

Laboratory Diagnosticians Group of the South African Veterinary Association/State Veterinarians

The following are abstracts of papers presented at the Annual Scientific Meeting of the above two groups, 25 and 26 August 1997, Pietermaritzburg, South Africa.

CONTINUING EDUCATION AND STATE VETERINARY MATTERS

Continuing education and postgraduate training in veterinary science: a modular approach

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There are several veterinary faculties, technical colleges and other institutions in sub-Saharan Africa that offer formal or informal training in various aspects of veterinary science. Short, formal, structured, skills-orientated courses are not, however, readily available. Few people can afford the time and money to attend full-time postgraduate courses, but may need to acquire new knowledge and skills to perform their tasks more efficiently. The introduction of modular courses for veterinarians and veterinary technical personnel was given impetus by the Office International des Épizooties-sponsored workshop on *The Requirements of a Sustainable Veterinary Diagnostic Service in Southern and Eastern Africa* that took place from 12–14 July 1995 in South Africa. At this workshop it was resolved that the maintenance of a functional veterinary diagnostic service is dependent on training of all levels of personnel involved in veterinary diagnostics. The Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, has in collaboration with a number of faculties and institutes in the Southern African Development Community, offered modular courses during the last 3 years. Modular courses provide ideal opportunities for collaboration with scientists from other veterinary faculties and institutes. A network of tutors and trainees can be established so that they can contribute towards harmonisation of veterinary services within a region. They also provide opportunities for capacity-building or career development without candidates necessarily embarking on a formal postgraduate degree programme. Credits that are given for each module can, however, be used towards obtaining a postgraduate degree. This paper deals with experience gained with modular courses related to veterinary diagnostics and epizootic diseases, and touches on efforts to secure recognition of credits by veterinary faculties throughout the region.

Project management

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Gauteng Veterinary Services is implementing a multiple projects management (MPM) approach for organisation of these services. A project has been defined as an endeavour in which human and financial resources are organised in a novel way so as to undertake a unique scope of work, of given specification within constraints of cost and time, in order to achieve beneficial change, defined by quantitative and qualitative objectives. Some adaptation of this 'idealistic' approach is required, since an integral part of our work is routine and repetitive, *i.e.* regulatory and hence neither novel nor unique. We are nevertheless adopting a MPM approach for operational activities and organising them to fit into the budgetary year. For our purposes a project can also be viewed as a network of related activities aimed at the accomplishment of a predetermined objective by a given deadline. The concept through which all projects are to be managed makes use of a sponsor *i.e.* the financier of the project, the champion, *i.e.* the technical expert and initiator of the project, and the project manager for the team management procedural expertise. A project should ideally have a starting point

and an envisaged completion point and this should preferably hold true for each activity within it. The approach to project management has 3 fundamental levels: premise (purpose, content and principles), strategy (objectives, processes and levels), and tactics (tools and techniques), and 4 basic stages in its life: proposal/feasibility, design, implementation and closure. Gauteng Veterinary Services has a list of approximately 61 projects. In any given project, actions are organised into responsibilities (responsibility charts) and time-schedules. Other advantages of a MPM approach are that all personnel become involved, everyone takes on responsibilities, and a useful tool is created to evaluate personnel performance. Although there will initially be problems in creating and implementing the necessary methodology, we believe that after about 2 years, the MPM approach will be of great benefit. The Cresta software computer programme will be used to administer the multiple projects and, in particular, to organise interlinked time-schedules, since all staff members will be involved in multiple projects.

Provision of a clinical service as a state veterinary function within the North-West Province

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Clinical service as a state programme is in rigid alignment with existing government policies and principles, for it seeks to enhance access and capacity-building for a specified target farming community. At the same level, enormous constraints such as inadequate resource provision by the state are exerting a negative effect on the sustainability of this service. These factors warrant a timeous intervention and contribution from all the stakeholders so as to develop a better framework for implementation and optimisation of this service.

Participatory needs assessment and extension

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The generation of appropriate technology through research and its transfer to farmers by extension is important for sustainable agricultural development. In traditional learning institutions, the teacher decides in advance what needs to be taught. Adults (farmers) learn on a basis of 'need to know'. A farmer's knowledge and experience in farming are acquired through decades of encountering practical problems, so that indigenous knowledge is of importance and should be recognised. Self-identity is partly a result of past experiences. Ignoring these experiences may be perceived not simply as a rejection of the experiences, but also of the people themselves, and a sign of disrespect. The role of the teacher is to engage in a process of mutual enquiry with adults, who are responsible for decisions affecting their lives. Previous experiences may, however, also have negative effects such as mental bias to new ideas and alternative ways of thinking. Extension officers with their superior education may feel under pressure to offer all the answers to problems. The extensionist should identify the farmers' perceived problems, help them define them, and ultimately help them find solutions. This results in 'betterment' but not necessarily capacity-building or empowerment. Empowerment can apply to an individual, an organisation, or a community, and leads to the realisation that one has the ability to influence issues affecting one's life, and to participation in community organisations. Identifying

not only problems but also assets within the community and how these can be used for further development is more likely to result in community development. Research and development should be conducted in such a way that there is farmer participation, but should not be too expensive in terms of time and resources. Rapid appraisal (RA) methods meet many of these requirements. They are quick, multidisciplinary and interactive. The appraisal should be completed within a few weeks, by a team of workers from different disciplines who share their different perspectives during the appraisal. Samples are chosen purposively rather than randomly. The focus is on opportunities rather than problems. At Medunsa we have used RA methods to initiate a development programme in the Jericho area. These experiences will be discussed.

Community services projects: Gauteng Veterinary Services

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The overall aim of the projects is to empower communities with information on veterinary matters so as to allow them to make informed choices and decisions. Key areas are controlled animal diseases: rabies, brucellosis (CA), tuberculosis (TB) and public health (zoonoses, meat hygiene). Critical points are the 'resistance to change (RC) factor', infrastructure, price of meat and education. Veterinary health advisors were deployed in various townships to initiate campaigns centred on our key animal diseases. Videos on rabies, in consultation with education authorities, are shown at schools with the target group being children under the age of 13. Certain areas are then selected for a one-off vaccination campaign. The response has been very encouraging and so far we have vaccinated more than 18 000 dogs and cats since the middle of May 1997. An industrial theatre with the themes rabies, safe meat and milk hygiene got under way in the middle of May to complement the videos shown at the schools and to these too there was a fantastic response. Brucellosis is also covered in the industrial theatre, where the dangers of the disease and the zoonotic implications are stressed. Veterinary health assistants (VHAs) also visit cattle owners in the townships to test their cattle for brucellosis so as to establish the status of the herds in these areas. This has met with little success owing to an element of suspicion of anyone offering to test animals free of charge. The other main problem is lack of experience of VHAs in terms of communication skills, but this problem is receiving attention. The same approach is being employed for TB as for CA in an attempt to establish the health status of the herds in Gauteng townships. The most important aspects of veterinary public health are those of zoonotic transmission and meat hygiene. Here we also make good use of the industrial theatre to highlight the various aspects of meat hygiene and zoonotic diseases. To alleviate the problems associated with lack of proper infrastructure for dispensation of wholesome meat, a container project is currently under way and should help tremendously for the provision of safe meat to inaccessible areas.

Rural and commercial beef cattle production in the Northern Province

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Breeding beef cattle for meat production has been neglected in the rural areas of the Northern Province. Beef cattle production has followed traditional tribal pastoralism, the objective of which has been to maximise animal numbers rather than animal production, to the detriment of the environment. By contrast, true commercial pastoralism would require maximum profits by maximising animal production with proper management of the biosphere so that it may yield the greatest sustainable benefit to present generations, while maintaining its potential to meet the needs and aspirations of future generations. This situation has been the culmination of many

separate but interwoven strands, the majority of which have been sociopolitical and economic in nature. However, before the present situation can be assessed and understood, there is a need to understand the past circumstances. Rural people have changed from living in the traditional way on the land and they have become peasant farmers, migrant labourers and westernised townsmen. Their former political and economic systems have virtually disappeared, their religious beliefs have been influenced and their culture modified by prolonged contact with western culture. This presentation will consider improvement of beef-cattle production in the rural areas of the Northern Province via an ethological evaluation of rural versus commercial beef-cattle production in the rural areas. A holistic resource-management approach will be used according to the contextual diagnosis principle and the following will be considered: disease surveys, socioeconomics, beef breeds in the Northern Province, comparison of management systems, and veld management.

Mortality in stall-housed pigs and the results of pathological examinations

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Pig mortality in a local non-commercial stall-housing scheme was recorded in 3 groups of pigs, namely preweaner piglets, hogs and gilts and adult sows and boars over a 4-year period from 1988 to 1991. Mortality in the 3 groups varied each year during the 4-year period, ranging from 1.4 % for hogs and gilts to 35 % for piglets in 1990, with an average annual mortality ranging from 3.4 % to 4.8 %. Average mortality for the different groups was 10.8 % for the piglets, 7.5 % for sows and boars and 2.2 % for hogs and gilts. Gross pathological and microbiological analyses of the pig carcasses identified 7 'infectious disease syndromes' and 4 'non-infectious disease syndromes'. The 'infectious' conditions included colibacillosis/coliform gastroenteritis/oedema disease, pneumonia, peritonitis, septicaemia, arthritis, suppurative pyelitis, haemorrhagic enteritis and valvular endocarditis, and reproduction-associated problems, namely post-farrowing endometritis, coliform metritis and mastitis and haemorrhagic endometritis and oophoritis. The 'non-infectious' conditions were oesophago-gastric ulceration, nephrosis, heat stress and interventricular septal defect. Different disease syndromes were associated with the 3 age groups and the principle conditions in the preweaner piglets included colibacillosis/coliform gastroenteritis/oedema disease, iron deficiency anaemia and a single case of *Corynebacterium* spp. infectious arthritis. Peritonitis resulting from intestinal rupture, volvulus, castration or ruptured inguinal hernia occurred relatively commonly in both the piglet and hogs and gilts groups. In hogs and gilts, oesophago-gastric ulcers, pneumonia on its own or associated with an adhesive pleuritis and/or serofibrinous peritonitis and nephritis/cystitis were the most notable conditions with a single case of an interventricular septal defect in a gilt. In sows and boars the most common disease conditions were those associated with the reproductive process as well as miscellaneous conditions such as nephrosis, vegetative endocarditis, haemorrhagic enteritis, upper respiratory tract infections, trauma and heat stress. The diseases diagnosed were mostly sporadic in nature except for a single outbreak of colibacillosis and coliform gastroenteritis in piglets during 1990 that was attributed to lack of appropriate medication.

VIRAL CONDITIONS

The viruses of summer 1996 and 1997

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Every summer, particularly if very wet, has its own vector-borne diseases and viruses. If we compare 1996 (wet) with 1997 (average), a number of different trends emerge. After a quiet African horse-

sickness (AHS) period we recorded 130 cases that probably reflect only 1/10 of the actual number for 1996, and represent a 15-year high. We learnt that massive exposure to vectors leads to increased deaths, even in well-vaccinated horses; that maternal immunity is lost before the age of 6 months; that at least 3 consecutive vaccinations are required to confer adequate immunity; and, most importantly, that no polyvalent vaccine is 100 % effective. In 1996, bovine bluetongue (BT), an accepted asymptomatic seasonal event, suddenly became an identifiable symptomatic entity. The 4 serotypes identified in cattle, where type 2 was dominant, were all among the 8 sheep serotypes isolated. When the appearance of bovine BT could not be explained in terms of a new or rarely encountered BT serotype, massive exposure and/or multiple re-exposure with sensitisation were thought to be the most likely explanations for the many clinical cases seen. Epizootic haemorrhagic disease, a seasonal first that shared prominence with bovine BT, will be better understood when it has been serotyped. In 1997, AHS and BT, with 45 and 20 submissions respectively, were overshadowed by the emergence of lumpy skin disease (LSD) and ephemeral fever (3DSS). Cases of 3DSS rose from 14 to 36, with the first 2 positive virus isolates made in over 10 years. Unless the isolates prove to be a new rhabdovirus, it will be difficult to explain the dramatic explosion of 3DSS cases solely by poor vaccine performance. The isolates will, however, form the basis of important field challenge material to test the efficacy of what is perceived to be a poor vaccine. LSD circulates most years but lesions submitted doubled in 1997 and diagnostic sera showed an increase from 22 to 141 samples. Apart from complaints of disease in vaccinated animals, not attributable to needle transmission, unusually high mortality, > 10 % in an unvaccinated herd, was recorded. Vaccination recommendations were duly changed to annual administration. Lastly, 2 emerging diseases worth mentioning are herpes mammillitis (BHV-2) and enzootic bovine leukosis (EBL). The European model of BHV-2 is disease in recently calved heifers whereas in South Africa, lesions have been seen in calves or adults, not associated with calving but circumstantially linked to insects and grazing near water. Increased awareness of EBL led to submission of 1634 samples in 10 months with positive seroprevalence averaging 43.1 %, particularly in the Eastern Cape and Correctional Services herds.

African horsesickness: control measures

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In an effort to allow export of horses from South Africa to countries where African horsesickness (AHS) does not occur, a protocol was agreed upon by the European Union on the 7 January 1997. This was followed by the declaration of the Western Cape Province as an AHS Controlled Area; and AHS as a Controlled Animal Disease by the publication of Regulations on the 6 February 1997. This led to the proclamation of specific AHS zones in South Africa. The AHS-infected zone comprises the whole of South Africa outside the Western Cape Province. The whole of the Western Cape Province constitutes the AHS controlled zone, which is divided into 3 areas, the AHS-free area (essentially the metropolitan area of Cape Town); the AHS surveillance zone (an area surrounding the AHS-free area and essentially bordered by the Berg River in the North and the mountain ranges in the East); and the AHS protection zone (the rest of the Western Cape Province). Annual vaccination of all equines is required in South Africa except in the AHS-free area and surveillance zone, where equines may only be vaccinated with written permission by the Director of Animal Health. All equines including zebras in the AHS-free area, as well as the relevant land, must be registered by the Director of Animal Health. Movement of horses into the Western Cape, or from the protection zone to the surveillance zone requires specific veterinary health certification 48 hours before movement. This includes veterinary AHS vaccination at least 60 days before and not longer than 24 months before movement, as well as possession of a movement passport. Pre-notification of movement is also required. Unregistered horses and zebras may only enter the Western Cape Province and the relevant zones following 40 days' quarantine in vector-protected premises.

Movement from the surveillance zone to the AHS-free area requires health certification similar to the above, but specifically no AHS vaccination in the 60 days before movement. Sentinel horses are bled monthly in the surveillance zone and the serological results submitted to the European Union. Vector-free quarantine facilities exist within the AHS-free area where horses are kept before export. It is of the utmost importance that all parties follow these measures, as the export of horses from South Africa is totally dependent on the maintenance of the Cape Peninsula as an AHS-free area.

Bovine malignant catarrh: investigation into an outbreak on Telperion farm, Witbank district, Mpumalanga

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An outbreak of bovine malignant catarrh (BMC) that occurred in 1997 on the farm Telperion in the Witbank district, Mpumalanga Province, is described. The outbreak involved Friesland cattle purchased in 1990 and Nguni purchased in September 1995 from KwaZulu-Natal and in March and September 1996 from Gravelotte and Pietersburg in the Northern Province. The cattle are reared extensively and share grazing and a waterhole with approximately 166 blue- and black wildebeest that have been present on the farm for many years. The blue wildebeest on the farm calved during January and February 1997 and the 1st case of BMC, confirmed histopathologically, occurred in one of the Nguni cattle in March 1997. Several cases of the disease were noted thereafter and an investigation into the disease outbreak was initiated to determine the prevalence of the disease in the herd and factors influencing its occurrence. The investigation focused on the epidemiological and clinical findings in the field and the PCR test for BMC in the laboratory. The pertinent epidemiological and clinical findings are discussed. PCR results were controversial, as initially in April 1997 when 12 cattle (7 with typical clinical signs of BMC and 5 that appeared listless and inappetent) all tested positive for the wildebeest form of the disease. Subsequently, however, in July 1997, when all 66 cattle in the herd were bled for BMC-PCR, only 2 cattle tested positive, both for the sheep-associated form. This prompted a re-evaluation of the BMC-PCR test as performed by the Onderstepoort Veterinary Institute (OVI) and investigations are under way at OVI to make the test more reliable so that this and other future outbreaks can be followed with a view to finding answers to puzzling questions about this disease.

An outbreak of Wesselsbron disease in boer goats

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During the period April to May 1997 an outbreak of Wesselsbron disease (WBD) was investigated in 2 separate flocks of boer goats, each consisting of 30 pregnant ewes and 30 kids, on 2 farms in Mopani-type veld in the Messina district of the Northern Province. The area had received above-average annual rainfall of 488 mm, especially from December to May 1997 when 357 mm was recorded, compared to the average annual rainfall for the previous 20 years of 334 mm. This favoured the establishment of shallow pans that created ideal breeding conditions for floodwater *Aedes* spp. mosquitoes. The pens where the goats were kept overnight were situated next to such a pan. Eight (27 %) stillbirths were recorded, 2 (7 %) ewes died 3 weeks after lambing and 4 (13 %) 2-month-old kids died, although the mortalities could not all be attributed to WBD. The outbreak was unusual in that the death of 1 ewe was a direct result of WBD. The diagnosis was initially based on histopathological findings of severe acute hepatic necrosis with numerous cytosegroves, severe nephrosis and lymphoid necrosis and depletion of lymphoid tissues, and later confirmed by a strongly positive result with immunohistochemical (IH) staining for WBD on selected sections of formalin-fixed liver. The 2nd ewe revealed only a few scattered positive hepatocytes with the IH technique, but was highly positive serologically with a titre $\geq 1:1280$ using the

haemagglutination inhibition (HI) test for WBD. The histopathological examination suggested that, although WBD-type lesions were present in the liver of this ewe, these were too mild to have accounted for her death. The 4 stillborn kids received for necropsy were all negative for WBD histologically, serologically, and virologically. The livers of 2 of these kids were subjected to IH testing, but only 1 was positive for WBD. Serum was collected for the HI test from 4 ewes that had experienced stillbirths and 5 non-pregnant, clinically healthy ewes shortly after the occurrence of the stillbirths and again 3 weeks later. Titres were negative in all ewes at both samplings.

Rabies in Bushmanland

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Bushmanland is a sparsely populated, dry grass plain approximately 40 000 m² in the dry northwest of South Africa. The only viable way for people to make a living in this region is through extensive sheep farming. Termites, in particular *Hodotermes mossambicus*, form an integral part of the ecosystem. They are a major dietary item for the bat-eared fox (*Otocyon megalotis*), with a density of 0.2/km², in which rabies has been shown to occur. Bat-eared foxes feed and hunt as a family unit or in larger groups and up to 15 can occur within an area of only 0.5 km². Their widespread distribution, high density and social behaviour have all contributed to this species being an important carrier of rabies in Bushmanland. Although only 9 cases of rabies were confirmed in *O. megalotis* from Bushmanland during the period 1994–1997, 90% of Bushmanland farmers indicated that they had observed clinical signs typical for rabies in bat-eared foxes on their farms. With the exception of a few cases where human contact was known to have occurred, the brains of these animals were not submitted for rabies confirmation. It is obvious that the actual incidence of rabies in Bushmanland is higher than the official figures based on confirmed cases. One farmer came across 5 cases in 1997 and on another farm 60 km away 3 cases were confirmed within 3 months. During a survey of rabies amongst bat-eared foxes in the Serengeti National Park, rabies was found to be the most common cause of mortality in this species. Symptoms not usually associated by the general public with rabies may add to under-reporting of rabid animals. The initial spread of rabies to bat-eared fox in South Africa probably occurred during an outbreak of rabies in 1955 amongst domestic dogs and black-backed jackals (*Canis mesomelas*) in the northern parts of South Africa along the borders of Botswana and Zimbabwe. Isolates of rabies from the Bushmanland region have been typed as the canid strain. This poses the real threat of rabies spreading from Bushmanland to the bat-eared foxes of the southern Cape region and thence to the domestic dog population of this densely populated area. Further evidence for the spread of rabies in Bushmanland is the confirmation of 3 cases in 'aardwolves' (*Proteles cristatus*), 2 in the African wild cat (*Felis lybica*), 2 in sheep and 1 in a goat. As guard dogs, hunting dogs and in particular sheep dogs are an important part of the Bushmanland culture it is extremely worrying that the majority of these domestic dogs are not vaccinated against rabies. Bushmanland should be regarded as an endemic region for rabies in South Africa and the necessary precautionary measures against spread of this disease should be instituted as soon as possible.

BACTERIAL CONDITIONS

The identification of Gram-positive branched filamentous bacteria

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Distinguishing pathogenic *Nocardia* and *Actinomyces* from common contaminants such as *Streptomyces*, *Agromyces* and

Oerskovia is difficult, particularly in a veterinary laboratory, as many similar contaminants occur in soil or compost. Identifying unique members such as *Dermatophilus* is relatively easy, but the others require specialised techniques, such as high-pressure liquid chromatography analysis, which are unavailable in the normal clinical laboratory. The best approach is to carefully examine the morphology, on a variety of growth media, at different stages of growth, in the same way that fungi are identified. Both the colonies and stained smears should be examined. Liquid cultures may also be examined, but can present problems. An ordinary light microscope is required, preferably with a long working distance lens, to prevent fogging. Colonies may be examined directly, at all stages of growth, by placing the Petri dish containing a clear medium on the stage. If a pathogen is suspected, it is better to examine the dish upside-down, through the plastic. The techniques for growth and examination of the cultures are described in detail. Further tests that are helpful in this group include: nitrate, urea, acid production on oxidation and fermentation media, aesculin, starch or casein hydrolysis, growth on Sabouraud's agar, growth at 55 °C and ONPG test. An antibiogram differentiates between members of Gram-positive branched filamentous bacteria and fungi; penicillin is included as a distinguishing test.

Bacterial isolates and antimicrobial sensitivities from dogs and cats over a 4-year period

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A total of 2299 samples taken from dogs and cats were processed by the bacteriology laboratory of the Department of Veterinary Tropical Diseases from 2 January 1994 to 31 July 1997. The number of samples from dogs outnumbered feline samples by 7 to 1. Most breeds of dogs were represented but the most common were German shepherd dogs, bull terriers and Staffordshire terriers, rottweilers, dobermans, boerboels and Maltese poodles. The most common samples included skin ($n = 580$), urine ($n = 543$), transtracheal aspirates (TTA) and lung aspirates ($n = 139$) and nasal flushes or cytobrushes ($n = 139$). Of the samples received, 818 were found to be negative on culture, particularly samples of bone, cerebrospinal fluid, blood, liver and spleen. *Staphylococcus intermedius* was the most common bacterium isolated, representing 23% of all isolates, with *Escherichia coli* being next at 16%. *Staphylococcus intermedius* was the most common isolate ($n = 307$) from skin, and was mainly associated with canine pyoderma, either as the sole agent or as a co-infection with *Streptococcus canis* ($n = 69$). Gram-negative bacilli predominated in urine samples cultured. Of these, *E. coli*, representing 40% of the isolates, was the most common and was usually isolated in pure culture. The skin and urine samples are discussed in detail. *E. coli*, staphylococci and enterococci isolated from animals with a history of prolonged or multiple antimicrobial therapy tended to be resistant to most antimicrobials.

The control and eradication of *Brucella melitensis* from KwaZulu-Natal

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The natural hosts of *Brucella melitensis* are adult goats and certain breeds of sheep, in which the disease spreads quickly, causing abortion, reduced milk yield and orchitis. *B. melitensis* is the least host-specific of the *Brucella* species and can spread from infected goats to various other species, including humans, in whom it causes the zoonotic disease known as Malta or Mediterranean fever. *B. melitensis* is thought to have originated from the Mediterranean region, but now also occurs in Central Asia, parts of Latin America and sporadically in the USA, Northern Europe and Africa. The 1st documented outbreak of *B. melitensis* in South Africa occurred in sheep in 1965 in what was then known as the Transvaal Province. A single case was also recorded in 1989 in a flock of boer goats on a

smallholding near Pretoria in the same province. In September 1994 an outbreak of *B. melitensis* amongst goats was discovered after a medical practitioner diagnosed Malta fever in the owner of a flock of goats on a plot adjacent to the Makhatini experimental station in northern KwaZulu-Natal Province (KZN) close to the Mozambican border. After the diagnosis of Malta disease shortly afterwards in a worker on the plot, all the goats in the flock were slaughtered and blood and/or tissue swabs were collected for serological testing and culture for *B. melitensis*. Twelve of 14 goats tested serologically positive and *B. melitensis* (biotype 1) was isolated from a range of tissues from several goats. A preliminary survey at various dip-tanks throughout the Ubombo and Ingwavuma districts along the Mozambican border to detect possible infected areas/foci within a ± 50 km radius of the original outbreak revealed a 2.8 % infection rate from 3 dip-tank areas. A more extensive survey revealed an average infection rate of 1.3 % in goats from 3 dip-tank areas. The South African Directorate of Animal Health decided to eradicate *B. melitensis* from South African goats. Positive goats were ear-tagged and slaughtered at the Cato Ridge abattoir in KZN and the owners compensated. The low prevalence amongst the goats tested and the surprisingly slow rate of spread amongst South African goats, with fewer abortions compared to other countries and as yet no cases of spread to in-contact cattle, is comforting. However, a positive case was detected recently in the Ladysmith State Veterinary area of KZN. As the disease is a serious zoonosis and could have disastrous economic implications should it become established in South African cattle and small-stock population, the current policy of the Directorate of Animal Health remains one of total eradication. The prevalence of the disease in neighbouring Swaziland is purported to be up to 12 % in some dip-tank areas, which is of concern for transborder spread, and this may ultimately force a policy change with regard to eradication of this disease from South Africa. An outbreak of listeriosis in cattle and sheep ingesting potato offcuts

An outbreak of listeriosis in cattle and sheep ingesting potato offcuts

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Listeria monocytogenes is a Gram-positive organism that is widely distributed in nature. Three different disease syndromes namely septicaemia, meningoencephalitis and abortions can occur in infected animals and humans. A case of listeriosis in a heifer from the Delmas district in Mpumalanga Province is described. The heifer exhibited nervous signs of incoordination, severe salivation and difficulty in swallowing water, and according to the owner unilateral 'corneal opacity'. Treatment by the farmer with unspecified antibiotics did not have any effect. At necropsy, *Aeromonas hydrophila* was isolated and on histopathology mild, multifocal acute fibrinous meningitis was noted, but no specific aetiological diagnosis could be made. Two weeks later a sheep developed severe nervous signs characterised principally by circling. On clinical examination the sheep was depressed, had severe unilateral 'corneal opacity' and bilateral nystagmus. Necropsy revealed severe liver fluke infestation, swollen and pale kidneys and severe cerebral congestion. Histopathologically there was a severe meningoencephalitis characterised by a predominantly lymphocytic vasculitis and multifocal micro-abscesses (foci of necrosis with severe neutrophil infiltration). Small Gram-positive rods were evident in and around the micro-abscesses. Culture of the brain yielded *Listeria monocytogenes* that was sensitive to amoxicillin, bacitracin, ampicillin, kanamycin and streptomycin. The 'range' sheep and cattle on the farm had been fed potato chips rejected by a potato-chip manufacturer owing to size discrepancies. The potato chips are sold in bulk and the owner made these available to the 'range' sheep and cattle on the farm. The potato offcuts were dumped on the ground and left there for extensive periods, and a degree of decomposition had taken place. The feedlot cattle and pigs that were given fresh potato chips daily did not develop any clinical signs. Morbidity increased sharply after heavy rains and cold spells. No *Listeria* organisms were isolated from the feed, probably owing to the presence of contaminants. In sheep, outbreaks are normally associated with feeding of silage, but carrier animals are also important in spread of the disease. In this outbreak

the sheep were emaciated and the on-farm hygiene poor, which further exacerbated the disease. Lambs were more prone to develop the disease but no abortions were noticed by the farmer. It is believed that the suboptimal hygienic conditions, the presence of carrier animals and the feeding of 'potato offcut chips' were the predisposing factors for listeriosis on this farm. The state veterinarian who performed the necropsy developed fatigue, a recurrent fever, headaches and general muscle aches and pains consistent with listeriosis 2 weeks later. The symptoms subsided after 3 days treatment with an antibiotic, known to be effective based on the antibiogram of the sheep necropsied.

Ovine paratuberculosis survey in the Western Cape Province

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The 1st case of ovine paratuberculosis in the Western Cape Province (WCP) of South Africa was diagnosed in March 1993 from a sheep in the Ceres district, followed by a positive diagnosis in the Caledon district in October 1993. Subsequently, cases were diagnosed on 3 more farms in the Caledon district in October 1994, March 1995 and December 1995. A survey was initiated in June/July 1996. Ninety sheep, 2-tooth and older, emaciated or in poor condition, were selected on each farm. These were bled and an Agar Gel Immunodiffusion (AGID) test for paratuberculosis conducted. All positive AGID reactors were slaughtered and examined. Diagnosis was confirmed by histopathology. In September 1996 the tally was 9 positive farms (Caledon 5, Ceres 4). By 28 November 1996, 53 838 samples representing 750 farms had been tested, with a total of 34 infected farms (Caledon 26, Ceres 6, Bredasdorp 1, Mossel Bay 1). The initial survey was completed on 31 March 1997, by which time 123 837 samples had been collected and tested, representing 61 % of the farms and 48 % of the sheep in the WCP. A total of 47 farms (2.7 % of farms tested) were positive, 33 in the Caledon district, 8 in the Ceres district, 4 in the Mossel Bay district, 1 in the Bredasdorp district and 1 in the Knysna district. Examination of the distribution of the infected properties indicated a positive correlation between acidic soils (especially silcretes) and infection. Only 1 of 47 farms was not situated on acidic soils. The relatively high prevalence of this disease in the WCP and lack of state funding renders eradication impractical. Control of spread and on-farm disease management seem to be the practical approach. Leaders in the sheep industry were consulted and a proposed voluntary control policy was drafted. This control policy was submitted to the National Department of Agriculture for comments and suggestions and for its application throughout South Africa.

Ovine paratuberculosis in South Africa – prevalence and serological diagnosis

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Ovine paratuberculosis or Johne's Disease (JD) caused by *Mycobacterium paratuberculosis* is a chronic, intractable, enteric disease of domestic and wild ruminants. It has a worldwide distribution and is of economic significance in various countries, particularly in New Zealand, the United Kingdom, Spain, and recently also Australia. It is a relatively new disease in South Africa, diagnosed for the first time in 1967 in an imported German Merino ram. Since then a serious outbreak, first recognised in 1986, occurred in a flock of sheep later named the Nooitgedacht-Irene paratuberculous (NIP) flock, housed either at the state-owned experimental farm Nooitgedacht in Ermelo (Mpumalanga Province) or the Animal Improvement Institute (AII) of the Agricultural Research Council (ARC) at Irene. During this decade an increasing number of cases were confirmed in the Western Cape, resulting in the decision early in 1997 to declare Johne's Disease a notifiable disease, at which time the Directorate of Animal Health also decided to conduct a nationwide JD survey to determine the significance of this disease in South Africa. Between January and June 1997 a total of 22 097 sheep

were tested at the tuberculosis laboratory of the Onderstepoort Veterinary Institute (OVI) using the Agar-gel immunodiffusion (AGID) test. The sera originated from 301 farms in 8 provinces. Tests on an additional 54 000 sheep from the Western Cape Province were carried out at the Stellenbosch Provincial Veterinary Laboratory (PVL). Besides the Western Cape, positive sheep were only diagnosed in 3 provinces, namely Eastern Cape, Free State and Mpumalanga, and the overall prevalence was 0.16 %. A research project to investigate the possible use of an ELISA-based test system for ovine paratuberculosis is presently being carried out at the Tuberculosis Laboratory of the OVI. Two ELISA systems developed for bovine paratuberculosis will be investigated. The commercial Parachek[®] kit (CSL Veterinary, Australia) has successfully been modified for use on ovine sera. However, owing to late seroconversion during the advanced stages of the disease, the sensitivity is not expected to be comparable to ELISA systems for other pathogens. The advantages are rather in the labour- and time-saving aspects of the ELISAs as opposed to the AGID test for testing large numbers of sera.

SURVEYS/REPORTS/DIAGNOSTIC PROCEDURES

Diseases, disease conditions and toxicities causing stock mortality in the Free State Province of South Africa

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The diseases, disease conditions and toxicities causing stock losses over a period of 11½ years as diagnosed at the Regional Veterinary laboratory of the Free State Province from January 1996 to June 1997 are reported. Figures given are as accurate as possible in the context that persons submitting the cases frequently only supply estimated figures of numbers involved and often fail to give an accurate account of the background history and clinical signs. In adult cattle, 237 outbreaks were recorded, involving 37 conditions with 439 (2.2 %) fatalities on 19 755 farms. The most significant conditions included plant toxicities (14 %), involving in particular cardiac glycoside-containing plants, the inkberry bush, *Cestrum laevigatum*, and *Argemone* and *Amaranthus* spp.; anaplasmosis (12 %); black quarter (10 %); abscessation (7 %); actinobacillosis (7 %); bloat, emaciation and helminthiasis (6 % each); botulism (5 %); and 3-day stiff sickness and ruminal acidosis (4 % each). In calves, 16 conditions were diagnosed, involving 90 outbreaks with 312 fatalities (9.3 %) on 3368 farms. The principal conditions diagnosed included *Escherichia coli* septicaemia (20 % of outbreaks), bacterial pneumonias, 75 % of which were due to *Pasteurella* spp. and the remainder to *Corynebacterium* spp. (17 %), dystokia (13 %), non-specific enteritis (12 %) and salmonellosis (11 %). In adult sheep, 32 conditions were recognised, involving 566 outbreaks with a mortality rate of 0.86 % on 300 880 farms. The principle conditions included internal parasitism (20 % of outbreaks), 52 % of which were due to wireworm; pulpy kidney (14 %); abscessation (14 %); pasteurellosis (9 %); plant toxicities, especially 'tulp', 'geeldikkop', prussic acid-containing plants, 'kaalsiekte', *Geigeria* and *Phalaris* spp. (7 %); bluetongue (6 %), coccidiosis (4.5 %), ketosis (3.7 %) and acidosis (3.5 %). In lambs, 64 outbreaks involved 13 disease conditions with a 2.1 % mortality rate on 16 733 farms were recorded. The main conditions were starvation/emaciation (28 %), necrobacillosis (15.6 %), *E. coli* septicaemia (15.6 %) and dystokia (1 %). In goats 53 outbreaks of 17 conditions occurred with a mortality rate of 1.8 % on 19 279 farms. The most significant conditions were coccidiosis (17 %), internal parasitism (13.2 %), pasteurellosis (13.2 %), abscessation (11.3 %), pulpy kidney and emaciation (7.5 % each) and acidosis and metritis (3.7 % each).

Causes of abortion in cattle over a four-year period (1993–1996)

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A total of 194 bovine foetuses were examined by the pathology section of the OVI from 1993 to 1996, during which period a standard

procedure was adopted for procurement of background history and clinical signs, necropsy examination and collection of specimens. All necropsies are performed in a negative-pressure fume cupboard so as to minimise the possibility of contracting zoonotic conditions, in particular brucellosis and Q-fever. Necropsy examination includes examination of the foetus and placenta, when received, for level of autolysis, pathological lesions, body fluid accumulations and the presence of congenital/organ anomalies. Specimens are collected aseptically for aerobic/micro-aerophilic bacterial isolation and smear examinations, and in 10 % formalin for histopathological examination (HPE). Only if the background history is suggestive of a viral cause are tissue specimens, in particular lung, liver and spleen, as well as foetal body fluids, collected for viral culture and serology. The ideal specimens for bacterial culture were found to be abomasal fluid, lung, liver and brain, and *always* when available 1–2 placental cotyledons. A wide range of tissues are collected for HPE, but must include liver, lung, spleen, brain, kidney, heart, skeletal muscle and of course placenta, when available. Diagnoses are grouped as: cause not determined, infectious causes and non-infectious causes. Infectious causes included bacteria, further subdivided into brucellosis, *Actinomyces pyogenes*, miscellaneous bacteria and suspected infectious, based on the presence of histopathological lesions suggestive of an infectious aetiology, but in the absence of a positive bacterial isolation; fungus; protozoa and viruses. Non-infectious causes comprise dystokias, developmental anomalies, mummies, metabolic/nutritional and stress-related conditions. A cause was not determined in 42 % (81) of cases. Of the 58 % (113) of cases for which a cause was determined, 59 (51 %) comprised bacteria or a suspected bacterial aetiology, although for 28 (47 %) of these no bacteria were isolated. Only 1 fungal case was diagnosed and 2 suspected viral cases. Protozoa caused 10 cases, *Anaplasma* 9 cases and *Trichomonas* 1 case. Of 42 non-infectious abortions, 22 (56 %) cases were dystokias and 12 (31 %) were developmental anomalies. The remainder included 3 mummies, 1 nutritional case (a case of congenital white-muscle disease) and 1 stress-induced case.

Myeloid leukaemia in South African broiler breeders

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In 1992 a new subgroup of the leukaemia/sarcoma avian retrovirus group was identified in poultry in the United Kingdom (UK). This virus was classified as a subgroup J avian leukaemia virus and was characteristically associated with myeloid leukaemia and nephromas in meat-type (broiler) lines. Over the next 4 years numerous 'outbreaks' of this condition were reported from the USA and Europe. In South Africa the 1st cases of suspected myeloid leukaemia were diagnosed in the spring of 1996 when cases were submitted for necropsy to the Medunsa Animal Hospital. The poultry submitted were all Ross broiler breeders and both male and female birds were affected. At necropsy, multifocal to coalescing grey neoplastic nodules were present in the livers, spleens and kidneys. Accompanying these changes were multiple nodules arising from various bones such as the keel, the acetabulum (leading to the lameness seen clinically), the skull and the cartilaginous bones of the tracheal rings. Histologically these masses consisted of a uniform population of myelocytes with large vesicular nuclei, a distinct nucleolus and moderate amounts of cytoplasm packed with acidophilic granules. A diagnosis of Group J myeloid leukaemia was based on the classical histological presentation of this condition.

The PCR technique as a diagnostic tool

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The polymerase chain reaction (PCR) is an extremely powerful molecular technique, which is increasingly used as a diagnostic tool. By using this method, minute traces of nucleic acid (DNA or RNA) from infectious organisms or specific parts of chromosomes can be

amplified and detected. PCR technology is still in its infancy, considering that the 1st paper about PCR appeared in 1985. Until recently, the technique resided mainly within the domain of the research laboratory. However, owing to the tremendous potential of the technique, there is a general tendency to bring this exquisite technology into the realm of the routine diagnostic laboratory. Apart from its application in fields such as molecular biology, medical diagnostics, including forensic analysis and population genetics, the PCR technique has also been developed successfully for the diagnosis of various pathogens of veterinary importance. Other applications in the veterinary field include paternity determination, diagnosis of genetic diseases (malignant hyperthermia gene in pigs), detection of drug-resistant helminths, and sexing of bovine embryos and birds. Although the technique has shortcomings, characteristics such as high sensitivity and specificity, repeatability, ease and speed of performance and affordability make this technique a competitive alternative for a variety of conditions. At the Onderstepoort Veterinary Institute, a certain number of tests are already offered routinely and many others are in the process of development. These include the detection of various infectious agents as well as some genetic assays such as sexing of birds and paternity determination in birds and game animals.

The diagnosis of bovine pleuropneumonia

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Contagious bovine pleuropneumonia (CBPP) is a highly fatal disease of cattle that does not at present occur in South Africa. As the disease can cause serious economic losses, all available measures should be taken to prevent its entry into South Africa. The incubation period of CBPP, which varies from ± 20 days to 4 months, is such that inadvertent spread may already have occurred by the time that the disease is suspected. Rapid and reliable laboratory tests for confirmation of CBPP, preferably at an accredited laboratory, are therefore vital. Laboratory diagnosis of CBPP is required at 3 different levels, namely diagnosis in dead animals, in live animals showing suspicious clinical signs, and carriers. Suspicion of disease is based on clinical signs and macro- and microscopical pathological lesions. Confirmation depends on recognition of the presence of either the antigen or antibodies. Diagnosis of the disease in animals not showing clinical signs is much more difficult, and directs most of the research efforts into the diagnosis of CBPP at present. The diagnosis of carrier animals is of paramount importance in the control of CBPP. Animals incubating the disease have been shown to harbour the mycoplasma in their nasal passages for 40 days or longer before developing clinical signs of infection or serological response to it. Recovered animals may contain sequestered infective organisms for 12 months or longer and it is believed that stressful conditions such as transport may lead to immunosuppression and the breakdown of sequestra, resulting in recrudescence of disease and shedding of infective material. Techniques available for laboratory diagnosis of CBPP include those for recognition of the antigen and detection of antibody. Classic methods for recognising the antigen are based on culture of the organism, which is in itself not easy, as the organism is fastidious and has special growth requirements. The most promising lines of many investigations appear to be ELISA and PCR techniques. Detection of the antigen by the direct or indirect fluorescent antibody technique (FA) may be performed on field samples, but requires a practised eye. Immunoperoxidase staining is highly specific, but can only be applied to tissues in a laboratory equipped to do histopathology. Training in the PCR technique should be available to personnel of reference laboratories, but it must be borne in mind that the PCR technique demands a level of good laboratory practice that may not be achievable in all laboratories. Serological detection of antibody is, and probably will remain, the most important method of detecting carriers. The serological test recognised at present by the Office International des Épidémiologies is the complement fixation test (CF), but advances have been made in the much more sensitive ELISA technique, and it is likely that an ELISA test will soon be used or even replace the CF test.

Combined borehole water and phyto-genous oxalate poisoning of cattle in the Northern Province of South Africa

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Serious disease involving approximately 30 % of cattle over 2 months of age occurred on a farm in the Warmbaths district of the Northern Province of South Africa. The cattle were reared on star-grass pastures irrigated with water from a borehole on the farm that also served as their only supply of drinking water. Clinical signs generally occurred about 2 weeks after the animals had been introduced onto these paddocks and included poor growth and marked loss of condition. Affected calves frequently developed swollen knee joints and the older cows exhibited stiffness of the hip joints. The eyes of some of the adult animals were sunken and there was overgrowth and black discolouration of periorbital and facial hair. Although the total number of deaths was not recorded, an estimated 50 cows and calves with advanced clinical signs had to be slaughtered over a 10-year period. At necropsy there were multifocal ulcers and multifocal thickening and induration of the ruminal and small intestinal mucosa. The kidneys were swollen, pale yellow and oedematous, with numerous raised white cortical nodules, and felt gritty when sectioned. Histopathological examination of tissues from 1 calf and 2 adult cows revealed scattered crystals compatible with oxalates and mildly positive with the von Kossa stain for calcium within renal tubules and in the submucosa and walls of larger blood vessels of the gastrointestinal tract. Mild chronic interstitial nephritis with dilation of scattered tubules was also present. The water from this borehole also caused excessive corrosion of the steel water-pipes and deleteriously affected the irrigated vegetable and citrus crops. Specimens of star grass and *Tribulus* sp. collected at random from the irrigated pastures revealed high levels of oxalates. Although certain grass species have been reported to contain oxalates, this is, to the best of our knowledge, the 1st report of oxalates in star grass and a *Tribulus* species. It is believed that oxalates in the diet were absorbed, bound to calcium in the blood or kidneys and deposited as insoluble calcium salts in the gut and renal tubules resulting in gut stasis and renal failure. The skeletal malformations are believed to have been due to fluorosis. Certain aspects of the New Water Quality guidelines of the Department of Water Affairs and Forestry (1996) are discussed.

Gousiekte in boer goats in the Camperdown district of KwaZulu-Natal, caused by ingestion of *Pachystigma latifolium*

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Sudden deaths in a boer goat flock on a farm in the Camperdown district in KwaZulu/Natal were found to be due to the typical cardiomyopathy and cardiac failure of gousiekte. In this instance the condition was caused by ingestion of the leaves of *Pachystigma latifolium*. This plant was found to be growing extensively on the farm and had clearly been browsed by the goats. Significant losses in the flock over the years had been assumed to be due to heartwater. This is the 1st report of gousiekte due to *P. latifolium* from this part of KwaZulu/Natal.

The diagnosis of *Babesia gibsoni* in imported dogs

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Canine babesiosis is a tick-borne disease caused by 2 haemoprotozoan parasites: *Babesia canis* and *B. gibsoni*. In South Africa,

B. canis is prevalent in dogs in all regions of the country and is transmitted by the yellow dog tick *Haemaphysalis leachi*, although the kennel tick, *Rhipicephalus sanguineus*, is also believed to transmit this parasite. During the summer months, approximately 80 % of babesiosis cases diagnosed in private practices in South Africa are due to *B. canis* infections. *B. gibsoni* occurs in Asia, Africa, the Middle East and North America. It affects domestic and many wild canid species, but no clinical cases of *B. gibsoni* have as yet been reported from South Africa. The increased number of dogs being imported into South Africa has increased the risk of this parasite entering the country, as many healthy dogs are asymptomatic carriers of *B. gibsoni*. *B. gibsoni* is smaller than *B. canis* and is transmitted by *H. bispinosa* in India and *H. longicornis* in Japan, although *R. sanguineus* has also been incriminated. The most commonly observed clinical signs in naturally infected dogs are anaemia, pyrexia, anorexia, lethargy and splenomegaly, and infected domestic dogs often develop moderate to severe haemolytic

anaemia that may result in death. Dogs with acute *B. gibsoni* infections may be misdiagnosed as cases of autoimmune haemolytic anaemia based on similar clinical signs in the 2 conditions. Definitive diagnosis of *Babesia* infections is usually based on the identification of parasites on thin blood smears stained with Giemsa or Rapid Diff stains, although the latter are inadequate for accurate parasite identification. Proper staining of peripheral blood smears is critical in the diagnosis of *B. gibsoni* infections, particularly in view of the small size of the parasites. The detection of antibodies against *B. gibsoni* in the blood of infected dogs can be useful for diagnosis, especially in chronically infected dogs that may have low or no detectable parasitaemias. Some drugs are effective in halting and reversing the clinical progression of the disease, but they do not clear the blood of *B. gibsoni* organisms, making these dogs a source of infection for ticks. Quarantine and serological testing of imported dogs is justified to prevent *B. gibsoni* infection entering and spreading through South Africa.

Book review — Boekresensie

Evaluation of certain veterinary drug residues in food

1998. WHO Technical Report Series 879, Geneva, 74 pp., paperback. Price Sw.fr. 16, (Sw.fr. 11.20 in developing countries). ISBN 92 4 120879 1.

This publication is the 48th report of the joint FAO/WHO expert committee on food additives, and presents conclusions reached on the safety of certain veterinary drug residues in foodstuffs. The expert committee was set up to provide guidance to FAO and WHO member states on veterinary drug residue issues. Part of the work of the committee is to recommend appropriate maximum residue limits (MRLs) for each drug and its metabolites and this report sheds some light on how these limits are determined.

For each veterinary drug a MRL is set in every species routinely treated with that drug and different MRLs are specified for different organs (liver, kidney, muscle and skin/fat). The MRL is the maximum allowable level of a drug in a specific organ of an animal at the time of slaughter if that animal is to be considered fit for human consumption. Animal products such as milk and eggs are also allocated MRLs.

This particular report deals with 13 veterinary drugs: 2 anthelmintics (moxidectin and tiabendazole), 8 antimicrobials (ceftiofur, danofloxacin, dihydrostreptomycin, streptomycin, enrofloxacin, flumequine, gentamicin and spiramycin), 1 glucocorticosteroid (dexamethasone) and 2 insecticides (cyfluthrin and fluzuron).

The drugs are discussed under the categories: toxicological data, residue data, maximum residue limits, microbiological data (where applicable) and analytical methods. Not all categories are covered for every drug, as there are cases where the data have been presented before or where data are as yet unavailable. Gentamicin, spiramycin and dexamethasone are touched on only briefly, while the other drugs are dealt with more thoroughly.

Toxicological information on the drugs is provided

in detail, with descriptions of the actual experiments carried out and discussion of the results. The sections on residue data cover topics such as drug metabolism in the target animal and distribution of the drug (or metabolites) in the various organs after administration. Microbiological information relevant to human intestinal flora is presented for the antimicrobial agents. Toxicological data and/or antimicrobial activity are used to determine the ADI (acceptable daily intake) for each drug. This, together with residue data and any other relevant information, is used to determine an appropriate MRL for each organ, as discussed under the heading 'Maximum residue limits'. Analytical methods are briefly summarised without experimental detail.

A summary of the committee's recommendations on each of the veterinary drugs listed above is included at the end of the report.

There is growing awareness in South Africa of the importance of residue issues. Programmes such as the Directorate of Veterinary Public Health's National Agricultural Residue Monitoring Programme for food of animal origin, are being implemented. Residue monitoring is important from the point of view of increasing food safety for local consumers and for export certification.

This publication will be useful to anyone working in the area of veterinary drug residues, be they administrators, toxicologists or analysts. To those with a specific interest in the drugs discussed or those who want to learn how values for ADI and MRLs are established, this report can also be recommended.

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