the cause of the poisoning, what other clinical signs should you look for in the animal? Should you call the veterinarian or deal with the case on your own? Give reasons for your answer.
(4) Why should pets never be left in a room with a running gasoline power generator?
(5) What is the toxic principal (ingredient) in antifreeze? Why do dogs and cats happily drink this substance?
(6) During the course of a year, a clinic has three cases of dogs bitten by snakes. One dog was bitten by a mamba, one by a boomslang and one by a puff adder. Name the types of venom involved in each case. Describe the clinical signs that would have been seen in the different cases.
(7) Remember to update your glossary as you work through this study guide. Add for example the following terms to your glossary:

neutropenia
mucopurulent
MLV
haemorrhaging
haematoma
immunocompromised

neutropenia
lymphadenopathy
anaemia
pruritis
bradycardia
fasciculation
cytotoxic
neurotoxic
coagulopathic
antidote
activated charcoal

STUDY UNIT 10

Diseases affecting the different organ systems

LEARNING OUTCOMES

See the section entitled "Learning outcomes for study units 7 to 10" on page 51.

10.1 INTRODUCTION

There are various pathological conditions that can affect each organ or organ system. Pathology negatively affects the functioning of a particular organ and leads to a degree of disease. **The conditions and symptoms described in this study unit need to be confirmed and appropriately treated by a qualified veterinarian**. When you encountered them it is your duty, as animal welfare assistant, to recognise the presence of disease and to ensure that the sick animals get the necessary veterinary care.

If you are enrolled for the anatomy module, please revise the anatomy of each organ system before you continue with the study unit.

Activity 10.1

This study unit looks at an extensive list of potential diseases or disorders that affect each organ system. For each organ system, make a list of the commonly encountered diseases or disorders. Then draw your own mind map that shows the main diseases or disorders that affect each organ system. For each disease or disorder, show the animals affected, the abnormalities we can recognise in each case (signs of disease), and any treatment and/or prevention measures specified.

If you have access to the internet, use Google Images to find pictures of the diseases, conditions, lesions or symptoms discussed. Pictures and photographs help the brain to remember details of the specific disorder.

In this study unit we discuss diseases or conditions that affect the following organ systems:

- **musculo-skeletal system and joints**

- **central nervous system**
- **reproductive system**
- **eye and ear**
- **skin**
- **circulatory system (heart and blood vessels)**
- **respiratory system**
- **mouth and teeth**
- **gastro-intestinal system**
- **urinary system**

10.2 DISEASES AFFECTING THE MUSCULO-SKELETAL SYSTEM AND JOINTS

The health of muscles, bones, joints, tendons and ligaments are all necessary for normal movement (locomotory function). Damage to any of these structures in the limbs can lead to a degree of **lameness**. It can change an animal's way of walking or its ability to move. Lameness can range from being **weight-bearing** to **non-weight-bearing**. Weight-bearing means the animal limps, but still puts some weight on the limb. Non-weight-bearing means the animal keeps the limb lifted from the ground at all times or just slightly touches the ground with the toe. The degree of lameness depends on the seriousness of the underlying cause of the lameness.

Diseases that affect the musculo-skeletal system and joints often cause **pain**. When the affected area is touched or manipulated the animals may cry out, grind their teeth, shy away, look at or lick the area, contract the muscles surrounding the area or even become aggressive. One must be very careful not to get bitten by a dog in pain when examining it.

When a muscle is not used to its full extent it **atrophies**. This means the muscle becomes smaller or wastes away. This can usually be seen clearly. Muscle atrophy can lead to visible lop-sidedness. It is a **clear indication of an underlying condition**.

Disease of the musculo-skeletal system can be caused by the following:

- **trauma (e.g. fractures)**
- **wear and tear (e.g. arthritis)**
- **genetic predisposition (e.g. hip dysplasia)**
- **nutritional imbalances (e.g. rickets)**

Common disease conditions are discussed in more detail below.

10.2.1 Fractures

A fracture or **broken bone** is really a break in the continuity of the bone tissues. It is usually the result of a **traumatic injury** to bone. In dogs and cats this often happens when the animal is hit by a car. The fracture is sometimes not obvious when the skin remains intact, but can be confirmed with an x-ray.

An animal with a broken bone is generally in acute, severe pain and needs urgent medical attention. If a bone in a limb is broken it causes **non-weight-bearing lameness.** Sometimes broken bones are exposed through broken skin.

10.2.2 Osteoarthritis

Osteoarthritis is the inflammation of one or more joints. The main symptoms of arthritis are **joint pain and stiffness**, which typically worsen with age. Arthritis is typically worse the day after hard exercise and during cold weather.

Osteoarthritis causes cartilage to break down. Cartilage is the hard, slippery tissue that covers the ends of bones where they form a joint. The condition is relatively **common in older, large-breed dogs**.

Osteoarthritis cannot be cured and the condition can be very painful and debilitating. The main goal of treatments is to reduce pain and stiffness and to improve the animal's quality of life. There are various good products on the market to help relieve the symptoms of arthritis up to a point.

Animals suffering from osteoarthritis need patience and a lot of care. They must not be overweight, because that puts extra strain on their sore joints.

10.2.3 Hip dysplasia

Hip dysplasia is caused by a **subluxation in the hip joint.** The term "subluxation" refers to a partial dislocation and is illustrated in figure 10.1 below.

Subluxation creates abnormal wear and erosion of the joint, which result in **osteoarthritis and pain**. It is caused by an **abnormal joint structure** and laxity (loose ligaments) of the structures that normally support the joint.

Subluxation can occur in all animals and humans, but is most common in **large or giant-breed dogs**. Predisposed breeds include German Shepherd dogs, Labrador Retrievers, Rottweilers, Great Danes, Golden Retrievers and Saint Bernards.

Most dysplastic dogs are born with normal hips. However, a dog's genetic make-up and possibly other factors cause the soft tissues around the joint to develop abnormally. This causes the subluxation.

Hip dysplasia is **hereditary** and animals suffering from the condition must not be used for breeding.

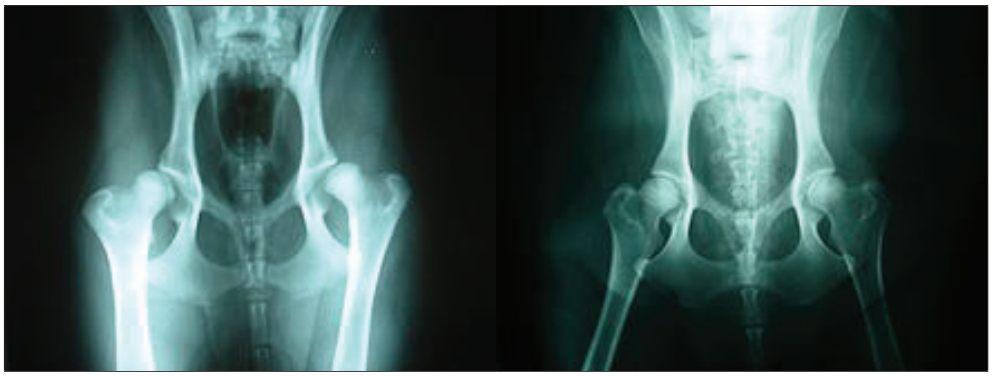


FIGURE 10.1

On the left is an x-ray taken of a Labrador Retriever suffering from hip dysplasia. On the right is an x-ray of a set of normal hips. The circle shows a subluxated hip. Note the displacement of the head of the femur bone and in comparison to the other three joints

Source: http://en.wikipedia.org/wiki/Hip_dysplasia_%28canine%29

10.2.4 Elbow dysplasia

Like hip dysplasia, elbow dysplasia is an **inherited developmental condition** most commonly seen in dogs. It normally affects one of four structures in the elbow. Symptoms of elbow dysplasia can range from occasional lameness to severe, crippling arthritis and very **painful elbows.**

Elbow dysplasia is typically seen in puppies between 4 and 10 months of age, but sometimes dogs only show signs of the problem as adults, when they develop osteoarthritis as the result of the abnormal joint.

10.2.5 Cruciate rupture and patella luxation of the stifle joint

The stifle joint is equivalent to the knee in humans. This is a complex joint with many structures, including the cruciate ligaments and the patella.

Patellar luxation occurs when the patella (kneecap) is dislocated from its normal anatomic position in the groove of the thigh bone (femur).

When the kneecap is dislocated from the groove of the thigh bone, it can only be returned to its normal position when the quadriceps muscles in the hind legs of the animal relax and lengthen. This is why animals with the condition will hold up their hind legs for a few minutes after luxation. A dog with a dislocated kneecap normally exhibits **abnormal hind limb movement** over a long period, **occasional skipping** or hind limb lameness and **sudden lameness**.

A dislocated kneecap is one of the commonest knee joint abnormalities in dogs, particularly in **toy and miniature dog breeds**. It can also occur in foals. It is a congenital (physical abnormality present from birth) condition, but it can also occur as the result of trauma. When patellar luxation happens in horses, the prognosis is poor.

The specific symptoms and required treatment of a dislocated kneecap depend on the seriousness and persistence of the condition, and the extent of osteoarthritis that has already developed. A veterinarian will be able to advise on the best course of action.

Cruciate rupture is a common cause of **acute developing hind-leg lameness** in dogs. It can also occur in horses. The cruciate ligaments are ligaments in the stifle joint. They keep the femur and tibia (bones of the hind leg) from sliding too far forward or backwards in relation to each other.

Cruciate ligament rupture is usually **traumatic** in nature. Certain breeds of dogs are predisposed to this injury because of the formation of their stifle joints and hind legs. If a cruciate ligament rupture is not repaired, the animal will have abnormal movement and eventually develop osteoarthritis in the affected joint.

Activity 10.2

Make a list of all the potential causes of limping or lameness in animals we have discussed thus far. Include any infections that may cause limping or lameness.

10.2.6 Laminitis

Laminitis is an **extremely painful inflammatory condition** of the tissues (laminae) that bond the hoof wall to the pedal (coffin) bone in the **horse's hoof**.

Laminitic hooves are typically abnormally **warm to the touch** and there is an **increased pulse in the artery of the hoof.** The condition causes pain and affects the horse's gait (movement) in accordance with the severity of the pain. Unless it is a very mild case, we will get a reaction from the hoof tester. (A hoof tester is an instrument used to determine whether there is pain in the foot of a horse.)

Laminitis should be treated as an **emergency** and the nearest veterinarian should be called immediately for advice when you suspect a horse suffers from it. If it is not treated promptly, laminitis can damage the foot permanently.

The following factors can predispose a horse to laminitis:

- **feeding too much concentrates**
- **infectious diseases**
- **administration of excessive doses of certain drugs (e.g. corticosteroids)**
- **metabolic diseases (e.g. Cushing's disease)**
- **concussion from riding on hard surfaces**
- **excessive weight-bearing by one leg owing to severe lameness in the opposite leg**
- **stress resulting from long distance transport**

Activity 10.3

Discuss the prevention of laminitis with a friend or relative who owns a horse.

10.2.7 Equine azoturia

Azoturia is also known as **Monday-morning disease**, **tying up** and **Equine Rhabdomyolysis Syndrome**. It is a condition seen in horses and most often occurs when **a horse in hard work is given a rest day, but its working diet is not reduced on that day**.

Azoturia is caused by metabolic abnormalities. It can develop rapidly and leads to **muscle weakness and cramps**. In severe cases the horse can collapse. Affected horses usually have very high temperatures and fast heart rates, and they sweat profusely. In severe cases the myoglobin released from the damaged muscles turns the urine dark red.

Regular exercise with warming up and cooling down periods, combined with only the necessary amount of feed and the reduction of feed on rest days, will help to prevent azoturia.

10.2.8 Rickets

Rickets is a classic metabolic bone disease of humans and animals. The condition causes **deformities** in young growing animals. These deformities include the swelling of joints and bending of the long bones. Rickets is caused by **insufficient vitamin D and phosphorus levels in the diet** as well as insufficient sunlight. (Note that many animals can make their own vitamin D if they are exposed to natural sunlight.)

If pets are fed a complete, balanced ration they will not develop rickets. If rickets does occur and the condition is detected and treated before the bones have finished growing, the deformity may be corrected during the remaining growth phase. However, if the bones have already stopped growing, deformities can only be corrected by surgery.

10.3 DISEASES AFFECTING THE CENTRAL NERVOUS SYSTEM (CNS)

The central nervous system consists of the brain and spinal cord. Any number of infectious, immunological and cancerous diseases or injuries can affect the CNS.

If an animal shows any of the following symptoms it may indicate that there are problems in the CNS. Take an animal with one or more of these symptoms to be examined by a veterinarian as soon as possible:

- **loss of consciousness**
- **seizuring**
- **ataxia**
- **paresis (impaired movement) or paralysis**

- **head tilt**
- **circling**
- **nystagmus (rapid, involuntary eye movement)**
- **sudden change in behaviour**

Activity 10.4

(1) Make a list of all the infectious diseases you know that can cause CNS symptoms in dogs, cats and horses.
(2) Make a list of all the toxic substances you know that can cause CNS symptoms in dogs, cats and horses.

Epilepsy is a relatively common CNS disorder in dogs. It is also seen in cats. It is a chronic neurological disorder marked by sudden recurrent episodes of loss of consciousness or convulsions due to abnormal electrical activity in the brain. When a dog is suffering from epilepsy it will be maintained on life-long medication by the attending veterinarian.

It can be quite frightening to see an animal **seizuring.** Always stay calm when an animal seizures. If the animal is near something that could hurt him, like furniture or the stairs, gently push it out of danger. Stay clear of the animal's mouth and head as it could bite you unintentionally. Do not put anything in the animal's mouth – it is a myth that animals can choke on their tongues. Time the seizure. If the seizure lasts for more than a couple of minutes, the animal is at risk of overheating. If possible, turn on a fan and put cold water on animal's limbs to cool it down. Take the animal to the nearest veterinary facility when the seizure ends.

If the animal has seizured for more than 5 minutes there is a high risk that it may overheat or become brain damaged. Rush the animal to a veterinary clinic without delay.

10.4 DISEASES AFFECTING THE REPRODUCTIVE SYSTEM

Diseases of the reproductive organs are common in unspayed females and uncastrated males. (These animals are called "intact" animals.) Intact animals may also display unwanted behaviours like roaming and fighting. Unwanted pregnancies and the homeless puppies and kittens that result are a big concern in South Africa. **This is why you, as animal welfare assistant, should widely advocate the sterilisation of pets.** Pet owners often assign human emotions to their pets to justify not sterilizing them. There are no benefit to the pet, emotionally of physically, in being intact.

Let us now discuss some reproductive disorders you are likely to encounter.

10.4.1 Vaginal prolapse

Vaginal prolapse is a condition that occurs particularly in **young, unspayed bitches**. It usually begins as a small fleshy pink **mass protruding from the**

vulva. This mass can become up to 10 cm in diameter. The swelling is caused by hormones that are produced when the bitch comes on heat. Once the bitch comes off heat, the drop in hormones causes the gland to shrink again. However, in some cases it does not return to its original size.

A bitch that develops vaginal prolapse usually develops the condition every time it is in heat. The condition is hereditary and therefore one must not breed with affected bitches.

The best treatment is **spaying (ovariohysterectomy)**. Until the time of surgery, the protruding mass must be kept clean and moist with a product like Hibiscrub®. If the mass becomes damaged or if it interferes with normal urination, take the animal to a veterinary clinic immediately.

10.4.2 Transmissible venereal tumours

A transmissible venereal tumour (TVT) is a **tumour that is sexually transmitted from one dog to another**. It is usually seen in young, intact (non-neutered) free-roaming dogs.

TVT usually appears as **small red nodules bulging from the surface membrane of the vagina or on the penis**. The masses are fragile and bleed easily. Dogs usually lick the affected area frequently. The mass or masses can spread to the adjacent skin or mouth, and sometimes metastases to other organs. **Chemotherapy** is indicated and usually very successful.

10.4.3 Pseudopregnancy

Pseudopregnancy is also called **false pregnancy** or **phantom pregnancy**. It can be seen in dogs and horses.

In the reproductive system there is a structure called the corpus luteum. It develops after ovulation and produces the pregnancy hormone progesterone. When mating is unsuccessful and the oocyte (egg cell) is not fertilised, the corpeus luteum regresses (becomes smaller) and decays. Pseudopregnancy occurs when mating has been unsuccessful but the corpus luteum does **not** regress normally. In such a case the female is not pregnant, but her body reacts as if she is.

Affected females display **nesting behaviour, are very protective over toys and can even become aggressive and produce milk**. It is important not to encourage the behaviour or allow the animal to lick the mammary glands, because this can cause mastitis.

The condition is usually self-limiting within 2 to 3 weeks, but medical treatment can solve the problem. **An ovariohysterectomy is a permanent solution to pseudopregnancy.**

10.4.4 Misalliance

Misalliance is the **early termination of an unwanted pregnancy** in an animal (similar to an abortion in humans).

Generally more than 60% of matings are unsuccessful, therefore a veterinarian must confirm that the animal is pregnant before misalliance commences. In the past drugs used to cause misalliance had a lot of unwanted side effects. Nowadays we have safe and effective pharmacological methods for misalliance. Discuss the options with a veterinarian.

Pet owners must always be encouraged to spay or castrate their pets to avoid mismating.

It is important to note that genital locking in dogs shows that mating has already taken place. **Forcefully separating the male and female at this stage will not the prevent fertilisation of an oocyte (egg cell) and will only hurt the dogs.**

10.4.5 Pyometra

Pyometra is a very common **uterine disease of middle-aged to older unspayed bitches.** It is also seen in **queens** (unspayed female cats). The disease usually presents 4 to 6 weeks after heat.

Animals given drugs to delay or suppress heat, or mismated bitches given oestrogen are more likely to contract the disease. Pyometra can also occur following a bladder or postpartum infection.

Females suffering from pyometra are usually **systemically ill**. The signs differ and are non-specific, and include lethargy, anorexia, polyuria (excessive urination), polydipsia (drinking excessive amounts of water) and vomiting. The animal may be feverish. If the cervix is open, a pussy vulvar discharge is present. The discharge is sometimes bloody. If the cervix is closed, there is no discharge and the large uterus may cause abdominal distension. If these signs are present, the disease can rapidly lead to shock and death.

The treatment of choice for pyometra is an ovariohysterectomy.

10.4.6 Dystocia

Dystocia refers to an **abnormal or difficult birth**, which can be caused by the following:

- **weak uterine contraction in the dam (uterine inertia)**
- **inadequate size of the birth canal (especially seen in certain breeds, e.g. English bulldogs)**
- **oversized foetus (e.g. when a small breed dog has been mismated by a larger male)**
- **abnormal orientation as the foetus enters the birth canal (common in horses)**

Dystocia should be considered in any of the following situations:

- Animals have a **history of previous dystocia** or reproductive tract obstruction.
- Parturition (birth) does not occur **within 24 hours after a drop in normal rectal temperature.** The owner can take the temperature every 12 hours, starting a few days before the expected due date of the litter, to get an idea of the bitch's normal temperature.

- **Strong abdominal contractions last for 1 to 2 hours** without passage of a puppy or kitten.
- Active labour lasts for 1 to 2 hours without delivery of subsequent puppies or kittens.
- A **resting period** during active labour lasts more than 4 to 6 hours.
- A bitch or queen is in obvious **pain** (e.g. crying, licking or biting the vulva).
- There is an abnormal vaginal discharge. Visible bleeding or a **dark green discharge** before any neonates are born indicates placental separation.
- In horses a vaginal examination must be performed if the foal is not delivered within 30 minutes after the foetal membranes have ruptured, or if second-stage labour does not begin within 4 hours after obvious first-stage labour.

If any of the above abnormalities are seen during labour, a dystocia is likely and urgent veterinary assistance is needed. Surgery (a caesarean section) may be needed to save both the litter and dam.

Ideally pet owners should know the expected due dates of their pets and how big the litter is. We therefore recommend regular check-ups by a veterinarian.

Activity 10.5

The owner of a pregnant Jack Russell terrier contacts you. She has no experience of bitches giving birth. She wants you to explain how she will know, when the bitch is giving birth, that she needs medical intervention to help deliver the puppies. Explain the signs that will indicate that the bitch needs help to deliver the puppies.

10.4.7 Cryptorchidism

Cryptorchidism means that **one or both testicles do not descend (drop) into the scrotum**. This can happen in all domestic animals. It is common in stallions and is also the most common sexual development disorder in dogs.

In dogs the testes should drop before the dog is 2 months old. Although foals are usually born with their testes descended, the time of descent can vary between individual colts and between different breeds.

Bilateral cryptorchidism (failure of both testes to descend) results in sterility. Unilateral cryptorchidism, when only one testis drops, is more common and the male is usually fertile because the normal descended testicle produces sperm. Cryptorchid animals show normal secondary sex characteristics and mating behaviour.

The condition is hereditary and testicular cancer often develops in cryptorchid testicles, therefore affected animals should be castrated.

10.4.8 Enlarged prostate

Diseases of the prostate gland are relatively common in intact dogs, but less common in other domestic animal species.

Benign prostatic hyperplasia is the non-cancerous enlargement of the prostate. It is by far the most common disease of the canine prostate in intact males. The condition can be complicated by **bacterial infection, abscess formation, cysts or cancerous changes** (neoplasia). Clinical signs of prostate disease include the following:

- **straining during defecation**
- **occasional blood in the urine**
- **recurrent urinary tract infections**
- **caudal (to the back) abdominal discomfort**

Many intact males with benign prostatic hyperplasia are asymptomatic. If acute bacterial infections, abscesses and neoplasia are present, the dog may be systemically ill.

Cancer of the prostate (prostatic adenocarcinoma) may spread to the pelvis and lumbar vertebrae. It can cause lameness in hind limbs or obstruct the outflow of urine.

Dogs with prostate problems must be **castrated**. A yearly **prostate examination** (via rectal palpation) is advised for all male dogs.

10.4.9 Testicular infection and tumours

Acute inflammation of the testes or epididymis can be caused by trauma; fungal, bacterial and viral infection; or testicular turning (torsion). Clinical signs are **pain and swelling of the testes**, epididymis, and/or scrotum. Sometimes there are wounds or other lesions in the scrotal skin.

Testicular tumours are common in older intact males. These tumours often look like a unilateral swelling of the testes. Behavioural changes and changes to the hair coat due to hormonal changes often accompany the swelling.

Any changes to a male animal's genitalia must be examined by a veterinarian as soon as possible.

10.4.10 Mammary tumours

The dog is the domestic species that is most often affected by breast cancer. Intact bitches are particularly affected. 50% of all tumours in bitches are mammary tumours. Mammary tumours are extremely rare in male dogs, but not impossible.

An ovariohysterectomy before the heat reduces the risk of mammary neoplasia to 0,5% in intact bitches. This is yet another good reason to spay female dogs at a young age.

A mammary tumour is usually suspected when we find a **mass in the mammary glands**. The prognosis is based on many factors, but most dogs with malignant mammary tumours die within a year.

Activity 10.6

You are educating a community on responsible pet ownership. Give pet owners 5 **medical** reasons why their pets must be sterilised.

Interesting fact: In the US there are roughly 6 million new diagnoses of cancer in dogs each year. It is estimated that 10% of the dog population in the US develop cancer.

10.5 DISEASES AFFECTING THE EAR AND EYE

A dog's ear canal is L-shaped: it runs vertically towards the jaw and then turn 45° horizontally towards the ear drum. This makes it difficult to examine the ear canal. Dogs are vulnerable to a variety of ear ailments, including parasites and yeast infections.

10.5.1 Common conditions of the ear

10.5.1.1 Otitis externa

Otitis externa or **inflammation of the outer ear canal** is common in dogs, but is also seen in other animals. It can be acute or chronic.

The affected ear canal is normally **red and swollen**. The animal usually appears irritated, scratches the ear constantly and **shakes** its head. This behaviour can lead to self-trauma to the pinna (cartilage flap) of the ear and cause an othematoma (see figure 10.1 below). The ear can also have secondary yeast and bacterial infections that cause **a malodour** (bad smell).

Be careful when you handle the affected ear – the dog may be aggressive because its ear hurts.



FIGURE 10.2

The typical presentation of otitis externa. The ear canal is red and swollen, containing a malodourous, brown wax

Source: http://en.wikipedia.org/wiki/Otitis_externa_in_animals#mediaviewer/File:Ear_infection_in_cocker_spaniel.JPG

Some dog breeds are more likely than others to develop otitis externa. Certain factors, for example frequent swimming and skin allergies, are considered risk factors.

10.5.1.2 Othematoma

An othematoma or aural hematoma is the **collection of blood in the cartilage plate of the ear.** It forms a soft swelling on the inner surface of the ear pinna and is usually painless. Over a period of time the swelling becomes harder. The pinna may become permanently malformed. It often starts looking like a cauliflower.

The hematoma needs to be **surgically drained** to resolve successfully. An othematoma is usually a **secondary result of self-trauma following otitis externa** or **ear mites** (see study unit 7). The underlying cause must therefore also be treated.

Interesting fact: Dogs are known for their acute hearing, but cats' hearing is actually better. Cats can distinguish sounds much higher in pitch than dogs can. They can also detect tiny variances in sound, which helps them to determine how big or small their prey is.

10.5.2 Common conditions of the eye

Pets often get themselves into **emergency** situations that put their eyes in danger. The clinical signs below indicate an emergency. Veterinary attention is urgently required when you see one or more of these signs:

- **a very red eye**
- **a cloudy/blue eye**
- **bleeding in the eye**
- **blood coming from the eye**
- **bulging of the eye itself**
- **foreign body in the eye**
- **sudden trauma to the eye**
- **severe squinting**
- **swelling of the eye or lids**

Even the smallest eye injury (e.g. a tiny scratch) can become an infected wound and lead to loss of vision.

Excessive tear production or a discharge from the eye (watery/mucoid) is usually an indication that a degree of pathology is present.

10.5.2.1 Ocular foreign body

A foreign body in the eye is a medical emergency and urgent medical attention is needed to save the eye. If you can see something on the eye that needs removing, but that has not penetrated the eye, flush it out with tepid water or use a damp cotton swab to ease it out. If you cannot remove the object or if the object has penetrated the eye, fit a loose bandage over the eye and around

the head, and take the pet to the nearest veterinarian immediately. **NEVER remove a penetrating object yourself**.

10.5.2.2 Conjunctivitis

The conjunctiva is a thin mucous membrane that covers the inner surface of the upper, lower and third eyelids in dogs, cats and horses. Inflammation of the membrane is called a **conjunctivitis**. It is one of the most common eye pathologies seen in these animals.

When the conjunctiva is inflamed, it is typically **red, swollen and bulging**. Animals tend to squint repeatedly (called **blepharospasm**) and rub the affected eye frequently. There may be an ocular discharge.

Conjunctivitis is caused by a variety of things, like infectious agents, allergies and trauma. Conjunctivitis can also be caused by other ocular problems, like dry eye or glaucoma. The inflammation and its underlying causes must be treated. Pet owners **must never use any human eye preparations** in a pet's eyes without a veterinarian's concent, because that can worsen the problem. Always consult a veterinarian about the correct treatment of eye conditions.

10.5.2.3 Corneal ulcer

A corneal ulcer can be described as a **defect or a deep scratch in the corneal epithelium**. It is often caused by trauma, (for example when a cat has scratched a dog in the eye, or by a foreign body). Although the depth of the scratch predicts the seriousness of the condition, any ulcer can lead to complications that may lead to loss of vision. An eye with a corneal ulcer is typically painful and the affected animal is likely to squint or rub of the eye. Excessive tear production occurs.

A corneal ulcer can be confirmed with a simple test called a **fluorescein dye test**. The veterinarian applies a small drop of fluorescein dye to the eye. If an ulcer is present the dye fills the corneal erosion. When the light of an ophthalmoscope (instrument used to examine the eye) is shone onto the eye, the deficit shines green.



FIGURE 10.3

Large corneal ulcer in a dog as seen with fluorescein dye (green stain)

Source: http://en.wikipedia.org/wiki/Corneal_ulcers_in_animals

Ointments that contain corticosteroids are commonly used to treat inflamed eyes and conjunctivitis, but they can worsen corneal ulcers. It is therefore important that a veterinarian must make sure that an animal does not have an ocular ulcer before any eye preparations are used.

10.5.2.4 Cherry eye

Cherry eye is a laymen's term for the **prolapse of the gland of the third eyelid**. When this happens, a soft, moist, red mass protrudes from the median canthus of the eye. This condition is mostly seen in young dogs.



FIGURE 10.4

Close-up of a cherry eye

Source: http://en.wikipedia.org/wiki/Cherry_eye

Cherry eyes must immediately be treated by a veterinarian to ensure that the tear gland is not damaged. If it is permanently damaged, tear production is affected and the animal will suffer from dry eye (also see 10.5.2.5 below).

10.5.2.5 Dry eye

Dry eye is also called keratoconjunctivitis sicca (**KCS**). When the tear glands do not produce enough aqueous tears, it leads to a dry cornea and KCS.

The classic sign of dry eye is a **thick, stringy, mucoid to mucopurulent discharge**. (This is also typically seen with conjunctivitis.) In a dog with dry eye, the bright, glistening sheen normally seen in the eye is replaced by a **dull appearance** and the cornea is opaque.

If dry eye is not treated, the cornea will eventually become ulcerated or develop keratitis (inflammation of the cornea). The animal may go blind.

Dry eye has several causes and occurs more often certain breeds, like English Bulldogs and Cocker Spaniels, than in others.

Animals suffering from KCS generally needs **life-long treatment** in the form of tear stimulating eye drops or tear replacement therapy.

10.5.2.6 Pannus

Pannus is a chronic superficial keratitis, or a progressive inflammatory disease of the cornea. Common clinical signs of pannus include the following:

- **pigmentation (brown discoloration)**

- **vascularisation (blood vessels visible on the cornea)**
- **opacification (haziness) of the cornea**

These corneal changes can lead to scarring. They can affect an animal's vision and lead to blindness.

The exact cause of pannus is not known. It is more common in certain breeds like German Shepherd dogs, Labrador Retrievers, Border Collies and Greyhounds, which suggests a **genetic predisposition**. Ultraviolet radiation (excessive exposure to **sunlight**) and high altitudes increase the severity of the disease.

Dogs suffering from pannus normally require **lifelong treatment**.

10.5.2.7 Glaucoma

Glaucoma is a common eye disease in dogs, cats and horses. It causes the pressure in the eye (**intraocular pressure** or IOP) **to become abnormally high** and is usually very **painful**. In serious cases we can see that the affected eye is bulging.

Primary glaucoma occurs spontaneously in certain breeds of dogs. Secondary glaucoma is caused by cataracts, lens displacement, inflammation, trauma or certain forms of cancer of the eye.

Acute glaucoma is considered a **veterinary emergency.** If it is not treated promptly it can result in **irreversible blindness**. Signs of acute glaucoma are frequent blinking, redness caused by blood vessels in the white of the eye, a cloudy appearance and/or a dilated pupil that does not respond to light.

Activity 10.7

(1) Make a list of symptoms that indicate underlying eye conditions.
(2) Make a list of all the eye conditions that are veterinary emergencies because the animal can lose its vision if the condition is not treated promptly and appropriately.
(3) A cat, Maxie, is brought to the organisation where you work. The owner reports that Maxie, a young and healthy cat, was involved in a severe fight with a stray cat last night. Maxie has several scratches around the head, but this is not the main problem: there seems to be something wrong with Maxie's right eye. The eye is watering and Maxie is squinting repeatedly and rubbing the eye. What type of injury has Maxie possibly sustained? What kind of test can you perform to confirm this?

10.6 DISEASES AFFECTING THE SKIN

Diseases of the skin are very common in domesticated species, particularly in dogs. Disorders of the skin are accompanied by extreme discomfort in the affected animal. Animals that suffer from these conditions must be examined

by a veterinarian who can make a definitive diagnosis and prescribe the correct treatment. Skin conditions that are left untreated can become chronic and lead to permanent changes of the skin.

Activity 10.8

Revise study unit 7. Make a list of all the parasites that commonly affect the skin. These parasitic conditions are not discussed again in this study unit, but they are very important potential causes of skin conditions.

10.6.1 Hotspots

The medical name for hotspots is **acral lick granulomas**. They are the focal areas of ulcerative dermatitis caused by **excessive licking** of the area.

The underlying reason for excessive licking can be behavioural. Licking can also be caused by a medical condition, like the presence of mites, allergies, a foreign body or previous trauma.

Hotspots can be difficult to treat, because it is difficult to prevent a dog from licking the area and the reoccurrence of hotspots is common. Elizabethan collars give a degree of success, but **the underlying cause needs to be identified and treated**.

Secondary bacterial infection of the wounds is common and must be addressed.



FIGURE 10.5

A typical lick granuloma on a dog's paw

Source: http://en.wikipedia.org/wiki/Lick_granuloma

10.6.2 Skin abscesses

An abscess is a collection of pus in any part of the body. It usually causes swelling and inflammation around it.

Skin abscesses can be felt as **localised soft pockets of fluid under the skin**. A veterinarian can confirm the presence of pus by drawing some of the fluid

with a sterile needle. (This also enables us to rule out other causes of swelling like haematomas or tumours.)

Skin abscesses are most commonly seen in free-roaming male cats that have been bitten by other cats.

Bacteria form an essential part of the ethology of an abscess. Most abscesses resolve with **lancing and wound debridement.** This means the wound is opened and drained, and damaged tissue is surgically removed. If the abscess has caused systemic illness, the veterinarian may prescribe antibiotics.

10.6.3 Cellulitis

Bacterial cellulitis is a potentially serious **bacterial skin infection** that most commonly affects horses.

Infection is usually introduced via a skin wound or abrasion. Skin on the **lower legs** is most commonly affected, although cellulitis can occur anywhere on the body. The most obvious symptom is **a swelling that is warm and firm to the touch**. The condition is **painful** and can cause lameness in the affected animal. In extreme cases horses develop a fever.

Cellulitis requires symptomatic treatment with anti-inflammatories and cold compression, and often also require antibiotic therapy.

10.6.4 Dermatitis/pyoderma

Dermatitis is generally defined as **inflammation of the skin**, while pyoderma is a **bacterial infection of the skin** that can lead to ulcers.

Dermatitis has various causes and is classified as such. Animals with dermatitis are very uncomfortable and often depressed. The condition is often pruiritic and leads to excessive scratching and self-trauma, which predisposes affected animal to infections.

The most commonly encountered types of dermatitis are the following:

- **Allergic dermatitis.** Atopic allergies due to contact allergens, food allergies and flea allergies are particularly common in dogs. Insect-bite dermatitis is common in horses. **Managing allergies** and decreasing an animal's exposure to an allergen requires commitment from the owner, patience and a close relationship with the attending veterinarian.
- **Bacterial dermatitis.** This type of dermatitis is often secondary to allergic dermatitis. Animals suffering from bacterial dermatitis generally require **antibiotic therapy**.
- **Skin/lip fold dermatitis.** This dermatitis is common in breeds (e.g. Shar-pei's or Pugs) where multiple skin folds or overhanging lip folds form warm, moist areas where bacteria can flourish and cause infection. The daily cleaning and drying of these folds will prevent the development of dermatitis.
- **Juvenile pyoderma.** This is a sterile cellulitis mostly seen in young dogs (younger than 4 months). It causes **swelling and pustule formation around the muzzle and face**. Puppies suffering from this condition are often also lethargic and anorexic. Although the exact cause of juvenile pyoderma is

unknown, immunosuppressive therapy offers a good prognosis. Permanent scarring is possible.

10.6.5 Bite wounds

If a cat or dog has been bitten, the wounds must be treated by a veterinarian as soon as possible. These types of wounds may not look serious because we only see a few puncture wounds on the skin. However, the underlying tissue is often torn by the sheer force of the bite. This can have devastating effects. Bite wounds can lead to serious infections and vast tissue necrosis (dying of tissue) if they are not treated properly.

10.6.6 Burn wounds

Exposure to extreme heat, flames, certain chemicals and electrical trauma can lead to burn wounds on animals. Such wounds can be minor, but they can also cause death. The extent of a burn wound and the systemic effects it may cause are sometimes only visible after a few days, therefore all animals suffering burn wounds must be examined by a veterinarian immediately.

Small, superficial **thermal burns** can be treated by immersion of the affected skin in cold water, the removal of hair or debris from the burn wound and the careful application of a thin layer of non-oil-based antibacterial ointment after drying and a light bandage to hold it in place. If the burn wound becomes infected or does not heal, veterinary care is needed.

Deep thermal burns extending below the surface of the skin require emergency veterinary care. These burn wounds are serious and very painful. They may even cause some dogs to go into shock.

Animals can sustain **electrical burns** when they bite into an electrical cord. The burns are seen on the lips and tongue, but the animal's entire body received an electrical shock. **Even if it seems fine, immediate veterinary assistance is needed.** If you see an animal biting an electrical cord, do not touch it and do not try to pull the cord from its mouth. If you do, you may get shocked. **Pull the plug from the outlet before you do anything else**. If the animal is not breathing or its heart has stopped you may need to perform CPR.

Chemical burns (burns from acid or alkali compounds) may occur on the surface of the body. **Rinse the chemical** off the animal with water as soon as possible. Be careful not to touch the chemical yourself. If you know the compound is an acid, you can rinse the area with baking soda dissolved in water. If the compound is alkaline, then vinegar and water may be used.

When an animal has swallowed an acid of alkali compound, check the container for information about an antidote and seek veterinary care immediately.

10.6.7 Growth on the skin, warts, cysts and skin tumours

Various growths can occur on the skin of dogs, cats and horses. Although most lumps are harmless, it is impossible to tell what sort of lump it is by just

looking at it. However, a veterinarian can identify a lump by looking at cells from the lump under a microscope.

All lumps should be monitored. If a lump changes in any way (e.g. starts to grow faster), is painful or discharges fluid, an appointment should be made to see a veterinarian as soon as possible.

Lumps can be benign or malignant. **Benign lumps** may grow bigger but do not spread to the rest of the body. They sometimes cause local problems if they continue to grow, as they can restrict movement or breathing.

Malignant lumps are aggressive lumps (cancer) which grow and spread (**metastasize**) through the body. They can affect organs such as the lungs and liver. When a growth has spread, the prognosis for recovery decreases significantly. Malignant growths must therefore be removed before they can spread.

In most cases the treatment required for small growths is to remove them. However, if the growth is malignant, more diagnostic tests and treatment may be required.

Some common benign tumours in dogs and cats include the following:

- **Lipomas or fatty lumps.** These are probably the most common lumps found on dogs. They are more common in obese pets. Lipomas are benign cancers that usually grow slowly and rarely spread.
- **Warts.** Warts are more common in older animals and look like a small tag of skin attached to the coat. They can be irritating and lead to self-trauma, in which case they must be removed.
- **Sebaceous cysts.** These are swellings filled with a creamy matter that are often seen in older pets and found in the middle of the back. Sometimes the swellings become quite red and sore, but normally they do not cause any other problems.

Some more serious cancers include mast cell tumours, melanomas and squamous cell carcinoma (sun cancer). To avoid sun cancer it is important to protect animals from excessive sunlight by keeping them indoors during the warmest parts of the day, always providing shade and applying pet-friendly sunscreen when needed. White dogs and cats are more at risk of getting sun cancer than other dogs and cats and should preferably be indoors during the hottest times of the day.

It is important to teach pet owners to examine their animals' coats regularly in order to recognise lumps early.

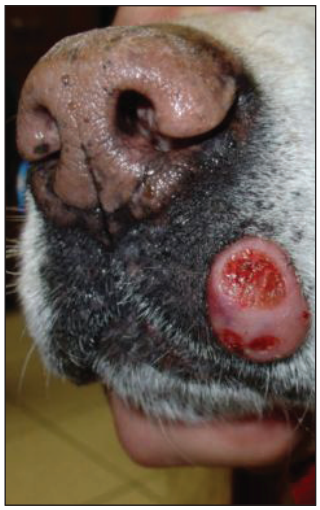


FIGURE 10.6

A mast cell tumour (diagnosed by identifying the cells under a microscope) on the lip of a dog

Source: http://www.dog-health-problems-online.com/skin-cancer-in-dogs.html

The most common skin tumour in horses is **sarcoids.** A sarcoid is a tumour found on the skin of horses, donkeys and mules. It is generally benign and non-life-threatening, but it can also be locally invasive. Sarcoids have several different appearances, and sometimes they look like thickened and bleeding sores (ulcerations) that may crust over as they heal.



FIGURE 10.7

A sarcoid on the skin of a horse

Source: http://en.wikipedia.org/wiki/Skin_cancer_in_horses

Other skin lesions, such as the equine papilloma, can be confused for sarcoids. However, the papilloma goes away on its own over time, while the sarcoid rarely regresses.

10.6.8 Hernias

A hernia occurs when an organ passes through a hole in the contained space it is supposed to occupy. Pets' hernias are sometimes congenital, which means they are present at birth. Hernias can also be acquired or they can be caused by a traumatic episode.

Hernias are also classified according to the state of their contents. If the contents of the hernia can be pushed back to its normal position, the hernia is **reducible.** If not, the hernia is **irreducible**.

Congenital hernias are usually painless. Irreducible hernias are more likely to develop into a more serious condition known as a **strangulating hernia**. This means the blood flow to the herniated tissue is cut off or reduced. The herniated tissue may deteriorate if the hernia is not quickly treated. Strangulating hernias are especially serious when intestinal loops or the urinary bladder is involved. Animals suffering from these hernias will be in pain and their condition will worsen progressively.

Some specific hernias include the following:

- **Umbilical hernia.** An umbilical hernia is visible as a soft swelling in the umbilical area. It may be an inherited defect or it may have occurred because the umbilical cord was cut too close at birth. An umbilical hernia is not critical unless the hole is large enough to allow organs or intestines to protrude. (Two or more fingers can pass through such a hole.) Umbilical or other congenital hernias are often repaired when the animal is spayed or neutered.

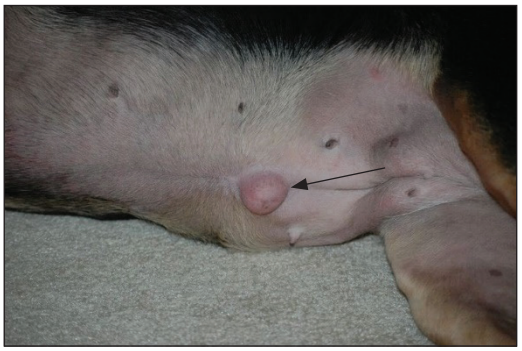


FIGURE 10.8

*An umbilical hernia in a female puppy (*indicated by arrow*)*

Source: http://healthsciencedegree.info/umbilical-hernia-dog/

- **Inguinal hernia.** An inguinal hernia is visible as a soft mass in the groin region. It is often congenital in males and occurs in females when they are in heat.
- **Perianal hernia.** This is a hernia in the region between the anus and vulva or testicles. It mainly occurs in older, intact male dogs.

Any unusual protrusion from a pet's abdomen needs to be examined by a veterinarian.

10.6.9 Pathological conditions of the anal glands

Dogs have two small pouches on either side of their anus (at 4 o'clock and 8 o'clock). These pouches contain the anal glands, which produce an oily, brown fluid with an unmistakable smell. The fluid is used by dogs to identify

one another and to mark their territory. (This is why they often sniff each other's behinds.)

Normally, when a dog defecates, the fluid in its anal sacs is squeezed out too. However, some dogs may not empty their glands completely and the fluid may become impacted and cause problems.

Anal sac disease begins as an uncomfortable **impaction** and can progress to an infection or abscess. Dogs with anal gland disease will **scoot, lick or bite their rear ends** and may have a bad smell. They often have pain when they defecate and may become constipated.

The glands can fortunately be gently emptied or expressed manually by using gloved fingers. A veterinarian can easily show you how to do this.

If left untreated, the impaction will turn into an infection. Infected anal glands may ooze blood or pus and are painful. Dogs with this condition need medical attention. An untreated infection can develop into an **abscess** that needs surgical drainage. Dogs that are on a healthy diet and get plenty of exercise are less likely to develop anal gland disease.

Activity 10.9

Answer the questions below. Then check your answers by comparing them with the information in the preceding text.

(1) A 9-year-old German Shepherd dog appears stiff and struggles to stand up in the mornings. He sometimes limps and is not keen to participate in exercise. What can be wrong with the dog? Name the condition that may affect the dog and require veterinary treatment to relieve its pain?
(2) What is pseudopregnancy? How can it be treated?
(3) What advice would you give to the owner of a dog with multiple skin folds to prevent the development of dermatitis?
(4) What changes in a lump that has been present on the skin of an animal for a long period of time would prompt you to take the animal for a medical examination?

10.7 DISEASES AFFECTING THE CIRCULATORY SYSTEM

Like humans, animals can also suffer from various heart diseases. The disease could be congenital, which means the animal was born with the condition, or the animal can develop problems as it gets older. **Congestive heart failure is an example of a common degenerative condition in older dogs and cats.**

Signs that an animal could be suffering from a heart condition include the following:

- **weakness**
- **tiredness and exercise intolerance**
- **weight loss and anorexia**

- **chronic coughing**
- **breathing abnormalities**
- **frequent loss of consciousness (syncope)**
- **accumulation of fluid in the body (oedema), for example in the abdomen, leading to a pot belly**

These clinical signs are not exclusive to heart disease, but an animal with any of these symptoms must be examined by a veterinarian as soon as possible.

10.8 DISEASES AFFECTING THE RESPIRATORY SYSTEM

Diseases of the respiratory tract can be:

- **infectious (see study unit 6)**
- **immunological (e.g. asthma)**
- **traumatic (e.g. a diaphragmatic hernia)**
- **secondary (e.g. due to cancer or a heart condition)**

Activity 10.10

Based on previous discussions, make a list of clinical symptoms you can expect to see in an animal suffering from a respiratory condition.

An animal that has difficulty breathing (**dyspnoea**) must receive emergency medical attention.

If you think an animal has a respiratory condition, keep it calm and quiet in a well-ventilated area until it can be examined by a veterinarian.

10.9 ORAL OR DENTAL CONDITIONS

Oral hygiene is incredibly important in pets. Unfortunately few pet and horse owners pay sufficient attention to their animals' teeth and therefore many pets suffer from oral or dental disorders. This does not only lead to foul breath, but can become very uncomfortable or painful to the affected animal. It can lead to anorexia, weight loss and loss of teeth. In horses poor dental health can put them at risk of colic. More serious complications, like kidney problems, have been associated with oral infections.

The conditions and symptoms often encountered in the mouth include the following:

- **Plaque** is the first build-up of material that adhere to tooth enamel. It can lead to caries, calculi build-up and periodontal disease.
- **Calculus (tartar)** is calcium carbonate and calcium phosphate combined with organic material and deposited on the surface of the tooth.
- **Caries** is an area of decalcification of the tooth enamel. It can lead to cavities in the tooth. Caries is rare in animals.
- **Gingivitis** is inflammation of the gums. This is often the first sign of dental disease.

- **Periodontitis** is a general term for a disease of the oral cavity that attacks the gum, bone and delicate tissues around the teeth.
- **Pyorrhoea** is inflammation of the gums and tooth sockets. It often leads to loosening of the teeth and the discharge of pus.

Activity 10.11

Make a list of practices owners can incorporate into the lifestyle of a pet to ensure clean teeth and a fresh breath.

Owners should brush their dogs' and cats' teeth at least 3 times a week with pet-friendly toothpaste. If started at a young age, most pets accept and even enjoy this.

A **proper diet** also helps to maintain good oral hygiene. Treats and soft foodstuffs should be kept to a minimum. Raw hides are a good chew treat to prevent tartar build-up in dogs. Hooves, cooked bones and bones that splinter, like pork and chicken bones, and any bones with sharp edges must be avoided.

In additions to the symptoms and conditions listed above, pets can also develop **tooth root abscesses**. If an animal drools excessively, shows pain when eating or develops a swelling on its cheek area, veterinary attention must be sought as soon as possible.

Any growth that develops in the mouth msut be checked out by a veterinarian as it can interfere with normal eating and grooming behaviour.

In horses routine dental care is essential. Periodic examinations and regular maintenance, such as **floating** (filing and rasping), are especially necessary. Horses often adapt to discomfort and therefore a problem may not be seen early on. If a dental problem is only discovered when it has reached an advanced stage, it has already caused serious problems. Oral examinations are an essential part of an **annual physical examination by a veterinarian** in order to identify and correct dental problems.

Indicators of dental problems in horses include the following:

- **loss of feed from mouth while eating, difficulty with chewing, or excessive salivation**
- **loss of body condition**
- **large or undigested feed particles (long stems or whole grain) in manure**
- **head tilting or tossing, bit chewing, tongue lolling, fighting the bit or resisting bridling**
- **poor performance, such as lugging on the bridle, failing to turn or stop and even bucking**
- **foul odour from mouth or nostrils, or traces of blood from the mouth**
- **nasal discharge or swelling of the face, jaw or mouth tissues**

10.10 DISEASES AFFECTING THE GASTROINTESTINAL SYSTEM (GIT), INCLUDING THE LIVER

Ailments of the GIT are very common. The clinical signs of these ailments we see most often are **anorexia, vomiting and diarrhoea.** Ailments of the GIT can be parasitological, infectious, dietary, toxicological, immunological or anatomical in nature.

Disorders of the liver and spleen can present with similar symptoms as a gastro-enteritis.

Activity 10.12

Make a list of all the

(1) parasites
(2) other infectious agents

that cause disorders of the GIT.

10.10.1 Gastro-enteritis

Gastro-enteritis is **inflammation of the stomach and intestines**. It is one of the most common complaints seen by veterinarians in practice. More often than not the animals suffering from gastro-enteritis have mild to moderate diarrhoea and nausea only, but are otherwise clinically healthy. Such **uncomplicated gastros are usually self-limiting** and animals may only need a bland diet, like chicken and rice, and as always free access to fresh, clean water for a few days to recover. More serious gastros require supportive therapy.

Garbage disease is often the cause of mild to more severe gastro-enteritis. Like the name says, it is a condition dogs get because they eat waste.

Parasites like worms, coccidian and giardia must always be ruled out as the cause of gastro-enteritis.

More complicated ailments that cause **severe vomiting, stomach pain, depression and blood in the stool** require intensive veterinary care. In cases of acute vomiting the swallowing of a **foreign body** (balls, toys and bones) must always be ruled out. Dogs are known to swallow objects that cannot pass through the GIT or may penetrate the GIT wall. If such objects are not surgically removed the animal will die. Bones must always be considered a risk factor.

Vomiting must always be treated, because it can have serious complications like choking, foreign-body pneumonia and oesophagitis (inflammation of the oesophagus). Vomiting must be distinguished from **regurgitation,** which means that undigested food is pushed back into the mouth from the stomach almost immediately after being swallowed. The causes of regurgitation differ considerably from the causes of vomiting.

When animals lose a lot of fluids and electrolytes through vomiting and diarrhoea, especially if they are not eating or drinking, fluid therapy is given to prevent potentially dangerous dehydration and the loss of electrolytes.

10.10.2 Gastric dilation-volvulus

Gastric dilation-volvulus is a very serious condition. It occurs when the **stomach rotates on its mesenteric axis** (vertical line). **The condition is usually seen in large and giant-breed dogs, in particular if they are fed only once a day and are active or exercise after feeding**.

When gastric dilation-volvulus occurs the animal becomes severely bloated. It is in pain and often collapses or appears in shock. This condition is a **veterinary emergency**. The prognosis is guarded. If more than 5 hours lapse form the start of the clinical signs to receiving treatment, the mortality rate is high.

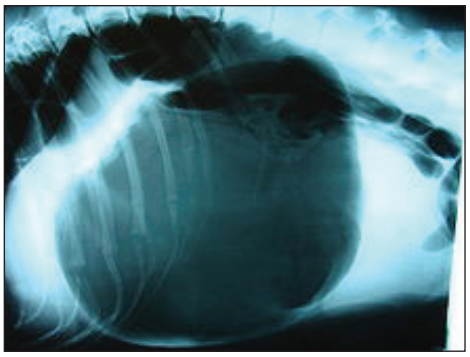


FIGURE 10.9

The large gas filled stomach (black round structure) of a dog suffering from gastric dilation-volvulus as seen on an x-ray

Source: www.wikipedia.org/wiki/Gastric_dilatation_volvulus

10.10.3 Constipation

Animals that are on a correct diet, have access to plenty of water and exercise regularly do not often suffer from constipation. Immobility for prolonged period of times (e.g. when caged) and pain in the perineum or hipscan lead to constipation. Cats with long hair can become constipated as the result of the formation **of hair balls** following grooming.

Constipation usually presents with difficulty in passing stool, with the stool being hard and dark. Keep in mind that an animals that is straining can also be suffering from diarrhoea or a urinary tract disorder. The best way to confirm constipation is by rectal examination.

A diet high in fibre and oral fluids can help prevent constipation. There are mild laxatives available for animals. If the condition is severe, a constipated animal is best treated with an **enema,** which is soapy water administered rectally by a veterinarian.

10.10.4 Colic in horses

Interesting fact: The horse's small intestine is 15 to 21 m long and can hold up to 45 ℓ ingesta.

Equine colic is a relatively common disorder of the digestive system. Colic simply means abdominal pain, but in horses the term refers to a condition of **severe abdominal discomfort characterised by pawing, rolling and sometimes the inability to defecate.**

There are a few different types of colic. These types have different causes and their treatment varies from case to case. The severity of the condition also differs from case to case. Sometimes a horse may have a mild bout of abdominal pain that resolves with a single dose of medication. At other times, surgery and even euthanasia may be warranted. For this reason, all cases of colic should be treated as an **emergency.**

When a horse displays colic symptoms, immediate veterinary assistance is needed.

Despite the various presentations of colic, most **horses with this condition display a combination of the following symptoms**:

- **anxiety or depression**
- **pawing at the ground**
- **looking at the flank**
- **rolling or wanting to lie down**
- **playing in the water bucket but not drinking**
- **lack of defecation**
- **lack of appetite**
- **excessive sweating**
- **abnormally high pulse rate (over 50 beats per minute)**
- **lack of normal gut noises**
- **frequent attempts to urinate**
- **changes in body temperature**
- **dark mucous membranes**

Recognising the symptoms of colic will enable you to seek veterinary assistance immediately. Observing the affected horse's behaviour closely and taking its vital signs (heart rate, respiratory rate and mucus membrane colour) until the veterinarian arrives will be of great help to the veterinarian.

Ensure that horses are on good diets, have access to plenty of water, are not suffering from internal parasites and do not swallow sand to help prevent colic.

Activity 10.13

(1) Make a list of the most common symptoms seen when GIT pathology is present in:

(a) dogs and cats
(b) horses

(2) A dog that has suddenly started vomiting severely is brought to the organisation where you work.

(a) What condition should be ruled out in this case?
(b) What can be done to prevent dehydration in the dog?

10.11 DISEASES AFFECTING THE URINARY SYSTEM

10.11.1 Cystitis

Cystitis is inflammation of the urinary bladder. The disease can be caused by bacteria (called a **bacterial cystitis**), in which case the sick animal needs antibiotics to cure the infection. It can also be **idiopathic**, which means there is no obvious cause for the inflammation. This is common in cats. Idiopathic cystitis is often associated with **stress.** Managing and changing to decrease stress and pheromone therapy are used successfully in these cats.

There are special urinary diets on the market that regulate the pH of urine in order to prevent the reoccurrence of cystitis. Incorporating wet food into cats' diets to ensure sufficient fluid intake is also important.

Clinical signs of cystitis include the following:

- **pollakiuria (frequent urination)**
- **dysuria (painful or difficult urination)**
- **haematuria (blood in the urine)**
- **urinating in inappropriate places**
- **pain on palpation of the caudal abdomen**

10.11.2 Urolithiasis

Urolithiasis is the presence **of uroliths** (calculi or stones) in the urine. These uroliths form when mineral solutes form crystals that combine and grow to macroscopic calculi. The chemical composition of uroliths differ and the type of crystal predicts the medical treatment needed to dissolve the stone.

Urolithiasis is a general term for stones found anywhere in the urinary tract. Uroliths can develop in the kidney, ureter, bladder or urethra.

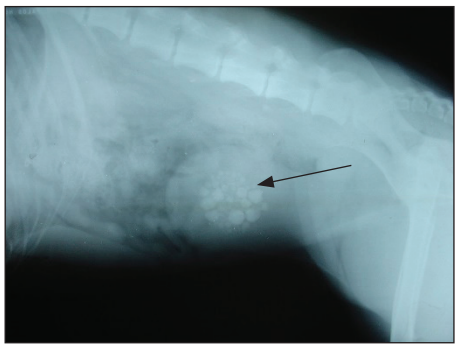


FIGURE 10.10

*Multiple stones in the bladder of a dog seen on an x-ray (*indicated by arrow*)*

Source: http://en.wikipedia.org/wiki/Bladder_stone_%28animal%29

Clinical signs associated with urolithiasis are seldom caused by the microscopic crystals. Macroscopic uroliths in the lower urinary tract can irritate the mucosa of the bladder and cause cystitis, or they can interfere with the flow of urine. In male dogs and cats, where the urethra is very narrow, uroliths can partially or completely block the passing of urine. This is a very dangerous condition.

Urethral obstruction can occur suddenly, or can develop during the course of days or weeks. In the beginning the animal may frequently attempt to urinate and produce only a fine stream of urine, a few drops, or nothing. The affected animal can exhibit **extreme pain and cry out when attempting to urinate**.

A complete obstruction causes **systemic illness** within 36 to 48 hours. The animal will be depressed, anorexic and probably vomiting and suffering from diarrhoea. It will be dehydrated. Within 72 hours the animal can go into a coma and die. **Urethral obstruction is therefore an emergency condition**, and immediate veterinary attention is needed to get rid of the obstruction.

When the bladder is distended because outflow is obstructed, the **bladder can also rupture**. You must be careful when you palpate the caudal abdomen in such cases, because applied pressure can cause the bladder to burst. Animals with spontaneous bladder rupture may appear temporarily improved because the pain associated with bladder distension has been relieved. However, the presence of toxins in the abdomen rapidly leads to depression, abdominal distension, cardiac arrhythmias and death.

10.11.3 Renal failure

The kidneys are vital organs, essential for removing metabolic waste products from the body and regulating body water and electrolytes. When the kidneys fail, waste products build up in the blood and the animal becomes visibly ill.

Kidneys can fail acutely. This happens when there is an abrupt failure of glomerulus filtration (the structure in the kidney that filters the blood). These animals typically show the following signs:

- **decreased urine output**
- **drowsiness and fatigue**
- **shortness of breath**
- **nausea**
- **seizures or coma in severe cases**

Acute renal failure (ARF) is relatively uncommon, but is often the result of nephrotoxic substances. **ARF is an emergency condition.**

Activity 10.14

Revise study unit 9. Make a list of toxins that can damage the kidneys directly.

There are various possible causes of **chronic kidney disease (CKD**). CKD is in particular common in **older animals**, where it is the result of an age-related

decline in kidney function. The prevalence of CKD is particularly high in domestic **cats.**

While some kidney problems occur suddenly, chronic kidney disease shows up more slowly over a period of time. Timely veterinary assessment with ongoing **supportive care and dietary management** enable animals with kidney problems to maintain an adequate quality of life for some time.

The following clinical signs can point to CKD:

- **a decrease in appetite**
- **weight loss**
- **vomiting or diarrhoea**
- **lethargy or depression**
- **dehydration**
- **change in water consumption (polydipsia)**
- **more frequent urination (polyuria)**
- **pain in the kidney area**
- **litter box aversion**
- **mouth ulcers**
- **bad breath**
- **constipation**
- **bloody or cloudy urine**
- **urinating in abnormal places**
- **stumbling, appearing drunk**

10.11.4 Polyuria/polydipsia

Whenever there are changes in the amount of water an animal consumes or in its voiding behaviour, veterinary assistance should be sought.

Drinking abnormally high volumes of water (polydipsia) and urinating excessively (polyuria) can be symptoms of many conditions. Some of these conditions are:

- **renal failure**
- **liver problems**
- **diabetes mellitus (*suikersiekte*)**

10.11.5 Urinary incontinence

Urinary incontinence can be described as **the involuntary leaking of urine**, or loss of bladder control. This can present as dribbling of urine or voiding small amounts of urine, especially while sleeping. In younger dogs incontinence is often due to congenital abnormalities. Incontinence is relatively common in older, spayed female dogs due to **sphincter incompetence**. There are also various other causes of incontinence and a definitive diagnosis must be made by a veterinarian. Treatment for urinary incontinence is generally successful.

Activity 10.15

(1) Make a list of clinical signs that indicate the presence of urinary tract pathology.
(2) A cat owner tells you that her young and otherwise healthy cat has recently started urinating very frequently, not only in the litter box but also in various other places in the house. The cat never urinated in the house before. This behaviour began soon after renovations were started in the house, and the house was full of building workers, noise and dust.

(a) What condition does this cat have? Give reasons for your answer.
(b) Name at least two things that can be done to treat the condition.

10.12 CONCLUSION

Different diseases of the various organ systems can have similar clinical symptoms. As an animal welfare assistant you must be able to recognise the presence of disease and decide on the necessary course of action. In the majority of cases this means you must ensure that the affected animal gets medical attention. Understanding the basic principles of disease will enable you to explain these conditions to pet owners.

10.13 REVISION QUESTIONS

(1) Revise the mind maps you drew while working through this study unit. Make sure they are correct.
(2) Extend your glossary and include all the important terms that were new to you. Does the glossary contain the terms otitis externa, gingivitis, floating of a horse's teeth and urolithiasis?
(3) What would you do if a dog seizures?
(4) Name the clinical signs that an old dog is suffering from congestive heart failure and needs to be examined by a veterinarian.
(5) When is a gastro-enteritis considered complicated, requiring immediate veterinary attention?
(6) Name the factors that put dogs at risk of developing gastric dilatation-volvulus.
(7) Make a list of the clinical symptoms typically seen when a horse has colic.
(8) Explain what urinary incontinence is.
(9) In which animals is CKD most prevalent?
(10) Name two developmental musculo-skeletal conditions commonly seen in dogs.
(11) A puppy is brought to the organisation where you work. It has swollen joints and legs that are bent abnormally. You question the owner and discover that the puppy has been kept indoors permanently, and fed only bread and water. From which condition could this puppy be suffering, and how can it be prevented?
(12) Name four factors that could put a horse at risk of developing laminitis.
(13) Under what circumstances does equine azoturia typically occur?
(14) Define misalliance.
(15) Define cryptorchidism.

(16) What is the prognosis of a TVT?
(17) An owner brings a spaniel to the organisation where you work because the dog has been repeatedly shaking its head and scratching its right ear. On examination you find that the ear canal is red and swollen. There is also an unpleasant smell around the ear. The owner tells you that the spaniel loves swimming.

(a) What condition is this dog most likely suffering from?
(b) What are the risk factors for this condition?
(c) What other clinical signs can you expect to see? What causes the smell?
(d) What are possible complications of the condition?

(18) What would you define as an ocular emergency?
(19) How would you remove a non-penetrating object from the eye?
(20) Explain the difference between a benign and malignant lump.
(21) How is a skin abscess best treated?
(22) What is a hotspot?
(23) What type of congenital hernia is commonly seen in puppies?
(24) When is an umbilical hernia considered a strangulation risk?
(25) When would you suspect anal gland disease in a dog?
(26) What is the clinical signs of cystitis?
(27) Make a list of all the conditions we discussed in this study unit that are considered medical emergencies.

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Field services: Eradication and control of animal diseases

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ABSTRACT

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Prevention, eradication and control of animal diseases, as well as public health assurance are major functions of veterinary authorities. The strategies to control animal diseases differ from disease to disease but are often similar on a disease basis from country to country depending on the main objective of the measure employed. These measures include among others movement control and quarantine, vaccination, treatment and mass slaughtering. However, not every country uses all these control measures at the same time. A combination of measures may be employed to avoid spreading of the disease from infected to clean animals and success is dependent on a variety of factors, including the strength and capacity of the veterinary services, cross border efforts for disease surveillance, political will, diagnostic facilities and financial support.

INTRODUCTION

Global trade in animals and animal products has grown significantly in recent years. The improvement of global transport systems makes it easier for animal products to be transported much faster and so can animal disease causing agents. The impact caused by these diseases may be localized or global. Some diseases are not apparent but cause severe economic losses because of their nature. Some that affect man are notorious for causing lower productivity. For these reasons, it is important to prevent, control and eradicate animal diseases using a science-based approach. Disease control measures are undertaken to minimize the various impacts they may have. When disease control measures are undertaken, often some unintended impacts are experienced. These undesired results need to be monitored, measured and the cost thereof be determined so as to justify the choice of the measure employed.

In addition, it is necessary to take into consideration factors contributing to animal disease occurrence which include climate, vegetation, animal population, interaction of the wild and domesticated animals, farming systems and management of animals, presence of vectors, and type of animal breed (e.g. indigenous Sanga and Zebu cattle's resistance to tick-borne diseases). It is also important to ensure that the interaction between wild animals and domesticated animals is limited as this interaction may have undesired effects on both. This interaction can be minimised in a number of ways including fences and movement control. Climate and its changing nature has recently become an important consideration since it is believed to influence the epidemiology and spread of some diseases, particularly arthropod-borne ones. Understanding of the epidemiology of animal diseases is a very significant consideration in animal disease outbreak control and prevention.

The World Organisation for Animal Health (OIE) provides adequate guidance on disease prevention and outbreak management and serves as an international standard-setting body and a world reference centre for activities involving animal disease outbreak management and trade involving animals and animal products. However, there are still some animal disease management approaches that are not yet harmonised. As a result, research on animal diseases and outbreak management carried out in different parts of the world at research institutes and universities is necessary and will continue being necessary for many years to come. It is for this reason that approaches to animal disease and outbreak management is constantly changing as new knowledge is gathered and new discoveries are made available to veterinarians. Traditional approaches to disease control for purposes of trade are receiving a strong challenge from new concepts like compartmentalisation, commodity-based trade and containment zones. Although some of these concepts are not really new disease control approaches, they tend to contribute to new thoughts in disease control.

MANAGEMENT OF DISEASE OUTBREAKS

Prevention, eradication and control of animal diseases, as well as public health assurance, are major functions of veterinary authorities in most countries. Strategies to control animal diseases differ from disease to disease but are often similar for the same diseases from country to country depending on the main objective of the measure employed. The success of these measures is dependent on a variety of factors amongst which the strength and capacity of the veterinary services, cross-border efforts for disease surveillance, political will, diagnostic laboratory and financial support are important (Perry & Sones 2007).

Those countries that are successful in effectively managing animal diseases have strong animal disease policies and legislation, normally based on principles and guidelines of the OIE's terrestrial and aquatic animal health codes (2007), and a strong laboratory network guided by the biological standards of the OIE (2007). Furthermore, these countries have statutory bodies that also monitor the conduct of veterinarians, including those in the private sector. Privately practising veterinarians, although independent, are expected to report certain animal diseases to the state once they have been diagnosed. This emphasizes the importance of the existence of strong links between the state veterinary service and private practitioners.

Prevention of disease outbreaks is more cost effective than eradication and control after outbreaks have taken place. Effective and efficient organization of preventative measures following a risk assessment approach is essentially the first step in controlling the spread of disease. In addition, effective movement control and quarantine, vaccination, treatment and mass slaughtering can be used for disease confinement and eradication purposes (Perry & Sones 2007). Each control measure acts by reducing the effective reproductive index of the infective agent in the population. It is not necessary to use all these control measures simultaneously. However, a combination of these measures may be required to avoid spreading of the infective agent from infected to clean animals.

Movement control and quarantine

The prevention of the interaction of wild and domesticated animals is often a necessary step in the prevention of disease outbreaks as some diseases can be easily exchanged between the two. The classical examples where diseases can be exchanged in this manner are foot-and-mouth disease (FMD), classical swine fever, avian influenza and even bovine tuberculosis. Separation of wild and domestic animals could be achieved by fencing or other physical or natural barriers like rivers, forests, mountains, thus effectively controlling the movement of animals and confining them to their respective territories. Electrified fences are sometimes used for this purpose. Such separation can however be resource intensive and has recently been questioned as the cost and benefits have not been assessed, particularly for African countries (Perry & Sones 2007).

In addition to separating wild and domestic animals, movement controls are also essential in separating animals of different disease status, such as vaccinated from unvaccinated animals. It is often necessary that these animals be identifiable in order to detect an animal that is wandering out of its rightful territory on time. Such fences need to be checked for intactness, and should be immediately repaired as soon as any damage is detected.

The South African approach for the control of foot and mouth disease, as explained in the unpublished FMD protocol of the Department of Agriculture (2005), is to have the infected area enclosed by an electrified game proof fence, and immediately surrounded by a zone in which all ruminants are vaccinated twice a year and inspected regularly for FMD lesions. This zone is commonly referred to as the buffer zone. All animals in this zone are identi-

fied as animals that have been vaccinated. The buffer zone is in turn surrounded by a zone in which all ruminants are inspected at less regular intervals but also separated from the vaccinated animals with a fence. This zone is often referred to as the surveillance zone. The surveillance zone is traditionally a disease free area. The same zoning concepts are applied during disease outbreaks, when certain zones like infected zone, buffer zone and surveillance zones are declared.

Movement control also aims at controlling the translocation of possibly infective animal products either by people or mechanically. It is often necessary that only products that have been rendered safe be allowed out of the infected area into areas that are free from disease. It may be necessary that vehicles and other mechanical means be disinfected with an effective disinfectant. The need for roadblocks is brought about by these procedures.

Quarantine is an extreme form of movement control where animals, their products and sometimes even handlers are confined to an area with limited movement in order to avoid contact with susceptible animals or their handlers. All the principles explained above are applicable.

Vaccination

Without doubt vaccination, when available and applicable, is still the most cost effective means of preventing and controlling and even eradicating infectious animal diseases (Pastoret, Lombard & Schudel 2007). Vaccines are normally easily available, also to farmers, unless their application needs special attention. Vaccination can, however, interfere with future diagnoses of disease if an inappropriate vaccine has been used. The dawn of marker vaccines has to a large extent contributed to reducing these interferences significantly and led to the ability to differentiate between vaccinated and diseased animals (Vannier, Capua, Le Potier, MacKay, Muylkens, Parida, Paton & Thiry 2007).

Scudamore (2007) reported that the FMD outbreak in the United Kingdom was unprecedented with the need to develop a vaccination policy at the height of an epidemic. He also indicated that during a survey conducted in that country it was very clear that a high percentage of consumers have a propensity not to consume animals that have been vaccinated. However, this new technology, being able to differentiate between diseased and vaccinated animals commonly known as DIVA, also contributed to continued disapproval by the public of the culling of large numbers of animals when there are other alternatives like vaccination.

In an unpublished report of the South African Department of Agriculture on the outbreak and control of classical swine fever in the eastern Cape (2005) it is stated that vaccination in most cases requires the possibility to handle animals individually, often repeatedly for boosters, which can be a challenge in more extensive, free-ranging farming systems without intensive handling facilities. In some instances it is possible to use bait vaccines and still be able to sufficiently and effectively control animal diseases as was the case in the control of rabies in the Czech Republic (Matouch, Vitasek, Semerad & Malena 2007).

Treatment

Treatment can be aimed at treating the affected animal against the particular agent of concern or treating the animal to prevent it from being attacked by disease-carrying arthropods like ticks and insects. Dipping the animals, together with vaccination where appropriate, is still considered to be one of the most effective strategies against some arthropod borne diseases. Dipping, however, has to be properly applied as resistance to some acaricides is developing at an alarming rate (Ntondini, Van Dalen & Horak 2008).

Mass slaughtering

The availability of the technology enhancing the differentiation of diseased from vaccinated animals has contributed to an increase in public disapproval of some veterinary prophylactic measures such as mass slaughtering of livestock to control outbreaks of epizootic diseases (Scudamore 2007). Although this is the case, slaughtering of infected animals will still be necessary in many circumstances.

It is emphasized therefore that decision-making in the control of animal disease outbreaks should be a dynamic and flexible process. (Ge, Mourits & Huirne 2007). When a disease is diagnosed at the beginning of an outbreak there are many uncertainties about the consequences and success of control options. In the South African context and probably everywhere else in the world, there is always a possibility of a strong public outcry at the methods employed to control outbreaks of animal diseases. Industries and the public should therefore be involved for successful animal disease prevention and control. At the same time, flexible decision-making can avoid unnecessary control costs through learning and adjusting.

NEW CONCEPTS IN ANIMAL DISEASE CONTROL AND TRADE

Although the above guidelines have been applied for many years and are still applicable, the concept of trading with animals and their products on the basis of geographical freedom from disease is currently being challenged. In the concept, any incursion of the disease in the so called disease free area automatically resulted in loss of trade from the entire country or region. New concepts such as compartmentalization, containment zones and commodity based trade have recently been introduced. These concepts, as well as the dawn of marker vaccines, have changed disease control approaches significantly.

Compartmentalization

Trade 'regions' and 'zones' are based on principles of epidemiological science and risk analysis that assess and manage animal disease risks so that the safety of trade can be ensured by establishing geographical boundaries (Scott, Zapeda, Garber, Smith, Swayne, Rhorer, Keller, Shimshony, Batho, Caporale & Giovannini 2006). These scientists argue that the boundaries of geographical regions and zones can be breached through numerous epidemiological pathways. The concept of a 'compartment' extends the application of a 'risk boundary' beyond that of a geographical interface and considers all epidemiological factors that can contribute to the creation of an effective boundary.

Containment zone

The terrestrial animal health code (OIE 2008) describes a containment zone as a defined zone around and including suspected or infected establishments, taking into account the epidemiological factors and results of investigations, where control measures to prevent the spread of the infection are applied. The concept has helped to a large extent to spur authorities in a country to move with speed in the control of animal diseases and the necessary establishment of measures to prevent the spread of disease so as to allow trade on safe commodities even if the freedom status of the country by the OIE has not been established yet.

Commodity-based trade

In the context of trade, commodities could be anything from live animals to their products or even genetic and pathological material (OIE 2008). The concept of trading in commodities only from countries that are free from the disease in question is believed to be trade limiting and unnecessarily wasteful by the British Department for International Development (2008). It is argued that the ability to export should be determined by the product or animal's disease status and not by the country's disease status. The advantage is that this approach allows countries with endemic diseases that cannot be eradicated, to participate. It is also believed that this approach will help many developing countries to participate in international trade even if they have not eradicated certain animal diseases. It is however also argued that this may not necessarily be the case, as once this approach is made a standard, every country, including the developed ones, will be allowed to use the same standard. It is also believed that this will be a disincentive for countries to control animal diseases that can be eradicated. Some of these diseases, especially erosion diseases, could become endemic and lead to general low production of food worldwide.

THE SITUATION IN SOUTH AFRICA SINCE 2000

Since 1994, South Africa has joined the global village with regards to tourism and trade, contributing to the occurrence of some diseases. It is now understood that the 2000 FMD outbreak in the KwaZulu-Natal Province occurred as a result of the illegal feeding of swill or galley waste obtained from ships in the Durban harbour ((Department of Agriculture, unpublished 2001). It is also clear that the avian influenza outbreak was probably facilitated by insufficient attempts by ostrich farmers to keep ostriches apart from wild birds, especially water fowl (Department of Agriculture, unpublished 2005). It is not known how classical swine fever (CSF) was introduced into the country.

Foot-and-mouth disease: Camperdown outbreak

Since 2000, outbreaks in South Africa mainly affected the Limpopo Province, but also occurred in the Mpumalanga and KwaZulu-Natal Provinces. These FMD outbreaks led to the suspension of international trade in a number of commodities, including beef and cloven-hoofed animal products. The main outbreak occurred in 2000 when a type O FMD virus was introduced into South Africa for the first time. This outbreak was dealt with decisively by Veterinary Services. The occurrence of the disease affected international agricultural trade negatively, but also affected local trade in diverse agricultural

products such as milk and strawberries. The major concern was the fact that type O FMD virus was diagnosed for the first time in South Africa. The natural response was to go ahead and cull all affected and at risk animals. The culling process was slower than desired, however, and the disease was spreading fast. The strategy was consequently changed to that of vaccination after due consideration of a number of factors including the fact that the disease was moving into territories which were difficult to access.

Foot-and-mouth disease: Middelburg outbreak

The Mpumalanga outbreak of FMD occurred shortly after the one in KwaZulu-Natal. This outbreak, however, occurred as a result of the contact between buffaloes that escaped from the Kruger National Park and domestic cattle. Cattle from this outbreak area were inadvertently taken to a feedlot in Middelburg from where animals were sold to a slaughterhouse in Swaziland. A clinical diagnosis of the infection was made at the abattoir and as a result Swaziland lost its export status and the much needed revenue. The outbreak was approached from a significantly different angle because the animals were confined to a feedlot and only a few pens were affected. The affected animals were culled and buried, whereas those that were still free from the disease were vaccinated and later slaughtered under supervision at designated abattoirs. This again demonstrates that there are no hard and fast rules in disease eradication, especially if we consider that the same disease, although due to a different strain of the virus, was involved at Camperdown and Middelburg but were controlled differently, depending on the prevailing conditions.

Equine influenza: Cape Town

Equine influenza occurred in horses in the Western and Eastern Cape Provinces. It is believed that the disease occurred when infected horses that were certified to have been vaccinated against the disease, entered South Africa via Cape Town from Europe. These horses could not be quarantined properly to prevent transmission of the infection. In this case, vaccination and supportive treatment of affected animals was employed.

Porcine reproductive and respiratory syndrome

Outbreaks of a few animal diseases unknown to South Africa before 2004 raised some concern amongst veterinarians. One of these diseases is caused by *Salmonella cholerasuis,* which was diagnosed for the first time in April 2004 in pigs in the Western Cape Province (Department of Agriculture, unpublished 2004). Not long thereafter, another disease, which had not been diagnosed before in this country, i.e. porcine reproductive and respiratory syndrome (PRRS), was discovered and again in pigs in the Western Cape Province. For PRRS, isolating infected farms and slaughtering affected herds were used without the need for vaccination.

Notifiable avian influenza in ostriches

Notifiable avian influenza (NAI) occurred in ostriches in the Eastern and Western Cape Provinces in 2004. This disease had been diagnosed before in this country, but had never been reported in its highly pathogenic form. This time it caused high morbidity and mortalities in ostriches and led to suspension of trade in all poultry and poultry products with trading partners. The ostrich industry lost close to R700 million and had to lay off 4 000 workers due to this loss of income during the period (Department of Agriculture, unpublished 2005). The poultry industry, including ornamental birds, also lost several million rand as they could not export their produce for months causing a severe shortage of poultry meat in this region. South Africa had to prove to trading partners that the poultry industry itself was not affected by the disease before they could be allowed to export meat to the region. In this instance, the approach utilized was testing, isolating infected flocks, culling and burying the culled birds. It ended up as an exercise which adversely affected the emotional wellbeing of veterinarians and technicians alike, requiring psychological counselling in some cases. This is an example of an unintended impact that needs to be taken into consideration when disease eradication campaigns are planned.

Classical swine fever

Classical swine fever (CSF) devastated the pig industry and affected both the Eastern and Western Cape Provinces. Control measures for this disease continued for more than two years, at a great cost to the state, and included the establishment of road blocks in and around the province and a surveillance programme. Animals that tested positive for the disease were put down humanely and buried. Food security within the province and in other provinces was affected adversely.

Brucella canis

Brucella canis was never before reported in South Africa and was introduced into the country in 2005

in the Western Cape Province. So far it is not known how the disease was introduced, but it is suspected that an infected dog escaped from a ship/sea vessel and found its way inland where it may have infected other dogs. The canine was put down and no further cases were seen.

GENERAL CONSIDERATIONS

It is not easy to predict when and how a disease will be introduced into a country. Governments therefore have to be vigilant at all times and ensure that animal diseases are kept out of its territory to the best of their abilities. When these diseases are introduced, pre-conceived mitigation strategies should be implemented immediately.

If an exotic disease is introduced, the speed of detection and prompt reaction of the veterinary services are of paramount importance in limiting the impact of such an outbreak. This requires surveillance strategies that include all parts of the livestock farming sector, a particular challenge for countries with a large informal and emerging farming component. A strong veterinary service component is essential for executing effective surveillance strategies and effective response to outbreaks. South Africa is grateful for the support of international organizations, like the OIE, for their assistance in promoting on a political level the need for independent and strong veterinary services systems to safeguard animal and human health, food safety and security as well as international trade in animals and animal products. Poor implementation of disease control measures may contribute to localized negative impacts. Improper use of chemicals and drugs, in particular, can expose animals, humans and the immediate environment to possible toxic effects, either directly, and/or indirectly, or through residues in livestock products (Perry & Sones 2007).

Participatory epidemiology

The use of 'existing veterinary knowledge' or indigenous knowledge for epidemiological purposes and early detection and the use of local communication routes, e.g. tribal heads and chiefs, often improve the success rate in disease control and eradication. These traditional routes of communication are often an effective means to inform the public of the existence of serious animal diseases, but also of vaccination and inspection days and points. Disease control programmes are also more acceptable to the affected community when their traditions are taken into account (McLeod & Rushton 2007).

Geographic information systems

A strong veterinary service component is essential for executing effective surveillance strategies and effective response to outbreaks. Geographical information systems (GIS) are able to provide information from a database and display it on a map. It can, for instance, depict the percentage of animals vaccinated at each dip tank in a particular year. It gives a clear picture of the disease situation in a particular country or area and can provide vast amounts of information during an outbreak such as:

- Exact location of index cases/infected farms
- Farms involved
- Farms located within a specified radius

Therefore, GIS is valuable during the planning of control efforts.

CONCLUSION

Many factors have to be considered when deciding which disease control measure to employ. The approach to disease control differs from situation to situation and depends on available resources. It is advised that decision makers in animal disease control should constantly evaluate the effectiveness of control measures employed and adjust them where necessary. At the same time, disease control approach is moving with the times—as new technologies are discovered.

A better understanding of the epidemiology of diseases is also leading to new approaches, such as compartmentalization and containment zones, to facilitate trade in commodities. These new concepts emphasize the necessity for flexibility in disease control decision-making.

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