AN ASSESSMENT OF CONSTRAINTS TO ACCURATE REPORTING OF CATTLE MORTALITY IN ODI DISTRICT, NORTH WEST PROVINCE

by

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Submitted in partial fulfillment of the requirements for the degree of *Magister Scientiae* (Veterinary Science) in the Department of Paraclinical Sciences, Faculty of Veterinary Science, University of Pretoria

Date submitted: June 2004

ACKNOWLEDGEMENTS

Professor C M E McCrindle my supervisor for her guidance, advice and support during this study.

Professor N Duncan for demonstrating how necropsies were done.

Ms R Owen for statistical analysis and advice.

Mr Seape, Mr Motshabi, Mr Manoto: thanks to my three Animal Health Technicians for helping in organising farmers and collection of data.

Department of Pathology for allowing me to use the post-mortem hall for a farmer's day.

National Research Foundation for funding the project.

The farmers who participated in the project for their time and understanding.

Directorate of Veterinary Services NWP for allowing me to do the study.

DEDICATION

To my two sons, Mpho and Dikgang

DECLARATION

I , **Cathrine Nndithseni Makgatho**, hereby declare that the work on which this thesis is based is original and that neither the whole work nor part of it has been, is being, or shall be submitted for another degree at this or any other university, institution for tertiary education or professional examining body.

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SUMMARY

AN ASSESSMENT OF CONSTRAINTS TO ACCURATE REPORTING OF CATTLE MOTRALITY IN ODI DISTRICT, NORTH WEST PROVINCE

BY

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Degree : MSc (Veterinary Science)

The aim of the study was to assess the constraints to accurate reporting of cattle mortality in Odi district, North West Province.

The method that was followed in this study was based on participatory action research. The cattle owning community of Odi district participated at every phase. They were the ones who first spoke to veterinary services about ways to decrease the diseases and mortalities of their cattle. Out of this came a questionnaire so that the actual facts could be determined.

A total number of 60 farmers were randomly selected from 12 villages. One farmer pulled out and we were left with 59 farmers. Since the area of study was communal, most farmers were men (n=55) and only four of them were female.

It was suspected that there was a communication problem and this was proven, as 23 farmers were not even aware that mortalities have to be reported by law. The real problem was that causes of death were not being diagnosed because farmers were not aware that a necropsy could give information on the causes of death. Farmers were keen to receive training in necropsy techniques so as to be able to discuss the cause of death of cattle with the state veterinarian.

A skills training course was done with the farmers at the Department of Veterinary Pathology of the Faculty of Veterinary Science, University of Pretoria. Farmers were taught to recognise the names and characteristics of normal organs and how to cut open a carcass correctly. A necropsy was demonstrated and thereafter farmers were given cattle organs from the abattoir to cut open themselves using gloves and protective clothing. Diagnostic skills were not taught as diagnosis of diseases is the province of a registered veterinarian. Farmers were given a checklist of organs and encouraged to contact the state veterinarian to describe what the carcass and organs looked like as soon after death as possible. The state veterinarian could give a tentative diagnosis over the telephone. A CD-Rom was developed as a training aid for skills training of

small-scale farmers and animal health technicians (AHT's), in elementary necropsy techniques.

Farmers were thereafter visited monthly for 12 months by the state veterinarian and the AHT`s to record cattle mortalities and possible causes of death. As a result of the skills training, the number of animals reported dead did not change, but the number of unknown causes of death dropped significantly, as owners were able to correctly describe necropsy lesions in the carcasses and organs of the cattle that had died.

It was concluded that the skills training technique used was an effective method of extension for recognizing causes of death in cattle and it is suggested that the CD-Rom that was developed, be used for training purposes by the state veterinary services of North West Province.

CHAPTER 1

INTRODUCTION

1.1 Background and motivation

1.1.1 Background

A map of Odi district in the eastern region of North West Province (NWP) is shown in Plate 1.1. A large percentage of cattle farmers in this district use communal grazing and do not own the land (McCrindle, 1997). Livestock diseases have a significant impact on the population of many developing countries because people depend on livestock for nutrition, mainly for protein from meat. If cattle die, there will be less food for survival of humans (Schwabe, 1984). Most people in Odi district live in rural areas and depend on agriculture for their livelihood. Livestock may also be a form of saving, which can be cashed in through the sale of animals when needed. Diseases of livestock can cause major losses, both to livestock owners and the country as a whole (Cameroon, 1982). Commercial cattle farmers earned R2791 million from slaughtering of cattle and calves in 1996 (National Department of Agriculture, 1996). Farmers lose a lot of money when their cattle die. From the June edition of the Farmer`s Weekly (2000), the slaughter price of beef was R9. 00/kg and the weaner liveweight price was R5/kg (Janovsky, 2000).

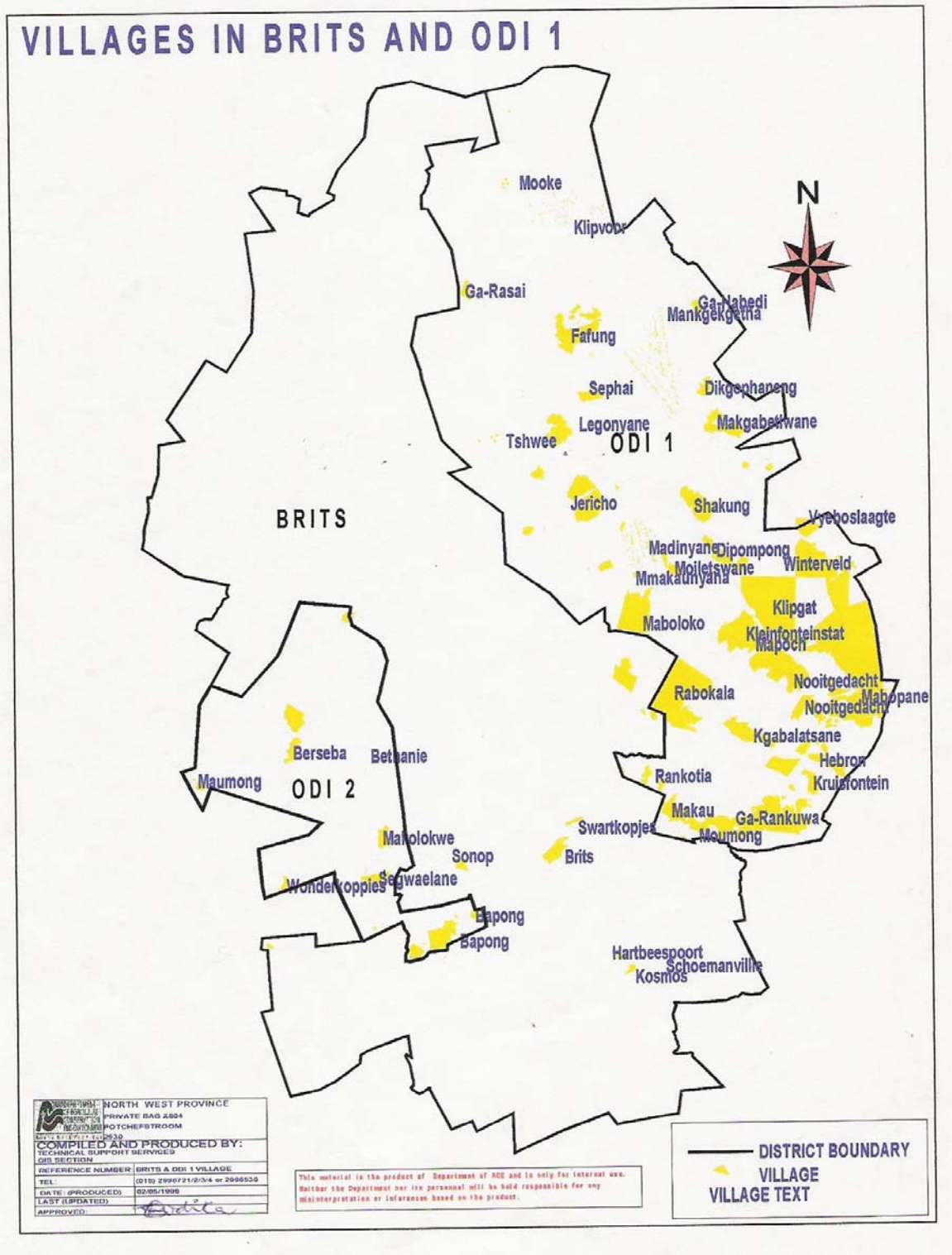


Plate 1.1 A map of Odi district in the eastern region of North West Province

In the September issue of the Farmer's weekly, the slaughter price was R13.50/kg and that of weaners was R7. 50/kg.

A high mortality rate in a herd has a depressing effect on the financial results of the farming enterprise (Carstens, 1971; Shoo *et al*., 1991). Although it is not possible to eliminate stock losses completely, it is a controllable factor that can be minimized by means of an effective disease control programme and good management.

According to Ristic and McIntyre (1981), it is important to know the level of mortality of cattle in order to be able to know the major diseases which cause mortality and be able to prevent and control causative agents. No mortality statistics were found in publications from the National Department of Agriculture and Statistics of South Africa. (Burger, 1998: National Department of Agriculture, 1999)

Possible constraints to reporting of mortality by cattle owners in communal areas may include lack of communication facilities in rural areas, lack of transport, time delay and access to the state veterinary office, however the significance of these is not known.

According to the annual report of the Odi state veterinary office, (Makgatho, 1998 and 1999) infectious and non-infectious diseases are the

main causes of cattle mortality in Odi District (Table 1.1). Some of the common causes of mortality are malnutrition, heartwater, anaplasmosis, blackquarter, babesiosis, lumpy skin disease, rabies, colibacillosis, pasteurellosis, anthrax, lumpy skin disease and motor vehicle accidents.

The total number of cattle for 1998 and 1999 was 22321 and 25572 respectively. According to the annual reports of 1998 and 1999, only 0.72% and 0.84% of cattle mortalities were reported to the State Veterinarian respectively (Table 1.1). The most important problem in recording of causes of cattle mortalities is probably that of under reporting. The weakest link in the reporting chain is usually the livestock owner, who may not recognise the disease, or may fail to report it for other reasons (Cameroon, 1982).

Table 1.1: Causes of death during 1998 (n=22321) and 1999 (n=25572)

Condition	Year	
	1998	1999
Heartwater	10	5
Anaplasmosis	7	8
Babesiosis	1	3
Blackquarter	2	3
Malnutrition	32	48
Lumpy skin disease	4	6
Downer cows	29	33
Plastic bags	13	20
Pneumonia	4	7
Diarrhoea	6	17
Unknown	53	65
Total	**161**	**215**

1.1.2 Motivation

This project investigated the constraints to accurate reporting of cattle mortality statistics in Odi. Mortality statistics are important in controlling the level of disease in livestock and currently these are not available. Emerging farmers were involved in the study, and this is beneficial to them, as they will start to recognise diseases that cause mortality and also the economic importance of keeping healthy animals, instead of losing animals as a result of diseases or management. Also important is that they will know the causes of mortality and so be able to prevent it. More accurate knowledge of cattle mortalities will assist the state veterinary services in planning the control of notifiable and non-notifiable diseases. It will also help to prioritise interventions and veterinary extension

1.2 Research Problem

No proper epidemiological study can be done on causes of mortality in cattle unless these are reported.

1.3 Hypotheses

The assessment of constraints to the accurate reporting will improve the accuracy of mortality statistics for cattle in Odi district, NWP.

1.4 Objectives

- To identify reasons for the poor mortality statistics using a questionnaire in the form of a structured interview with farmers.
- To list the constraints to accurate reporting of mortality statistics in order of importance. It is suspected that these may include:
    - Lack of communication systems
    - Lack of access to the State Veterinarian
    - Lack of transport
    - Too much delay before reporting
- To develop extension and skills training to assist farmers in recognising causes of mortality in their cattle.
- To evaluate knowledge of farmers before and after skills training and extension.

1.5 Work plan

- Identify cattle farmers in Odi district
- Select a representative sample from the different villages
- Interview farmers using a questionnaire/checklist
- Determine and rank constraints to reporting of mortalities
- Address the constraints; options which may be considered and evaluated are:

- State Veterinarian must go out to do the necropsies
- Farmers should be trained to do elementary necropsies:
  - To develop a post-mortem checklist card to be used by a farmer.
  - To have a farmer's day to demonstrate how to recognise abnormalities during an elementary necropsy and be able to describe them to the veterinarian.

- To evaluate over the course of 12 months if there is a change in reporting of mortalities by farmers.

CHAPTER 2

LITERATURE REVIEW

2.1 Historical aspects of communal farming

This is discussed under the headings of the political aspect of the homeland system, land tenure in South Africa and communal grazing.

2.1.1 Homeland system

During the 19th century, African family farming proved to be viable and was able to meet the agricultural needs of the growing urban and industrial centres. There was a relatively undistorted market for land, labour, inputs and outputs. African farmers competed with white settler farmers for the domestic and export markets, by adopting new technologies and expanding into new farming industries. The government was not able to intervene in the marketing of agricultural products and African farmers got support from land companies and big land owners who gave them the opportunity to rent land. This encouraged the African farmers to accumulate capital, wealth and farming skills (World Bank, 1994).

In 1913 the government instituted the Native Land Act, which separated Africans and Europeans by designating certain areas as African. These areas were “Homelands” and “Self-governing Territories”. Laws were passed so that Africans were only allowed to farm in those areas allocated to them. Some Africans migrated to areas of white settlement to find employment and to escape the traditional way of life in their village of origin. Their families tended for their farms in their absence (Vuuren, 1997). Approximately 86% of the agricultural land was reserved for 67,000 white farmers and supported a rural population of 5,3 million people. The rest of the population lived and farmed in the homelands. This led to overcrowded homelands, which lacked the infrastructure for successful agriculture. White farmers benefited from the reduced competition, as it was almost impossible for homeland farmers to reach a commercial level (Cooper, 1988).

2.1.2 Land tenure

There is an African tradition of communal land ownership, rather than individual land ownership. According to Steyn (1988), the communal land belongs to the tribe and the chief is in charge of that land. The district chiefs and herdsmen divide the land between different households (Braker, 2001). Every member of the group that owns the land has the right to use the land and is protected. Traditionally there are no well-

defined residential or arable areas. When a man marries, he is granted an area and owns the land for the rest of his life. When he dies, his children inherit the land (Babi, 1997). He can also give part of the land to a friend or relative, but he can never sell the land. The household can grow crops and also keep livestock for grazing purposes on that land. The land can only be confiscated if the owner is found guilty of a crime (McCrindle *et al.*, 1994).

2.1.3 Advantages of communal land tenure

- *Maintenance of tribal unity and authority:*

  The communal system of land use maintains the role of the chief as the traditional control of the people. If the traditional communal system is abandoned, it will also influence the social structure of the tribe.

- *Social security:*

  The right to land of every adult man within a tribe, secures a subsistence level of income from agriculture, provided there is sufficient land

- *Limiting wealth differentiation:*

  Prevents large differences in wealth within a tribe because it prevents individuals from becoming large landowners as the majority of the people consequently will become landless.

- *No land speculation:*

  To prevent land being acquired by people and not used to its best advantage, as well as to prevent outsiders acquiring land and eventually causing the disintegration of the tribe.

- *Benefits of collective development:*

  For the farmer, this means low cost grazing and therefore a low cost of maintaining cattle. The advantage for the community is that in this manner it can reach production levels not possible under private ownership.

2.1.4 Disadvantages of communal land tenure

- *Entrepreneurship and investment are discouraged:*

  Because of common use, investments and initiatives made by individuals will not benefit the individual, but the whole community.

- *No commercial value of land:*

  Land is not individually owned and does not have a monetary value. It can not be used as security when taking out a commercial loan and land is not seen as a commercial production factor, which has to be used optimally.

- *Limiting improvement of agricultural productivity:*

  Communal grazing limits agricultural productivity in different ways. Examples are uncontrolled animal numbers, uncontrolled breeding, and no possibility of the use of forage crops to supplement feeding, uncontrolled calving season, over-use of grazing and watering places and limited options to prevent the spread of livestock diseases.

- *Constraints to conservation:*

  Because of common use of resources, there is no regulation of the way in which these resources are used.

- *Constraints to social welfare:*

  The traditional social system of local leadership is being converted into a centralised government leadership. However the transformation is slow and partially finished. Some institutions have been replaced, while others have not. In this interim period,

degradation will begin or increase or shortcomings will emerge, while monitoring of the resource is absent.

- *Chiefs acting in their own interest:*

  Occasionally you can get chiefs that do not act in the interest of the community and keep more cattle, and as they are not elected, the community does not have the power to depose them.

- *Gender issues:*

  In this system, the rights of man to use the land are not always extended to women. Many women who are single mothers consequently do not benefit.

- *Insufficient land:*

  In South Africa, the majority of agricultural land is classified as marginal. The grazing capacity is low and there may be insufficient land available to support the rural population. Water may also be deficient in many areas and there is a high potential for droughts.

2.2 Communal grazing

In rural areas, there is no individual ownership of the land but the land belongs to the community. There is no clear demarcation of housing and

grazing areas. The grazing areas contain a large number of different species of grasses, shrubs and trees. In this grazing area, all species of domestic animals are found. There is no rotational grazing (Lebbie, 1996).

A “living wage” per farmer is estimated at approximately R2000:00 per month. According to Mokantla (2003), it was found that farmers sold unproductive cattle at a price of R1000.00 to R2400.00 (mean = R1278.00) and this price was comparable to the price structure in the commercial sector.

In Odi district, the suggested carrying capacity of the grazing is one large animal unit per five hectare (LAU/ha). The average size of communal grazing is too small to accommodate the number of cattle to produce a “living wage” for a full time cattle farmer, because many families use the same grazing. Farmers therefore must have some other form of income as well. This was found to be the case in the veterinary needs appraisal done by Stewart (1997) where farmers supplemented their income by working full time and farming part-time. Farmers also supplemented their income by having businesses or were dependant on the income or pensions of their family members.

There is no restriction on the number of animals each farmer can keep, so the farmer tends to keep as many animals as possible to maximise his

own benefit. They do not want to reduce the number of livestock because the land is common property and any problems that arise from the use of the land resources will affect the whole community (Maree and Casey, 1993). Consequently, too many cattle are kept and overgrazing results. Overgrazing is believed to contribute to the high levels of soil erosion and degradation that can be found in some rural areas of South Africa. This contributes to the poor condition of the animals particularly in the winter (Gobbins and Prankerd, 1983). Despite the problem of overgrazing in rural areas, the practice of communal grazing is still in use.

There is legislation being promulgated to control communal grazing (Government Gazette, 2002). The Communal Land Rights Bill changes the previous communal ownership of the land to individual tenure, although chiefs will still be involved in allocating land to individuals. The Bill also provides for leasing of communal land for commercial and developmental purposes. Cattle will no longer be kept in communal areas. People and cattle used to share communal land. According to this Bill, some farmers will be removed from the land they now think they own. The disturbing factor about this is that communal farmers are unaware of this Bill, let alone its consequences.

2.3 Traditional methods of extensive cattle farming

Cattle in rural areas are kept mainly to support the household and are used for meat and milk. The dung is also used as a fuel for making fires and as a type of cement for building purposes. Cattle are not kept for commercial purposes, but for security and status in the community (Babi, 1997). Some cultures like the Xhosa and Zulu, use them for paying lobola. Lobola is when a man and a woman want to get married and the woman's family wants payment for their child from the man's family. Cattle are slaughtered for cultural reasons like communicating with the ancestors, weddings and funerals (Schapera and Goodwin, 1996; Mokantla, 2003)

The cattle kraal used to be the central feature of most villages. Animals used to be slaughtered in the kraal and men came together there for meetings. Women were not allowed to enter the kraal unless they belonged to the family. However they were never allowed to enter when menstruating. The head of the family was also buried in the kraal, wrapped in the skin of a slaughtered ox. These traditional methods are changing daily and depend on individual beliefs and religious backgrounds. Christians, for instance, may not believe in the ancestors and sacrificing animals for them (Els, 1996). Cattle are now more commonly used for survival, security and status in the community (Bembridge & Tapson, 1993).

2.4 Value of cattle marketing and slaughter in communal system

Traditionally, a man wanted to have as many cattle as possible and the quality did not matter. This resulted in people owning many inferior cattle (McCrindle *et al.,* 1996). In communal grazing areas, people share the bulls and only a few calves are castrated. This can result in inbreeding (Bembridge & Tapson, 1993; Mokantla, 2003).

Cattle are kept for security reasons and can only be disposed of, when there is a need. In earlier days, cattle were often referred to as a ″bank″ (Botha, 1999). When a need arose, a number of cattle were sold to cover the expenses. Cattle were only slaughtered for ceremonial reasons like weddings and funerals (Tapson, 1993). The animal selected must be in very good condition, so the best cattle tend to be slaughtered and those in poor condition were retained in the herd.

People do not keep cattle for commercial gain, so they are mainly sold to anyone who needs them for a wedding, funeral or for paying school fees for children. In Odi district there is no place for auctions, so farmers have to go to auctions outside the district to sell their cattle. Most farmers would like to sell more cattle but are faced with problems like lack of transport, lack of auction areas, stock theft and insufficient nutrients in the grass (van de Moosdijk & Schifeli, 2002).

2.5 Cattle census

The census figures for the cattle population for the entire Odi district (Odi 1 and Odi 2) for the past five years are shown in Table 2.1. These figures are extracted from the annual reports of the state veterinary services for Odi district (Directorate Veterinary Services, 1997; 1998; 1999; 2000; 2001). The cattle were counted during state subsidised annual vaccination campaigns against Anthrax and Brucellosis, as these are controlled diseases in terms of the Animal Diseases Act, Act 36 of 1984.

Table 2.1: Cattle census figures over five years for Odi* District

Year	Number of cattle
1998	22321
1999	25572
2000	26681
2001	29110
2002	27135

* Includes Odi 1 and Odi 2

2.6 Infrastructure and communications systems in Odi, NWP

Odi district consists of urban, peri-urban and rural areas. The study area for this investigation was the rural areas, where there are communal grazing lands and small rural villages with little infrastructure. Each village represents a state veterinary area and is numbered. The level of

infrastructure like roads, water supply and communication systems are different in each area. There are three Agricultural Development Centres (ADC) in Odi District: Jericho, Brits and Mothutlung. Plate 2.1 shows a Geographic Information Systems (GIS) map of ADC`s in Odi District. The ADC`s are divided into field service units or wards. Wards include several villages (three or more) and an Animal Health Technician (AHT) services each ward (Plate 2.1).

2.6.1 Roads

In urban areas, roads are tarred and they are maintained regularly. In villages or rural areas, roads are not tarred; they are gravel and are not maintained at all. Access to these areas is more difficult. During the rainy season, from October to March, it is often impossible to travel in these areas to provide veterinary services.

Plate 2.1 GIS map of ADC`s in Odi District

2.6.2 Water supply

In urban areas, people use municipal water and cattle are seldom kept in these areas. In rural areas people get water from boreholes. Cattle get drinking water from dams, vleis and rivers (McCrindle et al, 1994; Stewart, 1997).

2.6.3 Electricity and communication systems

Most areas have been electrified since 1994 except a few rural areas. Telecommunications are still a problem. Previously most farmers did not have access to telephones and this made it difficult for them to report diseases and deaths in cattle to the state veterinary services. A few farmers, those who can afford it, have now acquired cellular telephones and it is easier for them to communicate with the State Veterinarian or the AHT.

2.6.4 Clinics and handling facilities in Odi, NWP

There is only one veterinary clinic situated at Mothotlung, where the state veterinarian is based. The three AHT are based at service centers in the villages (See plate 2.1 – GIS map of Odi district, showing location of service centers). Farmers can access AHT at these areas, but sometimes

it is impossible for the farmers to reach these areas because of lack of transport. The farmers rely mainly on busses, which travel only at certain hours of the day.

Handling facilities such as crush-pens and dipping tanks, which are built at state expense, are very important in communal areas, for treatment and prevention of diseases. In some areas these, are non-existent because the community have vandalised them.

2.6.5 The state veterinary service in South Africa

State veterinary services are responsible for carrying out the provisions of the Animal Diseases Act 36 of 1984, which has been updated to the Animal Health Act of 2002. The list of controlled, notifiable diseases is shown in Appendix 1. The international lists (*www.oie. int*) of diseases classified as A, B and C are also shown.

The main objectives of state veterinary services in South Africa are to control and prevent notifiable and zoonotic diseases and to improve animal health. In 1996, veterinary services were divided into national and provincial structures. The National Directorate is divided into nine provinces, one of which is North West Province. In the NWP, the Directorate of Veterinary Services falls under the Department of

Agriculture, Conservation and the Environment (DACE). The structure of the department is given in Fig 2.1.

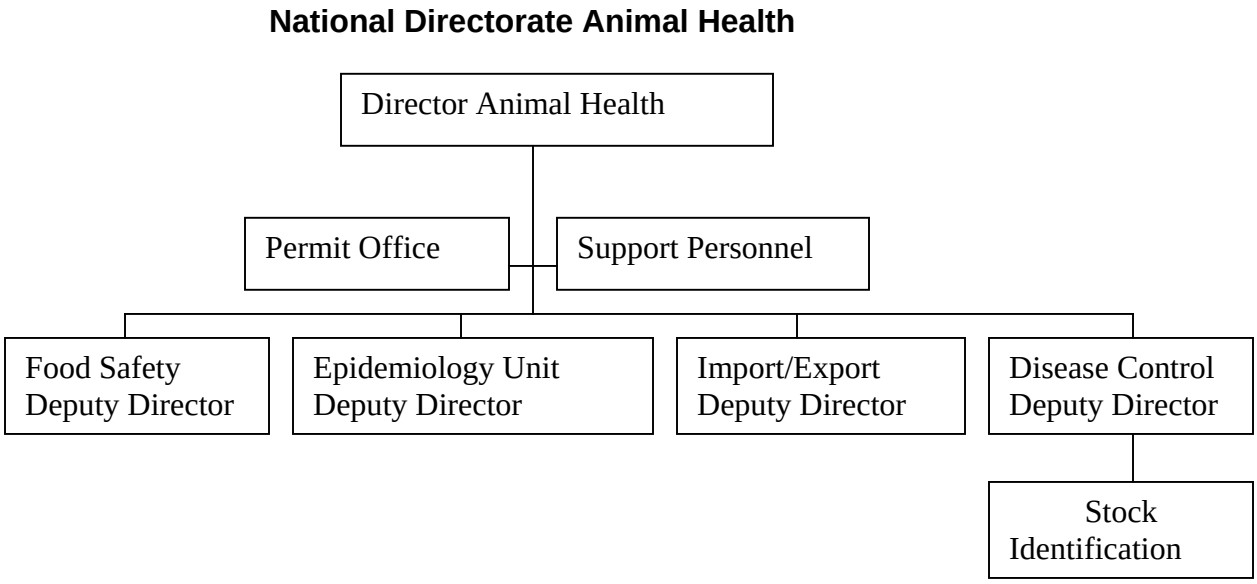


Fig 2.1: Structure of the National Directorate of Veterinary Services
(www.nda.agric.za, 2000)

The National Directorate Animal Health is responsible for imports, exports and border control. It is also responsible for setting and monitoring and auditing norms and standards of veterinary services in the country. The provincial veterinary services are more concerned with control and prevention of notifiable and zoonotic diseases and service delivery (National Department of Agriculture, 1996). The structure of the North West Province Veterinary Services is shown in Fig 2.2

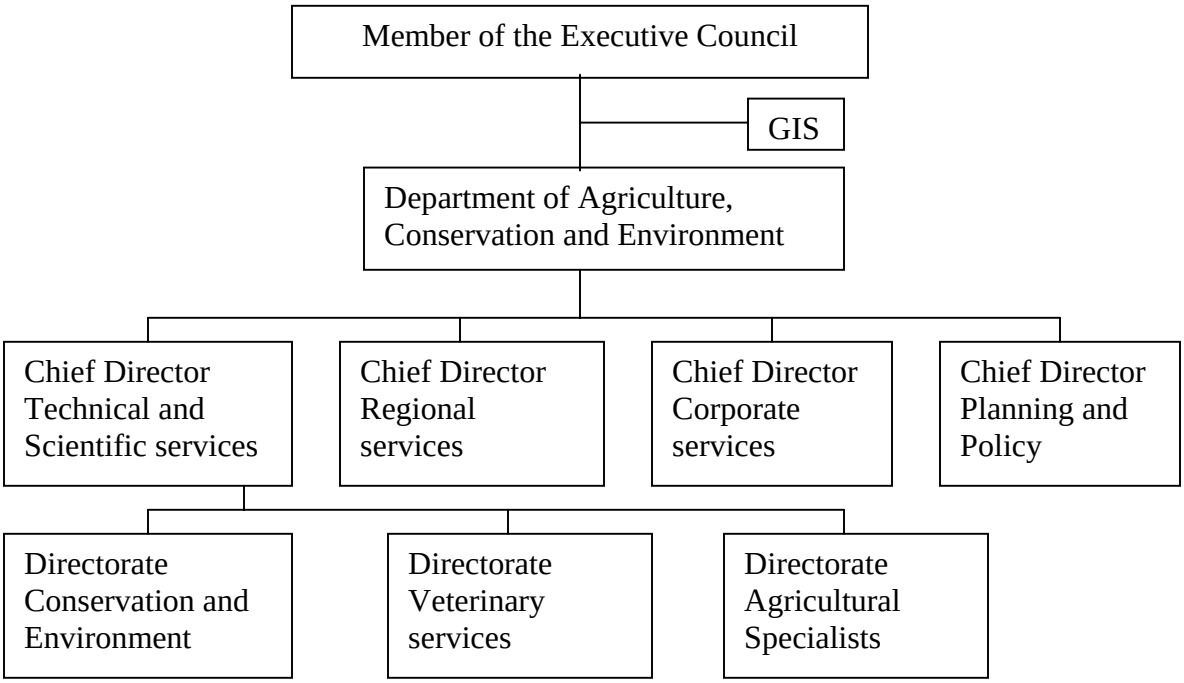


Fig 2.2: Structure of the Dept of Agriculture, Conservation and Environment (NWP)

The Directorate, Veterinary Public Health, is responsible for the maintenance of proper standards of hygiene during the slaughtering of animals destined for the human consumption. Abattoirs have to comply with certain legal requirements regarding the layout, structure, equipment and other facilities at approved abattoirs (Meat Hygiene, Act 40 of 2000).

Achieving household, provincial and national food security in South Africa is not only a challenge to produce sufficient and safe food for all, but to ensure that all people have access to adequate, safe and nutritious food at all times. This requires a holistic team approach, involving communities,

traders, nongovernmental organizations and different departments at all tiers of government.

Disease reporting in the country is not optimal, resulting in the underreporting of most diseases and unreliable statistics. In some provinces, great emphasis is placed on supplying information and carrying out extension work so as to create veterinary and animal disease awareness among the general public (National Department of Agriculture, 1997).

2.6.6 Treatment versus control of diseases

The productivity of livestock owned by subsistence farmers could be increased by veterinary intervention in the form of disease prevention, treatment and extension advice about management techniques. Improved animal management including regular dipping, deworming and vaccination of diseases also increase the productivity of cattle (Woods, 2001).

The veterinary services could improve stock management by intensifying extension work among farmers living and working in communal areas, by stressing the importance of health and production management and the increased output expected for investments in these fields (Chizoda *et al.*, 1996).

The major task of the state veterinary services of the Department of Agriculture, Conservation and Environment (DACE) in the NWP is to prevent and control outbreaks of disease in the local livestock industry. The provincial state veterinary services implement the provisions of the Animal Diseases Act (36 of 1984) updated to the Animal Health Act (40 of 2002) and its regulations. The state veterinary services are responsible for free vaccination of cattle against diseases like Anthrax, Rabies and Brucellosis. These are important zoonotic diseases. Vaccinations are compulsory and done annually.

The treatment of animals for diseases is not a priority of the department but it is done on a lesser scale. There is a clinic situated in Mothotlung for providing clinical services to the animals belonging to the communities living in Odi district.

2.7 Causes of death

The causes of death common in the Odi and Moretele districts were diverse. It was reported by van de Moosdijk and Schiferli (2002), that the cattle herd mortality for 2001 was 6% and 7% for Odi and Moretele respectively (Table 2.2). Calf mortality was the highest with 16% and 11% for Odi and Moretele respectively (n=1730 for Odi and n=2352 for

Moretele). Perry *et al* (1984) recorded a mean mortality rate of 20% in a study done in traditionally managed cattle in Zambia.

Table 2.2: Cattle mortality in Odi and Moretele district (After van de Moosdijk and Schiferli, 2002 page:40)

	Odi district				Moretele district			
	Dead	**Dead + alive**	**M-rate***	**SD M-rate***	**Dead**	**Dead + alive**	**M-rate***	**SD M-rate***
Calves	72	440	16.4	20.4	65	590	11.0	15.9
Heifers	7	396	1.8	4.2	32	490	3.2	10.3
Cows	23	711	3.2	9.9	57	985	5.8	9.1
Young bulls	6	100	6.0	24.0	11	133	8.3	7.3
Bulls	2	38	5.3	26.7	2	55	3.6	9.0
Young oxen	0	36	0	0	0	67	0	0
Oxen	0	18	0	0	2	32	6.3	7.9
Total	**110**	**1739**	**6.3**	**7.9**	**169**	**2352**	**7.2**	**7.4**

M-rate = Mortality rate, SD = Standard deviation

According to the state veterinary annual reports of 1998 and 1999 (Table 1.1), 0.72% and 0.84% of cattle mortalities were reported respectively. Van de Moosdijk and Shiferli (2002) recorded the mortality rate of 6.3% (Table 2.2) for Odi district. The data in Table 1.1 and 2.2 were different, probably because in the area where the study was done, there is a high concentration of cattle and the AHT are easily able to gather data. In the rest of the areas, the cattle are widely dispersed in small herds and the AHT cannot visit the farmers as regularly, or farmers are not at home.

Table 2.3: Causes of death in cattle (n=1739) (After van de Moosdyk and Schiferli, 2002)

Cause of death	Number of cattle dead
Lumpy skin disease	4
Blackquarter	1
Anaplasmosis	1
Sweating sickness	1
Diarrhoea	1
Downer	1
Malnutrition	1
Accidents	1
Plastic bags	2
Snake bite	1
Injuries	4
Unknown	92
Total	**110**

Table 2.3 shows the causes of death as recorded by van de Moosdijk and Schiferli (2002) in a sample of cattle (n=1730) from Odi district. It should be noted that the majority of causes of death are unknown (n=92).

2.7.1 Malnutrition

Cattle farming in Odi is mainly on communal grazing and grazing rotation is not done. This results in overstocking and overgrazing. Under winter conditions, 10 hectares per Mature Livestock Unit (MLU) is required as grazing is scarce and animals are thin. It was reported by Kiwanuka *et al* (1996) that in Madinyane and Ramogatla villages, there are forty owners with approximately 800 herds of cattle using 4820 hectares and there is overstocking. Farming is extensive and natural grazing is the main source

of feed. This natural feed source varies, however, in both quality and quantity, as a result of seasonal changes (Groenewald and Boyazoglu, 1980).

Protein energy malnutrition (PEM) has been used to describe insufficient provision of feed in terms of quality and quantity (Garett, 1988). The condition is the result of the negative energy balance caused by decreased quality and quantity of feed when fetal development and cold weather increase caloric requirements. Drought also plays an important role in this syndrome, especially where winter supplements are not used (Blood *et al.,* 1983; Debnath *et al.*, 1990).

The clinical syndrome that results from protein-energy malnutrition is not only difficult to recognise, but it may be difficult to convince owners of the diagnosis (Hungerford, 1990). Animals lose weight, develop a rough hair coat, go down and are unable to rise, but remain alert. Most cases die within 7 to 14 days of becoming recumbent (Bradford, 1996). Necropsy lesions are decreased muscle mass, lack of normal body fat and serous atrophy of fat (Garett, 1988). It is probable that the causes of death listed as “downer”, “malnutrition” and consumption of “plastic bags” are a result of malnutrition (Table 2.3).

2.7.2 Heartwater

Heartwater is a tick borne disease of cattle, sheep, goats and some wild ruminants caused by *Cowdria rumanantium* (Bezidenhout, 1987). The tick responsible for the transmission is *Amblyoma hebraeum* (Bezuidenhout *et al.*, 1994; Petney *et al.,* 1987; Walker, 1987).

According to the annual report of the state veterinarian (Makgatho, 1998 and 1999), it is estimated that 0,04% (n=10) and 0,02% (n=5) of cattle from six months of age to adults die after showing clinical signs (Table 1.1). In Odi, people farm mainly with Afrikander and Brahman cattle, and according to Bonsma (1944), mortality due to heartwater is far lower in Afrikander cattle and their crosses, than in exotic beef breeds, because of their thick skin in relation to other breeds.

Heartwater occurs in the bushveld areas of Odi, NWP. The vegetation is sourish mixed bushveld (Acocks, 1975). This type of veld is ideal for the vector, *A. hebraeum*.

The symptoms include high temperature, nervous signs, rapid breathing, and sudden death. Cattle aged between three and eighteen months of age die of this disease (Bezuidenhout *et al.*, 1994).

Necropsy lesions include hydrothorax, hydropericardium, oedema of the lungs, severe oedema of abomasal folds and the trachea filled with serofibrinous foam (Bradford, 1996; Prozesky, 1987).

Confirmation of a diagnosis of heartwater requires the demonstration of *C. ruminantium* in the cytoplasm of the endothelial cells of blood vessels from stained smears of the brain (Prozesky, 1987; Malika *et al*., 1991). Heartwater should be differentiated from rabies, malignant catarrhal fever, cerebral babesiosis and theileriosis.

Treatment, vaccination, tick control and chemoprophylaxis can control the disease. The tetracyclines, especially oxytetracyclines, are most effective and widely used for the treatment of the disease. A dosage rate of 10-20mg/kg is recommended (Purnel, 1987).

Vaccination is successfully used to protect susceptible animals against the disease, especially when they are first introduced into endemic areas (Oberem and Bezuidenhout, 1987; O`Callaghan *et al*., 1999). It is noted that in Odi, no vaccination is done in young calves in the endemic areas. Farmers use dips minimally, because they often claim that they cannot afford them even if they own more than 50 cattle. Heartwater causes death in animals and can be controlled by controlling tick infestation by dipping. Chemicals remain the best method to be used to control ticks in

cattle (Schroeder, 1987). Excessive reduction of tick numbers, however, interferes with the maintenance of an adequate immunity through regular challenge and may result in heavy losses. Endemic stability must be created and this happens when an average of 10 adult male and female *A. hebraeum* ticks are counted on animals (Du Plessis *et al,* 1992; Stewart, 1987; Tice *et al*., 1998). Deaths from heartwater are probably included in the 92 deaths from unknown causes in Table 2.2. In Table 1.1, heartwater was diagnosed but the difference in numbers (10 in 1998 and 5 in 1999) probably means that there is a problem in diagnosing the disease or there is under-reporting of the disease.

2.7.3 Anaplasmosis

Anaplasma marginale and *centrale* cause anaplasmosis in cattle (Potgieter and van Rensburg, 1987). From State Veterinary annual reports (Makgatho 1998 and 1999), it is estimated that 0.03% (7 out of 22321 and 8 out of 25572) of cattle in Odi, from six months of age, die of the disease (Table 1.1). The nutritional status of animals, especially those on a high plane of nutrition may play a role in 70% of the cases of the clinical disease. *Bos indicus* breeds are more resistant to the disease (Bonsma, 1944).

The symptoms of anaplasmosis are anemia, inappetance, general weakness, constipation, decrease in milk production, icterus and death (Ajayi *et al.,* 1978).

Necropsy lesions includes anemia in early stages and icterus in late stages, splenomegaly, hypatomegaly, and distended gall bladder (Potgieter and Stoltsz, 1994).

Demonstrating the parasite microscopically on thin blood smears confirms the disease (Balows *et al*, 1988). Anaplasmosis should be differentiated from bovine babesiosis, trypanosomiasis, leptospirosis and *Lantana camara* poisoning, where the animal also shows icterus.

Treatment requires the suppression or elimination of the parasites and the alleviation of secondary complication. Tetracyclines are the only effective drug for treatment (Jones and Brock, 1966).

2.7.4 Babesiosis

Bovine babesiosis is a tick borne disease caused by the intra- erythrocytic protozoan parasites, *Babesia bovis* and *Babesia bigemina*. B.bovis is transmitted by *Boophilus microplus* and *B bigemina* by *Boophilus microplus and decolaratus* (de Vos *et al.,* 1994).

According to the Odi state veterinary annual reports (Table 1.1), 1998 and 1999, 0.01% (1 out of 22321 in 1998 and 3 out of 25572) of cattle from six months of age to adults died after showing signs of the disease without treatment. It is possible that this is under-reported as a cause of death.

Necropsy lesions include, anemia, icterus, haemoglobinuria (with light to dark red discoloration of the urine), splenomegaly, swollen and yellowish liver, thick granular bile in the gall bladder, enlarged lymph nodes and kidneys. In cattle with cerebral babesiosis, the grey matter of the cerebrum and cerebellum has a characteristic cherry pink colour (Guglielmone *et al.*, 1992).

Eradication of the tick vectors would be the only long-term solution to the problem of tick-borne diseases in South Africa, however this is not possible and control is thus practised. Controlling the ticks can include chemical control using acaricides in an attempt to reduce the disease (Spickett and Fivaz, 1992). In South Africa, endemic stability for *B. bigemina* has been associated with infrequent dipping and high numbers of ticks, while the general situation has remained unstable for *B. bovis* whatever the strategy, because of the low numbers of *Boophilus microplus* (de Vos and Potgieter, 1983; Emerton, 1994).

Vaccination is another method of controlling the disease and there is a vaccine produced at Onderstepoort, which consists of pooled blood collected from animals in the acute stage of infection with either *B bovis* or *B. bigemina* (Coetzer *et al*., 1994).

Babesiosis was not listed as a cause of death in Table 2.2, however it probably was included in the "unknown causes" group. It was listed in Table 1.1.

2.7.5 Blackquarter

This disease is caused by *Clostridium chauvoei*. Blackquarter causes a peracute or acute disease with sudden death being the main sign. The state veterinary services vaccinate the animals against the disease free of charge. Estimated mortality was 0,008% and 0,01% for 1998 and 1999 respectively (Table 1.1) based on annual reports (Makgatho, 1998 and 1999). Outbreaks are seasonal, occurring during summer and autumn and especially after heavy rains. The disease is mainly found in animals aged between nine months and two years of age (Kriek and Odendaal, 1994).

There may be sudden death with no ante-mortem symptoms seen. In those that do not die, there may be lameness due to swelling of muscles

and crepitation over larger muscle masses can be felt. Affected animals soon become recumbent, dyspnoeic and die (Williams, 1977).

Necropy lesions in muscles are well circumscribed, spongy due to accumulation of gas bubbles, dark red in colour and have a butter-like smell. Elevated levels of enzymes associated with muscle damage such as creatinine kinase, may be detectable. The carcasses of animals that die of the disease undergo rapid putrefaction and bloat (Kriek & Odendaal, 1994).

A presumptive diagnosis can be made on the basis of the history, clinical signs and necropsy (Balows *et al*., 1988). Six thin smears from the exudate emanating from the lesions should be prepared on microscope slides for diagnostic purposes. Specimens of affected muscle as well as liver should be taken for microbiological processing. The disease can be difficult to distinguish from Anthrax (Sippel, 1972).

Systemic treatment with large doses of penicillin for five days and an acceptable surgical method of wound treatment, may result in recovery of animals suffering from gas gangrene, but they take several weeks to recover.

The occurrence of blackquarter can be adequately controlled by immunisation at three to six months of age (Kriek and Odendaal, 1994). A multivalent bacterin toxoid is used and is inoculated subcutaneously. A booster vaccine is given four weeks later, followed by an annual booster until the animals are three weeks old (Brown *et al.*, 1976).

2.7.6 Lumpy skin disease

Lumpy skin disease (LSD) is an acute or subacute viral disease of cattle. The disease is caused by a capripox virus (Barnard *et al*., 1994).

The mortality rate rarely exceeds three per cent. The higher morbidity rate is of economic importance, however, because of the prolonged debilitating effect it may have on animals that recover with consequent losses resulting from emaciation, temporary or permanent cessation of milk production, infertility in both bulls and cows, abortion and permanent damage to hides (Prozesky and Barnard, 1982).

LSD is characterized by fever, inappetence, salivation, mucopurulent nasal discharge and lachrymation. Skin nodules are the characteristic feature of the disease and are randomly distributed and involve both the skin and the subcutaneous tissues and sometimes even the underlying

musculature. These nodules are well circumscribed, firm, round and raised.

On necropsy, nodules of 5-50mm in diameter are found in the skin and the subcutaneous tissue and are grayish on cross-examination. Most affected animals have multifocal, roughly circular, necrotic areas on the muzzle and in the respiratory tract, buccal cavity, forestomachs, uterus, vagina, teats, udder and testes. Generalised lymphadenopathy is also found (Davies and Otema, 1981).

A tentative diagnosis may be based on characteristic lesions in the skin. A presumptive diagnosis of LSD may be confirmed by means of an electron microscopic demonstration of virus in biopsy specimens taken from affected skin. The disease is controlled by vaccination. Severe outbreaks may occur if the cattle population is not vaccinated and climatic conditions favour the multiplication of insect vectors.

2.7.7 Rabies

Rabies is a zoonotic disease caused by a virus which is present in saliva and is generally transmitted by the bite of the diseased animals, most commonly dogs (Swanepoel, 1994).

The clinical symptoms in cattle include bellowing, salivation, choking, aggression, wind sucking, inability to swallow, weakness, knuckling over, paralysis and death (Turton, 2000; Cluver, 1927). It is estimated that 0,0001% of cattle die from rabies in the North West Province (Giesecke, 1998).

Rabies is a controlled disease according to the Animal Disease Act of 1984 and a full necropsy cannot be done in the field as it may spread the disease. Brain samples must be taken to the Onderstepoort veterinary diagnostic laboratory for diagnosis (Bruckner *et al.*, 1978).

Rabies is not included in the tables because it occurs sporadically as outbreaks in the study area and there were no outbreaks over the three years. However, it is always possible that some of the unknown causes could be rabies.

2.7.8 Colibacillosis

Newborn and young calves are most susceptible to enteric colibacillosis, especially those under 10 days of age (Henton and Hunter, 1994).

The course of the disease is usually acute, ranging from one to three days. Diarrhoea is the most prominent sign seen and calves may die without showing signs (Janke *et al.*, 1990).

Lesions seen at necropsy include congestion of the small intestines, which contain greyish to yellowish fluid, the mesenteric lymph nodes are oedematous and congested (Acres, 1985). This disease is probably accounted for a large proportion of the deaths caused by ”diarrhoea” (Table 1.1).

2.7.9 Pasteurellosis

Pneumonic pasteurellosis in cattle is caused by both *Mannheimia* (*Pasteurella) multocida* and *haemolytica* (Carter, 1967). The main clinical signs seen are, fever, nasal discharge, tachypnoea and difficulty in breathing (Hjerpe, 1983).

Necropsy lesions include a carcass that is fevered, deep red or cyanotic in appearance. The respiratory system and the lymph nodes are affected (Allan *et al.*, 1985). An initial serous rhinitis and tracheitis, may be followed by congestion, oedema, petechiation, erosion and ulceration of the mucosa and a thick voluminous mucopurulent exudate (Yates *et al*., 1983). An acute fibrinous lobar pneumonia can be seen. Up to 90% of the

lungs are affected (Jensen *et al.,* 1976). The infected lung is consolidated and the interlobular septa are distinct. The lung has a mottled appearance because of oedema, haemorrhage, red and grey hepatisation and necrosis of the parenchyma (Daoust, 1989).

Diagnosis can be made from the history, clinical and pathological signs but a definite diagnosis is only made by isolation of the causative agent in the laboratory (Carter, 1967).

Pasteurella species are sensitive to antibacterial agents such as sulphonamides, penicillins and tetracyclines (Bateman *et al*., 1990). This disease is probably the aetiological agent of the “pneumonia” in Table 1.1.

2.7.10 Anthrax

Anthrax is a peracute, acute or subacute, highly contagious disease of domestic animals caused by the bacterium, *Bacillus anthracis* (Coetzer *et al.*, 1984). The disease is usually fatal and is a zoonotic disease and has not been diagnosed in Odi district for several decades, probably because the state veterinary services vaccinate all cattle annually. Anthrax was diagnosed in Standerton, Mpumalanga in April 2002 (Odendaal, 2002)

Anthrax is a potential cause of large-scale mortality but is probably controlled by the compulsory vaccination performed by the state veterinary staff. There was no outbreak in the study area over the study period. Because of its zoonotic potential and the high level of mortalities in outbreaks, it is important that diagnosis is made as soon as possible.

2.7.11 Motor Vehicle Accidents

In Odi district, most of the rural areas have dirt roads. These are often impassable when it rains. Stock-owners have thus moved to areas with better infrastructure. The fences are weak and cattle graze on the edge of the road. Often these cattle wander into the road and are injured or killed by passing vehicles. The “injuries” as well as “accidents” given as causes of death in Table 2.2 are probably the results of motor vehicle accidents.

2.8 Farming systems research extension (FSR-E)

A farming system is understood to mean the system where a farmer, farm family or a farm manager makes decisions to satisfy the needs of the farm family and to achieve their objectives. This requires that the farm and household are considered as one system and the decisions are made in the light of these objectives, taking into consideration the constraints and possibilities in the farm-household system (Worman *et al.*, 1992). Humans

form part of the ecosystem and are not independent of it. McCrindle *et al*., (1994; 1996) mention that the system of interest to the veterinarian has three main internal components: human beings, animals and diseases. The system is affected and influenced by extrinsic factors such as socio-political and socio-economic circumstances as well as the environment (rainfall, climate, vegetation and geography) (Krecek *et al*., 1995). The farmer or the farming family is the operator of the farming system. The way in which farmers earn their living is dependent on the economic, social, and cultural wellbeing of their households. According to Whitlow (1980) the members of the farming household need to have goals that they strive for, and these differ from farmer to farmer. The three basic types of inputs include land, capital and labour and these should be allocated to different activities such as crops, livestock and off-farm enterprises. The farmer must then use his knowledge, coupled with good management, to maximise his income or produce enough feed for the family (James and Ellis, 1980).

Worman *et al* (1992) maintain that there are two ways to improve the productivity of farming families:

- The development of relevant improved technologies by research and their dissemination via extension.
- The development of relevant policies and support systems by planning and their implementation by extension (Worman *et al.*, 1992).

Through increasing the productivity of farmers, it is hoped that their incomes and standard of living will improve. Farmers, with the help of the extension workers, are actually responsible for improving the productivity of their farming systems (Worman *et al*., 1989) Therefore close linkages between planners, researchers, extension and development staff and farmers are very important. According to Norman (1989), in developing countries the one-way, top-down pattern as shown below (Fig 2.3) has been the most common.

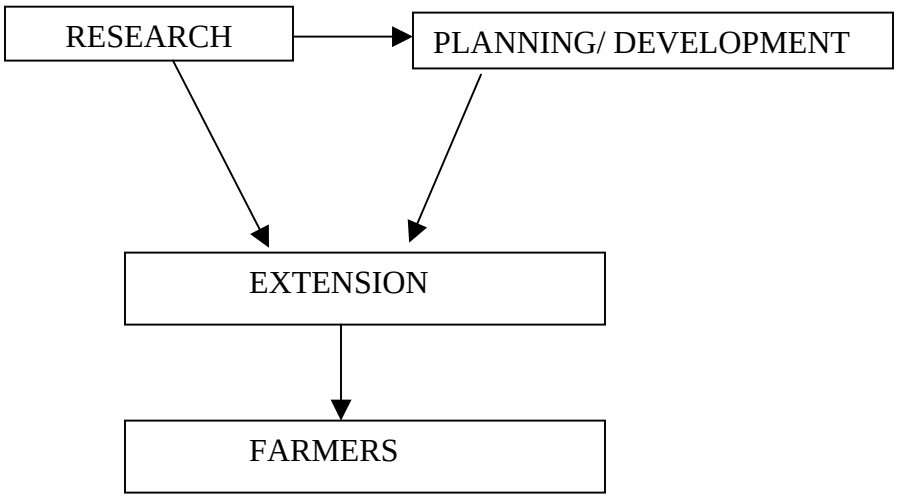


Fig 2.3: Top down extension method

2.9 Participatory research

An alternative method is using veterinary needs analysis (VNA) to first assess farmers needs. It is not static but dynamic. The interactive veterinary research evaluation method has borrowed from the techniques of qualitative and quantitative research used by sociologists,

epidemiologists and agriculturists (McCrindle *et al.*, 1996). Needs assessment is a critical factor in Farming Systems Research Extension (FSRE).

In the past, a considerable research emphasis was placed on the production of high yielding crop and livestock varieties for use in high potential areas especially urban ones. Thus most research programmes promoted improved practices that included high yielding varieties, fertilizer and improved management (Okali *et al.,* 1994).

It is now widely accepted that an alternative approach is required for poor people farming in low potential areas (Tice, 1997). This alternative approach is Participatory Rural Appraisal (PRA). In the past the lack of a structured methodology made participation costly and inefficient for developmental agencies. PRA provides a structure that brings together residents and leaders from the community, technical officers assigned to the area and non governmental organizations (NGO). Bridging the gap between intended beneficiaries and those who manage resources, introduces practices that village institutions can maintain (Etling and Smith, 1994; National Environment Secretariat, 1989).

McCrindle *et al* (1999) mention that participatory research emphasises participatory problems, identification, seeking of solutions, implementation

and evaluation. It addresses the community as whole and individual farmers as units. PRA maximises participation by gathering data in group discussions, using mostly visual instruments. It holds community meetings jointly with technical extension officers to rank options according to village priorities. According to the National Environmental Secretariat (1989) local villagers cooperate actively in each of the steps of PRA, which include:

- Site selection
- Preliminary visits by the PRA team
- Data collection
- Data synthesis and analysis
- Ranking of problems
- Ranking of opportunities
- Adopting a village resource management plan and
- Implementation of the plan
- Managerial experience for rural institutions and increase their capacity to act meaningfully on their own.
- *Action:* Participants are motivated to act.

The interactive veterinary research/evaluation model (McCrindle *et al.,* 1996), which uses the participatory approach, is shown in Fig 2.4. This method, based on participatory methods, is more practical for veterinary and paraveterinary staff, who are trained in a diagnostic, problem-solving approach.

INTERACTIVE VETERINARY RESEARCH EVALUATION MODEL

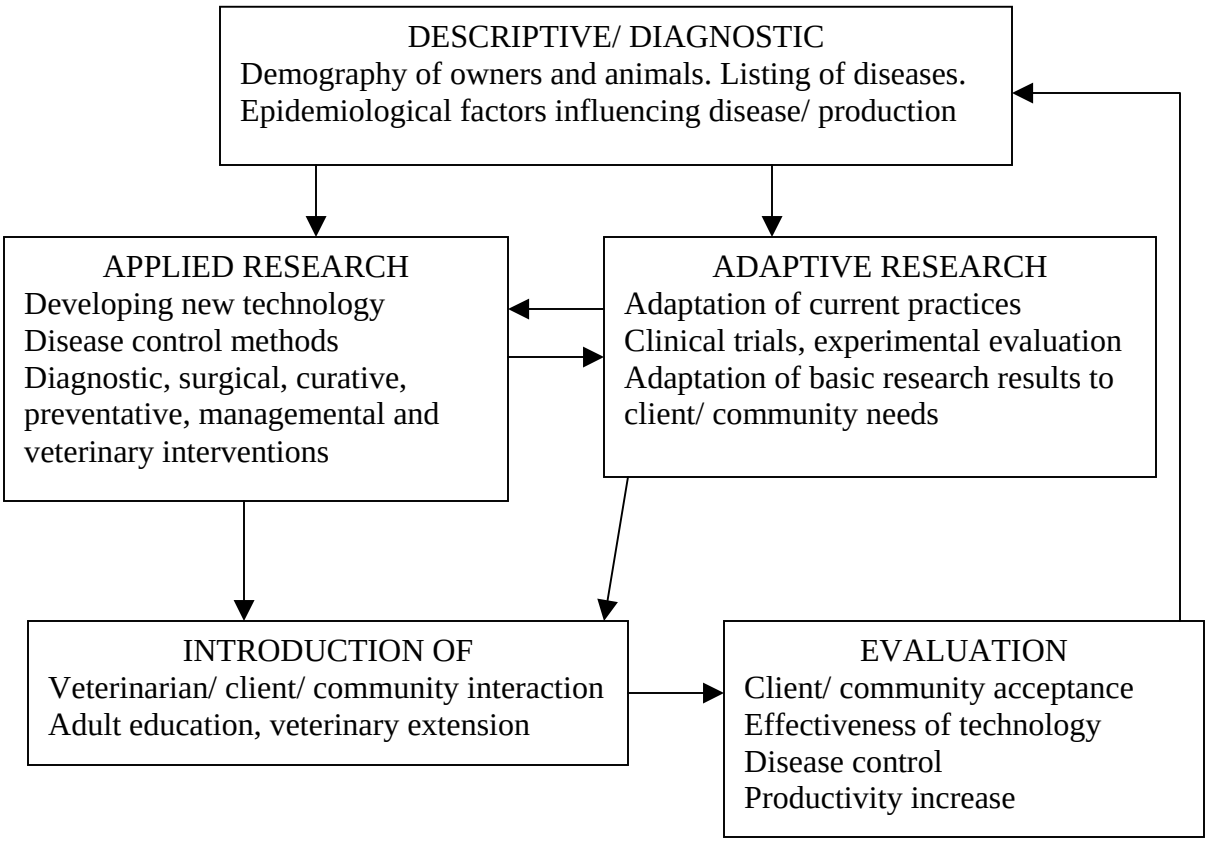


Fig 2.4: Interactive diagnostic veterinary research evaluation model (After McCrindle *et al.*, 1996)

2.10 Necropsy as a method for diagnosing causes of death

Necropsy is a technique used to examine a dead animal. It helps to identify infectious diseases and prevent their spread to other animals. In order to carry out an effective post-mortem examination, it is important that the size, colour and texture of normal organs are known, so that any abnormality can be observed and recorded (Peacock, 1996).

2.10.1 How to do a post- mortem examination (necropsy)

The post mortem (necropsy) must be done away from the owner's house and other livestock to avoid contamination. The chosen site must be away from any water supply and grazing area. A hole needs to be dug for unwanted organs and fluid (Section Veterinary Pathology, 2003).

Ideally, post-mortem examination should be carried out wearing rubber gloves and facemasks, but in the field this might be impractical. Thin plastic bags can be worn over the hands if available. Careful attention should be paid to hygiene and the person concerned should wash their hands and contaminated clothing thoroughly with soap and water as soon as possible after necropsy. If the person has cuts or scratches on their hands they should not perform necropsies without using gloves (Peacock, 1996).

2.10.2 Standard necropsy

The following suggestions for standard necropsy technique are those used for training undergraduate veterinary students of the Faculty of Veterinary Science at University of Pretoria.

- **Observe the animal.** Check the animal for any dark bloody discharge and do a blood smear to exclude Anthrax and the presence of blood parasites.
- **Identify the animal**, taking the history of the animal into consideration
- **Opening the animal**

  - Animal must be placed on the right side or laid on its back depending on preference.

  - After skinning, examination of the subcutaneous tissue, and removal of the superficial lymph nodes, the left front and left hind legs are cut from their attachment to the body and reflected

  - Thereafter an incision along the ventral midline from the sternum to the rim of the pelvis is made. The flap of the abdominal muscles must now be reflected so that the topography of the abdominal organs can be examined and the presence of abnormal abdominal contents assessed.

  - The diaphragm is then pierced with a sharp knife to assess the extent of the thoracic negative pressure

  - Open the body by cutting the ribs along the line of the backbone and along the chest and removing the ribcage.

  - The whole digestive tract is then removed by tying the top and the bottom ends with a string. The tract together with the liver and the spleen, are removed to be examined later.

- The heart is then examined for any fluid accumulation inside the outer membrane of the heart.
- Cut the top of the trachea and remove it with the lungs. The trachea is then opened to check for any foam, mucus, blood and any foreign bodies. The lungs are also checked for any colour change, consistency and foam.
- The kidneys are then checked.
- The bladder is then opened to check for haemorrhage and colour of urine.
- Cut the spleen from the rumen and palpate it thoroughly for the presence of lesions, abnormality in size and the edges inspected for sharpness.
- Inspect the liver by examining the capsular surface, attachment of the gall bladder and the main bile ducts. A number of incisions are then made across the large bile ducts and into the parenchyma. Slight pressure should be applied to the capsular surface to express any parasites that may be within the bile ducts. The bile ducts and the gall bladder are then opened to check the mucosa.
- All the compartments of the forestomachs should be examined carefully and the ruminal pH taken. The mucosa is then checked. Any toxicological sample should be taken at this stage.
- After examination of the mesenteric vessels for the presence of parasites and the rest of the mesentry and the lymph nodes, it

should be cut from the intestines as close to the intestinal wall as possible to facilitate opening the intestines along its entire length. The entire mucosal surface must be inspected for the presence of lesions or parasites.

- The head and the spinal column is the last to be examined. After severing the head from the vertebral column, the brain is removed. The brain is checked for consistency, any accumulation of fluid and any lesions. A brain smear is also made at this point to exclude or confirm *Cowdria ruminantium.* If there is an indication from the history that there may be lesions in the central nervous system, the brain and the spinal cord should be fixed in formalin.

- **Taking samples during a post mortem**

Any organ found not to be normal should be preserved as a sample and taken to a laboratory for further investigation. Samples can be preserved in 10% formalin or frozen. The samples should be clearly labeled (Department of Pathology, 2000).

CHAPTER 3

MATERIALS AND METHODS

3.1 Model system

Cattle farmers in Odi district were selected for the survey. Odi district is accessible to academic institutions, like the University of Pretoria and often researchers do research in this area and do not come back to farmers with feedback. Because of this, some farmers are no longer willing to participate in research projects. Only willing farmers were consequently selected.

3.2 Experimental design and procedure

Two-stage cluster sampling (Thrusfield, 1995) was done where villages were the primary units and the farmers were the secondary units. Twelve villages were randomly selected from the 55 villages in Odi District. Non-random selection criteria (purposive selection) was done according to Dargatz and Hill (1996) to select farmers using the following criteria:

- Only farmers with cattle were selected
- Farmers had to show a willingness to participate
- A minimum of two farmers were selected from each of the 12 villages

3.3 Selection of areas

Twelve villages were selected. A Geographical Positioning System (GPS) was used to locate the farms. The location of the farms and the names of the villages are shown in Table 3.1.

Table 3.1: GPS location of farms

Name of village	Name of farm	Farm no	Geographical location
Sephai	Roodekuil	179 JQ	27° 50′ 00 E, 25 15 00 S
Bethanie	Bethanie	405 JQ	27° 37′ 00 E, 25 34 00 S
Rietgat	Rietgat	224 JQ	27° 50′ 00 E, 25 25 00 S
Modikwe	Waaikraal	396 JQ	27° 35′ 00 E, 25 33 00 S
Bapong	Modderspruit	458 JQ	27° 41′ 00 E, 25 43 00 S
Boschpoort	Boschpoort	288 JQ	27° 29′ 00 E, 25 31 00 S
Winterveld	Winterveld	101 JR	27° 59′ 00 E, 25 24 00 S
Rabokala	Oskraal	248 JQ	27° 55′ 00 E, 25 30 00 S
Hebron	Mamogales-kraal	258 JR	28°00′ 00 E, 25 36 00 S
Legonyane	Elandsfontein	180 JQ	27° 47′ 00 E, 25 17 00 S
Maboloka	Klipgat	243 JQ	27° 53′ 00 E, 25 26 00 S
Mmakau	Elandsfontein	432 JQ	25° 27′ 00 E, 25 36 00 S

3.4 Number of farmers selected per village

The following numbers of farmers were selected from each of the villages:

- Sephai: 6 farmers
- Bethanie: 8 farmers
- Rietgat: 3 farmers
- Modikwe: 4 farmers

- Bapong: 7 farmers
- Boschpoort: 3 farmers
- Winterveldt: 6 farmers
- Rabokala: 5 farmers
- Hebron: 5 farmers
- Legonyane: 6 farmers
- Maboloka: 5 farmers
- Mmakau: 2 farmers (1)

Total number of farmers: 60. One of the farmers at Mmakau could no longer participate and was eliminated from the trial.

3.5 Population

Most of the people in Odi district, which was formerly part of the homeland known as Bophuthatswana, speak the Setswana language, although other languages like Zulu, Xitsonga, Xhosa, Northern Sotho, Southern Sotho, Venda also exist in this area. It was estimated by Malan and Hatting (1975) that 50% of the population live in Mabopane and Ga-Rankuwa, which are urban areas and the rest of the population was living in peri-urban and rural areas. Most of the rural areas are poorly developed and lack infrastructure such as electricity, telecommunications, transport and water (Pistorius and Gumbi, 1997). The communities still maintain their traditional heritage, norms and values, which can be noticed from the way

in which people co-operate with the chief and the headman (McCrindle *et al.*, 1994).

3.6 Interviews

A structured interview is a structured procedure with scientific purpose by means of which the respondent, through a series of questions, is induced to give verbal information (Pfeiffer, 1996; Simpson and Wright, 1988).

The following rules (Miller, 1991) should be used to read questions during structured interviews:

- Read questions exactly as worded in the questionnaire
- Read each question slowly
- Use correct intonation and emphasis
- Ask questions in the order they are presented in the questionnaire
- Ask every question that applies to the respondent
- Repeat in full questions that are misheard or misunderstood
- Use only allowable probes
- Read all linking and transitional statements exactly as printed on the questionnaire
- Do not add apologies or explanations for questions unless they are printed in the questionnaire

During the recording of answers, the interviewer should use the following rules (Amstrong *et al.,* 1*992*):

- Make sure you understand each response
- Make sure each response is adequate
- Do not answer for the respondent
- Record all responses
- Begin writing as soon as the respondent starts talking
- Use the respondent's own words
- Include everything pertaining to the objectives of the question
- Note in the questionnaire the nature of important probes
- Do not erase anything

Structured interviews were conducted with the 59 farmers. They were done with each farmer at their places of residence for convenience sake because most of them did not have transport. The questionnaire that was used is attached as Appendix 2.

3.7. **Observation and analysis**

Data obtained from the questionnaire was typed into the software programme Microsoft Excel ® and analysed using simple observational (qualitative) statistical methods. Results are reflected as Tables, Histograms and Pie charts (Chapter 4).

3.8 Group work and evaluation of knowledge

After the structured interviews, which were done in small groups with farmers, data was analysed to design a skills training day in necropsy techniques for these farmers. All farmers in the study participated (n=59) in the training day. At the beginning of the day, all farmers were questioned on their level of knowledge of cattle organs, using pictures. Following this, farmers attended a short visual presentation on the anatomy of cattle, and then visited the Anatomy museum at the Faculty of Veterinary Science, to see the skeleton and organs of cattle. After a question and discussion session, a necropsy on a calf was demonstrated. This necropsy has been recorded for future extension on the CD-ROM attached to this dissertation. A print-out is attached to Appendix 3. Farmers were then provided with protective clothing and plastic gloves and groups were given abattoir specimens to examine and cut up. Following a second question and discussion period, all farmers were re-examined on their level of knowledge of cattle organs.

A flow diagram of the process is given in Chapter 4 (Fig 4.3)

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Respondents

During the survey, structured interviews were done and it was found that although 60 farmers were originally included in the survey, one dropped out before the interview. Groups of farmers from an area were interviewed on one day. Of the respondents (n=59), 55 were men and only four were women.

The fact that only four women were involved may be due to the fact that women are not interested in large animals like cattle, they are more interested in small animals like goats and sheep and chickens (Maree and Casey, 1993). In the communal system, there is still complete dominance by male farmers. In comparison with Nthakheni (1993) where 14% (n=57) of the female farmers were widows, in this study only one person (1,69%) was a widow.

The ages of farmers ranged from 20 to 89 years old with 25 farmers in the range of 50 and 69 years (Fig 4.1). This was probably because young

people are not interested in farming and the old ones take up farming after taking packages from their work place and buy cattle as a form of security and investment of savings. The older the farmer, the more forgetful they become. They do not keep records and tire easily and this impacts on their management, which then becomes poor and affects the productivity of their animals. Because of their advanced age, sometimes they cannot walk long distances to Service Centres to report sick and dead animals.

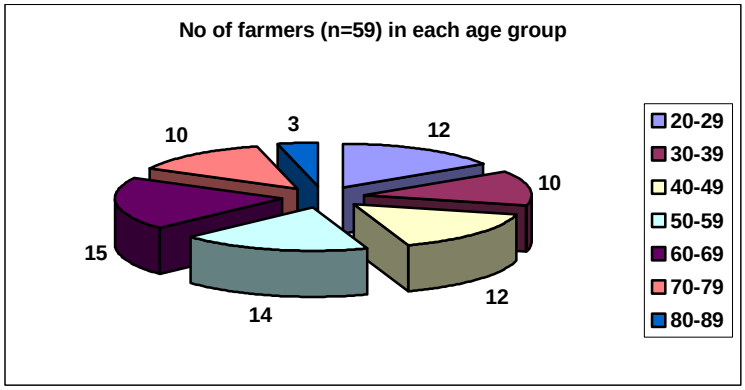


Fig 4.1: Ages of farmers in years (n=59)

4.2 Education level

The education level of the respondents varied, 21 of them (35%) went to high school, 19 (31%) of them went as far as primary school, 8 (16%) of them completed matric, 5 (8%) went to a tertiary institution and only six of them (10%) did not attend school at all (See Table 4.1)

Table 4.1: Education levels of participants

Education level	No. of participants
None	6
Primary school	19
High school	21
Matric	8
Tertiary institution	5
Total	**59**

The high level of education of the participants was important in understanding the extension material used. Because most of them had some form of schooling and could read and write, it was easier to impart the knowledge and skills on how to perform a post-mortem examination and recognize organs of cattle.

4.3 The main source of income of participants

Respondent`s main source of income was from full-time farming (n=25), pension (n=20) and salary of family member (n=20). Only four had other businesses.

Farmers regard cattle as a form of saving and security. That is why they keep cattle and get money by selling them for funerals and weddings. Men get social grants like pensions from the age of 65 and women from 60 and most farmers fall within this age group range, so pension money is the other source of income for them. Besides farming, others were helped by their family members who were working elsewhere. Sebei (2003) showed

that communal goats were a valid type of savings as the return (interest) on capital, when goats were managed in the traditional way, was comparable to the interest received from commercial banks. It is possible that the same situation exists for traditional cattle farming.

Cattle were mainly cared for by the owners (n= 41,69%), while 17% (n= 10) were looked after by herdsmen, 12% (n=7) by children and only 2% (n=1) by the wife of the owner.

More than half of the participants looked after their own animals as they were not working or were on pension. Those who were working, employed herdsmen to look after their animals. These herdsmen were also responsible for taking the cattle for vaccination during campaigns and reporting any sick cattle to the owner. Sometimes sick or dead animals are not reported in time to the state veterinarian as the owners work far from home and only see the animals over the weekend. Other members of the family also look after the animals.

4.4 Herd size

Respondents (n=59) kept a total of 1699 cattle. The highest number of cattle kept by one farmer was 99 and the lowest was three (Table 4.2).

4.4.1 Definitions of terminology

For this study, we have defined the cattle age groups as follows:

- Bulls are male cattle over two years of age
- Cows are female cattle over two years of age
- Heifers are female cattle from 12 months up to 24 months
- Bullocks are male cattle from 12 months up to 24 months
- Oxen are castrated male cattle above two years
- Calves are young male and female cattle less than one year

Table 4.2: Distribution of cattle owned by age and gender

Age/ gender	Number*	Actual number**
Bulls	38	45
Cows	686	700
Heifers	475	489
Bullocks	97	105
Oxen	46	47
Calves	357	376
Total	**1699**	**1762**

* Number estimated by farmers during the interview

** Number counted by AHT during census

The number of cattle reported by farmers and the actual number of cattle according to census figures, are shown in Table 4.2. It may be noted that the two figures do not correspond. Cattle were not counted during the structured interviews, but farmers reported the number of cattle they had. Some farmers were reluctant to give the correct number of cattle they had,

especially those with more than 50 cattle. Some farmers were not sure of how many cattle they had.

The reasons for not reporting the correct number of cattle were established during the farm visits. These reasons were similar to those recorded by Mokantla (2003), which were:

- Age: Most farmers were old and forgetful.
- Fear: Farmers still associate stock counting with forced removals and stock reduction to control stock density and overgrazing.
- Education: Those with low education level could not count
- Receiver of Revenue: Farmers with many cattle thought that they will be reported to the Receiver of Revenue and pay tax.
- Lack of record keeping: Farmers do not keep records of their livestock.

4.5 Herd composition

4.5.1 Bulls

Bulls represent 2.23% of the cattle in the herds. It was found that 52.54% (n=31) of respondents did not have bulls, 33.90% (n=20) kept one bull, while10.17% (n=6) had two bulls and 3.39% (n=2) had three bulls.

A bull to cow ratio of 1:25 is recommended by Babi (1997). The bull to cow ratio in this total herd was 1:18, which is acceptable. In this study, 27 bulls would be required for 686 cows. This compares well with the bull to cow ratio of 1: 19 recorded by Mokantla (2003), even if the number of participants in his study were 14 compared to the 59 of this study.

Cattle were kept on communal land, as the farmers did not own land. It was found that more than half of the participants did not own bulls and were relying on other farmer's bulls as they graze and drink together. There was also a tendency by individuals to keep more bulls, as they were not castrating bull calves.

In this study bullocks comprised 5.7% of the total herd population. Farmers kept bullocks for security reasons. When there was a need for money, they sold them for weddings and funerals. Only those with potential for breeding purposes were kept as bulls.

Oxen comprised 2.7% of the total herd population. This was comparable to the 3.4% recorded by Nthakheni (1993) in communal areas. Keeping oxen in a herd is of no value to the farmer, as these will not produce any calves. The farmer also loses money by not selling them and they are also fed in the meantime, which is a waste.

4.5.2 Cows

It was found that cows comprised 40.37% of the total herd population. Van de Moosdijk and Schifelli (2002) also recorded a cow population of 42.2% and 42,5% for Odi and Moretele respectively. The number of animals was not counted during their study, the farmers estimated them during the interview. Some farmers did not know the ages of their cattle and this brought confusion in recording the actual number of cows and heifers. During farm visits, it was observed that farmers kept old cows instead of culling them.

4.5.3 Heifers

In this study, heifers comprised 27.96% of the herds. These findings were a little bit higher than the 19.5% recorded by Nthakheni (1993) in communal areas.

4.5.4 Calves

Calves are young cattle less than one year of age. It was found that calves comprised 21% of the herds. This figure was higher than 14.9% and 7.75% recorded by Mokantla (2003) and Nthakheni (1993) respectively.

4.6 Type of breed and total number of cattle

The breeds of cattle and numbers of each breed are shown in Fig 4.2.

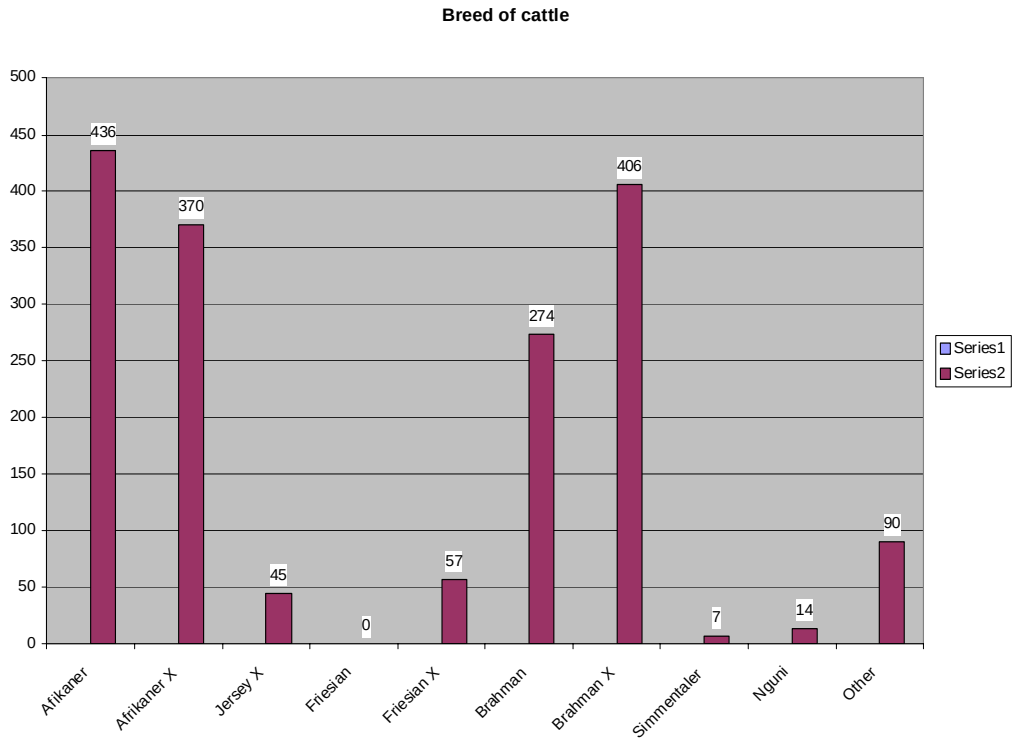


Fig 4.2: Distribution of cattle by breed.

Farmers prefer a resistant type of breed that does not get sick or die easily because they farm extensively. The Afrikander and Brahman breeds are resistant to most diseases, that is why they were the preferred breeds. The main breed kept was Afrikander (n=436) and the Brahman crossbred (n=406) as seen in Fig 4.2. The cross-bred Afrikander/ Brahman breed has the advantage that calves grow faster and have a better slaughter percentage than purebred Afrikander cattle.

4.7 Mortality of cattle

According to the results of interviews with farmers over a period of 12 months (from September 2000 to September 2001), the total percentage of cattle that died was 4,47% (n=76). The accepted percentage is 5%. The total percentage of 4.47% in this study was comparable to that recorded by Mokantla (2003) of 4.91%.

Table 4.3: Cattle that died from Sept 2000- Sept 2001 as a proportion of cattle surviving in Sept 2001

	Number of cattle	Number of cattle that died	% Mortality
Bulls	38	2	5,26
Cows	686	33	4,81
Heifers	475	13	2,74
Bullocks	97	2	2,06
Oxen	46	0	0
Calves	357	26	7,28
Total	**1699**	**76**	**4.47**

It was noted from Table 4.3 that the highest percentage mortality (7.28%) was in calves and the lowest was in oxen. The causes of death in calves were unknown and they were possibly dying due to poor management and infectious diseases. In a study done by Christensen and Svensmark (1997) in determining the causes of death in preweaning pigs, it was found that the farmers were willing to participate in the survey because they wanted to prevent the diseases. It was found at necropsy that the

predominant preweaning mortality causes at post-mortem pigs were trauma, starvation, unknown, ill-thrift and diarrhoea.

In a study done in Kenya (Mulei *et al*., 1995), it was found that calves were dying within the first two months of life due to lower immunity and inadequate intake of colostrum. The calves were dying mainly from malnutrition, collibacillosis and pneumonia.

4.8 Causes of death

Tables 4.4 and 4.5 show the causes of death as indicated by farmers during the initial structured interviews over a period of 12 months. These are the results of the cattle that died during the study (n=76).

4.8.1 Death caused by infectious diseases

The mortality resulting from infectious diseases is shown in Table 4.4. These are the results from the structured interviews.

Table 4.4: Infectious causes of mortality in cattle that died (n=11) during 2001 (Total cattle n=1699)

Diseases	Number of cattle that died
Lumpyskin disease	6
Heartwater	2
Sweating sickness	1
Blackquarter	1
Anaplasmosis	1

It was found that the mortalities in cattle caused by infectious diseases from the survey were lumpy skin disease, heartwater, sweating sickness, blackquarter and anaplasmosis (Table 4.4). Meltzer *et al* (1996) reported that 51% of all mortalities in Zimbabwe were due to heartwater.

4.8.2 Non-infectious causes of death

The mortality of cattle from other causes is shown in Table 4.5 below. It should be noted that the cause of death was unknown in 56% (n=43) of cases.

Table 4.5: Non infectious causes of mortality in cattle that died (n=65) during 2001(Total cattle n=1699)

Causes of death	Cattle mortality (n=)
Unknown	43
Dystocia	10
Plastic bags	6
Diarrhoea	2
Hairball	1
Snake bite	1
Fractured leg	1
Motor vehicle accident	1

Non infectious causes of death included dystocia, plastic bags, diarrhoea, hairballs, snake bite, motor vehicle accidents and unknown causes as may be seen in Table 4.5 and Table 4.13.

Most of these diseases can be prevented before mortalities occur (Table 4.6).

Table 4.6: Control of diseases

Disease	Prevention
Heartwater	Vaccination and tick control
Anaplasmosis	Vaccination and tick control
Lumpy skin disease	Vaccination
Blackquarter	Vaccination
Sweating sickness	Tick control
Malnutrition	Proper feeding

Having good management practices could prevent other causes of death like plastic bags, hairball, diarrhoea and motor vehicle accidents. Good farm management like not throwing plastic bags all over the place, buying quality feed to avoid pica and fencing off the camps to avoid animals wondering around next to the road and being hit by vehicles.

4.9 Reasons for not reporting the dead animals

Farmers were asked why they failed to report cattle deaths to the State Veterinarian, AHT or Extension Officer. Their responses are shown in Table 4.7

Table 4.7: Reasons given by farmers (n=59) for not reporting dead animals (Farmers could give more than one reason)

	Always		Sometimes		Never	
	N=	%	N=	%	N=	%
No cell phone	10	16.95	2	3.39	47	79.66
Vet is not in office	3	5.08	7	11.86	49	83.05
I work in town	2	3.39	1	1.69	56	94.92
No telephone at home	11	18.64	2	3.39	46	77.97
No transport	10	16.95	9	15.25	40	67.80
Carcass is eaten	5	8.47	11	18.64	43	72.88
Not interested	13	22.03	8	13.56	38	64.41
Not his business	7	11.86	6	10.17	46	77.97
What can the Vet do?	9	15.25	5	8.47	45	76.27
No idea of reporting	23	39	0	0	36	61

Possible constraints for not reporting diseases were listed in the questionnaire and farmers were allowed to give more than one reason and these were rated from always, sometimes to never. The most important constraint seen from Table 4.7 was of not having any idea that they should report the dead animals to the State Veterinarian, AHT and Extension Officers. It is important to report dead animals to the state to be able to identify the disease and control it especially in cases of infectious diseases that spread quickly and causes economic losses to the farmers. Almost a third of the participants did not know that they should report dead cattle.

Communication has a vital role to play in any agricultural and rural development situation. Ideally the flow of information between the farmer,

extension and research should be developed to an optimum degree. If the potential for improvement is to be realized, lack of communication must be addressed (Steyn, 1982). From the questionnaire it was found that lack of communication, that is, having no cellular phone and no telephone at home were not major constraints to reporting mortalities as shown by 79,66% (n=47) and 77,97% (n=46) respondents respectively (Table 4.7).

Veterinarians and technicians should always be available for farmers to report dead animals. The possible constraint of veterinarian not being in office and what can the vet do, were not a major reason for not reporting as was seen by 83,05% of respondents answering that is not the problem.

Transport can be an impeding factor in reporting diseases and mortalities. Most areas in Odi are rural and farmers are old and do not have access to transport. Some of the service centres are very far from the farmers and the only mode of transport that they use are busses. The buses run infrequently and the time schedule is not always convenient for the farmers. (Stewart, 1996). Only 16% (n=10) of the respondents agreed that this was always the problem and 67.8% said that this was never the problem.

Odi district consists of villages and most farmers work in surrounding towns like Pretoria, Johannesburg and Brits. The animal owners who are

decision-makers regarding animal keeping and husbandry are absent during the weekdays and this leaves the herdsman stranded with decisions to make during this period (Letsoalo *et al*., 2000). It can be seen from Table 4.7 that this was also not a major reason for not reporting as shown by 94,92% (n=2) of respondents.

Table 4.8: Ranking of constraints in order of importance

Constraints	N=	Rank order
No idea of reporting (a)	23	1
Not interested (b)	13	2
No telephone at home (c)	11	3
No cellphone (d)	10	4
No transport (e)	10	4
What can the Vet do? (f)	9	5
Not his business (g)	7	6
Carcass is eaten (h)	5	7
Vet is not in office (i)	3	8
I work in town (j)	2	9

Constraints (a), (b), (f) and (g) can be addressed by motivating farmers through extension that explains the benefits for them in knowing the causes of diseases. Constraints (c), (d), (e), (h) and (i) can be addressed by the farmer doing a necropsy when he finds the carcass and reporting back to the veterinarian who can give some idea of the possible causes of death and what to do about it. This also addresses the time constraint that the cadaver decays or is eaten before the veterinarian can get there.

4.10 The fate of meat from dead animals

Farmers (n=59) were asked what they did with the carcasses of animals that died and their responses are shown below in Table 4.9

Table 4.9: The fate of meat from dead animals

Reasons	Always (n-59)	Never (n=59)
People eat them	3	56
Dogs eat them	44	15
They rot away in the veld	22	37
Bury them	26	33
Burn them	21	38
People sell the meat	3	56

Proper disposal of carcasses is important both to prevent livestock disease transmission, and to protect air and water quality. The chosen method must be environmental friendly. The carcass must be disposed off as soon as possible. In Manitoba, Canada, if a carcass is not disposed off in 48 hours, it must be refrigerated or frozen (Manitoba Agriculture, 2000).

According to the Minnesota Board of Animal Health and, the legal methods of disposal are

- Burial
- Composting
- Incineration
- Burning
- Rendering

These methods of carcass disposal are regulated by policies of that country which are: Minnesota Statutes 35.82, Minnesota Board of Animal Health Rules, Minnesota Pollution Control Agency Rules and Minnesota Department of Natural Resources Rules (Hartman, 1996).

In communal areas, most people are poor, and they do not dispose of the meat as quickly as they should and they depend on the protein of the meat for survival. In this study, however,it was found that only three people ate the meat of the dead animals.

Most farmers own dogs and they feed them mainly on left over food from the table, so when any livestock dies, they (n=44) cook the meat for the dogs. This is probably not a bad way of getting rid of the carcass if the animal died of a motor vehicle accident, babesiosis, anaplasmosis or heartwater as cooking would probably make the meat safe. However, it would be dangerous in the case of a disease like rabies or anthrax, which are zoonoses.

Burying carcasses prevents spread of infectious diseases and agents like spores in the case of anthrax. The carcass should be buried deep enough to prevent dogs and scavengers from recovering the carcass. These methods were used by 26 and 21 farmers who buried and burned dead animals respectively.

4.11 Evaluation on knowledge on post mortem examination

Farmers were asked whether they were able to perform a necropsy examination or not. It was found that most of them (n=52) did not know about necropsies and that they could be used to diagnose the cause of death (Table 4.10). They were also not aware that veterinarians were able to do a necropsy to determine the cause of death or that samples could be taken from the organs of dead animals. In a study done by Hans *et al* (1999) in Mali, it was found that performing post mortems on carcasses was a way to determine the causes of mortality in calves, which was high (20%).

Skills training has been targetted by the Skills Training Act (www.labour.gov.za) in South Africa, as a method of job creation and empowerment. In terms of this, it is not enough to merely give theoretical knowledge; skills must be linked to the occupation. After analysis of the questionnaires it was seen that farmers had no knowledge of necropsy methods. The other constraints such as availability of the state veterinarian to do necropsies on the farm were not affordable or practical. It was seen that skills training would be required to remedy the farmer's lack of knowledge of the cause of death, so they could discuss this with the state veterinarian on the telephone.

Table 4.10: Knowledge of farmers about use of post mortem examination of cattle that died

Know about PM*	Percentage
Yes	22.03
No	71.19
Did not know	6.78

*PM= necropsy of dead animals to find out cause of death

4.12 Evaluation of questionnaire and development of teaching material

After the questionnaire was statically evaluated, a participatory strategy was followed to assess the way forward. Farmer's opinions were gathered and it was decided to hold an information day to increase the knowledge of causes of death of cattle. It was found that 84.75% of farmers were in favour of learning how to do a necropsy

In discussion with the Sections, Veterinary Pathology and Veterinary Public Health at the Veterinary Faculty a skills training workshop was designed. A CD-Rom was prepared (attached as Appendix 3). A trial run was done with ten volunteers and the teaching materials were refined.

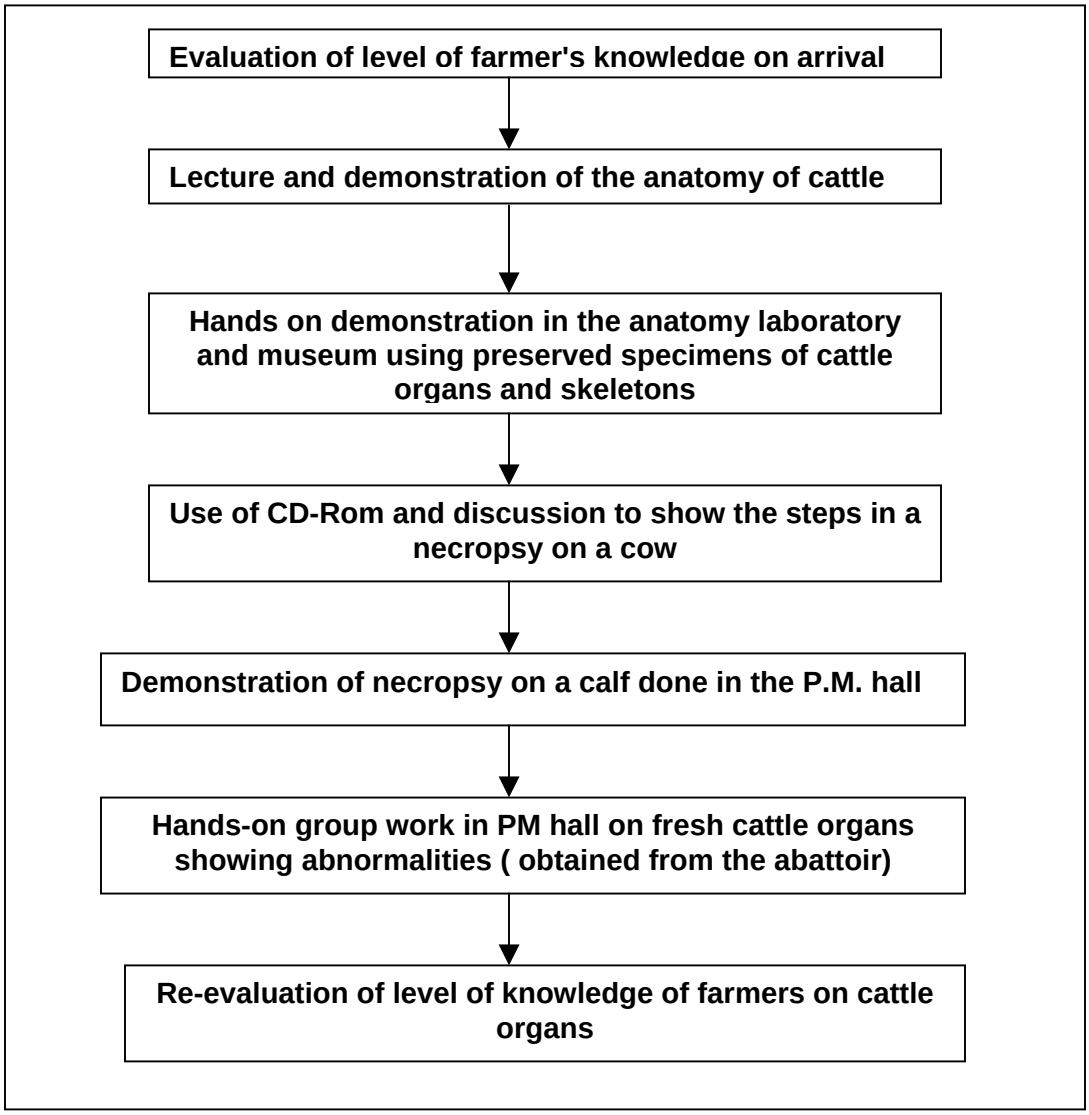


Figure 4.3: Diagram showing the programme followed during the workshop.

The programme for the workshop is shown in Figure 4.3. Sixty farmers attended the workshop (59 from the trial and one farmer who used his car to transport other farmers).

Farmers were first evaluated on their knowledge of recognizing normal and abnormal organs before the skills training. Skills training was later done during the farmer's day held at the University of Pretoria on how to recognize normal and abnormal organs, a full demonstration of how a necropsy was performed and a hands-on session using organs obtained from the abattoir. A second evaluation was done immediately after this training to assess whether the farmers could now recognize and name the organs of cattle.

Photographs taken during the workshop are shown in Plates 4.1 to 4.2

Plate 4.1 Farmers being shown how the organs fit into the skeleton of a cow

Plate 4.2 Demonstration of a necropsy on a calf

A sheet of paper was used and farmers were asked to write the names of five organs below photographs of the organs at the beginning and end of the skills training. The papers were marked, allocating one mark for each correct answer. The most difficult part of the exercise was to actively supervise and prevent the farmer's copying each other's answers.

Table 4.11 shows the level of knowledge of farmers before and after training. Fifty-nine farmers were from the project and one of the drivers, who was a cattle farmer, asked to be involved. It was decided to evaluate him as well.

Table 4.11: Knowledge of farmers before and after training (n=60)

Organs correctly identified (n=)*	Before training (n=)	After training (n=)
Zero	2	0
One	14	1
Two	26	2
Three	12	5
Four	4	10
All organs	2	42

* Organs were, brain, liver, kidney, lungs and the heart.

Table 4.12 shows the correct identification of organs before and after training.

Table 4.12: Correct identification of different organs before and after training

Organ correctly identified	Before (n=)	After(n=)
Brain	23	52
Liver	27	57
Kidneys	11	52
Lungs	7	53
Heart	54	58

It may be seen from Tables 4.11 and 4.12 that there was a very significant improvement in the farmer's ability to identify organs correctly, although a small percentage (9%) of farmers still had a problem.

4.13 Checklist developed for the farmers

Fig 4.4 shows the checklist developed for the farmers to use. The farmers were trained how to use the checklist during the skills training. Over the course of the next 12 months, farmers were supposed to use the checklist as help in describing the lesions found in different organs after animals died.

It was found in practice, that although some farmers used the checklist to write in their findings when their animals died, others just remembered and were able to describe the changes in the organs.

CHECKLIST FOR NECROPSY

Name of owner **Date the animal died**

Age of animal **Gender of animal: Bull/ Cow/ Ox**

Any symptoms you saw before it died

Organ	Comments	Normal	Abnormal
Out side of animal			
Colour of carcass and muscles			
Condition score			
Teeth			
Look at abdominal cavity			
Bladder and reproductive organs. Is the cow pregnant? What colour is the urine?			
Spleen: size and colour			
Rumen surfaces and ingesta and foreign bodies			
Intestines- colour surfaces and ingesta			
Liver and gall bladder			
Chest cavity- look for fluid			
Lungs and windpipe			
Heart			
Kidneys			
Brain			

Any other things noticed

Figure 4.4: Checklist for farmers to record the appearance of organs

4.14 Causes of death for the period Jan 2001- Dec 2001

The veterinarian or AHTs visited farmers once a month for recording of mortalities. The total number of animals that were reported from January 2001 to December 2001, with the presumed cause of death, are shown below in Table 4.13.

Table 4.13: Number of dead animals and the causes of death

Month	Mortalities (n=)	Cause of death
January	4 2	Tulp poisoning Lumpy skin disease
February	1 3	Blackquarter Lumpy skin disease
March	0	
April	3	Motor vehicle accident
May	0	
June	5 1	Pneumonia Unknown
July	1 3	Diarrhoea Malnutrition
August	4	Downer cow syndrome
September	2 1 2 1 1 5	Anaplasmosis Heartwater Plastic bag Dystocia Malnutrition Downer cow syndrome
October	2 4 2	Downer Malnutrition Unknown
November	5	Malnutrition
December	2 3	Heartwater Malnutrition
Total	56	

Three of the owners had passed away during the year and their wives decided to sell the cattle, as they could not look after them. These farmers were very old. From Table 4.13 it can be seen that few unknown causes were reported, unlike before the skills training as may be seen in Table 4.5, where 43 cases were of unknown causes. Farmers were able to record the changes seen in dead animals and those who could not write explained the organ changes to the technician.

REFERENCES

1. Acocks J P H 1975 *Veld types of South Africa with accompanying veld type map*. 2nd Edition. Botanical Research Institute, Department of Agricultural Technical Services, South Africa: 44-48
2. Acres S D 1985 Enterotoxigenic *Escherichia coli* infections in newborn calves: a review. *Journal of Dairy Science* 68: 229-256
3. Ajayi S A,Wilson A J and Campbell R S F 1978 Experimental bovine anaplasmosis: clinicopathological and nutritional studies. *Research in Veterinary Science* 25: 76-81
4. Allan E M, Gibbs H A, Wiseman A, Selman I E 1985 Sequential lesions of experimental bovine pleuropnemonic pasteurellosis. *The Veterinary Record* 117: 438-442
5. Armstrong B K, White E and Saracci R 1992 *Principles of exposure measurement in epidemiology*. Monographs in Epidemiology and Biostatistics No 21. Oxford: Oxford University Press
6. Babi F 1997 *Rural and commercial beef cattle production in the Northern Province.* MSc Thesis. University of Pretoria: 24-27
7. Balows A, Hausler W J, Ohashi M and Turano A 1988. *Laboratory Diagnosis of Infectious Diseases: Principles and Practices.* Vol 1. Springer-verlag, New York/ Berlin/ Heidelberg/ London/ Paris/ Tokyo: 57,111,193, 202, 205, 217
8. Barnard B J H, Munz E, Dumbell K and Prozesky L 1994 Lumpy skin disease. In Coetzer J A W, Thomson G R, Tustin R (Eds) *Infectious*

Diseases of Livestock with special reference to Southern Africa Vol. 1. Oxford University Press, Cape Town: 604-611

10. Bateman K G, Martin S.W, Shewen P E, Menzies P I 1990. An evaluation of an antimicrobial therapy for undifferentiated bovine respiratory diseases. *Canadian Veterinary Journal* 31: 689-697
11. Bembridge T and Tapson D 1993 Communal livestock systems. In Maree C and Casey N H (Eds) *Livestock Production Systems, Principles and Practices.* Agri Development Foundation, Brooklyn, Pretoria: 361-373
12. Bezuidenhout J D 1987 Natural transmission of heartwater. *Onderstepoort Journal of Veterinary Research* 54: 349-351
13. Bezuidehout J D, Prozesky L, du Plessis J L, van Amstel S R 1994 *Heartwater.* In Coetzer J A W, Thomson G R, Tustin R (eds) *Infectious Diseases of Livestock with special reference to Southern Africa* Vol. 1. Oxford University Press, Cape Town: 351-370
14. Blood D C, Radostits O M, Henderson J A (eds) 1983 *Metabolic diseases*. In *Veterinary Medicine.* 6th edition. London, Ballier Tindall: 970-973
15. Bonsma J C 1944. Hereditary heartwater-resistant characters in cattle. *Farming in South Africa*. Tafelberg: 19, 71
16. Botha C A J 1999 Culture and Development. In Botha C A J (Ed) *Human Aspects of Development towards inclusive participatory development*. University of Pretoria: 25-38
17. Bradford P 1996 *Large Animal Internal Medicine*, 2nd Edition. Don Ledig, St Louis Missouri: 938-939, 1049-1050

18. Braker M J E 2001 The analysis of subsistence farming systems and the influence of the commercialization of goats on these systems in South Africa. *MSc Thesis*. Wagenin University

19. Brown K K, Parizek R E, Stewart R C 1976 Prevention of clostridial disease in cattle and sheep by vaccination with a multivalent bacterin toxoid. *Veterinary Medicine/ Small Animal Clinician* 71:1717-1721

20. Bruckner G K, Hurter L R,Boschoff J N 1978 Field observation on the occurrence of rabies in cattle in the magisterial district of Soutpansberg and Messina*. Journal of the South African Veterinary Association* 49: 33- 36

21. Burger D 1998 The South African Yearbook. Government Communication and Information System (GCIS), Private Bag X745, Pretoria, 0001: 83

22. Cameroon A 1982 Active Surveillance for Livestock Diseases-*Practical techniques for developing countries*. Australian Centre for International Agricultural Research: 1-3

23. Carstens N W 1971 *`n Ekonomiese ontleding van boerdery in die noordelike vleisbeesstreke van Suidwes-AfriKa*, No 76. Department Landbou- Ekonomie en Bemarking, Pretoria

24. Carter G R 1967 Pasteurellosis-*Pasteurella multocida* and *Pasteurella haemolytica*. *Advances in Veterinary Science* 11: 321-379

25. Chizoda C B, Matita G and Kamwendo S P 1996 Health and production problems of importance of village livestock in Malawi and introduced control measures. In Zimmermann W, Pfeiffer D U and Zessin K H (Eds)

Primary Animal Health Activities in Southern Africa. *Proceedings of an International Seminar held in Mzuzu, Malawi, February 26 to March 8*, 1996: 90-107

26. Christensen J and Svensmark B 1997 Evaluation of producer-recorded causes of preweaning mortality in Danish sow herds. *Preventative Veterinary Medicine* 32: 155-164
27. Coetzer J A W, Thomson G R and Tustin R C (Eds) 1994 *Infectious Diseases of Livestock with special reference to Southern Africa.* Vol 1. Oxford University Press, Cape Town/ Oxford/ New York: 3-25,103-152, 227-305, 351-371, 407-431, 493-553, 642-651, 679-688
28. Coetzer J A W, Thomson G R and Tustin R C (Eds) 1994 *Infectious Diseases of Livestock with special reference to Southern Africa.* Vol 2. Oxford University Press, Cape Town/ Oxford/ New York: 1085-1103,1169-1180, 1233-1238,1262-1290, 1323-1343, 1346-1373,1385-1396, 1406-1416, 1425-1445
29. Cooper D 1988 *Working the land - A review of Agriculture in South Africa*. Environmenatal and Development Agency, P.O.Box 62054, Marshalltown, Gauteng, 2107 : 4-19
30. Cluver E 1927 Rabies in South Africa. *Journal of the Medical Association of South Africa* 1: 247-253
31. Dargatz D A and Hill G W 1996 Analysis of survey data. *Preventive Veterinary Medicine* Vol 28 No 4: 225- 237

32. Daoust P Y 1989 Morphological study of bacterial pneumonia of feedlot cattle: determination of age lesions. *Canadian Veterinary Journal* 30:155-160

33. Debnath N C, Sil B K, Selim S A, Prodhan M A M, Howlader M M R 1990 A retrospective study of calf mortality and morbidity on smallholder traditional farms in Bangladesh. *Preventive Veterinary Medicine* 9: 1-7

34. Davies F G and Otema C 1981 Relationship of capripox viruses found in Kenya with two middle eastern strains and some orthopox virus. *Research in Veterinary Science* 31: 253-255

35. De Vos A J, Potgieter F T 1983 The effect of tick control on the epidemiology of bovine babesiosis. *Onderstepoort Journal of Veterinary Research* 54: 327-329

36. De Vos A J, Potgieter F T 1994 Bovine babesiosis. In Coetzer J A W, Thomson G R, Tustin R C (Eds) *Infectious Diseases of Livestock with special reference to Southern Africa* Vol. 1. Oxford University Press, Cape Town: 278-291

37. Directorate Veterinary Services 1998 *Annual Report*: Odi District. Department of Agriculture, Conservation and Environment, Mmabatho NWP: 10-12

38. Directorate Veterinary Services 1999 *Annual Report*: Odi District. Department of Agriculture, Conservation and Environment, Mmabatho NWP: 16-17

39. Directorate Veterinary Services 2000 *Annual Report*: Odi District. Department of Agriculture, Conservation and Environment, Mmabatho NWP: 16-18

40. Directorate Veterinary Services 2001 *Annual Report*: Odi District. Department of Agriculture, Conservation and Environment, Mmabatho NWP: 17-19

41. Directorate Veterinary Services 2002 *Annual Report*: Odi District. Department of Agriculture, Conservation and Environment, Mmabatho NWP: 18-20

42. Du Plessis J L, Loock P J, Ludemann J F, 1992 Adult *Amblyomma hebraeum* and heartwater endemic stability in cattle. *Onderstepoort Journal of Veterinary Research* 59: 75-89

43. Du Plessis J L, de Waal D T and Stoltz W H 1994 A survey of the incidence and importance of the tick-borne diseases heartwater, redwater and anaplasmosis in the heartwater - endemic regions of South Africa. *Ondertepoort Journal of Veterinary Research*, 61: 295-301

44. Els H 1996 Socio-economics of animal husbandry in the rural communal areas of South Africa. *Socio-economics of Veterinary Research and Training: A Forum*, Community Service and Outreach Unit, Medunsa: 7-18

45. Emerton J 1994 How good are your dipping techniques? *Farmers Weekly,* February 11: 23

46. Etling A W and Smith R B 1994 Participatory Needs Assessment. *Journal of Farming Systems Research Extension*: 45-56

47. Garett R 1988 Protein Energy Malnutrition. *Veterinary Clinics of North America*: *Food Animal Practice* Vol. 4, No 2. 317-329

48. Giesecke W H 1998 *Rabies*. Annual report for Veterinary Services, Department of Agriculture, Conservation and Environment, Mmabatho, NWP: 12

49. Gobbins K E and Prankerd H A 1983 Communal Agiculture: A study from Mashonaland West. *Zimbabwe Agricultural Journal* 80(4): 151-158

50. Government Gazette 2002 *Communal land rights bill*. Http://www.labour.gov.za, 14 August 2002: 4-15

51. Groenewald J W and Boyazoglu P A 1980 *Animal Nutrition*. J L van Schaik (Pty) Ltd. Libri building, Church Street, Pretoria: 302

52. Guglielmone A A, Aguire D H, Spath E J A, Gaibo A B, Mangolg A J, de Rios L G 1992 Long term study of the incidence and financial loss due to cattle babesiosis in an Argentinian dairy farm. *Preventative Veterinary Medicine* 12:307-312

53. Hans L, Deplazes P, Betschart B and Bengaly S 1999 A study of calf mortality of N`Dama cattle in Mali. http://.www.sti.ch/animalh-calves.htm

54. Hartman B 1996 *Best management practices - carcass disposal*. Http://www.extension.umn.edu/administrative/disasterresponse/bmp96.html

55. Henton M M, Hunter P 1994 *Escherichia coli* infections. In Coetzer J A W, Thomson G R, Tustin R C (Eds). *Infectious Diseases of Livestock with special reference to Southern Africa*. Vol II. Oxford University Press, Cape Town / Oxford / New York: 1085-1113

56. Hjerpe C A 1983 Clinical management of respiratory diseases in feedlot cattle. *Veterinary clinics of North America*: *Large Animal Practice* 5: 119-142

57. Hungerford T G 1990. *Diseases of livestock*, 9th Edition, Lindsay Costelloe, Australia: 210, 242

58. James A D and Ellis P R 1980 *The evaluation of production and economic effects of disease*. Veterinary Epidemiology and Economics Research Unit, Department of Agriculture and Horticulture, University of Reading, Early Gate, Reading, England: 363-372

59. Janke B H, Francis D H, Collins J E, Libal M C, Zeman D H, Johnson D D and Neiger R D 1990 Attaching and effacing *Esherichia coli* infection as a cause of diarrhoea in young calves*. Journal of the American Veterinary Medical Association* 196: 877-901

60. Janovsky E 2000 First National Agricultural Markets Price Trends. *Farmer`s Weekly* June 16, 33

61. Jensen R, Peirson R E, Braddy P M, Saari D A,Lauerman L H, England J J, Keyvanfer H, Collier J R, Horton D P, Mc Clesney A E, Benitz A, Christie R M 1976 Shipping fever pneumonia in yearling feedlot dattle. *Journal of the American Veterinary Medical Association* 169: 500-506

62. Jones E W and Brock W E 1966 Bovine anaplasmosis: its diagnosis, treatment and control. *Journal of the American Veterinary Association* 119:1624-1633

63. Kiwanuka A, Stewart CG, Bryson N R, De Waal D T, Tice G A, Schoman H S, Pettey K P 1996 Participatory research and extension approach to tick control in a developing area of South Africa. *Proceedings of the 2nd International Conference on Tick borne pathogens at the host vector interface held at Kruger National Park*, South Africa, August 1 to September 1

64. Krecek R C, Cornelius S T and McCrindle C M E 1995 Socio-economic aspects of animal diseases in Southern Africa: research priorities in veterinary science. *The Journal of South African Veterinary Association* 66(3) 115-120

65. Kriek N P J and Odendaal M W 1994 *Clostridium chauvoei* infections. In Coetzer J A W, Thomson G R, Tustin R C (Eds) *Infectious diseases of livestock with special reference to Southern Africa* Vol II. Oxford University Press, Cape Town / Oxford / New York: 1325-1331

66. Lebbie H B 1996 Livestock and food security in smallholder production systems in Africa*. Proceedings of Second All Africa Conference on Animal Agriculture*, 1-4 April 1996, Pretoria: 381-396

67. Letsoalo S S, Krecek R C, Botha C A J and Ngetu X 2000 Animal husbandry in Moretele 1 of North West Province: implications for veterinary training and research. *Journal of the South African Veterinary Association* 71:92-96

68. Makgatho C N 1998 *Annual report*: submitted by Odi State Veterinary Office to the Deputy Director Agriculture, NWP: 5-9

69. Makgatho C N 1999 *Annual report*: submitted by Odi State Veterinary Office to the Deputy Director Agriculture, NWP: 4-6, 8

70. Malan T and Hatting P S 1975 (Eds) *Swart Tuislande in Suid Afrika*. Afrika-Instituut van Suid Afrika. Pretoria: 30-37,105-118

71. Malika J, Lawrence J A, Kafuwa P 1991 A simple method for collection of brain samples for the diagnosis of heartwater postmortem. *ECF-ABH Newsletter* (2): 2-3

72. Manitoba Agriculture 2000 Dead animal disposal. Http://www.gov.mb.ca/agriculture/livestock/pork/swine/bah07s00.html

73. Maree C and Casey N H (Eds) 1993 *Livestock Production Systems – Principles and Practice.* Agri-Development Foundation, P.O.Box 11309, Brooklyn, Gauteng: 69-88

74. McCrindle C M E 1997 *Veterinary needs appraisal*: Jericho. In Stewart C G (Ed) *Resources and needs of animal owners in Jericho*. Report published by Community Services and Outreach Unit, Veterinary Faculty, Medunsa 0204, South Africa

75. McCrindle C M E, Green E D, Bryson N R 1999 A Primary Animal Care approach to treatment and control of flea infestation in indigenous goats kept on communal grazing. *Journal of South African Veterinary Association* 70(1) 21- 24

76. McCrindle C M E, Tice G, Mogajane M.E, Stewart C G and Mosupi H 1994 An investigation into the potential veterinary needs of a semi-rural low-

income community. *Journal of the South African Veterinary Association Vol 65 No 3*: 90-96

77. McCrindle C M E, Stewart C G and Kiwanuka 1996 Methodology to assess animal health needs and extent of activities. In Zimmermann W, Pfeiffer D U and Zessin K H (Eds) Primary Animal Health Activities in Southern Africa. *Proceedings of an International Seminar held in Mzuzu, Malawi, February 26 to March 8*, 1996: 136-149
78. Meltzer M I, Perry B D and Donachie P L 1996 Mortality percentages related to heartwater and the economic impact of heartwater disease on large-scale commercial farms in Zimbabwe. *Preventive Veterinary Medicine*. Vol 26: 187-199
79. Miller D 1991 *Handbook of research design and social measurement*. 5th edition. Newbury Park: Sage Publications
80. Mokantla E 2003 *The influence of brucellosis, trichomoniasis, campylobacteriosis, herd management and bull fertility on the calving percentage of beef cattle kept on communal grazing system in Jericho*. M Med Vet Thesis. University of Pretoria
81. Mulei C M, Gitau G K and Mbuthia P G 1995 Causes of calf mortality in Kabete area of Kenya. *Onderstepoort Journal of Veterinary Research* 62: 181-185
82. National Department of Agriculture 1996 *Economic Review of South African Agriculture*. Directorate of Agricultural Statistics, Pretoria: 6

83. National Department of Agriculture 1997 *Annual report*: 2-18

84. National Department of Agriculture 1999 *Annual report*: 2-13

85. National Department of Agriculture 2000 *Structure of the National Directorate of Veterinary Services*. Http// *www.nda.agric.za*

86. National Department of Labour 2002 Communal land rights. Http// *www.labour.gov.za.* 1-15

87. National Environment Secretariat 1989 *An introduction to Participatory Rural Appraisal.* Ministry of Environment and Natural Resources, Kenya. P.O Box 67839, Nairobi, Kenya:

88. Norman D 1989 Communication and Information Systems Work. In University of Kansas (Ed). *Proceedings of Farming Research Symposium*. *How systems work*. *Farming Systems Research paper No 15. Fayetteville, Arkansas, USA. University of Arkansas and Winrock International Institute for Agriculture Development*: 287-303

89. Nthakheni D N 1993 *Productivity measures and dynamics of cattle herds of small scale producers in Venda.* MSc Thesis. University of Pretoria

90. Oberem P T and Bezuidenhout J D, 1987 The production of heartwater vaccine. *Onderstepoort Journal of Veterinary Research* 54: 485-488

91. O`Callaghan C J, Medley G F, Peter T F, Mahan S M and Perry B D 1999 Predicting the effect of vaccination on the transmission dynamics of heartwater. *Preventative Veterinary Medicine* 42: 17- 38

92. Odendaal D 2002 It was not pulpy kidney after all. Livestock Health and Production Review , Volume 6, 2002: 8-11

93. Okali C, Odde K G and Field T G 1987 Economic efficiency in cow-calf production. *Agripractice 8(5):* 28- 32

94. Peacock C 1996 *Improving Goat Production in the Tropics.* Manual for Development Workers: An Oxfarm/Farm- Africa Publication, UK and Ireland: 218-226

95. Perry B D, Mwanaumo B, Schels H F and Zaman M R 1984 A study of health and productivity of traditionally managed cattle in Zambia. *Preventative Veterinary Medicine,* 2: 633-653

96. Petney T N, Horak I G, Rechav Y 1987 The ecology of the African vectors of heartwater, with particular reference to *Amblyomma hebraeum* and *Amblyomma variegatum. Onderstpoort Journal of Veterinary Research* 54: 381-395

97. Pistorius A and Gumbi M 1997 Feedback report on the social dimensions of the Jericho needs and resource appraisal. In Stewart C G (Ed). *Resources and needs of animal owners in Jericho*. Community Service and outreach Unit, Veterinary Faculty, Medunsa, South Africa

98. Pfeiffer D U 1996 Survey Data Collection Methods-Questionnaires and Interviews. In Zimmermann W, Pfeiffer D U and Zessin K H (Eds*) Primary Animal Health Activities in Southern Africa. Proceedings of an International Seminar held in Mzuzu, Malawi, February 26 to March 8*, 1996: 159-167

99. Potgieter F T and Stoltsz W H 1994. *Anaplasmosis.* In Coetzer J A W, Thomson G R, Tustin R C (eds) *Infectious Diseases of Livestock with*

special reference to Southern Africa Vol. 1. Oxford University Press, Cape Town / Oxford / New York: 408-424

100. Potgieter F T, van Rensburg L J, 1987 Tick transmission of *Anaplasma centrale. Onderstepoort Journal of Veterinary Research* 54: 557-560

101. Prozesky L 1987 The pathology of heartwater III. A review. *Onderstepoort Journal of Veterinary Research* 54: 281-286

102. Prozesky L and Barnard B J H 1982 A study of the pathology of lumpy skin disease in cattle. *Onderstepoort Journal of Veterinary Research* 49: 167-175

103. Prozesky L and du Plessis J L 1987 The diagnosis of heartwater at postmortem in ruminants and confirmation of *Cowdria ruminantium* in mice. *Onderstepoort Journal of Veterinary Research* 54: 301-30

104. Purnel R E 1987 Development of a prophylactic regime using Terramycin LA to assist in the introduction of susceptible cattle in the heartwater endemic areas. *Onderstepoort Journal of Veterinary Research* 54: 509-512

105. Ristic M A and Mc Intyre I (Eds) 1981 *Diseases of cattle in the tropics*. Martinus Nijhoff Publishers, The Hague / Boston /London: 53-64

106. Schapera I and Goodwin A J H (Eds) 1962 *Cultural changes in tribal life*. Bantu speaking tribes of South Africa. Routledge and Kegan Paul Ltd, London, Seventh Impression: 365

107. Schroeder J 1987 Chemical control of the heartwater vectors. *Onderstepoort Veterinary Journal of Research* 54: 517-520

108. Schwabe C W 1984 *Veterinary Medicine and Human Health*. 3rd Edition. Publishers, Williams and Wilkins. Baltimore, London: 1-30

109. Sebei J 2002 *The assessment of some factors influencing the survival of kids in a small-scale communal goat production system.* MSc Thesis. University of Pretoria

110. Section Veterinary Pathology 2003 *Student notes for Diagnostic Pathology DIP 520*, at the Department of Paraclinical Sciences, Faculty of Veterinary Science, University of Pretoria. South Africa

111. Shoo M K, Semvua R H, Kazwala R R and Msolla P 1992 A study on the cause-specific mortality rates of dairy calves on farms in the eastern zone of Tanzania. *Preventive Veterinary Medicine.* Vol 13: 59-62

112. Simpson B H and Wright D F 1988 *The use of Questionnaires to Assess the Importance of Clinical Diseases in Sheep*. Ministry of Agriculture and Fisheries, Private Bag, Palmerston North, New Zealand: 97- 105

113. Sippel W L 1972 Diagnosis of clostridial diseases. *Journal of the American* Veterinary *Medical Association* 161: 1299-1305

114. Spickett A M and Fivaz B H 1992 A survey of cattle tick control practices in the eastern Cape Province of South Africa. *Onderstepoort Journal of Veterinary Research* 59: 203-210

115. Steyn G J 1988 *A farming system study of two rural areas in the Peddie district of Ciskei.* DSc Thesis, Faculty of Agriculture, University of Fort Hare, South Africa: 41-63

116. Stewart C G 1997 (Ed) *Resource and needs of animal owners in* Jericho. Report published by Community Services and Outreach Unit, Veterinary Faculty, Medunsa 0204, South Africa

117. Stewart C G 1987 Specific immunity in farm animals to *heartwater*. *Onderstepoort Veterinary Journal of Research* 54: 341-342

118. Swanepoel R. Rabies. In Coetzer J A W, Thomson G R, Tustin R C (eds) 1994 *Infectious diseases of livestock with special reference to Southern Africa*. Vol I: 493-553

119. Tapson D R 1993 The economic institutional role of livestock in developing countries. *Proceedings of a conference on livestock production under traditional systems held at Irene Animal Production Institute, South Africa, 15 Aprii 1993:* 1

120. Thrusfield M 1995 *Veterinary Epidemiology*. 2nd ed. London: Blackwell Science Ltd

121. Tice G A 1997 *Tick population dynamics and serological prevalence of tick-borne diseases in four communally grazed areas of South Africa.* M Med. Vet Thesis, Medical University of South Africa.

122. Tice G A, Bryson N R, Stewart C G, du Plessis B and de Waal D T 1998 The absence of clinical diseases in cattle in communal grazing areas where farmers are changing from an intensive dipping programme to one of endemic stability to tick borne diseases. *Ondestepoort Journal of Veterinary Research* 65: 169- 175

123. Turton R 2000 *Rabies - a killer disease.* National Department of Agriculture and ARC Onderstepoort Veterinary Institute: 5-10

124. Van de Moosdijk C and Schiferli K 2002 *The understanding of cattle farming systems in two districts in the North West Province, South Africa*. MSc Thesis. Wageningen University, The Netherlands

125. Vuuren A 1997 *The strengths and problems of black families in informal settlements.* Published by Human Science Research Council, 134 Pretorius Street, Pretoria, 0002, South Africa: 2-12

126. Walker B J 1987 The tick vectors of *Cowdria rumanantium* (Ixodoidea, Ixodidae, Genus *Amblyomma*) and their distribution. *Onderstepoort Journal of Veterinary Research* 54: 353- 379

127. Whitlow J R 1980 Environmental constraints and population pressures in the tribal areas of Zimbabwe. *Zimbabwe Agricultural Journal*. Vol 77 No 4: 173-181

128. Williams B M 1977 Clostridial myositis in cattle. *Veterinary Record* 100: 90-101

129. Woods P 2001 *Utilization and efficacy of veterinary services to small scale and subsistence farmers in Zimbabwe.* The influence of socio demographic and epidemiological factors. PhD Thesis, University of Utrecht, The Netherlands: 1-40

130. World Bank 1994 Structure, performance and options for the future. *Discussion paper No 6 Southern Africa Department of the World Bank, Washington D.C*: 28-40

131. Worman F, Heinrich G and Norman D 1989 Some Organizational Considerations in Implementing FSR in a Harsh Environment: Increasing farmer involvement in Botswana. *A paper presented at the Ninth Annual Association for Farming System Research- Extension Symposium, University of Arkansas, Fayetteville, October* 9-11: 120-137

132. Worman, F., Norman, D. and Ware-Snyder, J., 1992. *Farming Systems Research Handbook for Botswana.* Republic of Botswana. Department of Agricultural Research Ministry of Agriculture Agricultural Technology Improvement Project. Gaborone, Botswana: 1-6

133. Yates W D G, Jericho K W F, Doige C E 1983 Effect of the bacterial dose in pneumonia induced by aerosol exposure of calves to bovine herpes virus I and *Pasteurella haemolytica*. *American Journal of Veterinary Research* 44: 238-245

APPENDIX 1

OIE LIST A , B AND C DISEASES

List A diseases

- Foot -and –mouth disease
- Vesicular stomatitis
- Swine vesicular disease
- Rinderpest
- Peste des petits ruminants
- Contagious bovine pleuropneumonia
- Lumpy skin disease
- Rift valley fever
- Bluetongue
- Sheep and goat pox
- African horse sickness
- African swine fever
- Hog cholera
- Fowl plaque
- Newcastle disease

List B diseases

- Anthrax
- Anaplasmosis
- Actino bacillus pleuropneumoniae
- Atropic rhinitis
- Aujesky disease
- Avian bronchitis
- Avian infectious laryngotracheitis
- Avian tuberculosis
- Babesiosis
- Benign bovine theileriosis
- Bovine Brucellosis
- Bovine spongiforme encephalopathy
- Bovine genital campylobacteriosis
- Brucella ovis
- Caprine brucellosis
- Contagious caprine pleuropneumonia
- Contagious equine metritis

- Corridor disease
- Cystecercosis
- Dermatophilosis
- Dourine
- Echinococcosis
- Epizootic lymphagitis
- Enzootic bovine leukosis
- Equine encephalomyelitis
- Equine infectious anemia
- Equine babesiosis
- Fowl cholera
- Fowl pox
- Fowl typhoid
- Glanders
- Haemorrhagic septicaemia
- Heartwater
- Horsepox
- Infectious arteritis of horses
- Infectious bovine rhinotracheitis
- Leptospirosis
- Mareks disease
- Mycoplasmosis
- Ostrich influenza
- Paratuberculosis
- Psittacosis
- Porcine brucellosis
- Pullorum disease
- Pulmonary adenomatosis
- Q fever
- Rabies
- Screwworm
- Salmonellosis
- Salmonella enteritidis
- Scrapie
- Sheep scab
- Theileriosis
- Transmissible gastroenteritis of pigs
- Trichonellosis
- Trichomoniasis
- Trypanosomiasis

List C diseases

- Listeriosis
- Toxoplasmosis

- Melioidosis
- Blackquarter
- Botulism
- Actinomycosis
- Coccidiosis
- Other Clostridial infection
- Other pasteurellosis
- Intestinal Salmonella infections
- Distomatosis
- Filariasis
- Mastitis
- Mucosal disease/ Bovine virus diarrhoea
- Vibrionic dysentery
- Warble infestation
- Contagious pustular dermatitis
- Foot-rot
- Contagious opthalmia
- Enterotoxaemia
- Caseous lymphadenitis
- Sheep mange
- Goat mange
- Equine coital exanthema
- Ulcerative lymphangitis
- Strangles
- Salmonellosis
- Swine erysipelas
- Infectious coryza
- Avian encephalomyelitis
- Avian spirochaetosis
- Avian leucosis
- Canine distemper

APPENDIX 2

QUESTIONNAIRE

Filled in by: _____ **Date:** _____

Farmer/Herdsman details (these are confidential)
Name and Surname of person responsible for cattle_____

Name and surname of owner of cattle_____

Farm name and number_____

……

SV ODI QUESTIONNAIRE
Personal details (these will be kept confidential)

1.Farmer no _____ **V1** [ ][ ] **1-2**

2.Age …… **V2** [ ][ ] **3-4**

3.Gender

1 Male	2 Female

V3 [ ] **5**

4. Education level

1	2	3	4
Primary school	High school	Matric	Tertiary

V4 [ ] **6**

5 Village and farm:

V5 [ ][ ] **7-8**

6. Indicate which one is your main source of income

Pension	Yes 1	No 2
Own salary	Yes 1	No 2
Own business	Yes 1	No 2
Full time farming	Yes 1	No 2
Salary of family member	Yes 1	No 2

V6 [ ] **9**
V7 [ ] **10**
V8 [ ] **11**
V9 [ ] **12**
V10 [ ] **13**

7. Who looks after the animals?

Owner	**Y 1**	**N 2**	**V11**	**14**
Children	**Y 1**	**N 2**	**V12**	**15**
Wife	**Y 1**	**N 2**	**V13**	**16**
Other family member	**Y 1**	**N 2**	**V14**	**17**
Friend or neighbour	**Y 1**	**N 2**	**V15**	**18**
Herdsman	**Y 1**	**N 2**	**V16**	**19**

8. How many cattle do you have?

Bulls		**1**	**V17**	**20-21**
Cows		**2**	**V18**	**22-23**
Heifers		**3**	**V19**	**24-25**
Bullock (tollie)1-3 yr		**4**	**V20**	**26-27**
Oxen		**6**	**V21**	**28-29**
Calves (suckling)		**7**	**V22**	**30-31**
Total		**8**	**V23**	**32-33**

9.Main type of cattle farming

Beef		**1**	**V24**	**34**
Dairy		**2**		
Dual purpose*		**3**		
Traditional		**4**		
Other		**5**		

*** Do you milk your cows and also have them for slaughter**

10. Breed of cattle and number

Afrikander		1
Afr X		2
Jersey		3
Jersey X		4
Friesian		5
Fries X		6
Brahman		7
Brahman X		8
Simmentaler		9
Nguni		10
Brown Swiss		11
Other		12

V25		35-36
V26		37-38
V27		39-40
V28		41-42
V29		43-44
V30		45-46
V31		47-48
V32		49-50
V33		51-52
V34		53-54
V35		55-56
V36		57-58

11. How many cattle died last year (1-1-000 to 1-1-2001)

V37		59

12. What did the Bulls die of?

Cause	No. Dead	Reported	
		Yes=1	No=2
Babesiosis			
Anaplasmosis			
Blackquarter			
Malnutrition			
Downer			
Plant poisoning			
Motor car accident			
Heartwater			
Other(specify)=1			

V38		60-62
V39		63-65
V40		66-68
V41		69-71
V42		72-74
V43		75-77
V44		78-80
V45		81-83
V46		84-87

14. What did Heifers die of?

Cause	No. Dead	Reported	
		Yes=1	No=2
Babesiosis			
Anaplasmosis			
Blackquarter			
Malnutrition			
Downer			
Plant poisoning			
Motor car accident			
Heartwater			
Other (specify)=1			

15. What did Bullocks/ young oxen (tollies) die of?

Cause	No. Dead	Reported	
		Yes=1	No=2
Babesiosis			
Anaplasmosis			
Blackquarter			
Malnutrition			
Downer			
Plant poisoning			
Motor car accident			
Heartwater			
Other (specify)=1			

V47 88-90
V47 91-93
V48 94-96
V49 97-99
V50 100-102
V51 103-105
V52 106-108
V53 109-111
V54 112-115

V55 116-118
V56 119-121
V57 122-124
V58 125-127
V59 128-130
V60 131-133
V61 134-136
V62 137-139
V63 140-143

16 What did old oxen die of ?

Cause	No. Dead	Reported	
		Yes=1	No=2
Babesiosis			
Anaplasmosis			
Blackquarter			
Malnutrition			
Downer			
Plant poisoning			
Motor car accident			
Heartwater			
Other (specify) =1			

17. What did calves die of?

Cause	No dead	Reported	
		Yes=1	No=2
Babesiosis			
Anaplasmosis			
Blackquarter			
Malnutrition			
Downer			
Plant poisoning			
Motor car accident			
Heartwater			
Other (specify) =1			

V64		144-146
V65		147-149
V66		150-152
V67		153- 155
V68		156-158
V69		159-161
V70		162-164
V71		165-167
V72		168-171

V73		172-174
V74		175-177
V75		178-180
V76		181-183
V77		184-186
V78		187-189
V79		190-192
V80		193-195
V81		196-199

18. How often is the following the cause of not reporting deaths to the State Vet, AHT, Extensio Officer

	Always 1	Sometimes 2	Never 3			
No cell phone				V82		200
Vet is not in office				V83		201
I work in town				V84		202
No telephone at home				V85		203
I have no transport				V86		204
Carcass is eaten before Vet gets here				V87		205
Not interested				V88		206
Not his business				V89		207
What can the Vet do - Animal is dead				V90		208
Other (please specify)=1				V91		209

19. What happens to animals that have died?

	Always 1	Sometimes 2	Never 3			
People eat them				V92		210
Dogs eat them				V93		211
They rot away in the veld				V94		212
Bury them				V95		213
Burn them				V96		214
People sell the meat				V97		215

20. Do you know how to do a post mortem examination?

Yes		1	V98	216
No		2		
Do not know		3		

APPENDIX 3

CD-ROM USED FOR TRAINING

The handouts for the presentation are included in the next 13 pages for information. A copy of the CD-ROM is also included for reference to the full colour, full sized pictures used for extension.

Doctor, my cow is dead…

Elementary necropsy techniques for cattle farmers

CME McCrindle, N Duncan N & C Makgatho

Faculty of Veterinary Science

University of Pretoria

Instructions

- System requirements:
  - Pentium I or II
  - Windows 98 or higher
  - MS- Word
  - MS Powerpoint
- Insert CD Rom
- Open “Dr My Cow is Dead” in Powerpoint
- Open “ Checklist” in MS-Word
- Using for farmers day
  - Use as display on computer for 5 farmers or less
  - Print and use as flipchart for individual farmers
  - After display and discussion follow with skills training using organs from the abattoir

Doctor, my cow is dead…

Elementary necropsy techniques for cattle farmers

Prof. CME McCrindle, Prof N Duncan and Dr C Makgatho

Faculty of Veterinary Science, University of Pretoria

INTRODUCTION

- It is important to know why your cattle are dying so that you can prevent deaths in future. Many times the state veterinarian or animal health technician cannot get to your farm when the carcase is fresh, so it is important to know the names of the organs and how they should look, so you can explain what you saw when you opened up the dead animal.

Be careful – use gloves

- You can get diseases from working with the meat of animals that have died, so please be careful and hygienic and preferably wear gloves and protective clothing.

Some of these diseases are:

- **Brucellosis**
- **Salmonellosis**
- **Abscesses and wound infections**
- **Rift Valley Fever**

For more information about these diseases, press here

Watch out for Rabies and Anthrax

- There are two diseases that are very dangerous for people - these are anthrax and rabies. If you think either of these diseases is present you must call the state vet immediately and do not touch the carcase.

Press here to find out more about ANTHRAX

Press here to find out more about RABIES

Dispose of carcasses safely

- Dead animals should be disposed of in a safe way so that they do not cause pollution of water or act as a hazard to the health of the community. Consult your veterinarian about the correct method to use for disposing of carcasses. It must be emphasised that it is never safe to eat the meat of animals that have died of a disease.

HOW TO OPEN A CARCASE TO SHOW THE ORGANS

(Necropsy Technique)

Put the animal on its right side or on its back

Check the outside of the animal

- **Look at the condition – is it thin or fat?**
- **How old is it?**
- **Look at the body for abscesses, wounds**
- **Are there any injuries or broken bones?**
- **Look at the reproductive organs – was the cow calving when she died? Are there any other lesions or injuries to the male or female organs?**

Look at the head - mouth, teeth, eyes, ears, nostrils

Look at the eyes

Note the colour of the membranes…

Check the mouth, teeth and tongue

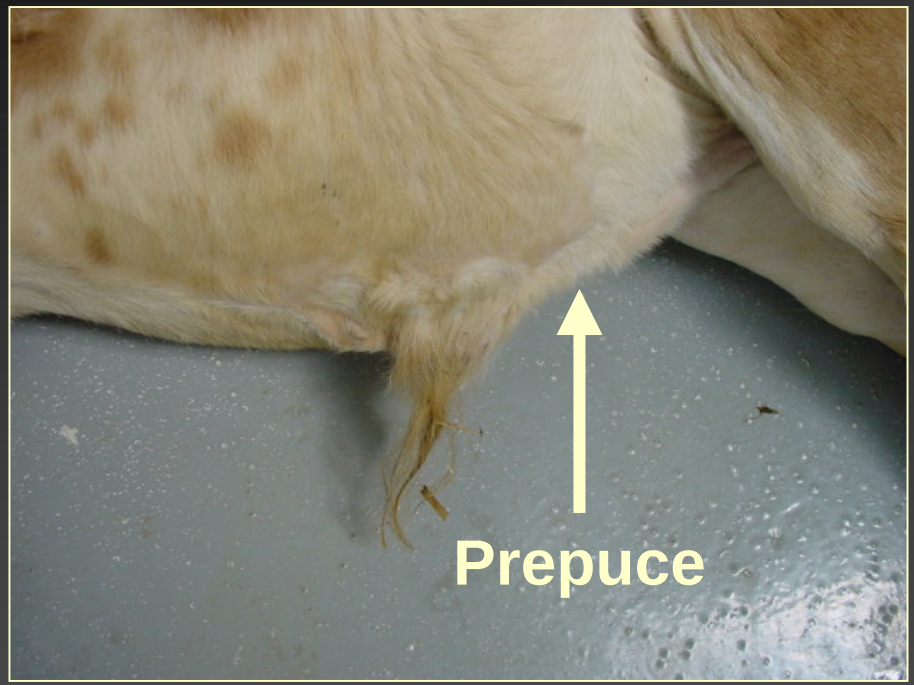
Look inside and outside the ears

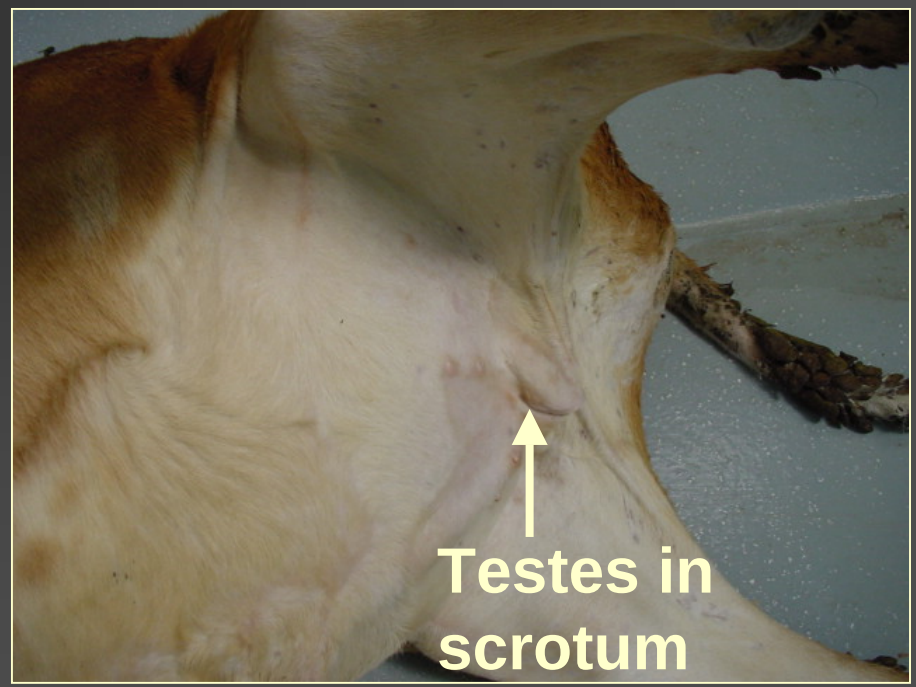
Check for ticks and abscesses and maggots

Look carefully at the udder and try to see the colour of the milk

Udder of adult cow – squeeze teats to see the milk

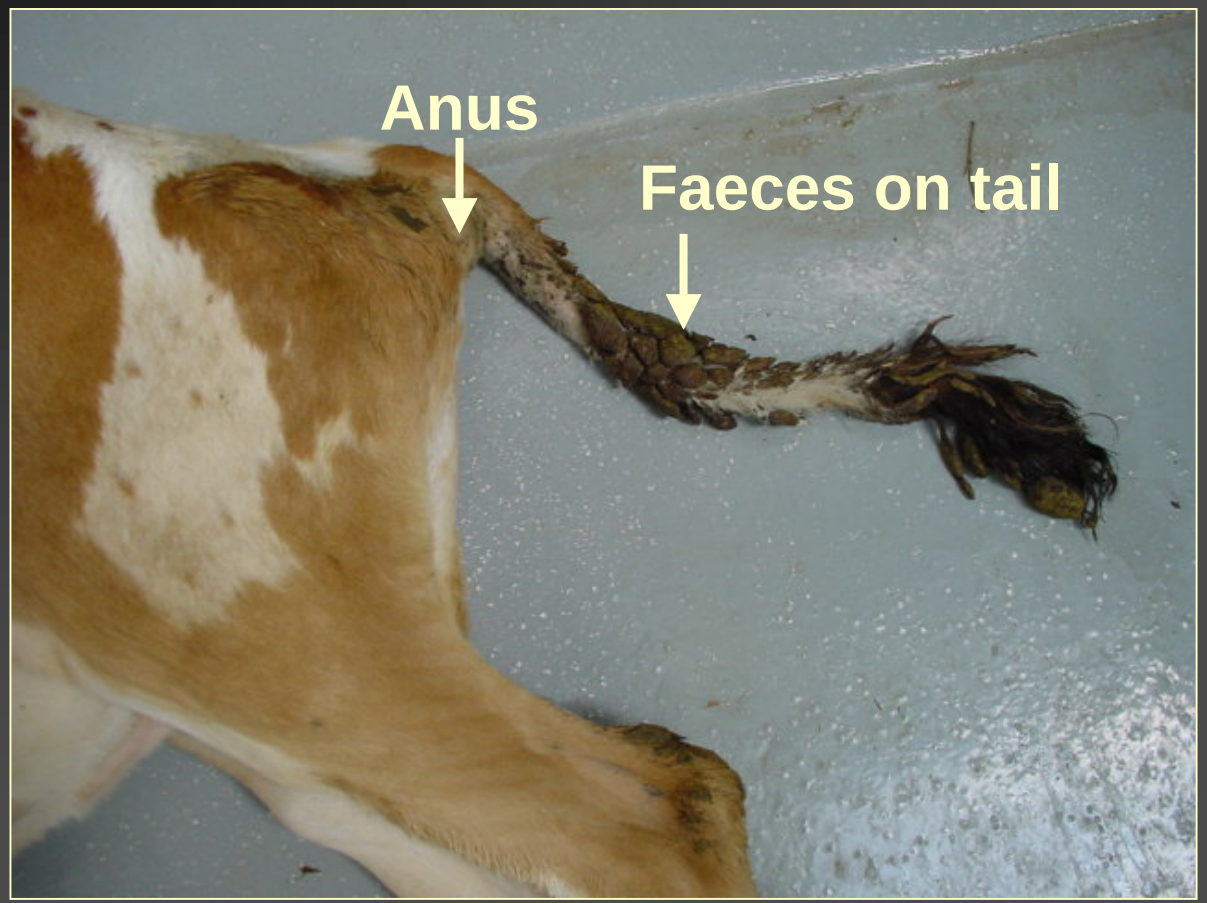
Check prepuce and testes





Look for injuries and swellings of the reproductive organs in male animals

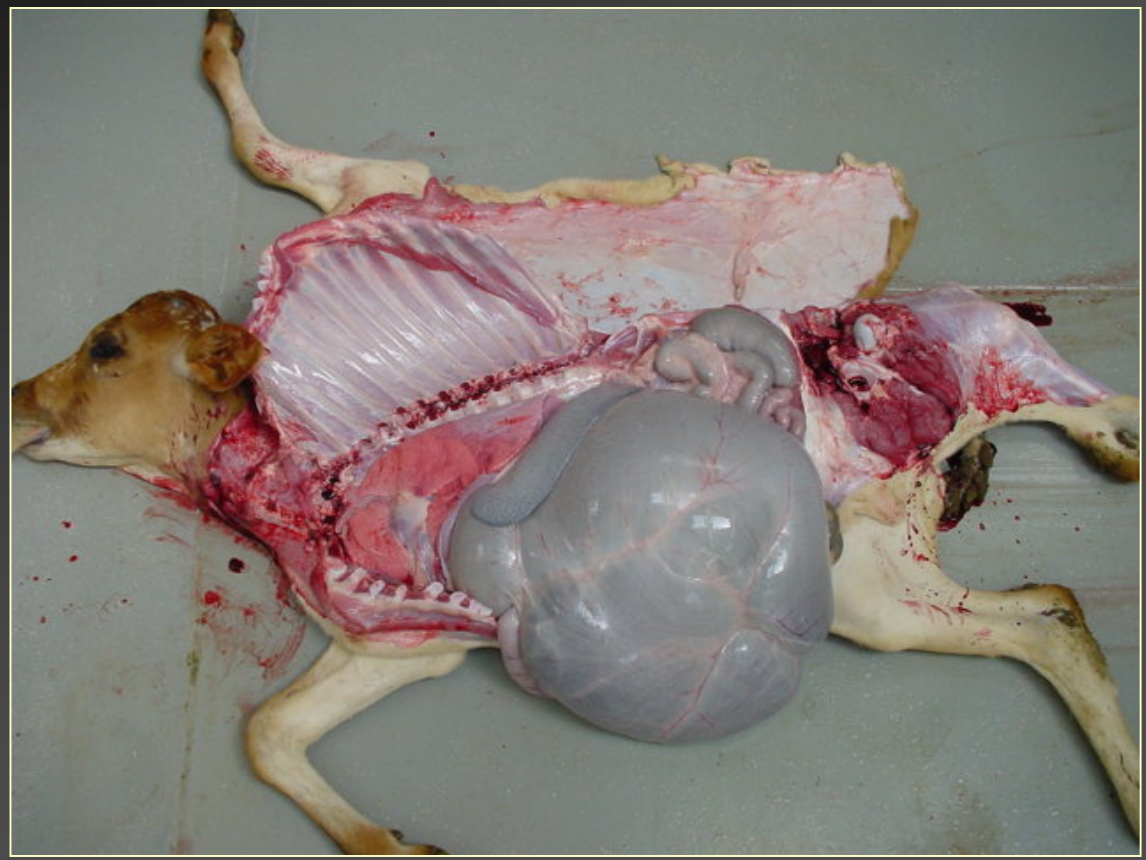
Look at the anus - what colour are the faeces?



Remove the skin of the animal - look at the colour of the carcase and the muscles

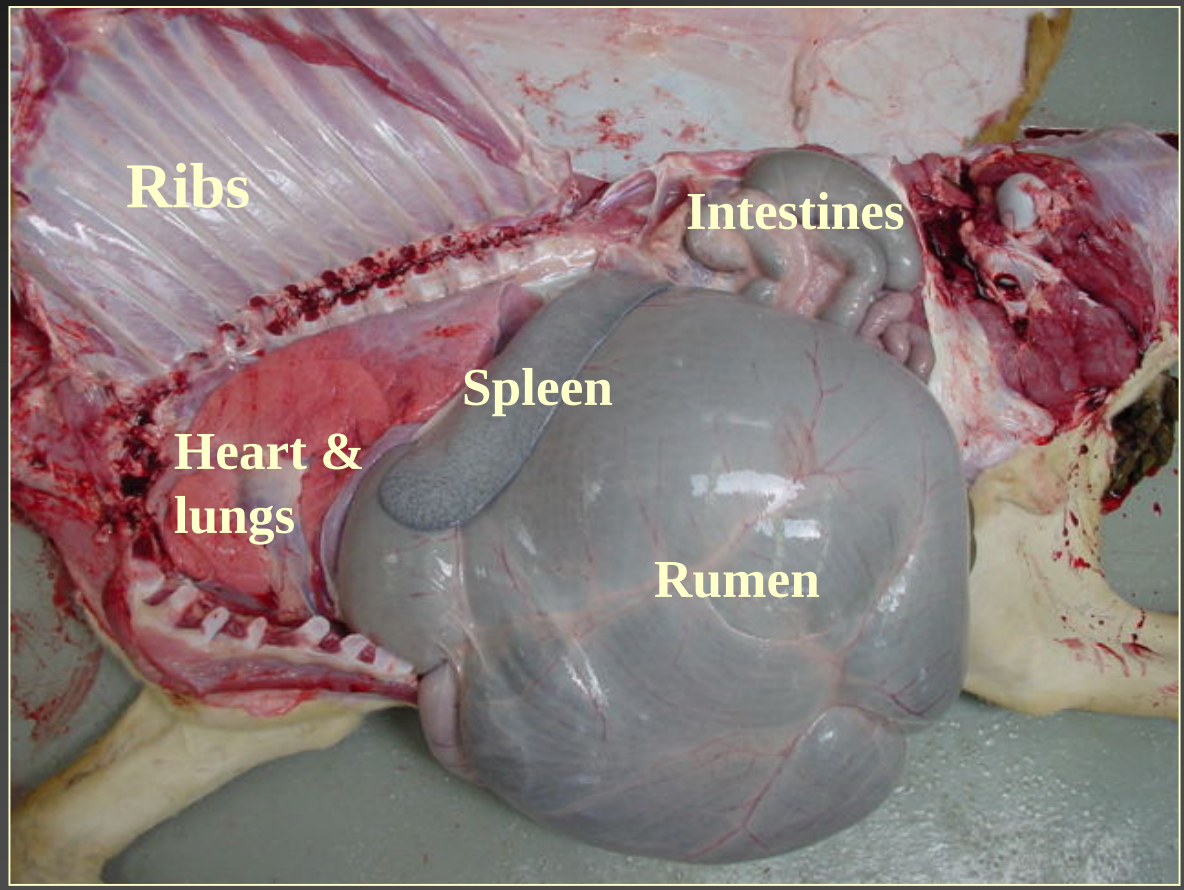
Press here to show a picture of a carcase that is yellow (jaundiced)

Open the abdomen using a sharp knife



If any fluid runs out, note the colour and consistency

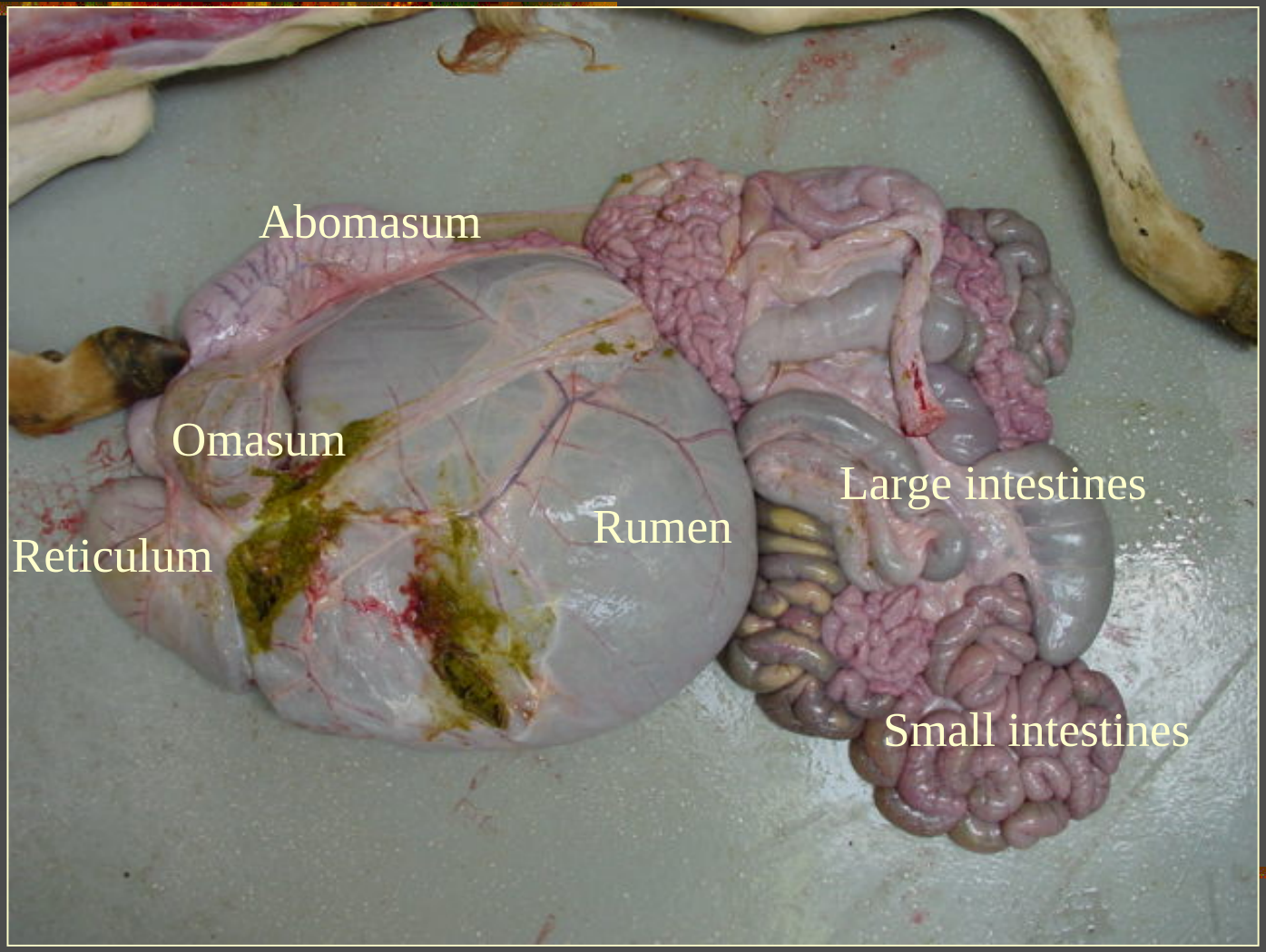
Now you can identify the organs



Remove spleen and cut it open

- *Notice the colour shape and size*
- *Cut into the spleen and look at the cut surface*
- *Pay attention to colour*
- *Note any tumors or abscesses*

Pull out all the stomachs (rumen, reticulum, omasum, abomasum), and intestines



Look at the surfaces of rumen and intestines

- Note the colour
- They should be smooth and shiny
- Look for any wounds or abscesses

Open up the Forestomachs

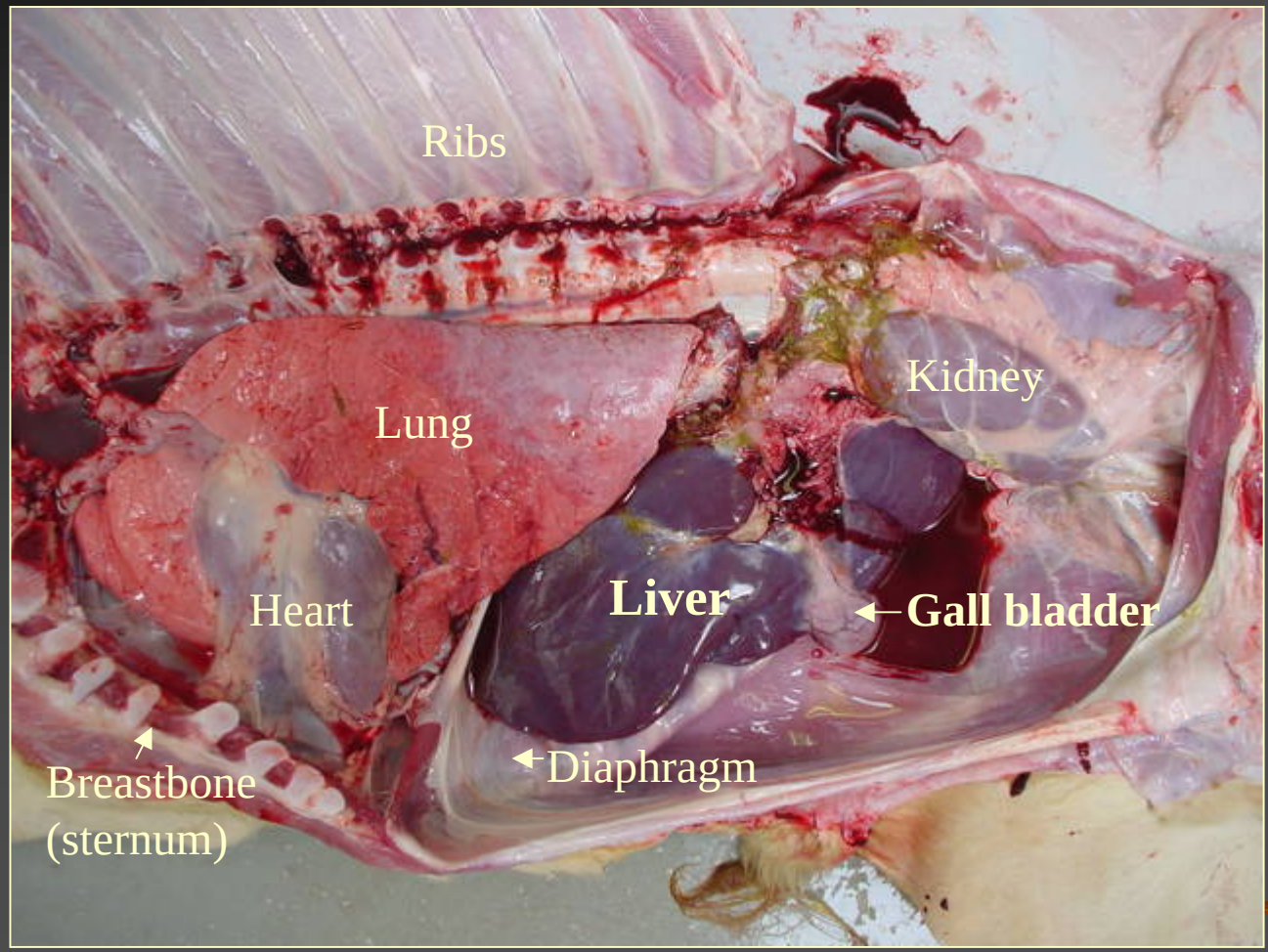
Look at the contents:

- Note the colour and smell of contents
- Look at the wetness/ dryness of contents
- Look for any foreign bodies like rope, plastic bags and wire
- Look for conical fluke in the rumen
- Look for worms in the abomasum

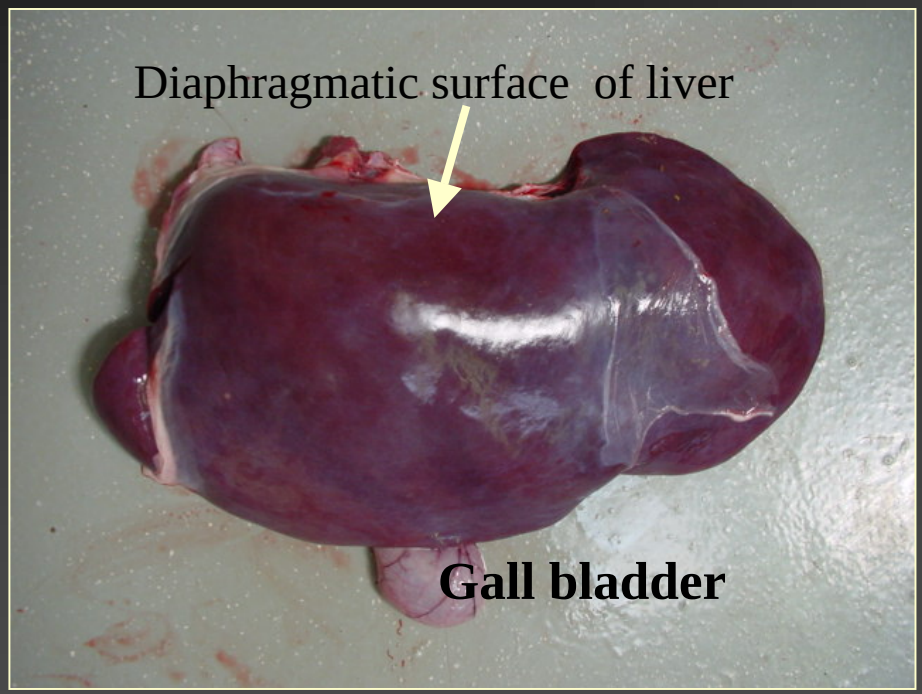
Examine the small intestines

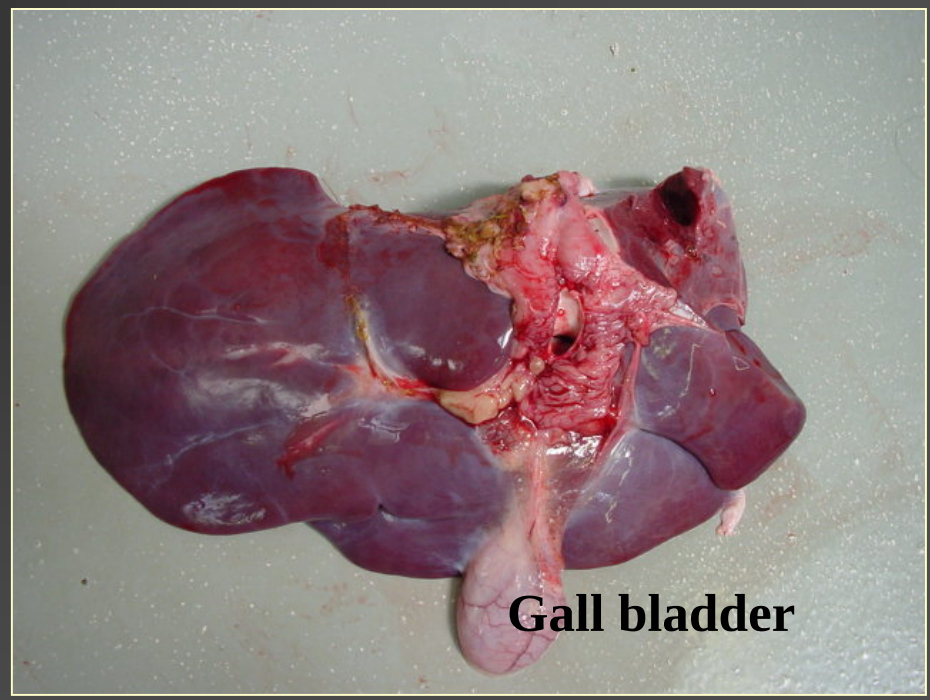
- *Note the colour of the surface*
- *Open the intestines in a few places and look at the inner surface and contents*
- *Note any foreign bodies or parasites*

Remove the liver and gall bladder



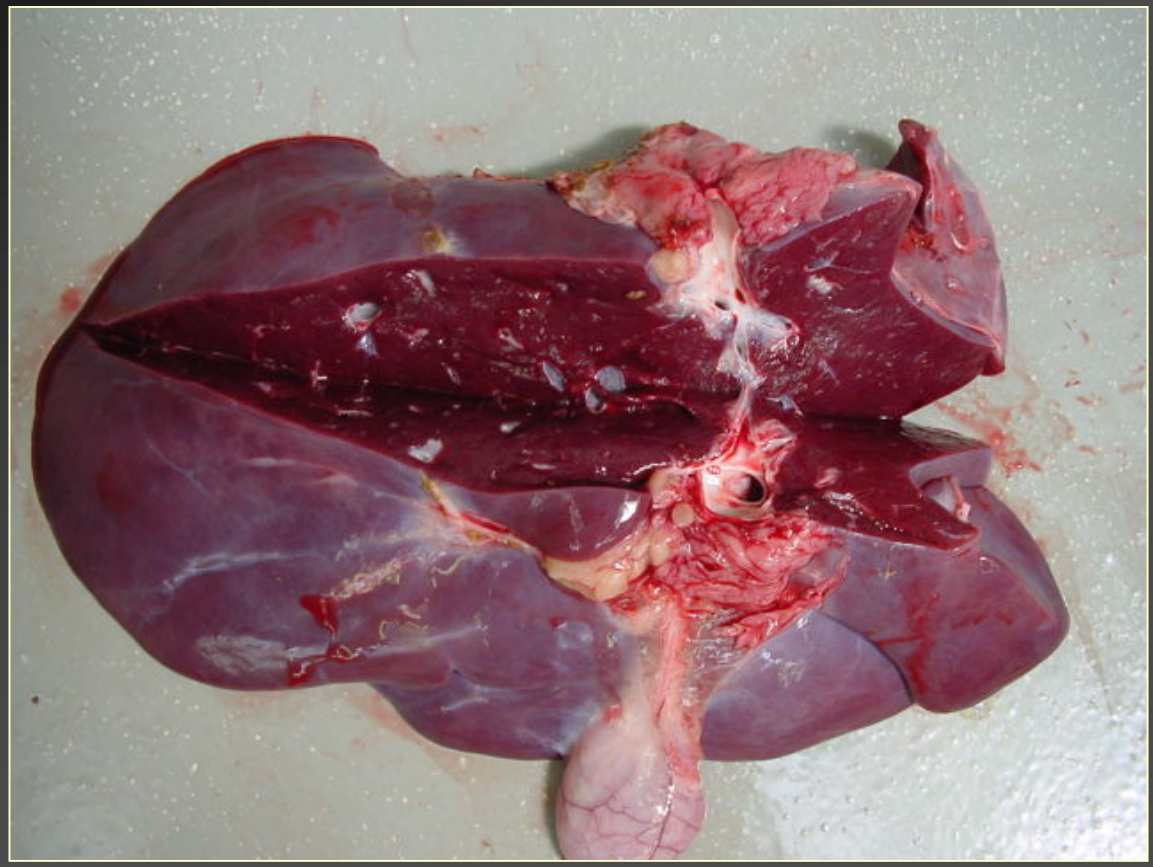
Look at both surfaces of liver





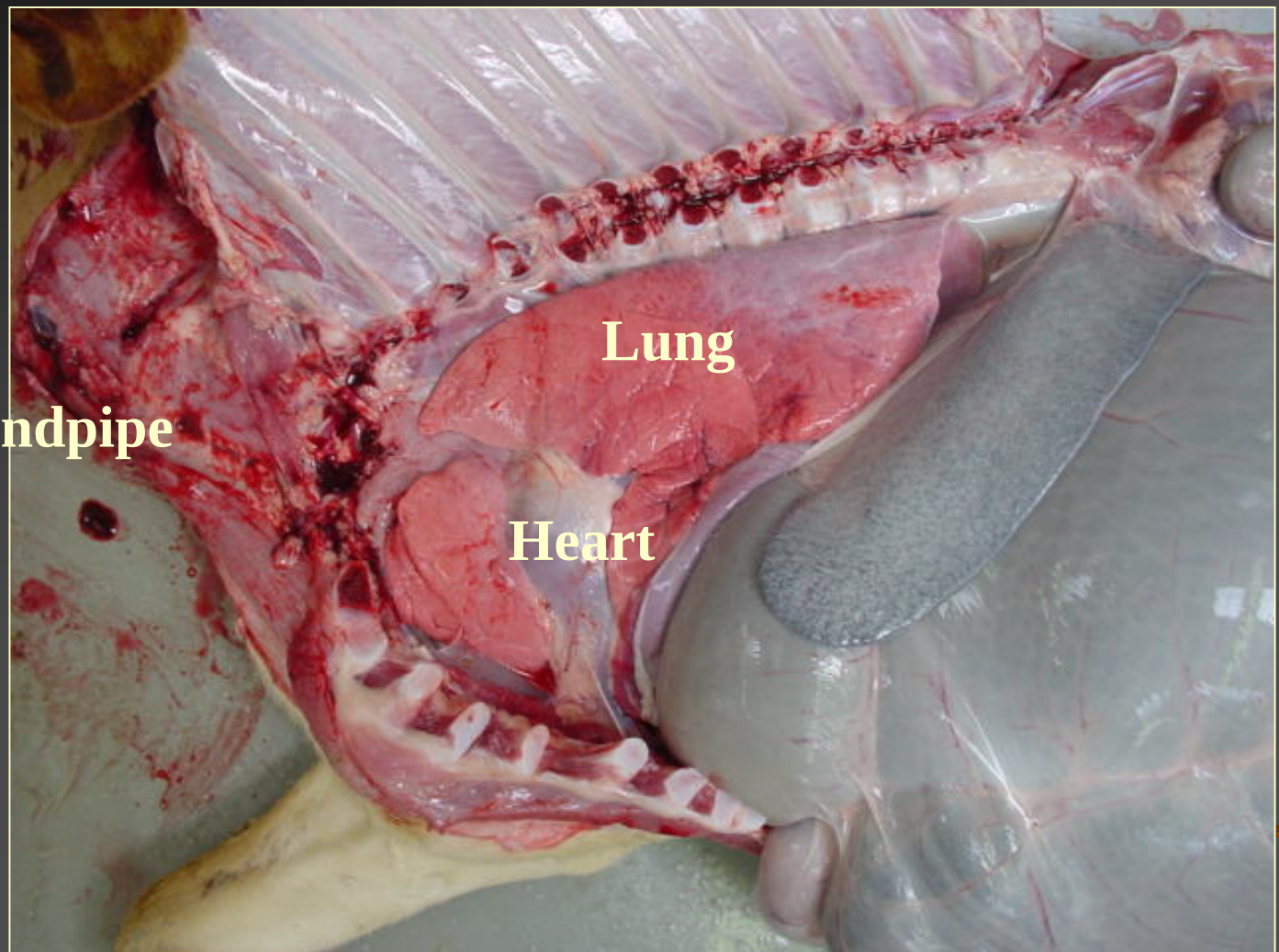
It should be smooth and shiny

Cut into liver

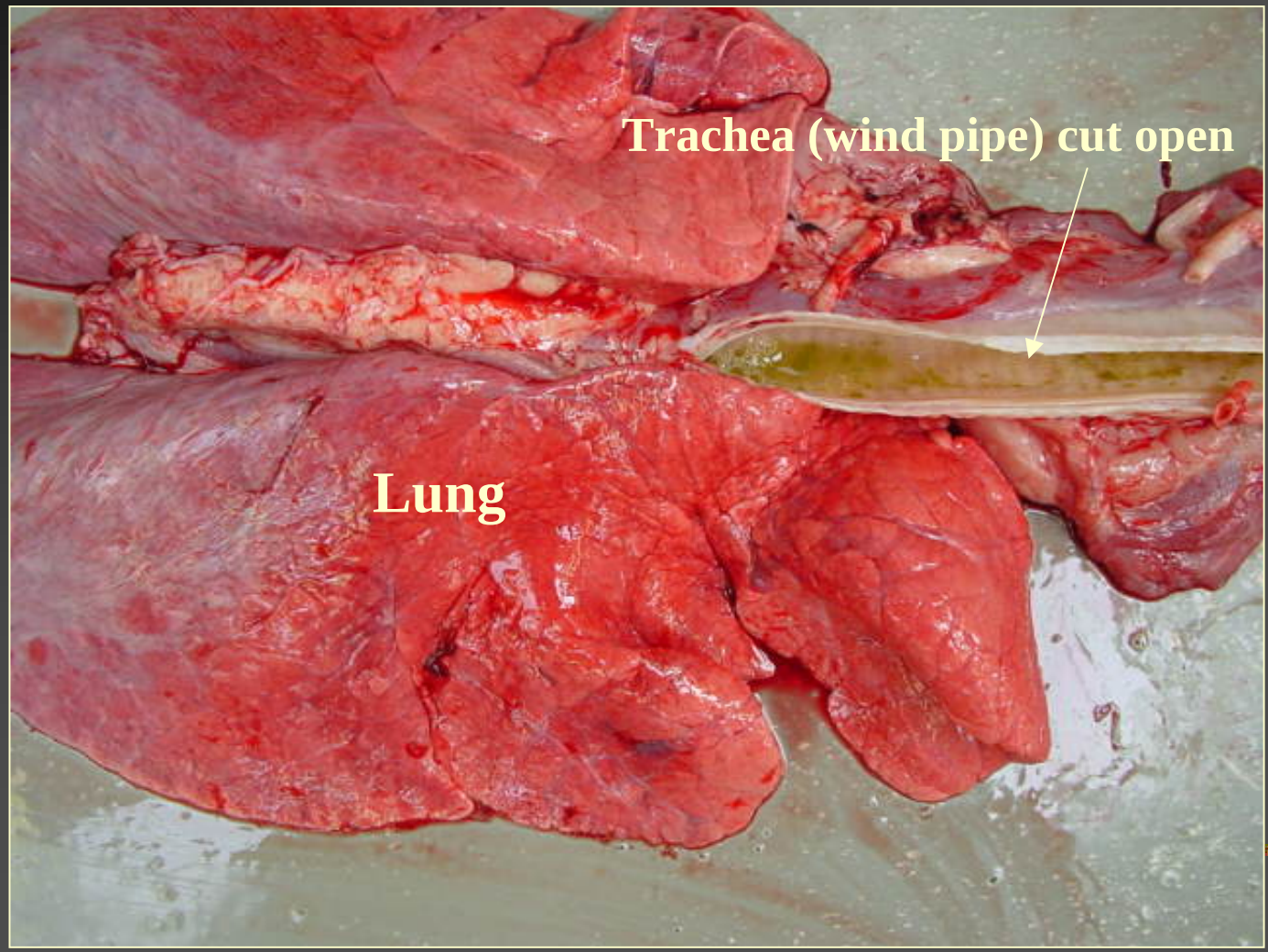


Look for liver fluke and tapeworm

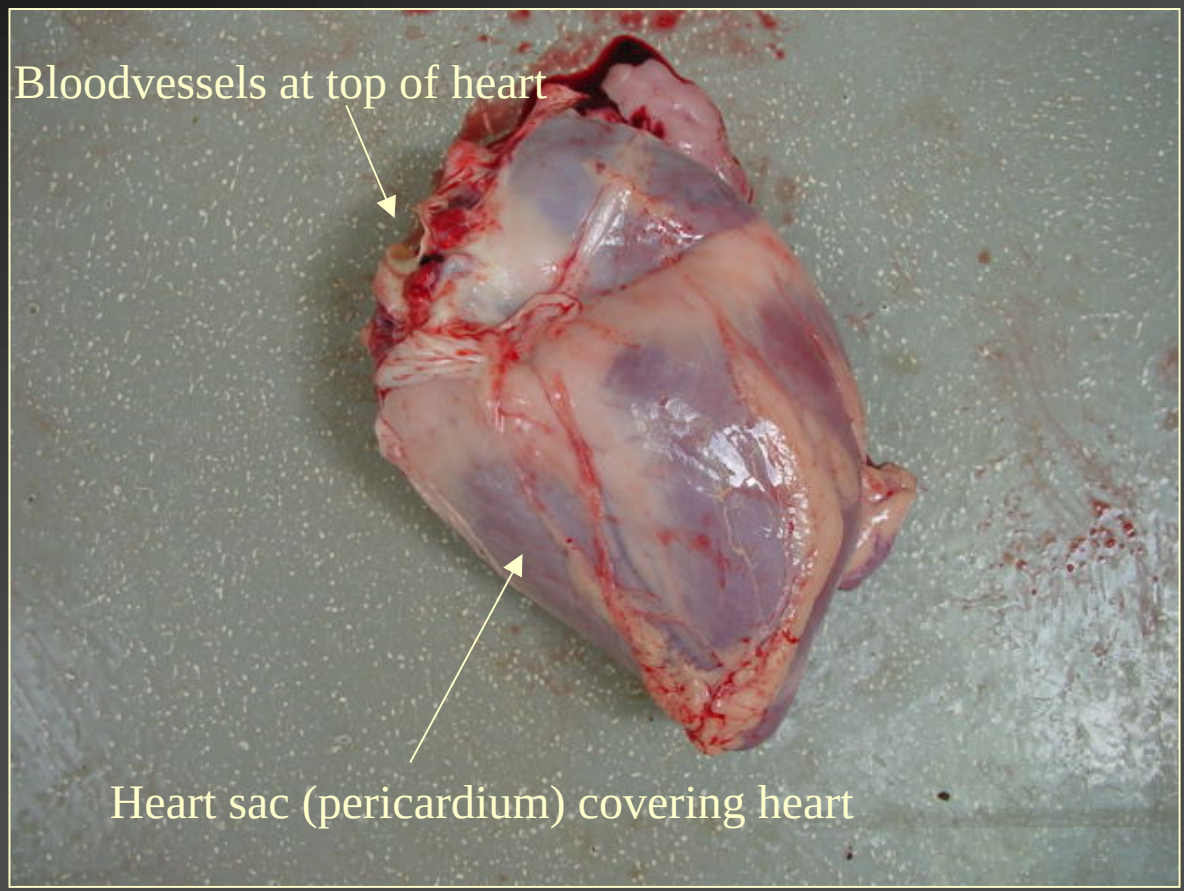
Remove the windpipe,lungs, heart



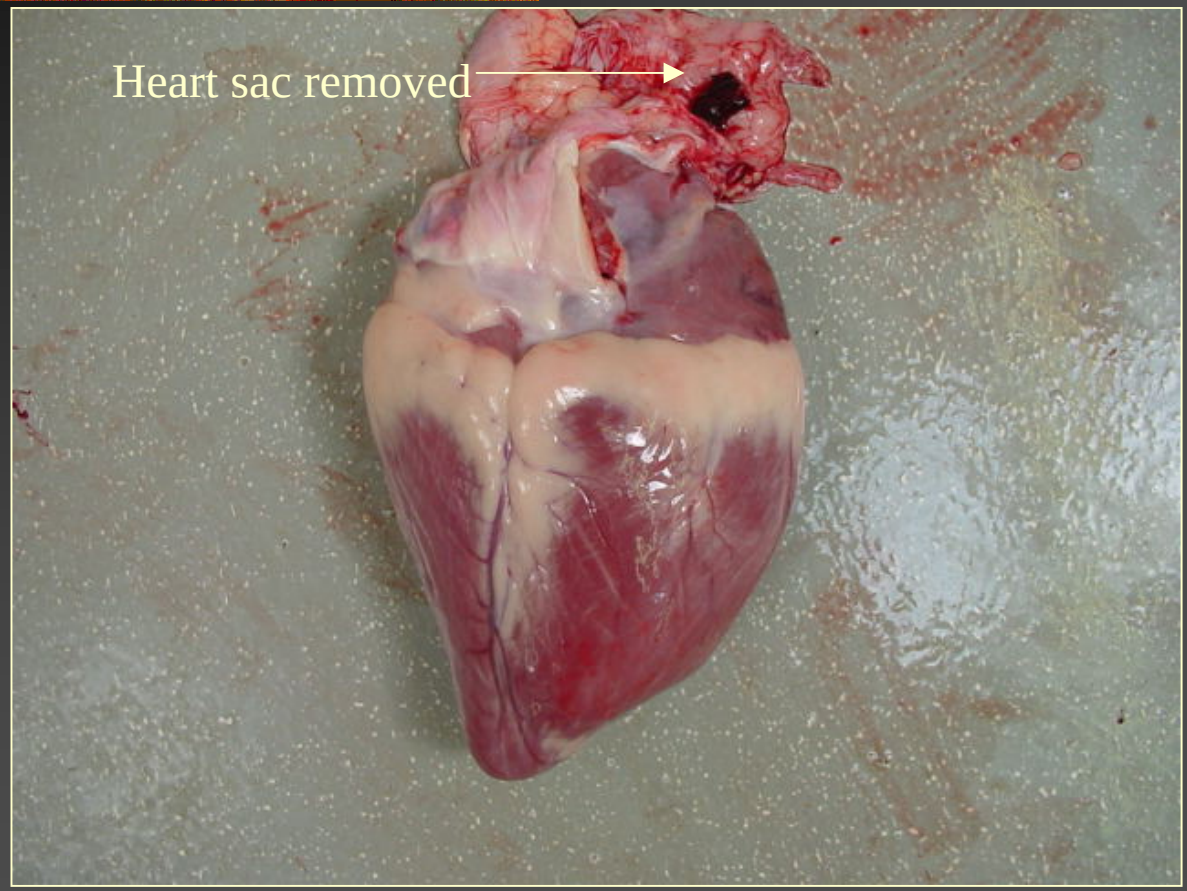
Look carefully at the lungs



Look at the surface of the heart and pericardium (heart sac)

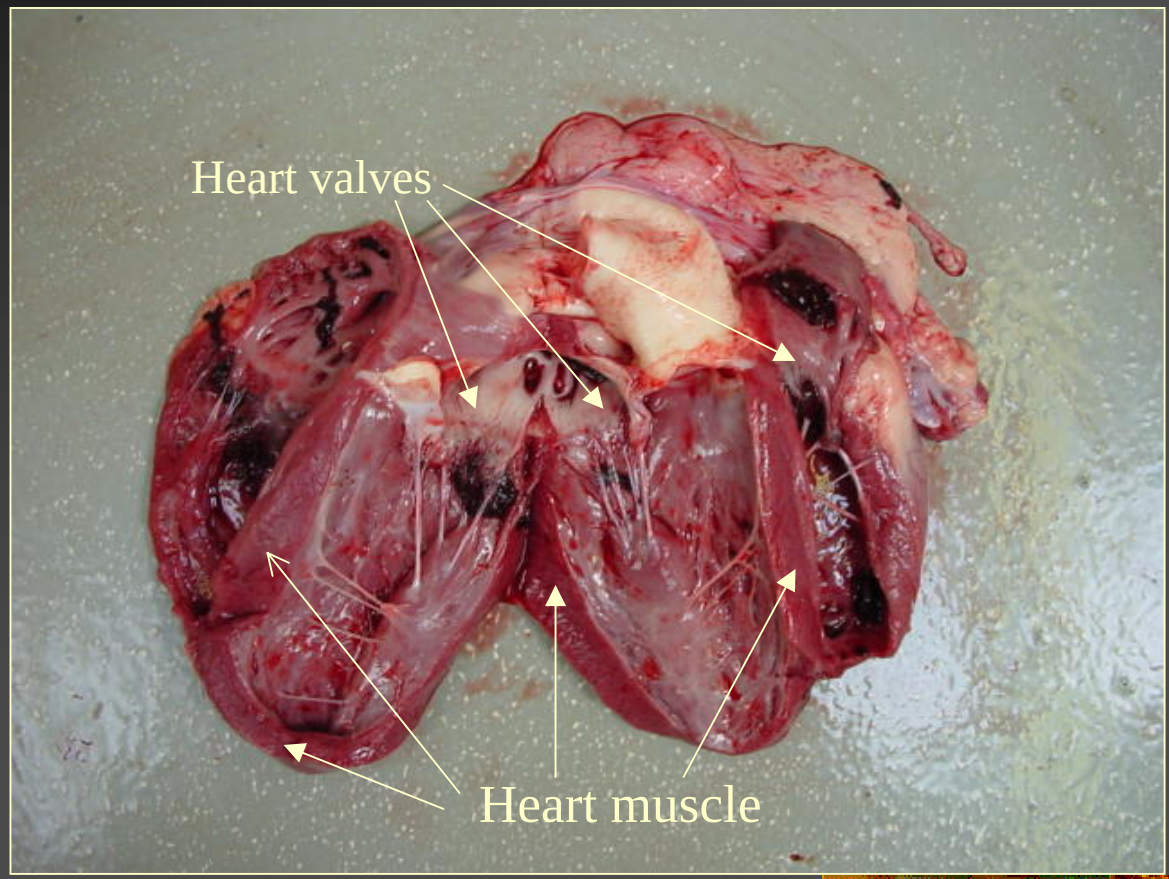


Cut into heart sac and remove

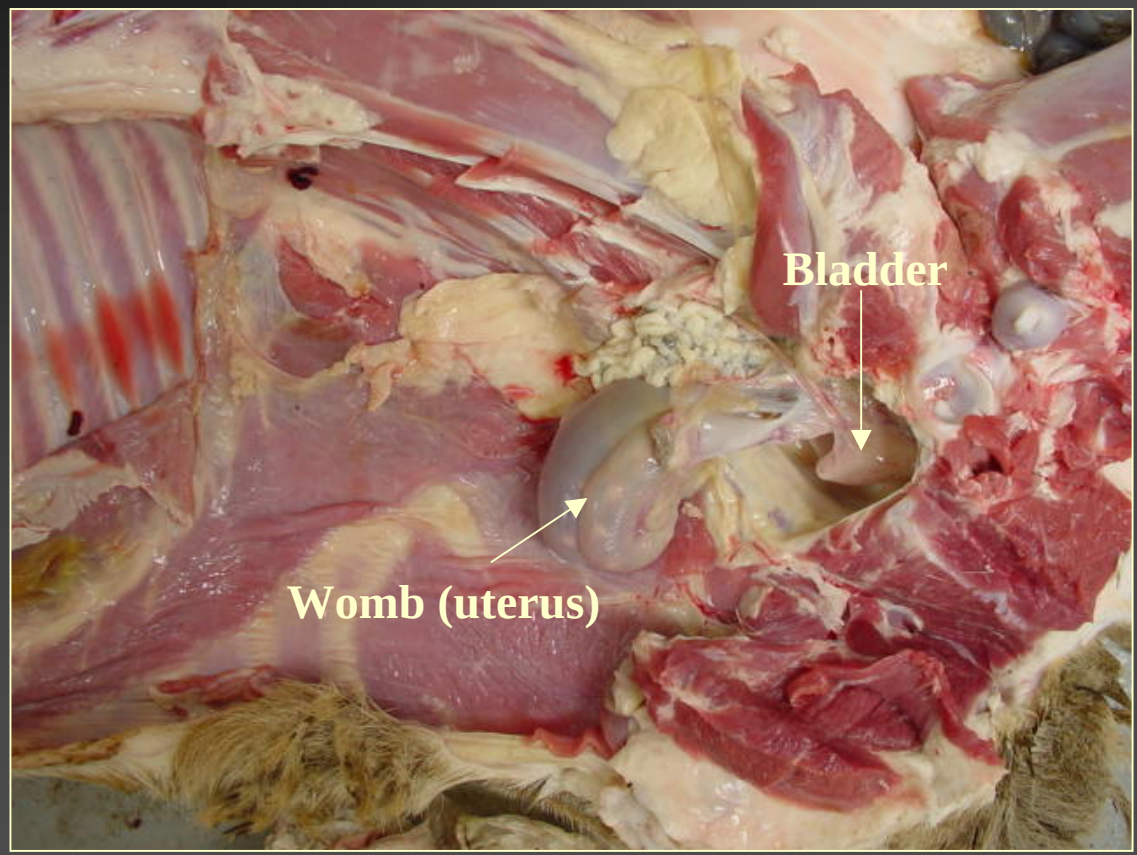


Note colour and amount of fluid in heart sac

Cut open heart – note valves and muscle



Look at the bladder and the reproductive organs

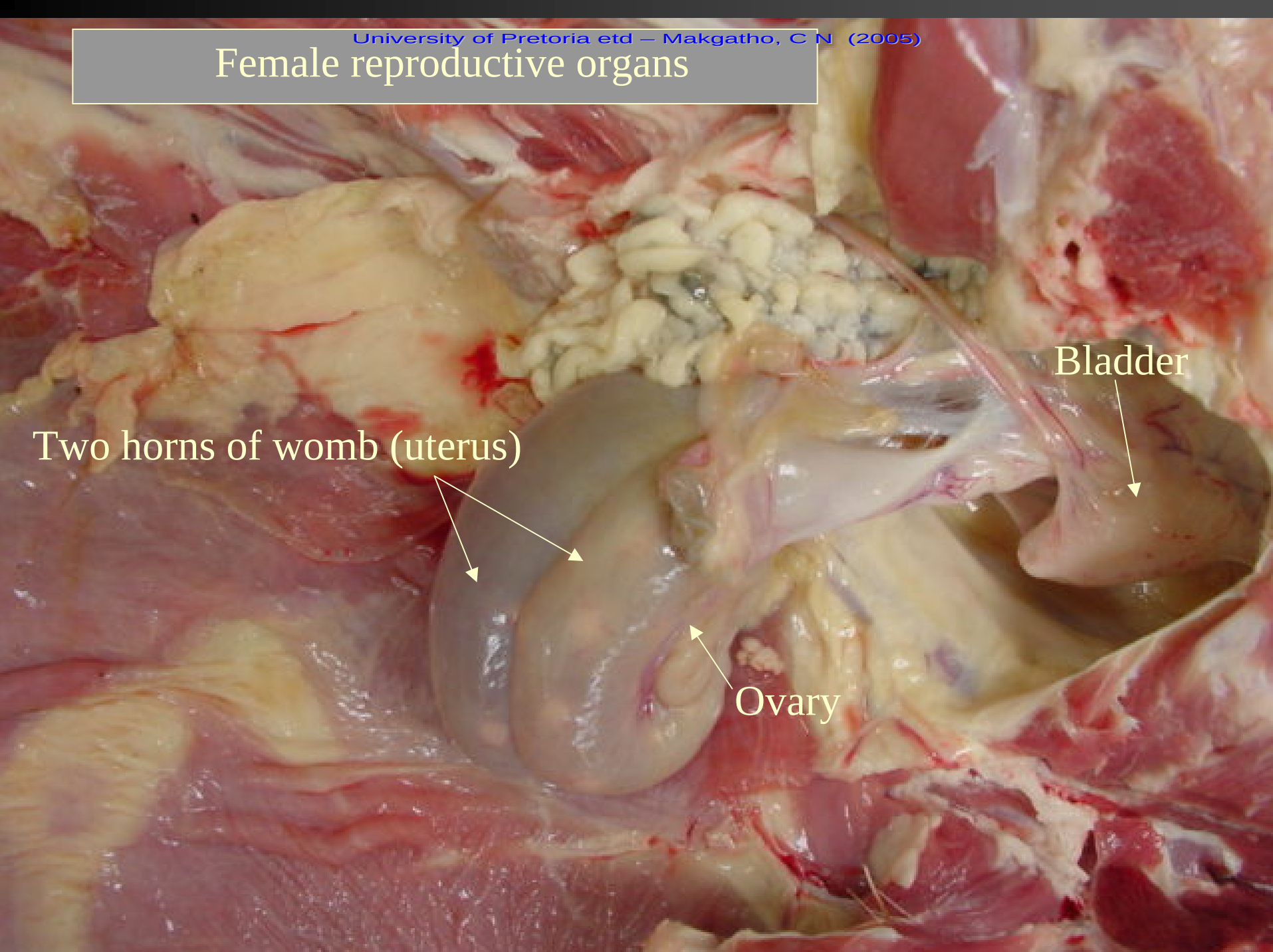


Bladder

- Cut open the bladder and look at the colour of the urine, it should be pale, clear yellow.

Press here for a picture of abnormal urine

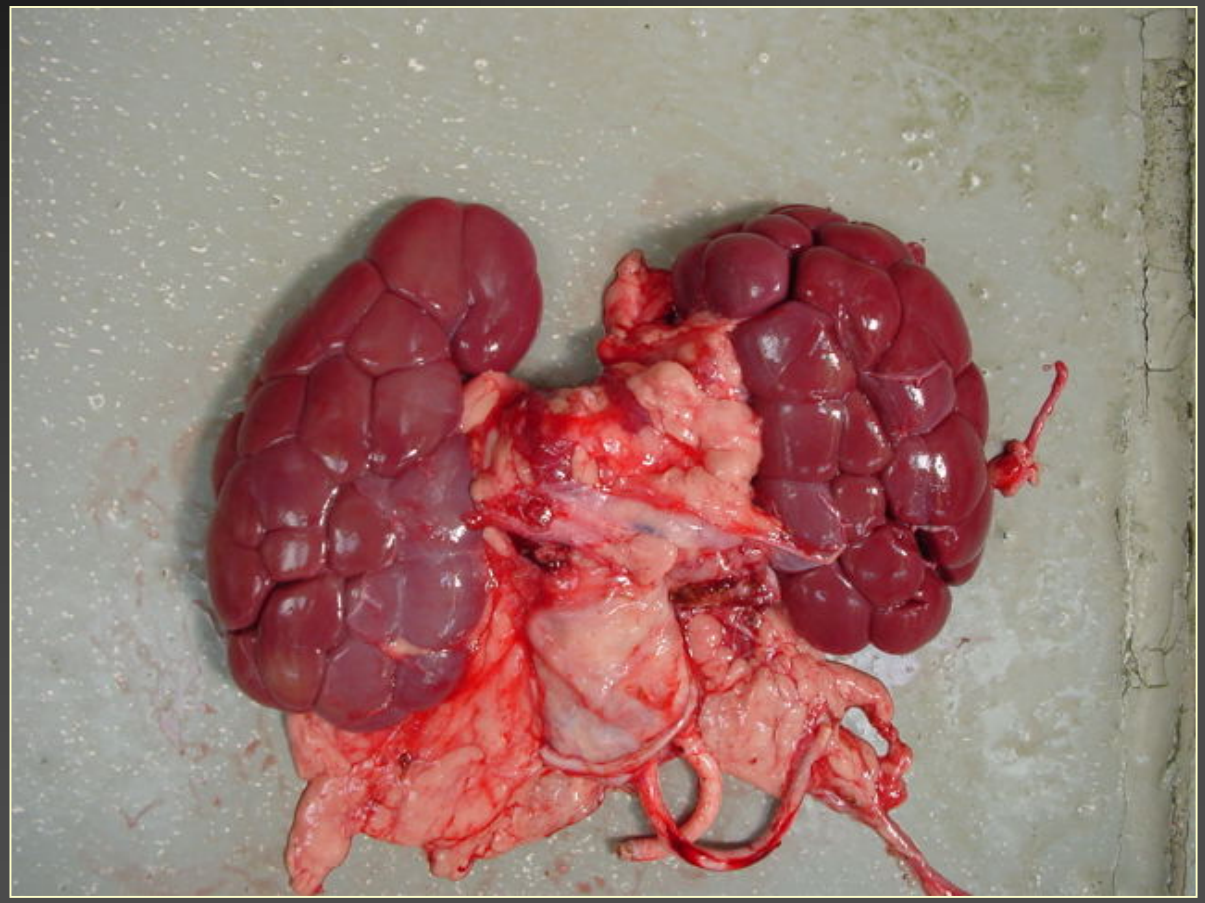
Female reproductive organs



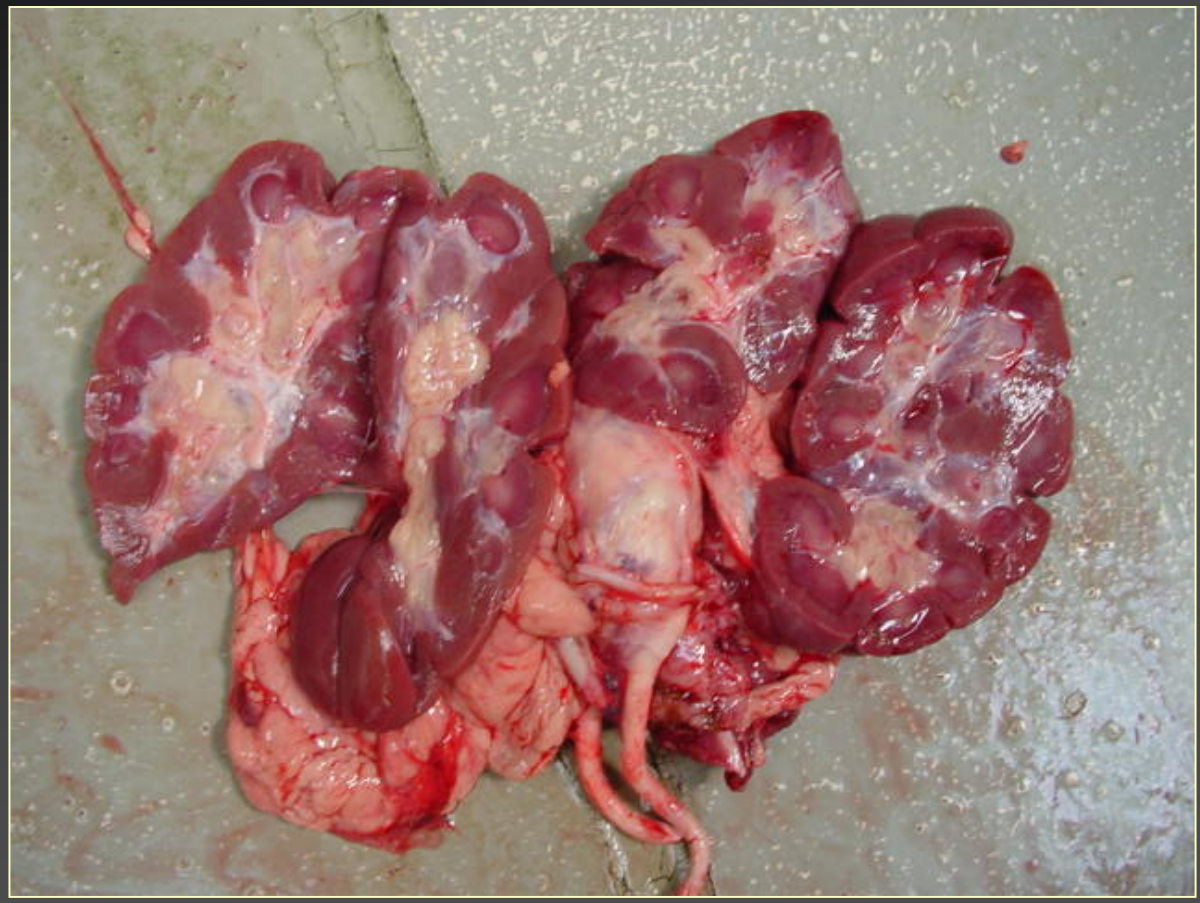
Examine the reproductive organs of the cow: womb(uterus), cervix and vagina

- Note if cow is pregnant
- Look to see how far pregnant she is
- Check if she died while giving birth because the calf became stuck
- Check for infections of the womb

Remove the kidneys and examine

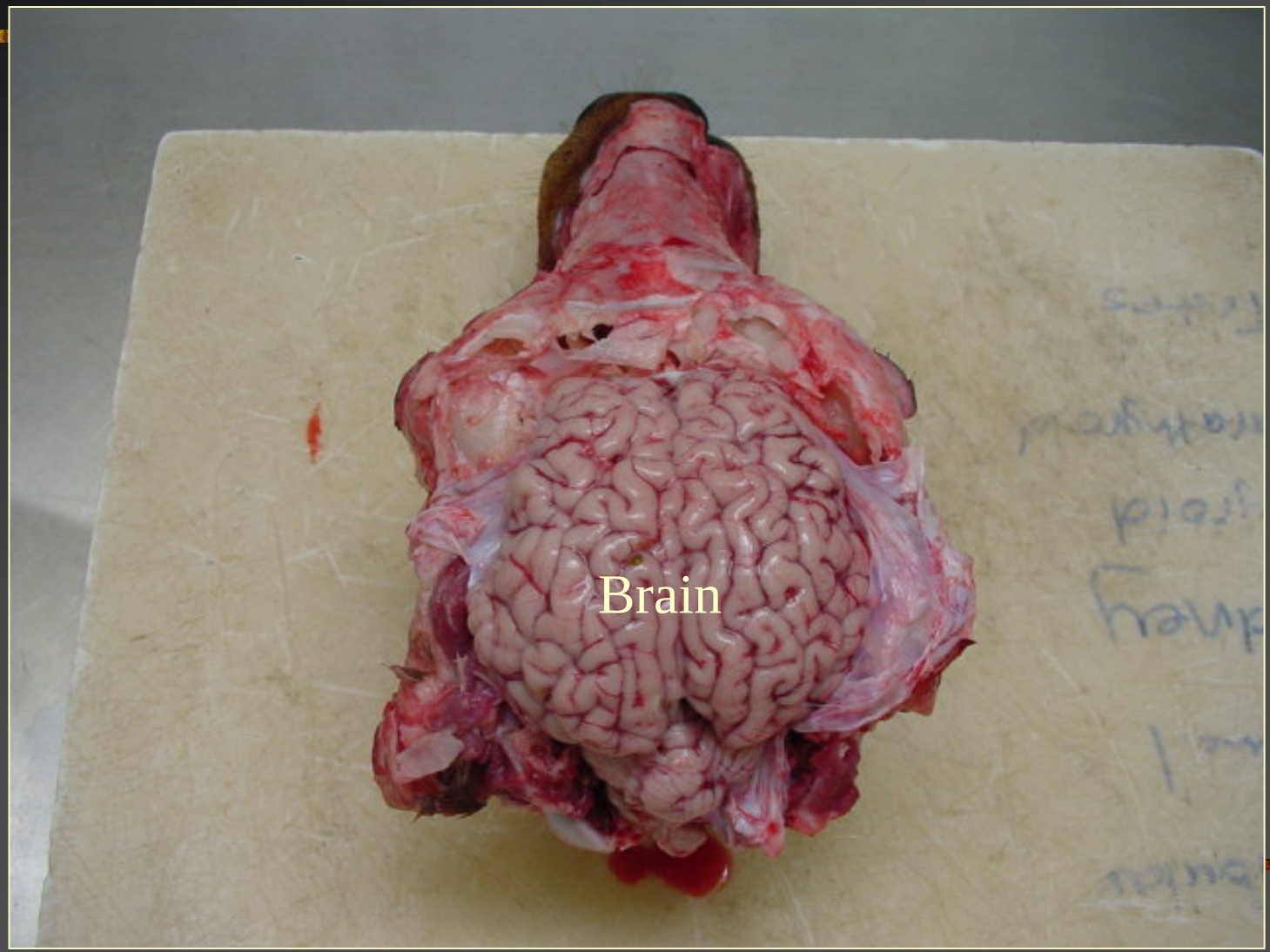


Cut open kidneys with a sharp knife

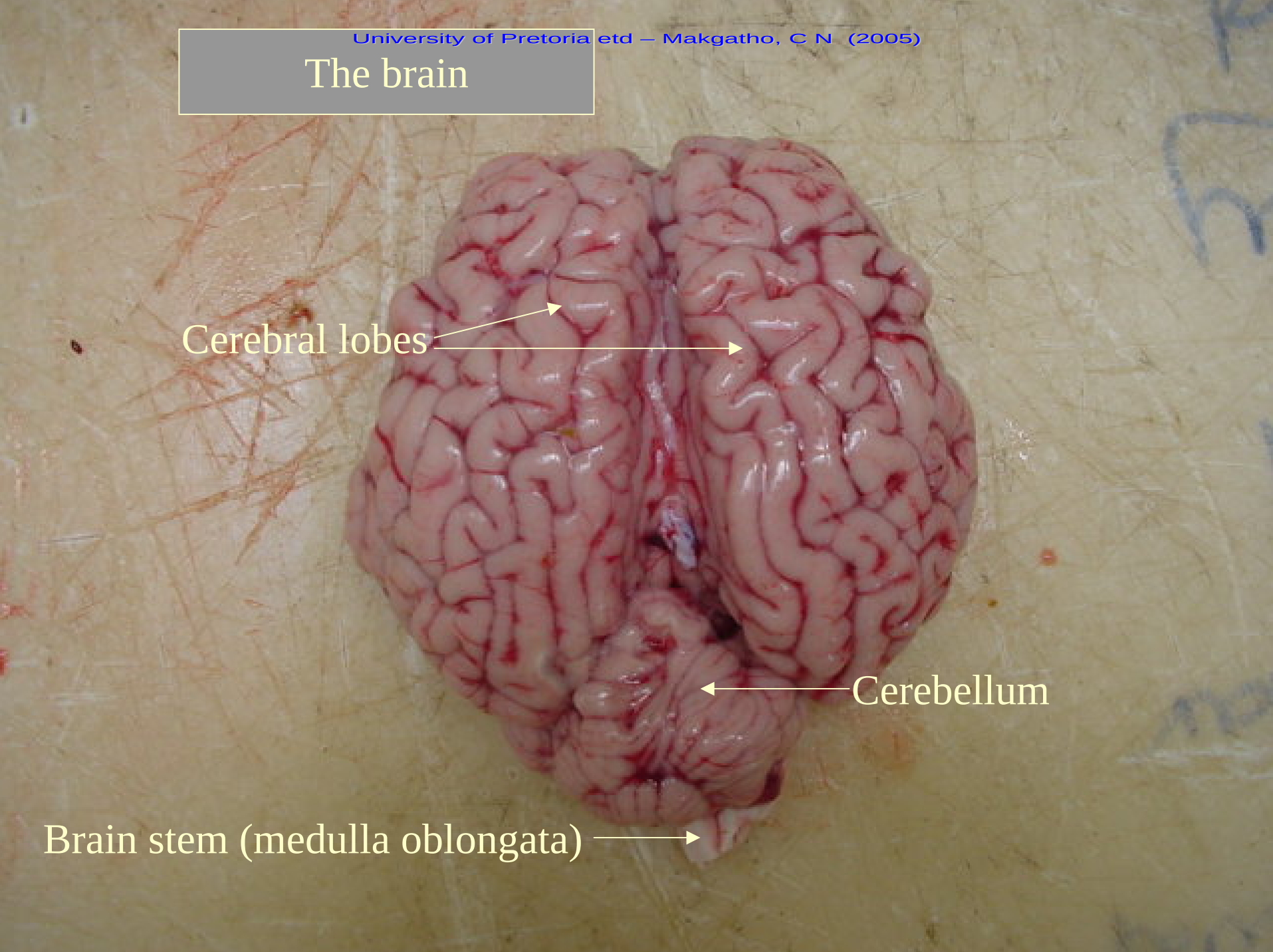


Look at the colour, feel the consistency, notice any abscesses or pus

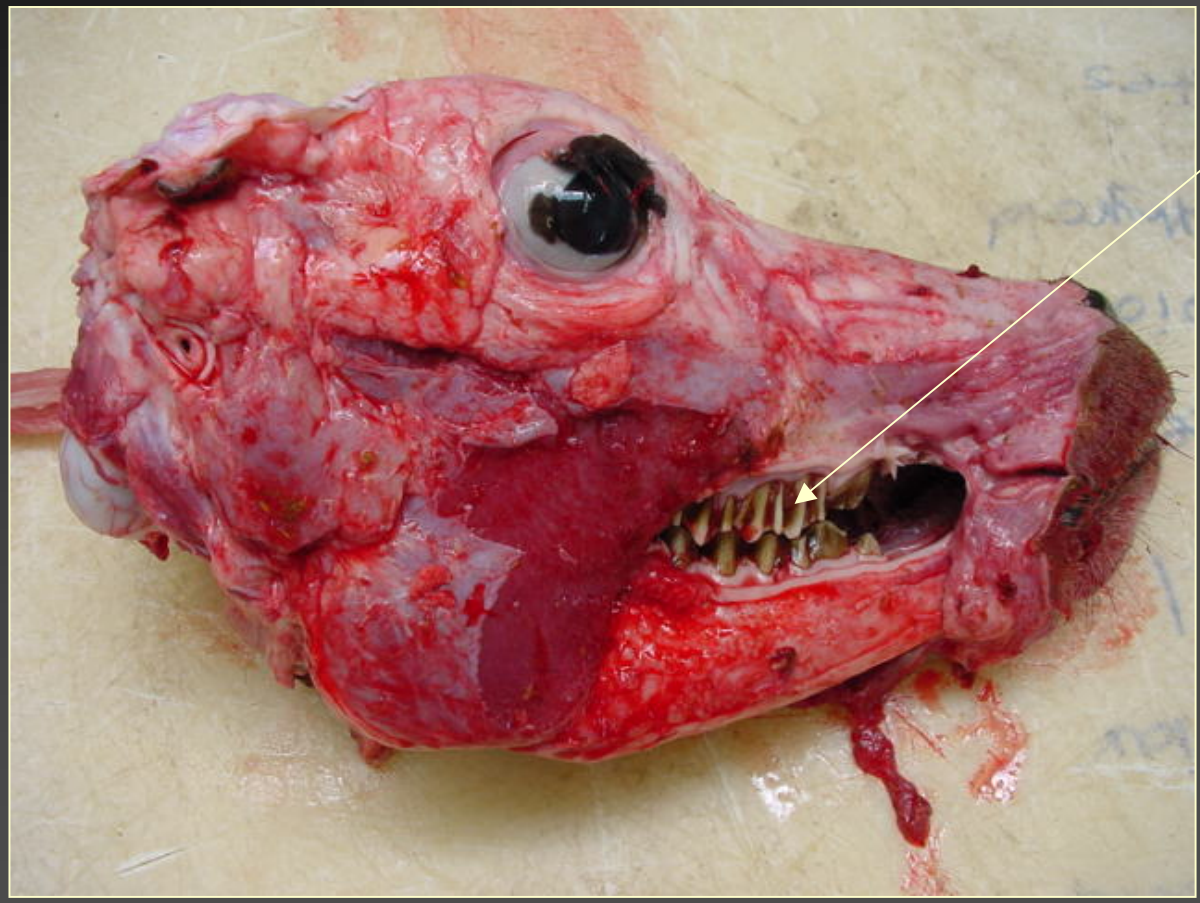
Remove the top of the head and expose the brain



The brain



Look at the back teeth:



Look at the back teeth (molars)

- This is a common cause of death in old cows
- The teeth are worn down and the cow cannot chew the hard grass in the dry season
- The cow dies of starvation

REMEMBER

- Do the necropsy as soon after death as possible
- Contact the state vet if you suspect rabies or anthrax, before you cut up the carcase
- Use gloves or wash you hands well after cutting up the carcass
- Note all the abnormal features (use the checklist)
- Describe these to the vet over the telephone or at the state veterinary office
- The vet will give some ideas about what caused the death of your cow
- Follow the advice of the state vet about the disposal of the carcase and organs

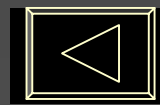
More details about these diseases:

Brucellosis: This is a disease that causes abortions in cows and can also cause fever, joint pains and infertility in humans

Salmonellosis: This disease causes diarrhoea and death in calves and can cause diarrhoea, vomiting and death in people

Abscesses and wound infections: The bacteria that cause wound infections in animals can infect any cuts on your hands as well

Rift Valley Fever: This virus can cause abortions in cows and blindness or even sometimes death in people that are infected



Press here to go back

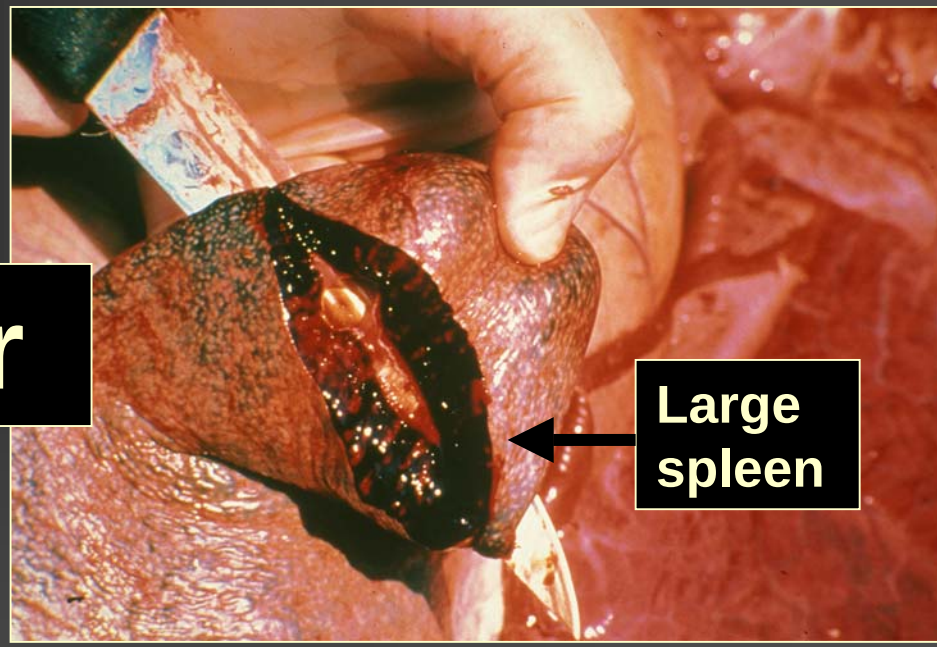
Anthrax

Anthrax is a bacterial disease that causes sudden death in cattle. Soon after death, blood comes from the anus and from the nostrils of the cow. The membranes are dark and if the dead animal is opened, the blood is also dark. The spleen is very large. If the carcase is opened the bacteria forms a spore which stays a long time in the ground. People can be infected with anthrax and the disease takes three forms, a skin form, an intestinal form and a lung form. This is a notifiable disease and you must contact the state veterinarian urgently if you suspect your cow has died of anthrax. Anthrax is prevented by vaccination, and cows should be vaccinated every year.

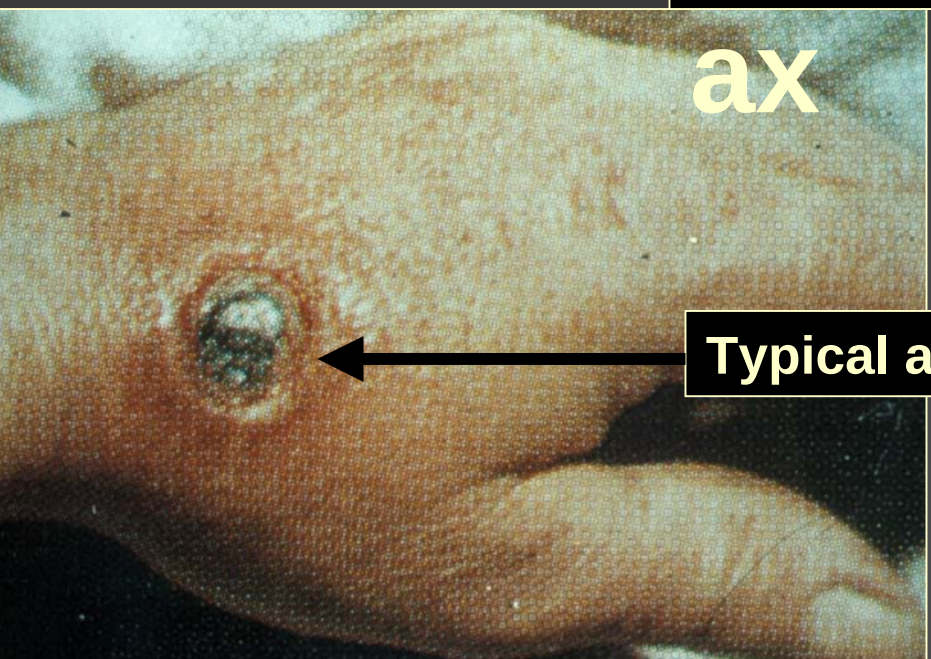
To see pictures of Anthrax, press here

Do not open carcase, rather make a blood smear

Anthrax



Large spleen



Typical anthrax lesion on person's hand

Press here to go back

Rabies

Rabies is a disease of people and animals caused by a virus. It is carried through the saliva and blood of an infected animal. Cows are usually infected after they are bitten by a dog or jackal. The cow or bull salivates a lot, moves strangely and stands or lies and bellows all the time. It can also look as if it has something stuck in its throat and will not drink water. After 6 to 10 days the cow will become paralysed and die. None of the organs are abnormal but the cow may have injuries to the mouth because of biting at strange objects.

People can be infected by the saliva of the live cow and the blood of a cow that has died from the disease. Unless they are treated, they will die. So this is a very dangerous disease.

To see pictures of Rabies, press here

Rabies

Cannot drink water

Phone the state vet immediately!!!

Bellows all the time

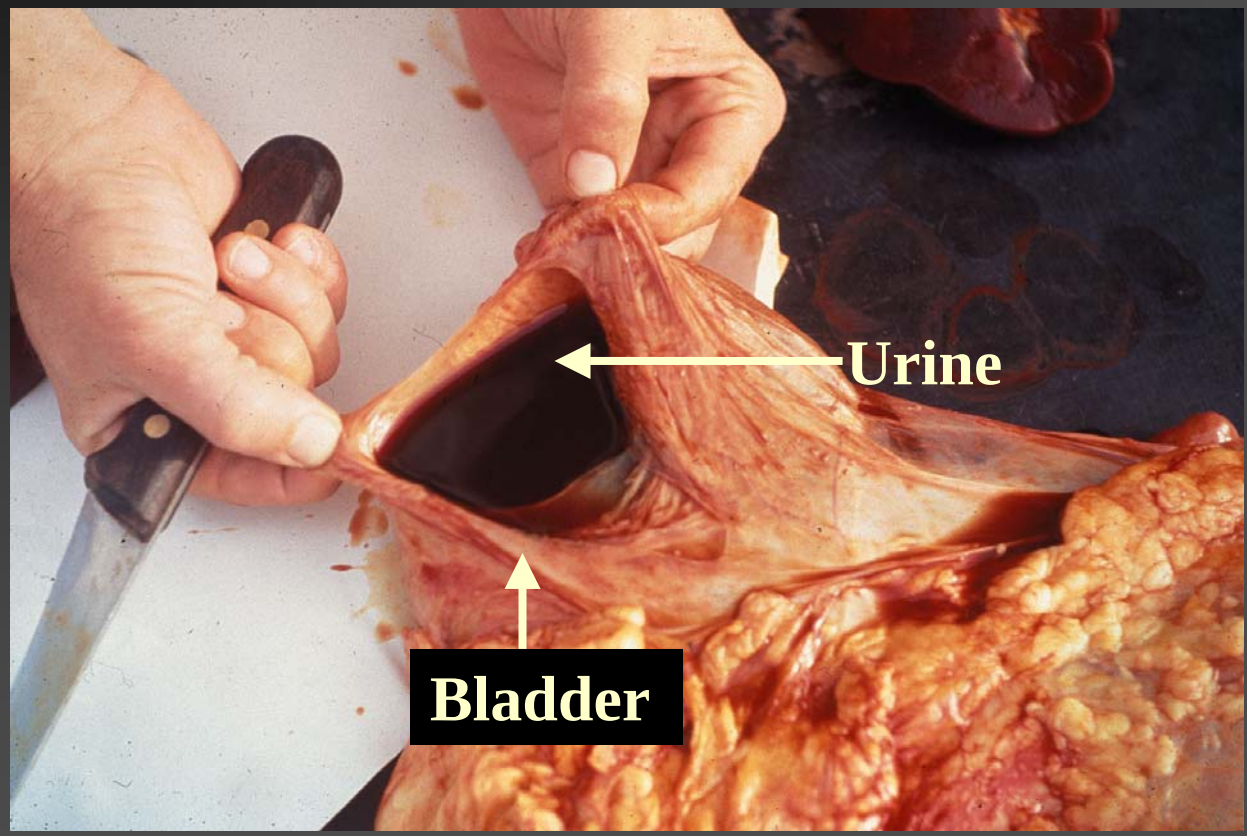
Salivates a lot

Press here to go back

This is a yellow or "jaundiced" carcase of a young calf with redwater

Press here to go back

The urine is red, this cow had redwater.



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