ANIMAL HEALTH SURVEILLANCE

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PREFACE

Since the previous issue of *Animal Health Surveillance Quarterly* (AHSQ) was published, Australia has been able to declare provisional freedom from equine influenza following a successful eradication campaign (in accordance with AUSVETPLAN and supported by comprehensive surveillance programs) in response to the incursion last August. I have been extremely pleased by the commitment and cooperative spirit of members of the horse industries, all levels of government, veterinarians and horse owners in working together to eradicate the disease; my thanks go out to all those involved in the response. An update of the current situation can be found in this issue of AHSQ.

Australia's animal disease surveillance is well coordinated by Animal Health Australia and the Australian and State and Territory governments. It has effectively demonstrated the health status of livestock, exceeded trading requirements and contributed to Australia's proud record of eradicating diseases such as bovine tuberculosis, brucellosis, contagious bovine pleuropneumonia and equine influenza. To ensure surveillance is relevant to emerging disease issues, the National Animal Health Surveillance Strategy (NAHSS) has been formed. A report on the implementation of the NAHSS can be found in this issue of AHSQ.

Other topics in this issue include highlights of disease surveillance activities, items of interest from States and Territories, and summaries of disease monitoring and surveillance programs reported to Australia's National Animal Health Information System (NAHIS). Only summary information is recorded in NAHIS; detailed data are maintained by the source organisations.

The information in AHSQ is accurate at the time of publication, but minor discrepancies may occur because of the short reporting and production time. AHSQ is also available on the Animal Health Australia website (http://www.animalhealthaustralia.com.au/status/nahis.cfm).

Andy Carroll, Australian Chief Veterinary Officer

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Australia free from equine influenza

The last cases of equine influenza (EI) in Australia were reported on 22 December 2007 in New South Wales and on 25 December in Queensland. Since then, there has been extensive surveillance to demonstrate that the disease is no longer present — no further cases have been identified. Surveillance, in both affected and unaffected regions under nationally agreed guidelines, involved extensive testing of more than 34 000 horses with both targeted and random sampling. Australia is confident that no active infection remains.

Following the diagnosis of EI in late August 2007, Australia implemented a rigorous control and eradication program. In January and February 2008, the emphasis of the program shifted to clearing previously infected areas, reclassifying zones to a lower risk status as appropriate to the circumstances and freeing up horse movements in response to the improving disease situation. The reclassification of previously infected areas in both States has been based on the following conditions being met:

- elapsed time since last case reported
- resolution of all infected, suspect and dangerous contact premises
- surveillance (both targeted and random sampling).

Key elements of the response plan for equine influenza

The Australian emergency animal disease response to EI involved governments and industry working in partnership. The AUSVETPLAN EI strategy was used as the foundation for the development of specific State-based response plans. The overall program involved an initial national horse standstill, movement controls, trace-forward and trace-back, strict biosecurity measures and strategic vaccination in buffer zones and infected areas.

Movement controls

The initial national horse standstill and subsequent movement restrictions were combined with strong biosecurity messages. This was effective in containing the disease to areas in New South Wales and south-east Queensland. The affected areas were zoned according to the risk of infection:

- ‘Purple’ and ‘red’ zones were infected areas.
- ‘Amber’ zones were buffer areas around infected areas.
- ‘Green’ zones were areas in Queensland and New South Wales that were not infected.
- ‘White’ zones were the remaining States and Territories in Australia that were not infected.

Initially there was a livestock standstill imposed nationwide on all Equidae; subsequently movement was managed within zones. As the outbreak progressed, horse movements were carefully managed and only permitted where risk-based assessments determined that the risk of transferring disease to another area or zone was very low. This was successful — there was no spread of the disease to other Australian States and Territories, and it was restricted to parts of New South Wales and south-east Queensland.

There has been free movement of horses throughout Australia since 14 March 2008, together with a regulatory framework to facilitate tracking of animal movements. This has provided a massive national sentinel animal program as thousands of horses from affected zones move into regions that were never affected.

Vaccination

Vaccine was used during the outbreak to create buffer zones around highly infected areas. Where appropriate, vaccination was also used to assist businesses that were at risk as a result of the outbreak. Except for the completion of administering the primary course, vaccination has ceased. The permits allowing emergency vaccination will expire on 30 June 2008.

Industry and public support

The support of all Australian horse owners, including those in the racing, competition and eventing, breeding and recreational sectors, was essential to the success of the eradication program. National horse industry representatives were involved in the

development of disease control policies and public communication at all levels (national, state and local).

Laboratory support

The availability of a type A influenza pan-reactive real-time polymerase chain reaction (PCR) test at the New South Wales Department of Primary Industries Virology Laboratory at the Elizabeth Macarthur Agricultural Institute (EMAI) allowed for rapid diagnosis, within hours of the first samples being collected. This assay was originally developed at the Australian Animal Health Laboratory (AAHL) at Geelong, Victoria, for avian influenza testing. The rapid detection of EI in New South Wales proved critical to preventing nationwide spread of the virus through the implementation of a national standstill on horse movements. AAHL made improvements to the antibody detection assays, which were then transferred to State government laboratories and used for rapid confirmation of infection and, later, in proof-of-freedom testing in conjunction with the PCR test. A series of refinements introduced at EMAI for PCR allowed large numbers of horses (up to 2500) to be tested daily, and within a few hours when required.

Next steps

Authorities have agreed that, until 30 June 2008, some control measures will remain in previously infected areas to manage any residual risk. These measures include:

- the use of travelling horse statements/waybills for the movement of horses
- the registration of horse events
- biosecurity measures at horse events and gatherings
- continued random surveillance and investigation of suspect cases.

Under Australia's national EI plan, assuming no further infection is found, the last 'green' zones in New South Wales and Queensland (previously 'purple' and 'red' zones, respectively) will revert to 'white' status on 30 June 2008. All remaining EI control measures will be removed at this time.

To regain international EI-free status after an outbreak, a previously free country such as Australia must satisfy the requirements of the World Organisation for Animal Health (OIE) that the country has had no clinical cases for a period of 12 months, and that appropriate surveillance has been carried out during that time.

Monitoring and surveillance for EI in Australia will continue, consistent with the current OIE requirements. In December 2008, assuming no evidence of active EI infection has been found, Australia expects to advise that it meets the requirements set by the OIE for freedom from EI.

Vaccine bank

Some ProteqFlu vaccine may remain unused. This vaccine will be held in Australia, so that if the surveillance activities over the coming months detect any EI infections, these can be quickly and effectively contained and eradicated.

National review

A national review of the EI response is under way to identify areas where improvements can be made in Australia's ability to respond in future emergency animal disease incidents.

Contributed by Lyndel Post and Scott Porteous, Office of the Chief Veterinary Officer, Australian Government Department of Agriculture, Fisheries and Forestry, and Animal Health Australia

E-surveillance in abattoirs

The collection of data for a range of endemic diseases and conditions that cause economic loss in abattoirs because of damage to the carcase has the potential to improve farm productivity, support maintenance and access to international markets, and expand the surveillance data currently available.

Several surveys and research reports have identified potential uses for animal disease information collected from abattoirs (Bejnarowicz 1990, Paton 1996). Benefits include the early detection of emerging diseases through syndromic surveillance, monitoring of endemic disease that could assist producers in making management decisions to improve profitability, and the potential to increase the level of complying product entering processing plants. Data collected in this way can also be used to inform government and industry policy decisions and support the case for continuing or improved international market access for livestock product.

The term ‘e-surveillance’ has been suggested to describe the process of collecting and recording information using computer-based systems during the meat inspection process, for the purpose of providing feedback within the supply chain to improve product compliance and supply chain efficiency.

The concept of an e-surveillance project developed from discussions held between Meat & Livestock Australia, the Australian Quarantine and Inspection Service, the red meat producer peak councils, the Australian Meat Industry Council and Animal Health Australia. There is general support for a better understanding of the costs associated with loss of production on farm and wastage in abattoirs through endemic disease. A coordinating group has been formed to oversee the development of a project plan that identifies a number of supporting projects, each addressing a particular aspect of the collection, management and possible use of the data.

The work plan for 2007–08 has identified two consultancies. The first will review existing surveillance data capture systems in Australian abattoirs, and the second will identify the diseases considered to cause significant production losses on-farm or wastage in abattoirs and attempt to quantify the costs of these to the whole supply chain and the benefits that could accrue from the implementation of an e-surveillance system. These consultancies will determine the feasibility of continuing the project.

The current Ovine Johne’s Disease Management Plan is underpinned by abattoir surveillance of a sample number of lines, which are examined for ovine Johne’s disease. These lines are also inspected for a number of other diseases as part of a small pilot project.

If shown to be feasible, e-surveillance systems have the potential to increase the efficiency and accuracy with which data can be collected and may also offer a cost-effective solution to the provision of ‘feedback’ within the supply chain, for the early identification of potential human health risks, and to assist with determining regional animal health priorities.

Bejnarowicz L (1990). A pilot study of a sheep health monitoring scheme. Department of Agriculture, South Australia.

Paton M (1996). Enhanced control of caseous lymphadenitis through improved farm management. Report to the Meat Research Corporation, Agriculture Western Australia.

Contributed by Lorna Citer, Animal Health Australia

National Animal Health Surveillance Strategy Reference Group meeting

A reference group was established by Animal Health Australia in late 2007 to provide strategic oversight to the National Animal Health Surveillance Strategy (NAHSS). The strategy, endorsed by the Primary Industries Standing Committee in 2007, is the cornerstone of animal disease surveillance in Australia; it covers surveillance requirements to demonstrate Australia's animal health status while prioritising areas where there may be impacts on human health (e.g. zoonotic diseases), food safety, the environment, productivity and market access. The strategy has the support of all stakeholders in the national animal health framework as a result of an extensive consultation process over the past two years.

A task of the reference group is to ensure that the strategy objectives are met, that Animal Health Australia's surveillance programs are compatible with the strategy, and that the strategy continues to reflect the direction of the Australian Biosecurity System for Primary Production and the Environment (AusBIOSEC).

Members of the reference group are listed in the following table. Individual industry and technical representatives will be invited to participate depending on the issues being addressed.

Person	Role / representative	Organisation	Position
Gardner Murray	Chair	Gardner Murray Pty Ltd	Consultant biosecurity adviser
Vivian Kite	Intensive livestock industries	Australian Poultry Industries Association	Deputy Director
John Stewart	Extensive livestock industries	Cattle Council of Australia	Industry representative
Hugh Millar	Animal Health Committee	Victorian Department of Primary Industries	Chief Veterinary Officer
Bill Scanlan	Department of Agriculture, Fisheries and Forestry	Department of Agriculture, Fisheries and Forestry	Senior Principal Veterinary Officer
Jonathan Miller	Department of the Environment, Water, Heritage and the Arts	Invasive Species Section	Director
Conan Liu	Office of Health Protection, Department of Health and Ageing	Surveillance Policy and System Section	Epidemiologist and Assistant Director
Peter Daniels	Subcommittee on Animal Health Laboratory Standards	CSIRO Australian Animal Health Laboratory	Assistant Director
Sam Beckett	Independent epidemiologist	Broadleaf Capital International	Consultant
Ian Langstaff	Animal Disease Surveillance Program Manager	Animal Health Australia	Manager Disease Surveillance
Jenny Hutchison	National Surveillance and Information Coordinator for Animal Health Australia	AusVet Animal Health Services	Partner

At the inaugural meeting of the group in February 2008, the main points of discussion were policy and strategic issues relating to 'One Health', AusBIOSEC and funding requirements. The solid reputation Australia enjoys for its surveillance programs was recognised for its critical contribution to maintaining market access. In addition, the Australian animal disease surveillance system was recognised as being effective in detecting new and emerging diseases, but the need for it to continue to evolve to meet future challenges also was noted. The group discussed the National Significant Disease Investigation and Wildlife Event Investigations Team projects, supported by the Primary Industries Standing Committee in 2007, and added support to their continued development.

Further discussions of a range of surveillance issues resulted in recommendations for a work program and funding required.

The reference group identified several immediate needs. One is to better understand the potential for

improved linkages between human and animal health surveillance activities. To achieve this, a brief study by reference group members has been initiated to describe the arbovirus surveillance and monitoring activities undertaken in Australia for animal and public health, to highlight any shared objectives among these programs and to describe how linkages between animal health authorities and public health authorities with respect to individual programs might improve program effectiveness or efficiency. The group also identified the need to evaluate the current relevance of targeted surveillance programs managed by Animal Health Australia against the objectives of the NAHSS. A brief review has been initiated with the Australian Animal Health Laboratory to describe the implications for the National Arbovirus Monitoring Program (NAMP) of the recent bluetongue (BTV-8) outbreaks in Europe (in 2006 and 2007) and climate change in Australia, and to review the relevance of the NAMP objectives considering our current understanding of the arboviruses involved. The three objectives of NAMP are to support trade, provide an early warning for new bluetongue incursions in the north and any southern spread of the strains present, and assist risk management by producers and exporters by providing expert advice on arboviruses.

The reference group recognised that an objective assessment of Australia's animal health surveillance system requires a comprehensive description and understanding of its components. Once the animal health surveillance system has been adequately described, appropriate qualitative and quantitative methodologies for evaluating the system can be applied, allowing strengths and weaknesses to be identified based on risk. A risk-based approach is considered by the reference group to provide a sound basis for government and industry allocation of investment in Australia. This process is under way, and interim reports will be considered by the reference group at future meetings, to be held every six months.

Contributed by Ian Langstaff, Animal Health Australia

Australian Biosecurity Cooperative Research Centre — update

The Australian Biosecurity Cooperative Research Centre (AB-CRC) is now well established, with an Australia-wide profile, and is addressing emerging infectious disease matters of significance to the Australasian region. Working in association with more than 20 research, government and industry partners across Australia, the centre's ability to form valuable multidisciplinary and cross-sector collaborations has built biosecurity capability and capacity in Australia and the region. Since its inception, the AB-CRC has funded 35 research projects (excluding postgraduate projects), 10 of which have been completed, delivering key centre research outcomes to agencies with responsibility for health, agriculture and biosecurity both here and overseas. An excellent example of this was the use of the avian influenza diagnostic test during the equine influenza outbreak, reported in *Animal Health Surveillance Quarterly* Vol. 12 No. 3.

Chikungunya workshop

In February 2008, the AB-CRC convened a workshop to discuss the threat of an outbreak of chikungunya virus in Australia. This came about following a number of confirmed cases in Melbourne, Victoria, in travellers to Australia who were infected in the Indian Ocean region. Chikungunya is transmitted by *Aedes aegypti* and *A. albopictus* mosquitoes, with symptoms similar to dengue fever and Ross River virus, and is endemic in South-East Asia and much of the Indian Ocean region. Dr Andrew van den Hurk (Forensic and Scientific Services, Queensland Health) presented research at the workshop suggesting that Australian mosquitoes are susceptible to infection with the East African strain of chikungunya, which has infected more than 1.5 million people worldwide since 2005, with more than 200 fatalities.

New technologies in biosecurity

AB-CRC projects in disease surveillance have led to the development of several new and innovative technologies in biosecurity. A mosquito-free surveillance system for arboviruses, such as Japanese encephalitis virus, has been developed by researchers at Queensland Health using a novel sugar 'lure' to sample the saliva of mosquitoes for viral testing while they feed. It has the potential to test for any arthropod-borne virus, including yellow fever, dengue and West Nile viruses. Researchers at Murdoch University in Western Australia have designed a highly specialised 'on-site' serum collection system that can preserve blood samples for months at a time, despite high temperatures and humidity. The project is undergoing final validation before commercialisation.

Students

The AB-CRC has far exceeded its predictions for postgraduate enrolments, with a large cohort of students enrolled from Australia and overseas. Sixty-four students are enrolled or have completed postgraduate studies with the AB-CRC, with more than 20% working on international projects in countries including Malaysia, Laos, Cambodia and Indonesia.

Future of the AB-CRC

The AB-CRC is in the process of applying for a second 7-year term of federal funding, as current funding will cease in 2010. New projects and areas of interest are being discussed and developed. Biosecurity CRC Mark II, if funded, will focus on the theme of 'One Health': the understanding that the health of humans, animals and the environment are inextricably linked. Biosecurity CRC Mark II will create a vibrant and dynamic regional partnership, seeking to improve the health and wellbeing of livestock, wildlife and humans by promoting cooperation and cross-sector collaboration to combat disease threats.

Contributed by Liz Williams, Project Officer, Australian Biosecurity Cooperative Research Centre

Australian Wildlife Health Network

Australia recognises the importance of monitoring wildlife health to address the impact that diseases and mass mortalities in wild fauna can have on livestock, human health, agriculture, aquaculture, biodiversity and trade.

The Australian Wildlife Health Network (AWHN) is a national initiative that links national, State and Territory agriculture, public health and veterinary agencies and laboratories; wildlife, conservation and environmental agencies; and overseas wildlife health centres in Canada, the United States, New Zealand, India and Europe. The network has a major focus on human and animal health issues associated with free-ranging populations of wild animals.

Key activities of the network include the operation of a national database of wildlife health information, monitoring field investigations of disease incidents, identification of surveillance and research needs and priorities, wildlife health emergency preparedness and response, and education and training in wildlife health.

Further information about the AWHN is available at http://www.wildlifehealth.org.au.

Wild bird mortality events and avian influenza

Seventeen wild bird mortality events were investigated between January and March 2008; all were atypical of highly pathogenic avian influenza (AI). AI was specifically excluded as the cause of seven of the events, and exclusion testing was not warranted in the remaining ten events based on clinical signs, history and the prevailing environmental conditions.

New South Wales reported the death of 1 wedge-tailed eagle (*Aquila audax*) (diagnosis open); 5 pigeons (diagnosis open); more than 38 mixed captive budgerigars (*Melopsittacus undulatus*), Gouldian finches (*Erythrura gouldiae*), rosellas (*Platycercus* spp.) and wild red-rumped parrots (*Psephotus haemotonotus*) (from *Chlamydia*); an unknown number of Australian magpies (*Gymnorhina tibicen*), currawongs (*Strepera* spp.) and a butcherbird (*Cracticus* sp.) (from severe

systemic protozoal infections); and 2 suspected poisoning events involving an unknown number of mixed native and exotic birds.

Queensland reported poisoning in an unknown number of crows (*Corvus* spp.) and three dead sacred ibis (*Threskiornis molucca*) (diagnosis open). South Australia reported one confirmed case of botulism in 27 dead Pacific black ducks (*Anas superciliosa*) and one suspected case of botulism in 8 dead silver gulls (*Larus novaehollandiae*). In Victoria, two suspected poisoning events were reported in 5 grey teal (*Anas gracilis*) and in an unknown number of long-billed corella (*Cacatua tenuirostris*) and galah (*C. roseicapilla*). Victoria also reported 2 Australian ravens (*Corvus coronoides*) with encephalitis of a probable parasitic origin. Avian pox in a collared sparrowhawk (*Accipiter cirrhocephalus*), poisoning in one duck (unknown species) and 9 Australian magpies, and leukocytozoon infection in 2 tawny frogmouths (*Podargus strigoides*) were diagnosed in Western Australia.

As part of Australia's wild bird AI surveillance program, sampling occurred at sites in New South Wales, the Northern Territory, Queensland, South Australia, Victoria and Western Australia. Swabs (cloacal, faecal and oropharyngeal) and blood samples were collected from approximately 2050 wild birds. The majority of samples were collected from waterbirds (e.g. ducks and waders). No highly pathogenic AI viruses have been detected. Evidence of low-pathogenic avian influenza viruses was detected in a small number of samples. Evidence of low-pathogenicity AI viruses is to be expected, as these viruses are known to occur at low prevalence in wild bird populations in Australia.

Marsupial investigations

The previous *Animal Health Surveillance Quarterly* (Vol. 12 No. 4) reported the sudden death of two captive Tammar wallabies (*Macropus eugenii*) from possible Tammar sudden death syndrome (TSDS) in New South Wales. Virology results have subsequently confirmed that the animals did not die from TSDS, and the diagnosis is open.

There have been reports of possums with fur loss in South Australia and eastern grey kangaroos (*Macropus giganteus giganteus*) and swamp wallabies (*Wallabia bicolour*) with possible blindness and cataracts in Victoria. Investigations will start once samples are obtained. Sarcoptic mange in a koala (*Phascolarctos cinereus*) and two common wombats (*Vombatus ursinus*), and demodicosis in a captive agile antechinus (*Antechinus agilis*), were also diagnosed in Victoria. A captive facility in Victoria euthanised 11 captive Tammar wallabies with a herpes virus infection.

Frog investigations

In the Northern Territory, 10 captive magnificent tree frogs (*Litoria splendida*) died either without premonitory signs or after becoming lethargic with bloody discharge from the mouth a few hours before death, or were euthanised due to being moribund, with or without skin ulcers. The main gross pathology findings were oedema, petechial or larger haemorrhages and enlarged spleens with multiple pinpoint white foci. Histologically, findings were typical of iridovirus infection, with haematopoietic and glomerular necrosis. The virus was isolated in a fish cell line, and electron microscopy was consistent with an iridovirus. Molecular characterisation is pending.

The information in this report is based on that submitted by network subscribers and network State and Territory coordinators. The network would like to thank all those who submitted information for this report.

Contributed by Chris Bunn, Office of the Chief Veterinary Officer, Australian Government Department of Agriculture, Fisheries and Forestry, and Leesa Haynes, Projects Coordinator, Australian Wildlife Health Network

Aquatic animal health

World Organisation for Animal Health and the Network of Aquaculture Centres in Asia–Pacific Training Workshop

The World Organisation for Animal Health (OIE) and the Network of Aquaculture Centres in Asia–Pacific (NACA) held a joint workshop on 25–28 March 2008 in Bangkok, Thailand, for senior aquatic animal health officers from countries in the Asia–Pacific region. The workshop built awareness about OIE aquatic animal health standards, the OIE standard-setting process, OIE disease reporting, and responsibilities of governments, including cooperation between veterinary and other competent authorities and the importance of effective collaboration between members.

Hands-on, on-line training on various aspects of the OIE's World Animal Health Information System (WAHIS) was provided, including the process for providing immediate notifications, follow-up reports, 6-monthly reports and annual questionnaires. The workshop also demonstrated the various avenues to interrogate the output from WAHIS, the World Animal Health Information Database (WAHID) that is freely available on the OIE website.

The workshop recommended that the nominated liaison point between OIE member delegates and the OIE/NACA for quarterly aquatic animal disease reporting-related matters be registered (through the OIE delegate) onto WAHIS to effectively submit aquatic animal health data to the database as required.

White tail disease

The Queensland Chief Veterinary Officer reported the presumptive detection of white tail disease (WTD) to the Aquatic Consultative Committee for Emergency Animal Diseases in January 2008. Clinical signs of white (opaque) muscle were seen in adult giant river prawns (*Macrobrachium rosenbergii*) held in aquaria at a research facility. The prawns had been collected from the Flinders River in northern Queensland.

Further testing at the CSIRO Australian Animal Health Laboratory in February 2008 confirmed the initial diagnosis.

WTD is caused by *Macrobrachium rosenbergii* nodavirus (MrNV) and is known to affect only giant freshwater prawns; it does not affect humans. Genetic analysis indicates that this strain of MrNV may be endemic and may have been present in giant river prawns in Australia for a long time.

Australia has notified the OIE in accordance with OIE requirements.

Contributed by Ingo Ernst, Office of the Chief Veterinary Officer, Australian Government Department of Agriculture, Fisheries and Forestry

State and Territory reports

In Australia, the States and Territories are responsible for animal disease control within their borders. National animal health programs are developed through consultation at the Animal Health Committee and are managed by Animal Health Australia.

New South Wales

Contributed by Rory Arthur, Department of Primary Industries

Sheep

Balanitis in Border Leicester rams

On a large property near Walgett, in western New South Wales, Border Leicester rams developed severe penile ulceration and inflammation that caused major disruption to the flock's breeding season. At least 31 out of 39 rams were affected, at significant cost to the owner in wasted rams and low lambing percentage.

The first mob of 29 Border Leicester rams, aged 18–30 months, was purchased in late January 2008 and joined to 873 merino ewes. Twelve days later, nine rams were removed due to 'bad pizzles' or foot abscess and treated with two doses of long-acting penicillin.

Two weeks later, with the problem persisting, veterinary examination found the rams were all in good body condition and could urinate, although one at least was observed to dribble urine rather than excreting a controlled stream. Some had paraphimosis (inability to withdraw the penis), and all had ulceration, purulent exudate, abrasion and swelling of the glans penis.

Culture of preputial swabs and necrotic material was unhelpful due to bacterial overgrowth by contaminants. A diagnosis of ulcerative balanitis was made on clinical grounds and histopathology.

Four ewes were examined, with no evidence of burrs attached to the wool in the crutch region or of ulcerative lesions characteristic of vulvovaginitis. One had a creamy white vaginal discharge, and one a serosanguinous discharge. Culture of vaginal swabs showed no significant growth.

The second mob of 10 rams was joined to 375 ewes. Twelve days after joining, one ram had an extruded and damaged penis, and the remainder showed various levels of inflammation and ulceration of the penis. Each penis and prepuce was treated topically with disinfectant and corticosteroid, and all rams were given long-acting oxytetracycline by intramuscular injection.

The ewes were rested for a week and then joined to White Suffolk rams that were treated prophylactically with long-acting oxytetracycline. These were checked after 2 weeks, with no sign of disease.

At least one other producer who purchased rams from the same breeder had similar problems. Balanitis of young Border Leicester rams occurs sporadically. A variety of bacteria, many of which can also be isolated from normal cohorts, are isolated from the ulcerated lesions. Balanitis has been reproduced experimentally with some of these bacterial species. It is presumed that damage to the penile mucosa is a predisposing factor. Why Border Leicesters are more likely to develop the disease is unknown.

Salmonellosis and haemonchosis

During a week of very hot weather in mid-March 2008, in the Riverina, 15 out of 450 feedlot lambs died and a further 10 were depressed and scouring after shearing. Necropsy revealed congested intestines, enlarged mesenteric lymph nodes and a thickened colon with blood-stained fibrinous tags. *Salmonella* Typhimurium was isolated on tissue culture. Severe barber's pole worm (*Haemonchus contortus*) infestation was also diagnosed.

Ill-thrift and hyperthermia in lambs

Ryegrass pastures and associated fungal or bacterial toxins cause ryegrass staggers, annual ryegrass toxicity and facial eczema. They may also be associated with ill-thrift from the toxin ergotamine, produced by the fungus *Claviceps purpurea*, or by the related compound ergovaline, produced by the endophytic fungus *Neotyphodium lolii*.

The latter was suspected as the cause of an ill-thrift syndrome in lambs in southern New South Wales because of the pyrexia found in sheep without concurrent infection.

In early autumn 2008, 40 out of 350 merino lambs, aged 8 months, in the Hume Rural Lands Protection Board (RLPB) district displayed ill-thrift, lethargy, lameness, a 'tucked up' posture and posterior paralysis. More chronic cases had lost weight. Affected lambs had elevated temperatures (40.5ºC to 41.0ºC).

Chlamydophila infection was excluded by blood test and on the basis that joints appeared normal. Because the sheep had recently grazed out the ryegrass component of the sward, ergovaline was suspected as causing the elevated temperatures. Ergot alkaloids can cause ill-thrift, hyperthermia and variable amounts of scouring in sheep.

Internal parasites and drench resistance in sheep

From an economic viewpoint, internal parasites are the main health problem of sheep in Australia. The increasing prevalence and severity of drench resistance is a major issue and a common cause of disease investigation by the veterinary service.

More than 90% of sheep farms in the State have barber's pole (*Haemonchus contortus*) and scour worms (*Trichostrongylus* spp.) that are resistant to the benzimidazole drenches. Eighty per cent of farms have scour worms resistant to levamisole. In northern New South Wales, 70% of farms have macrocyclic-lactone-resistant barber's pole worms, and 80% of farms in the same region have closantel-resistant barber's pole worms.

During the quarter, with wetter conditions in many areas, district veterinarians visited properties to assist with faecal egg count reduction tests (DrenchTest), simple checks on worm egg counts shortly after a routine drench (DrenchCheck) and regular worm egg count monitoring (WormTest) to provide objective information on worm control programs. Particular advice included:

- Avoid unnecessary treatment of animals, especially adults.
- Avoid moving newly drenched animals to very clean pasture.
- Ensure brought-in animals receive an effective quarantine drench.
- Do not treat ewes pre-lambing with long-acting anthelmintics.
- Do not use ineffective drenches.

Progress in footrot eradication

The prevalence of virulent footrot in the area covered by the Hume RLPB district in southern New South Wales is close to zero after 19 years of hard work by district veterinarians, footrot officers and producers working together. Only one infected flock remains in the region and it now has 'Protected' status, with less than 1% property prevalence.

This area was once heavily infected with virulent *Dichelobacter nodosus*, which has been controlled using inspection and culling of infected sheep. There have been more than 120 lameness investigations on properties in the past 12 months, which illustrates the surveillance capability of the veterinary administration in the region.

Gundagai RLPB district completed a random survey of the regional properties in March 2008 as part of its progress to Protected Zone status. Approval is pending completion of 'neighbour to infected property' inspections.

Photosensitisation in sheep

Plant toxicity disease is a frequent cause of property disease investigations by official veterinarians over much of the State, in order to exclude infectious disease.

Sporadic episodes of photosensitisation and death in sheep grazing hairy panic (*Panicum coloratum*) were investigated by district veterinarians in southern and central New South Wales during February 2008.

Affected lambs at West Wyalong were pyrexic and lame, and had swollen faces and ears, as well as severe jaundice with very dark discoloured livers and thickened granular bile. The hairy panic in the paddock was short and rapidly growing after recent

rain. No further stock losses were reported after the flock was relocated to another paddock.

As well, a case of photosensitisation caused by caltrop (*Tribulis terrestris*) was investigated. In this case, 2.5% of lambs on a property were affected. Severe, diffuse, crystal-associated cholangio-hepatopathy with secondary photosensitisation consistent with *T. terrestris* toxicity was observed on liver histopathology.

Mastitis in sheep

Mannheimia haemolytica mastitis killed 30 and affected 400 of 600 lactating merino sheep on a grazing property near West Wyalong. The organism was cultured from a number of hard, consolidated mastitic udders from which thick pus was expressed instead of milk. The underbelly of affected ewes displayed a patchy purple skin discolouration over areas of the abdomen and udder.

The outbreak occurred 3 weeks after a significant rainfall event of 50 mm overnight. The ewes were all fat, with body scores of 4–5, and had relatively large 3-month-old lambs at foot. The rain event may have suppressed appetite in the lactating ewe flock, resulting in a significant drop in milk production. The large lambs then caused bruising and tissue damage to the udders of the ewes while seeking milk, causing the udders to become infected.

Affected ewes were treated with oxytetracycline intramuscularly every second day for three treatments. The owner also implemented an early weaning strategy, with the larger lambs being sold at the saleyards.

Cattle

Bovine ephemeral fever virus

Widespread drought-breaking rain brought cases of bovine ephemeral fever (BEF) in several areas of New South Wales where it had not been diagnosed for many years.

Typically, BEF seroconversions are observed annually on the north coast, with regular spread inland and as far south as the Hunter Valley and Sydney. Extension of BEF seroconversion or clinical disease south of Sydney is uncommon. Clinical cases in northern New South Wales occur relatively frequently and are typically preceded by high rainfall in the previous month or two.

This year, extensive BEF virus transmission west of the Great Dividing Range occurred during January and February 2008. Cases were first reported in the central-northern regions of Bourke, Brewarrina, Walgett, Coonamble, Coonabarabran and Narrabri, following highest-on-record rainfall in late 2007.

From late January to early March 2008, cases were confirmed or suspected from the central-west regions around Dubbo down to the southern central regions of the Riverina, bordering the Murray River. The last time BEF was reported in the Riverina was at Wagga Wagga in 1996, when cases were also confirmed on a number of properties in northern Victoria in the Strathbogie Ranges.

This year, cases were recorded at Yanco, Euroley and Nericon in the Narrandera region, Gundagai and Wagga Wagga. In these cases, only a few animals were affected, typically showing sudden onset of fever, inappetence, depression, profuse salivation, shifting lameness and reluctance to move, and then apparent recovery within 3 days. In one case, near Finley, high morbidity occurred, with 40 of 140 cross-bred cattle showing lameness and reluctance to rise.

Nitrate poisoning

Nitrate poisoning caused the deaths of 60 out of 500 Angus cattle near Gundagai in late March 2008.

The cattle were fed millet hay for the first time, and by the next morning 60 animals were found dead in lateral recumbency with a bloody discharge from the anus and foam from the nostrils. One sick cow was observed to be ataxic and had a tremor of the lips. Nitrate poisoning was confirmed by the analysis of aqueous humour. A sample of the millet hay was found to contain 64 000 ppm of nitrate.

A second property in the Gundagai RLPB district lost 16 out of 38 Shorthorn cattle after feeding millet silage. The animals were too decomposed for necropsy, but a sample of the silage taken from the outside of the bale contained 16 000 ppm of nitrate.

When ruminal bacteria in cattle are not adapted to high levels of dietary nitrate, feed nitrate concentrations in excess of 6000 to 9000 ppm (dry-weight basis) may be toxic.

Anthrax

An outbreak of anthrax on 10 properties was reported in the Hunter district in *Animal Health Surveillance*

Quarterly Vol. 12 No. 4. In early January 2008, one further property in this cluster was affected, and an additional six cattle in the district died, bringing the total deaths to 53. Information determined from further investigations suggests that the affected properties were subdivisions of a larger property where anthrax was thought to have occurred in 1945.

Each affected property in the recent outbreak was quarantined, and the carcases were burnt according to policy. No stock had recently left the properties, and movement restrictions were audited using the national livestock identification system at abattoirs.

In a similarly rare case, anthrax was diagnosed on a property in the Narrandera RLPB district; anthrax had occurred on this property in 1946. Anthrax spores may have been disturbed when old fencing material was buried on a sandhill in the paddock 2 years ago. A number of cattle grazing wheat stubble in the paddock died. The property was quarantined and the affected mob vaccinated.

Anthrax was excluded as the cause of other sudden deaths in the Narrandera and Murray RLPB districts.

Histophilus somni *infection in cattle*

Histophilus somni is normally a commensal of the respiratory and reproductive tracts, but it can cause respiratory diseases and septicaemia if predisposing factors (e.g. stress and viral infections) are present. In at least two cattle herds near Mudgee, *H. somni* infection caused laryngitis/tracheitis, fibrino-suppurative bronchopneumonia and fibrinous pleuritis, as well as septicaemia, with preferential localisation of the organism in the brain, heart, muscles, joints or kidneys.

In one case, three calves out of the herd of 40 Angus calves died over a 1-week period, one with possible nervous signs, the other two with respiratory signs. One of the latter was necropsied and showed blue discolouration of mucous membranes and teats, blood discharging from the eyes, muscle haemorrhages, tracheal haemorrhages, fibrinous pleurisy and pericarditis with adhesions, oedema and emphysema of the lungs, congestion and haemorrhages of the abomasal mucosa and ruminal lymph nodes. Histopathology showed a severe, diffuse, acute fibrinous pleuritis with bacterial colonies, interstitial oedema and emphysema in the lungs, and haemorrhages in trachea, skeletal muscle and lymph node. No significant findings were noted in brain sections. *H. somni* was isolated from the lung. Pestivirus antigen capture enzyme-linked immunosorbent assay on lung fluid was negative. A complement fixation test for *Chlamydophila* on pericardial fluid revealed a titre of 16. Aqueous humour was negative for nitrate and nitrite.

After this investigation, two more animals died; one showed neurological signs, with floccules of purulent material in the cerebrospinal fluid as well as in joint synovial fluid.

In the second case, two heifers died from a herd of 70 Angus heifers, aged 9 months, on a property near Gulgong, and thromboembolic meningoencephalitis was diagnosed in a third heifer that was found recumbent. The animal was paralysed, with opisthotonos and a prolapsed tongue. It had some oral ulcers caused by grass seeds and an oedematous skin swelling in the flank area. *H. somni* was isolated from cerebrospinal and pericardial fluid.

In both cases, remaining animals showing respiratory or nervous signs responded to oxytetracycline injections.

Tick fever

A rare case of tick fever caused by *Babesia bovis* was confirmed on two north-coast properties in March 2008. A third adjoining property had been stocked with cattle imported from Queensland. It seems likely that these cattle arrived with the ticks and were the source of the *Babesia bovis* infection.

Twelve cattle died on one of the properties and two on the second property.

The second infected property on-sold cattle to other north-coast properties, and these cattle were traced to determine the likelihood of spread of cattle tick or tick fever and to implement control procedures.

Tick eradication programs on the properties where cattle ticks have been detected have commenced as New South Wales has a policy of tick eradication when outbreaks are detected.

Horses

Equine influenza

The last case of equine influenza (EI) in the State was confirmed on 22 December 2007. Intensive surveillance activities and movement restrictions continued until 28 February 2008. Since then there has been free movement of horses and there has been no further evidence of virus activity.

New South Wales has arrangements in place to monitor horse movements. Surveillance is continuing, and 31 properties with clinical cases resembling the case definition of EI were thoroughly investigated during March with negative results.

New South Wales will continue to investigate any suspect cases and expects that Australia will meet the World Organisation for Animal Health requirements for freedom from EI.

In all, approximately 6600 properties and more than 40 000 horses were considered to have been infected during the course of the outbreak in the State.

Northern Territory

Contributed by Francois Human, Department of Primary Industry, Fisheries and Mines

Zamia poisoning in cattle

An owner lost six head of cattle on a block near Batchelor in the Darwin region due to zamia palm ingestion. This mob of 240 young breeders had been moved to the paddock 3 weeks earlier from another property. At the time of the investigation, the affected animals showed signs of hind limb ataxia with fetlock knuckling. No pathological changes were observed at necropsy of one animal, but zamia stalks were present in the rumen. An investigation of the paddock confirmed that some zamia plants were being eaten. The owner moved the cattle to another paddock and did not experience further losses.

Zamia palms are members of the cycad family. The seeds are the most toxic, followed by young leaves. Cattle and sheep can be affected and are more likely to eat the plant when feed is scarce. The toxin affects the central nervous system and causes irreversible damage. Continuous grazing of the plant will cause death, and affected animals do not recover completely, even when removed from the source.

Lead poisoning in weaners

A number of animals in a mixed herd of 100 cattle in the Darwin region experienced depression, ataxia and blindness. The mob was recently put into a paddock containing two dump sites. Only younger animals were affected, and a 12-month-old weaner was presented for necropsy. No gross lesions were observed, and samples were submitted to the laboratory. Analysis of a liver sample revealed toxic levels of lead. The owner moved the cattle out of the paddock as there was evidence of scavenging and soil licking at the dump sites. He lost 10 animals over a 3-week period. The specific source of lead has not been determined at this stage.

Sporadic cases of melioidosis in goats

A number of goats with melioidosis have been presented to the laboratory during the past wet season. In three of four recent cases, inflammation and abscessation around larger arteries, with subsequent aneurysm formation, have been prominent. An 18-month-old Boer doe died with haemothorax from a ruptured aneurysm of the internal thoracic artery. Two Anglo Nubian goats from a group of 15 developed a swelling in the ventral neck region while undergoing treatment for illness characterised by depression, fever and cutaneous abscessation. At necropsy, the neck swellings were identified as multiple adjacent aneurysms of the carotid artery. In each case, *Burkholderia pseudomallei* was isolated from the aneurysm and from abscesses present in abdominal organs or the skin.

In the fourth case of melioidosis, a 4-year-old Boer doe presented with neurological signs. Suppurative meningitis and visceral abscessation were found at necropsy, and *Burkholderia* bacteria were cultured from various locations.

Melioidosis is a bacterial disease that occurs primarily in tropical areas, affecting humans and a range of animals. In the northern part of the State it is mostly diagnosed in goats and pigs. Contaminated soil, mud and water are sources of infection. The bacteria live below the soil's surface during the dry season, but after heavy rainfall are found in surface water and mud and may become airborne. They can enter the body via cuts and sores in the skin, via inhalation of dust or droplets or from the ingestion of contaminated water.

Queensland

Contributed by Greg Williamson, Queensland Department of Primary Industries and Fisheries

Cattle

Bovine ephemeral fever

The return to normal summer rainfall patterns contributed to widespread cases of bovine ephemeral fever (BEF) throughout the State. In the north and west regions, many animals were destroyed after being recumbent for more than 3 days. Typical symptoms of respiratory distress, recumbency and fever were seen. Immobility was not confined to the heavier stock, and producers had not experienced such a severe outbreak in several years.

Eighteen BEF cases were diagnosed in the following shires — Banana, Belyando, Bungil, Caboolture, Cloncurry, Cooloola, Eacham, Kilkivan, Maroochy, Monto, Noosa, Pittsworth, Tambo and Widgee. Diagnosis was made by a polymerase chain reaction test for BEF virus. On one extensive property in Cloncurry Shire in February 2008, 50 cattle from an at-risk group of more than 10 000 died.

Detailed analysis of one of the samples from Belyando Shire is continuing.

Salmonellosis

A single incident of salmonellosis was seen in cattle during the quarter. In Jondaryan Shire, 30 3-day-old calves died of acute diarrhoea from 300 calves at risk. *Salmonella* Potsdam was isolated from selective culture of rectal samples, ileum and heart blood.

Copper toxicity

In Johnstone Shire, north Queensland, copper toxicity was the cause of 42 deaths in 5–8-month-old dairy/beef-cross calves. The at-risk group comprised 680 calves that left a far north Queensland property in four or five separate movements, the first commencing in early December 2007 and the last in mid-February 2008. Mortalities occurred over a 14-day period on three separate properties. Jaundice, haematuria and listlessness were the main presenting signs. Kidney copper levels were elevated, with one case recording 231 mg/kg dry matter. The toxic range for cattle kidney copper is 50–800 mg/kg dry matter. Investigations into the source of the copper are continuing.

Lead poisoning

Following the death of one adult cow from an at-risk group of 40, a single 12-week-old calf was euthanised in Chinchilla Shire following febrile and nervous signs, which included ataxia, apparent blindness, bellowing, teeth grinding and salivation. The cow had suffered similar symptoms before death. Biochemical examination of the calf revealed a kidney lead level of 70 mg/kg fresh weight (FW) and liver lead of 11 mg/kg FW. Kidney lead levels below 4 mg/kg are considered insignificant. An old lead–acid battery was found in the paddock.

In a separate incident in Wambo Shire, two 2-month-old calves collapsed and died, convulsing on muster of the herd of 30 cattle. They had been observed circling and falling before the muster. No lead was found in the paddock, and plant toxicity was suspected. However, the liver lead level in the one animal subjected to necropsy was 23.6 mg/kg FW, making lead poisoning a more likely cause.

Horses

Equine influenza

No new cases of equine influenza (EI) infection have been detected in Queensland since 25 December 2007.

In March 2008, following random sampling of more than 950 properties and 4200 horses across south-east Queensland that found no signs of EI, movement restrictions were lifted and the subsidised vaccination program ceased.

EI surveillance activities are continuing to confirm that there is no unreported or unrecognised disease in horses in Queensland, to monitor vaccinated animals to make sure they are not shedding virus following undetected disease, and to provide data to study the epidemiology of the disease.

Sheep

Nitrate poisoning

In Waggamba Shire, there was a serious incident of nitrate poisoning. Nine hundred and ninety drought-

affected adult merino sheep were purchased from Wilcannia in New South Wales. After travelling for 3 days, they were placed in a paddock with Mitchell grass, pigweed (*Portulaca*), buffell grass, goat's head and saltbush. Within 2 hours, 60 sheep were dead.

Samples of plants showed toxic levels of nitrate in the pigweed but not in the saltbush. All animals sampled had toxic levels of nitrate in the aqueous humour. Pigweed is a known accumulator of nitrate.

Goats

Melioidosis

Melioidosis was diagnosed in goats on three separate properties in north Queensland during the quarter. These were in Whitsunday, Thuringowa and Townsville. All confirmed cases were in young animals aged between 6 and 14 months. The main presenting signs were weakness, incoordination and swollen joints.

In the Townsville case, four animals of a group of 12 were affected. The distal joints of the limbs were swollen with excess joint fluid and painful. One animal was recumbent and unable to stand. There were several hard lumps (1 cm) on the face and chest wall. On necropsy, the main features were multiple abscesses involving both lungs and all lung lobes. There were several abscesses in the spleen, kidney and intestinal mesentery. The superficial lumps were caseous abscesses. Enzyme-linked immunosorbent assay (ELISA) tests for caprine retrovirus were negative. The bacterium that casuses melioidosis, *Burkholderia pseudomallei*, was cultured from the splenic abscess, the joint fluid and the lung.

Pigs

Enterotoxaemic colibacillosis

Enterotoxaemic colibacillosis was the likely cause of the sudden deaths of twelve 6-week-old pigs (3 weeks post-weaning) out of 1500 at risk at a piggery in Murgon Shire in early January 2008. Necropsy revealed oedematous fluid in the mesentery and eyelids. Histopathology showed fibrinoid necrosis of the small arterioles consistent with changes found in enterotoxaemic colibacillosis.

In Crows Nest Shire in March 2008, 35 pigs from an at-risk group of 70, aged 3 months, died with diarrhoea, recumbency and nervous signs. Two pigs that were necropsied had mild subcutaneous oedema around the eyes and head, mild to moderate oedema of the mesocolon and marked oedema of the stomach wall. Histologically, in the sites where oedema was noted grossly there was the occasional small artery with haemorrhage and necrosis of the tunica media. Haemolytic *Escherichia coli* was cultured from lymph nodes and the small intestine.

Poultry

Ionophore poisoning

In Gatton Shire in late February 2008, ionophore poisoning was presumed to be responsible for the deaths of 225 2-week-old chicks (layer flock) out of 4500 birds at risk. Affected birds were depressed and squatting on their hocks. The crops and intestines were mostly empty. Four of the chicks sampled were vitamin A deficient, with liver levels less than 30 mg/kg wet weight. Histopathology revealed myofibre degeneration of skeletal and heart muscle, which was suggestive of a myotoxic insult. Ionophore coccidiostats are typically the cause of this pathology in birds of this age.

South Australia

Contributed by Celia Dickason, Department of Primary Industries and Resources

Acute bracken fern poisoning in heifers

In early January 2008, a number of recently weaned Simmental-cross heifers grazing a lucerne (alfalfa) pasture in the south-east of the State became lethargic and recumbent; five animals died. On investigation, it was noted that bracken fern (*Pteridium esculentum*) was present in the paddock. Bracken fern toxicity was diagnosed after a necropsy revealed a severely haemorrhagic heart, histopathology demonstrated the presence of bacteraemia at the time of death, and haematology showed a low platelet count. Bracken fern toxicity suppresses the bone marrow, leading to low thrombocyte counts and haemorrhages. Bacteraemia is due to decreased white blood cell numbers. Cattle with early signs of bracken fern poisoning can recover if they are moved to a clean paddock, but if

the symptoms become severe, animals are likely to die.

Drop in milk production in a dairy

A drop in milk production of 10% for 5 days was reported in a large dairy herd on the Fleurieu Peninsula in early March 2008.

Three days after the onset of decreased milk production, six cows collapsed in the dairy at milking time. The cows had not recently calved. They were lifted into a standing position and were then able to walk slowly. They were treated subcutaneously with calcium and phosphorus milk fever compounds. Blood samples were taken from four of the cows before treatment, and results indicated dehydration, with evidence of mild muscle and liver damage. Calcium and phosphorus levels were normal. The cattle had been grazing a paddock containing ryegrass on the night before the reported drop in milk production, and were then moved to a paddock with limited water access. This occurred during a time of high daily temperatures. Differential diagnoses included mycotoxicosis, annual ryegrass toxicity, botulism and blue-green algae poisoning. Samples of pasture and water were not sent for analysis, as all cattle made a full recovery and returned to normal milk production within 5 days of onset of clinical signs.

It is thought that the effect of a probable low level of exposure to a toxin in the pasture was exacerbated by hot weather and water deprivation, resulting in decreased milk production and clinical signs of collapse.

Maple syrup urine disease in Poll Herefords

In February 2008, a Poll Hereford cattle producer from the south-east reported neurological signs in nine calves born to a group of 80 cows that had been mated with three bulls. The calves appeared normal at birth but demonstrated progressive neurological signs a couple of days later. Clinical signs included initial ataxia and depression, followed by recumbency, head tremors, star gazing with titanic spasms and then death. The herd of cows had been vaccinated for pestivirus.

Blood samples tested negative for pestivirus antigen, with nonspecific changes in haematology and serum biochemistry. Histopathology of the brain suggested one of three possible congenital diseases, the most likely being maple syrup urine disease (MSUD), also known as branched chain ketoacid dehydrogenase (BCKAD) deficiency. MSUD is an autosomal recessive congenital disease causing biochemical lesions in the brain due to the accumulation of three amino acids (leucine, valine and isoleucine) that results from a lack of BCKAD. Other clinical signs of this disease (not noticed in this case) are high fever, and the urine being highly viscous and smelling like burnt maple syrup due to the increased amino acids that are excreted by the kidneys. DNA testing on hair samples from three of the cows (with affected calves) confirmed the diagnosis. All three were positive for the gene responsible for MSUD. Diagnosis can also be made by measuring the ratio of the three amino acids to BCKAD in fixed tissue, urine and blood.

There is no known effective treatment for MSUD in calves. Control of this disease is by culling known carrier animals, especially bulls. Good record keeping is also essential in identifying the probable carrier animals.

Suspected botulism in station cattle

Cattle losses were reported on a station in the far north of the State, with one bull and two cows found dead in mid-March 2008. The manager had started work at the station in October 2007, with no stock health records available from previous management. There was an unusually high rainfall (75 mm) in November 2007, but no unusual growth patterns of toxic plants were observed, although the three dead cattle were observed near a dam. Botulism has not been known to occur on this property, and it is not generally considered to be a phosphorus-deficient area. Cattle on the property were not vaccinated against any clostridial diseases. Stocking rate was approximately one animal per square kilometre.

Cattle gathered in yards appeared in good condition. One 5-month-old steer was ataxic when walking and showed tremors when standing still. The steer had a normal temperature, but decreased rumen movements. Blood samples were taken from this animal, as well as from 23 other adult cattle. Differential diagnoses included botulism, mycotoxicoses and plant poisonings.

Results demonstrated hypophosphataemia and low blood copper levels, with one animal testing positive for botulism type C antibodies. The producer was advised to vaccinate his herd with a long-acting botulism vaccine, and to provide copper and

phosphorus supplements to his cattle. No further deaths have been reported.

High mortality enteropathy in piglets

In early March 2008, acute deaths in 10% of 10–14-day-old piglets over a 3-day period were reported from a piggery situated north-east of Adelaide. Piglets from multiple sows with a range of parities were found dead in their farrowing pens. Subacute cases developed abdominal distension and scours. Three piglets were submitted for necropsy, all of which were in normal body condition with full stomachs. They were all dehydrated; one had mild nonspecific enteritis and one had fibrinopurulent peritonitis and enteritis. Histopathology confirmed peritonitis in one piglet, and the other two had possible bacterial attachment to the small intestinal epithelium. Heavy growths of predominantly haemolytic *Escherichia coli* (serotype K-88 O-149) were cultured from the faeces. A presumptive diagnosis of peracute enterotoxigenic colibacillosis was made. The pigs responded well to antibiotic therapy, and recovery was uneventful.

Tasmania

Contributed by Mary Lou Conway, Department of Primary Industries and Water

Severe acute mycoplasma infection in goat kids

A group of preweaned dairy goat kids was reported with sudden onset of depression, swollen knees, recumbency and bloating over a period of 3 days, with several deaths. Of the 24 in the group, 23 were affected and died or were euthanised over the following 2 weeks. The survivor was one of three kids introduced 5 days before the start of the outbreak. The kids were part of a herd of 60 mixed-age goats situated on the Tasman Peninsula. The affected group was housed separately from the rest of the herd and fed on milk sourced from the herd, calf pellets and pasture. The kids were in good body condition and well grown.

Several affected kids were presented to the Animal Health Laboratory in Launceston for necropsy over the 2-week period. Specimens from field necropsies, calf pellets, blood, faeces, suspect toxic plants and milk samples were also presented. The major pathology included nonseptic arthritis, pneumonia, nephrosis and hepatic degeneration. *Mycoplasma mycoides* subsp. *mycoides* Large Colony was isolated from various samples. A nonspeciated mycoplasma was also cultured from the milk of a mastitic adult doe. Milk from the remainder of the herd was negative for mycoplasma. The animals were negative for caprine arthritis encephalitis virus, the pellets were negative for bacterial growth, and the lasalocid level was normal. The plants submitted for toxic plant assessment were unlikely to have been involved in the disease process. Based on the laboratory results, it was concluded that an acute mycoplasma infection was the primary cause of the outbreak.

Sudden death in dairy heifers

Ten deaths occurred over a 24-hour period in a herd of 100 dairy heifers in the north of the State. The 8-month-old heifers were initially on a turnip paddock, then moved to a paddock of irrigated Italian ryegrass at two-leaf stage. The first death was noted within 6 hours of the animals entering the ryegrass paddock. The herd was immediately moved to another paddock, but several more died overnight. Animals found alive were in lateral recumbency, trembling and distressed but did not appear to be blind. They were treated with calcium and magnesium parenterally; four regained their feet. The herd and pasture were examined by a veterinarian several days later, after the case was reported. Clinical pathology indicated immunosuppression, which may have been due to nutritional stress. There was also some hepatocellular damage. Nitrate levels in pasture samples were high. Potatoes had been grown in the ryegrass paddock 2 years before, and high levels of residual fertiliser would be expected. Nightshade, potato, mintweed and a *Brassica* species were identified in the paddock. The deaths were most likely due to a toxic event; nitrate toxicity could not be excluded.

Neurological disease in a miniature pony

An 18-month-old miniature pony gelding in north-west Tasmania was observed with episodes of abnormal neurological signs for about a month before being euthanised. The intensity of the events varied, as did the periods of apparent normality (up

to 18 days). The duration of all episodes was not recorded; however, those observed in entirety did not exceed 30 minutes. The major features of the milder episodes were shaking, lip and eyelid twitching and ataxia. The signs appeared to be induced on several occasions. Three events were more severe, with recumbency and blindness and resulting entanglement in fences. No abnormalities were observed in the pony's companion, also a miniature pony. Between seizures, the pony's appetite and locomotion were normal, and the blindness resolved over a period of days. There was no history or other evidence of access to common toxins, including plants, that matched the clinical signs and pathology. Histological examination of the brain and sections of spinal cord, liver and other organs could not find any evidence of infectious (exotic or endemic) or toxic causes of neurological disease. This was supported by blood and urine results. Since this case, another miniature pony has been reported with seizures in the south of the State. Induction by some event such as veterinary examination is a feature of this case as well. Unfortunately, no other information is available on this second case; currently, the pony is alive and well.

Victoria

Contributed by Cameron Bell, Department of Primary Industries

Pestivirus deaths in persistently infected weaner beef cattle

Mucosal disease (bovine virus diarrhoea [BVD]) caused the death of 17 out of 47 mixed-sex weaner Hereford cattle, aged 10 months, on a property south of Traralgon in Gippsland over a 30-day period in January–February 2008. The calves had been freshly weaned onto abundant pasture when 17 died either suddenly or over a 2–3-day period. The affected animals displayed clinical signs of tenesmus (straining) and bloody diarrhoea. An initial necropsy showed colitis, leading to a provisional diagnosis of coccidiosis.

Further necropsies showed gross ulcerative lesions on the hard palate, lips and tongue of the mouth and on the coronary bands (especially the interdigital cleft), and heifer calves also had lesions on vaginal mucous membranes. Spleen samples were positive for BVD viral antigen by immunohistochemistry, confirming a diagnosis of mucosal disease. Subsequent sampling of the remaining cohorts showed that only nine of the 30 animals were not persistently infected. The dams of the viremic animals, from northern Victoria, were more than 6 months pregnant when purchased in 2006. The high percentage of persistently infected calves (55%) demonstrates that many of these purchased cows were naive to pestivirus and that they became infected between 2 and 6 months of pregnancy. The producer culled all the remaining calves.

Acorn poisoning in bulls

Acorn poisoning caused the death of two bulls and severe illness in three others in a herd of 22 dairy bulls that had access to windfall acorns (from *Quercus* spp. or oaks), in March 2008 on a property in south-west Victoria. Affected animals became depressed, inappetant and lethargic, and developed diarrhoea. The first bull to die became recumbent and developed swelling under the jaw ('bottle jaw') before death. The local knackery reported that a large volume of clear peritoneal fluid was released when the carcase was eviscerated. Examination of the viscera showed marked peritoneal serosal ecchymoses. The kidney medullae were grey-brown and 'mushy'. Histopathological examination of the kidneys showed diffuse, severe, subacute renal tubular necrosis with granular hyaline and cellular casts, interstitial oedema and haemorrhage, which are typical of *Quercus* poisoning; the changes on the peritoneal serosa were due to a terminal vasculitis. The producer had previously lost cattle from acorn poisoning, but was caught off guard on this occasion by an earlier-than-expected severe windstorm. The producer reported that the cattle have a craving for acorns and are usually removed from the paddock when acorns begin to fall.

Congenital deformities in Belgian Blue calves

Four out of 11 Belgian Blue embryo transfer calves were born with congenital deformities at a stud near Benalla in north-east Victoria in March 2008. The four calves had the same parents. A fifth calf from the same parents was normal. Other calves born at

the time were also normal. The recipient dams of the affected calves were grazed in different paddocks.

Three of the deformed calves were born with a brachygnathic head, misshapen lower jaw and shortened forelegs, and two of them had distended abdomens. All three died within 12 hours of birth. One was necropsied and found to have a cyst formation at the mandibular symphysis and loose incisors, but joints and growth plates were grossly and histopathologically normal. This calf was antibody negative to bluetongue and Akabane viruses, and negative to pestivirus antigen and antibody. Zinc, manganese, copper and biochemistry levels in the liver were normal. The calf's recipient dam was pestivirus antibody positive (but had been vaccinated 1 month before calving) and negative for antibodies to Akabane virus.

The fourth calf was born with a deformed lower jaw and shortened forelegs, although it had an average suck reflex and was bottle fed. Two days later, it developed a tremor in the forelegs while walking, which progressed to stiffness and goosestepping when walking, but no obvious intention tremor. It was difficult to determine whether the foreleg gait was due to pain or to a mechanical impediment. The calf was euthanised, and a necropsy was performed. The calf had large, fluid-filled cysts in the mandible that had caused a number of the incisors to detach, and the forelimbs had a slight valgus deviation. All growth plates were grossly normal but histologically showed some thinning, particularly in the proliferative zone. This was probably a collagen defect, causing a variation of osteogenesis imperfecta. The calf was negative to pestivirus antigen (by immunohistochemistry on the skin) and had normal zinc and manganese levels in the liver. Investigations into hereditary diseases, possibly involving a collagen defect of Belgian Blues, are continuing.

Photosensitisation in Holstein dairy cows

In March 2008, approximately one-third of a herd of 270 Holstein cows in south-west Victoria suffered reduced milk production, and 10 of the affected cows developed photosensitisation after moving from another property. Serum biochemistry on four of the affected cows showed markedly elevated levels of gamma-glutamyltransferase, glutamate dehydrogenase and aspartate transaminase, confirming hepatogenous photosensitisation. The animals recovered within 2 weeks, precluding the collection of liver samples. The cows had been introduced onto a hay aftermath that had regrown after two cuts, the most recent cut being in late December 2007. The paddock had been sown to a biannual ryegrass the previous autumn. The herd also had access to a poor pasja forage brassica crop, but was principally fed a mixture of ryegrass, silage, oats, straw, grape marc and pasture hay from a mixing wagon, as well as grain pellets in the bale. There were negligible levels of *Pithomyces chartarum* spores on pasture samples, excluding facial eczema as a cause. Investigations are ongoing to determine if this may be a case of acute bovine liver disease, given the high serum enzyme levels.

Pneumonia in weaner sheep

Pneumonia caused the loss of 70 of 1800 cross-bred weaner sheep on a property in south-west Victoria in late summer 2008. The sheep, which were born in September 2007, were run on a variety of pastures including dry standing feed, rape crops and germinated stubbles and pastures. The mobs began to develop a tail of depressed, inactive, ill-thrifty sheep in January 2008. Over the next 2 months, nearly all of these animals died. Three sheep were necropsied; all had extensive pulmonary consolidation, pleural adhesions and a fibrinous pericarditis. Histopathological examination of tissues confirmed a fibrinous pleuropneumonia, but bacterial culture was unrewarding. Aspiration pneumonia is a likely predisposing cause. The producer noted that an employee used an incorrect technique when drenching the sheep at weaning.

Calcium oxalate urolithiasis in rams

Urolithiasis (bladder stones or 'water-belly') caused the death of four rams of 20 on a sheep property in south-west Victoria over the summer of 2007–08. Affected rams became depressed and lethargic, and showed tenesmus before dying. At necropsy, calculi ('stones') were recovered from the bladder of one ram and the urethral process of a second. Scanning electron microscopy analysis of the calculi showed that they were composed of calcium oxalate. Since the spring of 2006, all sheep on the property had been hand-fed on cereal grains, with 1% crushed limestone. The ewe flock was also provided with salt licks. Predisposing factors for this outbreak include the failure to feed salt to the ram flock while being grain-fed, access to oxalate-containing plants (including 'sour-sob'[*Oxalis pes-capri*]), and

possibly an imbalance in calcium nutrition due to the method of mixing limestone with the grain. Urolithiasis is one of the hazards of grain-feeding rams or wethers for extended periods of time.

Suspected avian tuberculosis in backyard poultry

Ten birds of a 36-hen self-replacing flock of Rhode Island Reds died of suspected avian tuberculosis on a property near Euroa in north-east Victoria over the summer of 2007–08.

Typical clinical signs were severe weight loss, lethargy and diarrhoea over 2 weeks. A single dead hen was necropsied and found to be emaciated, with a markedly enlarged liver and spleen. Numerous multifocal granulomas were seen throughout the liver, spleen and kidneys. Histology demonstrated large numbers of acid-fast organisms within these granulomas. Another hen in good condition was then necropsied and found to have disseminated granulomatous disease with acid-fast organisms. Following depopulation of the flock, necropsies of 26 fowl, 2 Khaki Campbell ducks and 6 guinea fowl showed that all of the fowl over the age of 4 months (13 birds in total) had gross lesions consistent with previous cases. Neither the ducks nor the guinea fowl had gross lesions, and to date no histological lesions have been found in these species. Multiple tissue, soil and water samples have been cultured for *Mycobacterium*, with results pending.

With the hens, ducks and guinea fowl managed under free-range conditions, as well as being in contact with numerous wild birds, there was ample opportunity for transmission to occur. Advice on biosecurity and zoonotic aspects of avian tuberculosis was provided to the owners.

Broncho-interstitial pneumonia in a thoroughbred foal

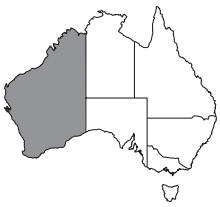
Broncho-interstitial pneumonia was the cause of illness in a 4-month-old thoroughbred foal from a property near Whittlesea in north-east Victoria, which was submitted for necropsy in February 2008 following a 4-day history of respiratory distress. The foal had been unsuccessfully treated with antibiotics for a presumed *Rhodococcus equi* infection. Necropsy showed patchy, red, irregular areas of consolidation throughout all lobes of the lung. There was no effusion within the thoracic cavity; however, there was a moderate hydropericardium. Histologically, the majority of lung alveoli were lined with hyaline membranes, and there was necrosis of terminal bronchioles and alveolar walls and epithelialisation of alveoli with type II pneumocytes. Large numbers of alveolar macrophages could be found within the lumen of alveoli, along with multinucleated syncytial cells. Aerobic culture yielded a light, mixed growth of bacteria, indicating likely contamination, with no *Rhodococcus* seen. Broncho-interstitial pneumonia in foals is a poorly understood disease, which occurs sporadically and has a high mortality rate. The formation of hyaline membranes, along with terminal bronchiolar and alveolar necrosis, type II pneumocyte proliferation and the presence of activated alveolar macrophages, is consistent with broncho-interstitial pneumonia in foals. Various aetiologies for broncho-interstitial pneumonia have been suggested, with a multifactorial cause involving viruses being likely. Concurrent infections with *Rhodococcus equi* and/or *Pneumocystis carinii* have also been seen.

Malignant catarrhal fever in farmed deer

Malignant catarrhal fever (MCF) caused the death of four out of 30 mature female hog deer (*Cervus porcinus*) during a 2-month period over summer on a property in north-east Victoria. The deer died after a short illness, clinically showing nasal discharge, corneal opacity, blindness and neurological signs. MCF was confirmed by histological examination of a full range of tissues, including the brain.

MCF in deer has two forms, acute and chronic. The acute form is more common, with rapid onset of bloody diarrhoea, dark-stained urine, depression and death within 48 hours. In this instance, the chronic form was observed, with histological examination revealing classical lesions of haemorrhagic lymph nodes and vascular degeneration in gastrointestinal and nasopharyngeal tissues and the brain.

Little is known about the epidemiology of MCF in farmed deer. Although only the sheep-associated form of MCF occurs in Australia, this deer herd did not have direct contact with sheep. There were, however, some neighbouring properties that ran sheep. The producer was advised to improve on-farm biosecurity and create more effective barriers along the boundary with neighbouring sheep properties to prevent possible future infection of the deer from sheep.



Western Australia

Contributed by Fiona Sunderman, Department of Agriculture and Food

Laboratory testing was conducted on 257 investigations of animal disease during the quarter. There were 28 investigations of suspected nationally notifiable diseases, although only one (a case of equine herpes virus 1) was confirmed. All of the 26 exotic disease investigations were category 1 alerts (low index of suspicion). They mostly involved routine exclusion of avian influenza and Newcastle disease in avian species, swine fever and postweaning multisystemic wasting syndrome in pigs, and equine influenza in horses. A diagnosis of an endemic disease was made in all cases where the animal was ill. Porcine dermatitis and nephropathy syndrome has been identified in an isolated herd of grower pigs. This porcine circovirus type 2-associated disease has been reported in Australia previously.

Cattle

Bovine necro-suppurative pneumonia

Bovine necro-suppurative pneumonia was diagnosed in a pregnant 3-year-old cow at Vasse that showed severe respiratory signs and died despite treatment. At necropsy, all lung lobes contained multiple caseous nodules, many of which were raised above the pleural surface. Histologically, the nodules were composed of suppurative inflammation centred on small airways and adjacent alveoli and populated by numerous gram-positive and gram-negative bacteria. *Arcanobacterium pyogenes* was cultured from the lung. The gram-negative bacilli are likely to be *Haemophilus* or *Pasteurella* species.

Selenium poisoning

Selenium poisoning was suspected in recently purchased beef steers that died 2 weeks after arrival on a Dunsborough property. They were treated with an anthelmintic on arrival and injected in the second week with multivitamins. At necropsy, there were pleural and myocardial ecchymoses and excessive straw-coloured pericardial fluid. Histopathological examination revealed severe periacinar to mid-zonal hepatic necrosis. A diagnosis of selenium toxicity was supported by liver selenium levels of 27.7 mg/kg (normal 1.5 mg/kg) and similar histological changes to those seen in a previous case (Shortridge et al 1971). Other causes of midzonal hepatic necrosis include poisoning with blue-green algae, or ingestion of the toxic plants *Boobialla* and rough dog's-tail (*Cynosurus echinatus*).

Shortridge EH, O'Hara PJ and Marshall PM (1971). *New Zealand Veterinary Journal* 19(3):47–50.

Bovine polioencephalomalacia and hepatic lipidosis

Bovine polioencephalomalacia and hepatic lipidosis were diagnosed in feeder steers from Esperance on a soda grain and hay diet; they showed blindness, progressing to recumbency and death. Significant necropsy findings included poorly developed rumen papillae and an orange liver. Histopathological examination revealed subacute polioencephalomalacia and hepatic lipidosis.

In cattle, consumption of high-energy diets results in an increase in the length of rumen papillae because volatile fatty acids (butyrate and proprionate, but not acetate) promote rumen epithelial growth. High rumen pH shifts volatile fatty acid production from butyrate and proprionate to acetate. It is suggested that the cause of poor rumen papilla development in this case was in part due to high rumen pH and high acetate levels arising from soda grain consumption.

Salmonellosis

Salmonellosis presented in three out of a mob of 40 calves, aged 4 weeks, at Benger. These animals, which were fed a hay and grain diet, died after a short illness. Histopathologically, there was severe, focally extensive, erosive, necrotising and haemorrhagic enterocolitis. *Salmonella* Typhimurium was isolated from the small intestine, liver and gall bladder. The presence of necrotising mucosal lesions that appear to 'skip' down the length of the small and large intestine, together with necrotising lesions of the gall bladder, is typical of salmonellosis in young calves. The endotoxaemia associated with salmonellosis often induces an interstitial pneumonia and probably accounts for the clinical manifestation of respiratory disease as the principal presenting sign in these calves.

Pestivirus

Pestivirus caused calving problems in a herd of 95 breeders at Albany. The herd began calving in early February 2008. Reproductive problems included premature births, stillbirths and deaths post-partum. A premature calf was submitted for necropsy and was confirmed with in utero pestivirus infection. Pestivirus antigen was detected in the spleen, and pestivirus antibody was detected in pericardial fluid. The presence of an antibody response to pestivirus in a calf that has not suckled is consistent with infection of the dam after 180 days. The history confirms that pestivirus infection is present in the herd, and it may be that the virus is responsible for other reproductive problems.

Sheep

Plant poisonings

Summer rainfall throughout the State resulted in a number of cases of plant poisonings.

Caltrop poisoning was diagnosed in two outbreaks in Merredin in sheep showing photosensitisation and jaundice. Grazing of caltrop (*Tribulus terrestris*) was confirmed by identifying characteristic lesions in histological sections of liver. The pathogenesis of caltrop poisoning involves the obstruction of bile ducts by crystals composed of plant-derived steroidal saponins.

Cardiomyopathy caused the death of 15 weaners in a flock of 110 merino weaners on a spray-topped ryegrass and clover paddock on a Cranbrook farm. Approximately 75% of the flock were affected, and many were thin and scouring. A monophasic nature of the cardiomyopathy and the lack of skeletal muscle involvement strongly suggested cardiac glycoside or fluoroacetate poisoning.

Pigs

Salmonellosis

Salmonellosis was confirmed in weaners on a number of properties over the summer period, mostly associated with infection with the Typhimurium serovar. Affected weaners consistently developed yellow diarrhoea and showed poor weight gains. Mortality rates were usually low. The spiral colon was most severely affected, with a yellow diphtheritic membrane covering the mucosal surface.

Vitamin A deficiency

Two of nine pigs, a boar and a gilt were diagnosed with vitamin A deficiency after being found down in their pen during an animal welfare investigation. They had been on a poor-quality diet. The plasma vitamin A concentration in the boar was a very deficient 0.01 mg/L. Its liver vitamin A concentration was below the limits of detection, whereas that of the gilt was a mere 1.2 mg/kg wet weight (the normal value for pigs is approximately 45 mg/kg). Histopathologically, there was Wallerian degeneration in the brains and spinal cords.

Horses

Equine herpes virus

An 8-year-old mare imported from Germany in July 2007 gave birth 7 weeks prematurely to a stillborn foal in January 2008. There was no milk production or signs of imminent parturition. The placenta was intact, with no lesions evident. Lesions in both the lung and liver were consistent with equine herpes virus (EHV), and polymerase chain reaction testing carried out on the liver proved positive for EHV1. The mare was antibody positive for EHV1 and EHV4. Virus isolation was negative. The mare is under quarantine surveillance.

Poultry

Avian pox

Typical avian pox lesions were evident in a collared sparrowhawk from the Kimberley region and bronzewing pigeons submitted from the Harvey area. Avian pox is a highly contagious disease acquired either by inhalation or through skin abrasions and biting arthropods. Some isolates are host specific, whereas others are infectious for one or more additional species. The large DNA virus (an avipoxvirus, family *Poxviridae*) is highly resistant and may survive for several years in dried scab. While most birds show a self-limiting infection characterised by proliferative skin lesions, the ‘wet pox’ form of the disease, where lesions are present in the oral cavity and upper gastrointestinal tract, may result in mortalities through the inability to feed and secondary infections.

Aspergillus *pneumonia*

Aspergillus pneumonia was diagnosed on two broiler farms in the Perth area and affected chicks in a number of sheds on each property. The case is

unusual in that fungal pneumonia is usually due to the sawdust or shavings litter becoming wet due to alimentary or renal disease in the birds. In this case, no concurrent illness was identified and it is suspected that the problem was associated with fresh litter used when new batches of birds were introduced. Recently, sawdust has been difficult to obtain and the current practice is to store it on site until it is needed. Moist sawdust and warm conditions can be ideal breeding conditions for fungi. As the litter settles down and droppings from the birds accumulate, the environmental conditions are thought to alter and suppress other potential pathogens.

Quarterly disease statistics

Control activities

Ovine brucellosis

Contagious epididymitis, caused by *Brucella ovis*, is present in commercial flocks at a low level that varies around the country. Voluntary accreditation programs (usually in stud flocks) for ovine brucellosis freedom are operating in all States. Table 1 shows the number of accredited flocks at the end of the quarter.

Table 1 Ovine brucellosis accredited-free flocks at 31 March 2008

State	Free
ACT	0
NSW	847
NT	0
QLD	66
SA	512
TAS	71
VIC	308
WA	181
AUS	1985

Johne's disease

In Australia, Johne's disease occurs primarily in dairy cattle and sheep, and to a lesser extent in beef cattle, goats, deer and camelids. Infection with sheep strains occurs to varying extents across the sheep-producing regions of southern Australia but has not been detected in Queensland. Cattle strains are endemic in south-eastern Australia, but surveillance programs have not identified endemic infection in Queensland, Western Australia or the Northern Territory, and active measures are taken to stamp out any incursions. Table 2 shows the number of herds and flocks known to be infected.

Table 2 Number of herds or flocks infected with Johne's disease at 31 March 2008

State	Cattle	Deer	Goat	Sheep	Total
NSW	111	1	8	1286	1406
QLD	0	0	0	0	0
SA	71	1	1	65[a]	138
TAS	16	0	3	58	77
VIC	871	2	4	511	1388
WA	0	0	0	19	19
AUS	1069	4	16	1939	3028

a Eight of these flocks are infected with 'c' strain.

New approaches based on risk assessment and management have been developed to control Johne's disease. Market assurance programs are in operation for cattle, sheep, goat and alpacas; the numbers of herds or flocks that have reached a status of monitored negative 1 or higher are shown in Table 3.

Table 3 Herds or flocks with a market assurance program status of at least monitored negative 1 at 31 March 2008

State	Alpaca	Cattle	Goat	Sheep	Total
NSW	118	457	32	309	916
NT[a]	0	0	0	0	0
QLD[a]	0	0	0	0	0
SA	47	271	18	199	535
TAS	2	112	8	31	153
VIC	16	285	3	78	382
WA	0	0	0	0	0
AUS	183	1125	61	617	1986

a Herds or flocks in free or protected zones have a status of monitored negative 1 or better because of the zone status.

Lists of beef, goat and alpaca herds and sheep flocks assessed in the market assurance programs are available at: http://www.animalhealthaustralia.com.au/programs/jd/maps.cfm.

Information about components of the National Johne's Disease Control Program can be obtained from State coordinators and Animal Health Australia's Johne's Disease coordinator, David Kennedy (02 6365 6016).

Enzootic bovine leucosis

Enzootic bovine leucosis accreditation programs have been operating in the dairy industries in Queensland and New South Wales for several years. Victoria, South Australia and Western Australia are undertaking a program of bulk milk testing of all dairy herds. Table 4 shows the number of dairy herds tested free from enzootic bovine leucosis at the end of the quarter.

Table 4 Dairy herds tested free from enzootic bovine leucosis at 31 March 2008

State	Infected	Non-assessed	BMT[a] negative	Provisionally clear	Monitored free	Total
NSW	0	35	39	0	821	895
NT	0	0	0	0	0	0
QLD	2	286	0	0	606	894
SA	0	0	1	1	338	340
TAS	0	471	0	0	0	471
VIC	33	38	1863	28	2837	4799
WA	1	0	0	0	175	176
AUS	36	830	1903	29	4777	7575

a Bulk milk test

Laboratory testing

Table 5 shows the results of serological testing for a range of viral diseases from routine laboratory submissions for the quarter.

Table 5 Serological testing from routine submissions to State laboratories

	Akabane[a]		Bovine ephemeral fever[a]		Bluetongue[a]		Enzootic bovine leucosis		Equine infectious anaemia		Equine viral arteritis	
	Tests	+ve	Tests	+ve	Tests	+ve	Tests	+ve	Tests	+ve	Tests	+ve
Jan–Mar 2007	2924	304	1512	227	10267	177	2099	1	1172	1	468	2
Apr–Jun 2007	2199	634	1204	254	5572	326	864	0	1360	0	748	6
Jul–Sep 2007	1833	428	1096	173	2231	237	4076	0	858	0	405	23
Oct–Dec 2007	1828	326	1420	207	7273	181	1142	0	236	1	116	3
Jan–Mar 2008												
NSW	654	110	596	117	4021	28	103	0	158	0	115	8
NT	459	176	441	120	402	144	0	0	0	0	0	0
QLD	365	104	434	174	327	31	327	0	167	0	1	0
SA	58	0	0	0	85	0	59	0	0	0	0	0
TAS	0	0	1	0	2	0	1	0	1	0	0	0
VIC	222	3	142	1	204	0	2308	0	234	0	270	7
WA	55	2	63	20	56	8	0	0	70	0	60	0
AUS	1813	395	1677	432	5097	211	2798	0	630	0	446	15

a http://www.animalhealthaustralia.com.au/programs/adsp/namp/namp_home.cfm

Surveillance activities

National Transmissible Spongiform Encephalopathies Surveillance Program

The National Transmissible Spongiform Encephalopathies Surveillance Program (NTSESP) is an integrated national program jointly funded by industry and governments to demonstrate Australia's ongoing freedom from bovine spongiform encephalopathy and scrapie, and to provide early detection of these diseases should they occur. Table 6 summarises the activity of the program over the past five quarters. All specimens tested were negative for transmissible spongiform encephalopathies. Information about the NTSESP is available at http://www.animalhealthaustralia.com.au/aahc/programs/adsp/tsefap/ntsesp.cfm.

Contact: Duncan Rowland, Animal Health Australia's NTSESP National Coordinator

Table 6 Transmissible spongiform encephalopathy surveillance

	Jan–Mar 2007		Apr–Jun 2007		Jul–Sep 2007		Oct–Dec 2007		Jan–Mar 2008	
State	Cattle	Sheep	Cattle	Sheep	Cattle	Sheep	Cattle	Sheep	Cattle	Sheep
NSW	15	33	18	18	19	8	14	13	13	13
NT	0	0	2	0	19	0	4	0	2	0
QLD	44	13	37	6	65	10	40	2	23	2
SA	4	18	9	24	2	10	2	3	3	9
TAS	2	0	4	1	2	1	1	1	0	0
VIC	28	21	29	17	19	48	29	22	12	8
WA	9	18	14	19	6	34	5	40	7	16
AUS	102	103	113	85	132	111	95	81	60	48

Bovine brucellosis

Although bovine brucellosis is now exotic to Australia, surveillance is maintained through abortion investigations and miscellaneous testing of cattle for export or other reasons. As shown in Table 7, 162 abortion investigations were performed during the quarter, all with negative results for bovine brucellosis.

Table 7 Surveillance for bovine brucellosis in cattle

	Abortion		Other reasons	
	Tests	+ve	Tests	+ve
Jan–Mar 2007	78	0	1433	0
Apr–Jun 2007	62	0	3011	0
Jul–Sep 2007	96	0	6243	0
Oct–Dec 2007	57	0	2522	0
Jan–Mar 2008				
NSW	15	0	3583	0
NT	0	0	0	0
QLD	15	0	262	0
SA	0	0	0	0
TAS	4	0	1	0
VIC	2	0	343	0
WA	126	0	59	0
AUS	162	0	4248	0

Tuberculosis

Australia was declared free from bovine tuberculosis (TB) on 31 December 1997, exceeding the World Organisation for Animal Health (OIE) requirements for declaration of country freedom. The last outbreaks of TB were detected in buffalo in January 2002 and in cattle in December 2000, and trace-forward and trace-back slaughter were carried out according to the Tuberculosis Freedom Assurance Program (TFAP).

All Australian laboratories supporting TFAP are accredited for veterinary testing by the National Association of Testing Authorities under ISO/IEC 17025. Laboratories approved for culture of *Mycobacterium bovis* must pass an external quality assurance program run by the Australian reference laboratory for TB on an annual basis.

The National Granuloma Submission Program has been the major surveillance tool for TB since 1992. Table 8 summarises the positive test results from the program.

Table 8 Results of the National Granuloma Submission Program

	Jan–Mar 2007	Apr–Jun 2007	Jul–Sep 2007	Oct–Dec 2007	Jan–Mar 2008
Submitted	178	214	234	192	145
TB +ve	0	0	0	0	0

Salmonella surveillance

The National Enteric Pathogen Surveillance Scheme (NEPSS) is operated and maintained on behalf of the Australian Government and State and Territory governments by the Microbiological Diagnostic Unit at the University of Melbourne. Data on isolates of salmonellas and other pathogens are submitted to NEPSS from participating laboratories around Australia. Quarterly newsletters and annual reports of both human and nonhuman isolates are published, and detailed data searches are provided on request to NEPSS. Table 9 summarises *Salmonella* isolations from animals notified to NEPSS for the quarter.

Contact: Diane Lightfoot, National Enteric Pathogen Surveillance Scheme, Microbiological Diagnostic Unit, University of Melbourne

Table 9 *Salmonella* notifications, 1 January to 31 March 2008

	Birds	Cats	Cattle	Dogs	Horses	Pigs	Sheep	Other	Total
S. Bovismorbificans	0	0	1	0	0	0	1	0	2
S. Dublin	0	0	10	0	0	0	0	0	10
S. Infantis	0	0	0	2	0	0	0	0	2
S. Typhimurium	8	2	14	2	5	0	12	1	44
Other	5	5	31	15	4	12	2	11	85
Total	13	7	56	19	9	12	15	12	143

Northern Australia Quarantine Strategy

In recognition of the special quarantine risks associated with Australia's sparsely populated northern coastline, the Australian Quarantine and Inspection Service conducts an animal disease surveillance program as an integral component of the Northern Australia Quarantine Strategy (NAQS). The NAQS surveillance program provides early warning of disease threats to livestock industries and, in some cases, to human health. NAQS surveillance activities include both offshore and onshore components. Information is derived from the use of sentinel animals, structured surveys and opportunistic sampling. Table 10 summarises NAQS activity in Australia over the past five quarters.

Contact: Jane Parlett, Australian Quarantine and Inspection Service, Australian Government Department of Agriculture, Fisheries and Forestry

Table 10 Summary of recent NAQS activity in Australia

	Jan–Mar 2007		Apr–Jun 2007		Jul–Sep 2007		Oct–Dec 2007		Jan–Mar 2008	
Category	Tested	+ve	Tested	+ve	Tested	+ve	Tested	+ve	Tested	+ve
Aujeszky's disease	0	0	0	0	0	0	0	0	0	0
Australian bat lyssavirus	1	0	0	0	1	0	0	0	0	0
Avian influenza — highly pathogenic	0	0	32	0	364	0	1036	0	60	0
Classical swine fever	0	0	107	0	158	0	183	0	28	0
Japanese encephalitis	45	0	15	0	0	0	8	0	70	0
Surra — *Trypanosoma evansi*	156	0	96	0	23	0	82	0	41	0

Ports Surveillance Program

The Ports Surveillance Program is conducted for *Culicoides* and screw-worm fly by Biosecurity Australia, and for exotic bees and bee mites by Product Integrity, Animal and Plant Health in the Department of Agriculture, Fisheries and Forestry. Seaports, particularly those servicing returning livestock vessels and those dealing with high-risk deck cargo, such as timber, mining equipment and containers, are considered to be high-risk locations for incursions of such pests. The program increases the capacity to detect any incursions at an early stage, and this in turn increases the probability of a successful eradication program. The *Culicoides* surveillance also supports the livestock export trade by confirming the continuous or seasonal absence of *Culicoides* vectors at ports from which livestock are loaded. Table 11 shows the number of times that insect trap sites at seaports were inspected for specific exotic insects or mites in the Ports Surveillance Program (Ports) and the NAQS surveillance program. No detections were recorded.

Contact: Iain East, Office of the Chief Veterinary Officer, and Howe Heng, Biosecurity Australia, both of the Australian Government Department of Agriculture, Fisheries and Forestry

Table 11 Ports Surveillance Program: number of inspections of insect traps

		Jan–Mar 2007	Apr–Jun 2007	Jul–Sep 2007	Oct–Dec 2007	Jan–Mar 2008
Ports	Asian bees	12	32	20	18	14
	Varroa mites	22	26	10	24	15
	Asian mites	22	26	10	24	15
	Tracheal mites	22	20	9	22	16
	Culicoides sp.	27	29	28	24	29
	Screw-worm fly	21	21	23	19	16
NAQS	Screw-worm fly	45	45	45	45	45

Avian influenza

Australia is currently free from highly pathogenic avian influenza. A number of low pathogenic subtypes of avian influenza have been found in wild birds. Please consult the Australian Wildlife Health Network report in this publication for information on avian influenza in wild birds. During the quarter, 223 birds from 54 laboratory submissions were tested for avian influenza; there were no positive results (Table 12). Tests include c-ELISA, haemagglutination inhibition, reverse-transcriptase polymerase chain reaction and virus isolation.

Table 12 Number and type of positive results of avian influenza testing, 1 January to 31 March 2008

H5 positive	H7 positive	Positive for a non-H5, non-H7 strain
0	0	0

Newcastle disease

Australia is currently free from virulent Newcastle disease (VND) or exotic Newcastle disease, even though precursor viruses are present in Australia. Vaccination against VND using a combination of live lentogenic virus (V4) and a killed vaccine is required in all Australian jurisdictions. The National Newcastle Disease Management Plan 2005–07 is managed by a steering committee of a set reference group. During the quarter, 124 birds from 23 laboratory submissions were tested for Newcastle disease; there were no positive results (Table 13).

Table 13 Number and type of positive results of Newcastle disease (ND) testing, 1 January to 31 March 2008

Virulent strain of ND virus	Peats Ridge strain of ND virus	Lentogenic V4 or V4-like ND virus	Other paramyxovirus
0	0	0	0

Zoonoses

The National Notifiable Diseases Surveillance System (NNDSS) of the Communicable Diseases Network Australia collects statistics about many human diseases. A summary of information about five important zoonoses is submitted to the National Animal Health Information System (NAHIS) each quarter (see Table 14).

Contact: National Notifiable Diseases Surveillance System, Australian Government Department of Health and Ageing (http://www9.health.gov.au/cda/Source/CDA-index.cfm)

Table 14 Notification of zoonotic disease in humans

	Q1 2007	Q2 2007	Q3 2007	Q4 2007	Q1 2008	Current quarter (January–March 2008)							
			AUS			ACT	NSW	NT	QLD	SA	TAS	VIC	WA
Brucellosis	14	8	10	8	10	0	1	0	9	0	0	0	0
Chlamydophilosis	33	26	19	29	18	0	8	0	0	0	0	8	2
Leptospirosis	48	34	9	16	40	1	4	0	32	1	0	1	1
Listeriosis	18	8	9	17	26	0	14	0	5	1	1	4	1
Q fever	120	122	112	115	112	0	53	0	50	4	0	4	1

National Residue Survey

During the first quarter of 2008, 3135 meat samples were collected and analysed in the National Residue Survey Random Monitoring Program (see Table 15). Fourteen samples were found with residues above the relevant standard in the Australian Food Standards Code.

One sample of cattle fat had a dieldrin residue of 0.36 mg/kg, exceeding the Australian maximum residue limit (MRL) of 0.2 mg/kg. A trace-back investigation by the relevant State department found the property to be noncompliant with their property management plan (PMP). As a result, a full audit of the PMP has been completed and a number of changes have been recommended.

Two samples of cattle liver contained lead residues of 2.4 mg/kg and 1.2 mg/kg respectively, which are above the MRL of 0.5 mg/kg. Trace-back investigations are ongoing.

Six samples of sheep liver had cadmium levels above the maximum level (ML) of 1.25 mg/kg but below the action level of 2.5 mg/kg required to initiate a trace-back investigation. A seventh sample of sheep liver contained cadmium at a level of 3.56 mg/kg, and a trace-back investigation is currently being conducted. Cadmium residues above the ML are a common finding in older sheep across southern Australia.

Two samples of sheep liver contained lead residues of 0.85 and 0.67 mg/kg respectively, which is above the MRL of 0.5 mg/kg. Trace-back investigations are continuing into the source of these residues.

One sample of pig liver contained a lead residue of 1.125 mg/kg, which is above the MRL of 0.5 mg/kg. A trace-back investigation is being conducted by the relevant State department.

One sample of emu liver contained a lead residue of 0.71 mg/kg, which is above the MRL of 0.5 mg/kg. A trace-back investigation into the source of this residue is under way.

Contributed by Jim Derrick, National Residue Survey, Australian Government Department of Agriculture, Fisheries and Forestry

Table 15 National Residue Survey (each pair of figures gives the number of residues above the maximum residue limit or the maximum level, and the number of samples tested)

		NSW		NT		QLD		SA		TAS		VIC		WA		AUS	
Anthelmintics	cattle	0	45	0	1	0	51	0	14	0	10	0	23	0	6	0	150
	pigs	0	10	0	0	0	19	0	12	0	0	0	11	0	3	0	55
	sheep	0	121	0	0	0	17	0	59	0	5	0	56	0	88	0	346
	other	0	14	0	0	0	13	0	0	0	0	0	9	0	2	0	38
	Total	0	190	0	1	0	100	0	85	0	15	0	99	0	99	0	589
Antimicrobials	cattle	0	63	0	0	0	50	0	19	0	7	0	39	0	9	0	187
	pigs	0	40	0	0	0	54	0	25	0	3	0	38	0	15	0	175
	poultry	0	30	0	0	0	13	0	20	0	0	0	26	0	4	0	93
	sheep	0	64	0	0	0	8	0	19	0	2	0	41	0	41	0	175
	other	0	2	0	0	0	14	0	4	0	0	0	13	0	0	0	33
	Total	0	199	0	0	0	139	0	87	0	12	0	157	0	69	0	663
Growth promotants	cattle	0	71	0	0	0	72	0	10	0	12	0	12	0	5	0	182
	pigs	0	20	0	0	0	34	0	16	0	1	0	30	0	10	0	111
	poultry	0	4	0	0	0	1	0	2	0	0	0	3	0	1	0	11
	sheep	0	75	0	0	0	13	0	34	0	2	0	21	0	47	0	192
	other	0	0	0	0	0	3	0	0	0	0	0	4	0	0	0	7
	Total	0	170	0	0	0	123	0	62	0	15	0	70	0	63	0	503
Insecticides	cattle	0	68	0	0	0	87	0	17	0	7	1	50	0	6	1	235
	pigs	0	12	0	0	0	14	0	5	0	0	0	18	0	6	0	55
	sheep	0	124	0	0	0	22	0	62	0	6	0	63	0	105	0	382
	other	0	20	0	4	0	16	0	5	0	0	0	13	0	3	0	61
	Total	0	224	0	4	0	139	0	89	0	13	1	144	0	120	1	733
Metals	cattle	1	13	0	0	0	22	0	8	0	1	1	12	0	2	2	58
	pigs	0	18	0	0	0	13	0	8	0	0	0	13	1	7	1	59
	sheep	1	27	0	0	0	3	0	11	0	1	0	17	8	200	9	259
	other	0	13	0	2	0	17	0	3	0	0	1	12	0	9	1	56
	Total	2	71	0	2	0	55	0	30	0	2	2	54	9	218	13	432
Miscellaneous	cattle	0	23	0	0	0	29	0	7	0	3	0	9	0	2	0	73
	pigs	0	21	0	0	0	13	0	7	0	0	0	12	0	3	0	56
	sheep	0	20	0	0	0	7	0	10	0	1	0	15	0	27	0	80
	other	0	1	0	0	0	2	0	1	0	0	0	2	0	0	0	6
	Total	0	65	0	0	0	51	0	25	0	4	0	38	0	32	0	215
Total		2	919	0	7	0	607	0	378	0	61	3	562	9	601	14	3135

Suspect exotic or emergency disease investigations

There were 48 investigations of diseases, suspected to be either exotic or a possible emergency, reported during the quarter, as shown in Table 16. These data do not include the sampling activities conducted in New South Wales and Queensland as part of the response to the equine influenza outbreak. More details about some of these investigations can be found in the State and Territory reports.

Table 16 Exotic or emergency disease investigations reported, 1 January to 31 March 2008

Disease	Species	State	Month	Response code	Finding
African swine fever	Porcine	WA	Feb	3	negative (2 unrelated investigations)
Contagious agalactia	Caprine	TAS	Feb	2	negative
Equine herpes virus 1 — abortigenic and neurological strains	Equine	TAS	Mar	2	negative
	Equine	WA	Jan	3	positive (abortigenic)
Equine influenza	Equine	SA	Jan	3	negative (11 unrelated investigations)
	Equine	SA	Feb	3	negative (8 unrelated investigations)
	Equine	SA	Mar	3	negative (2 unrelated investigations)
	Equine	TAS	Jan	3	negative
	Equine	TAS	Feb	3	negative
	Equine	VIC	Jan	3	negative (4 unrelated investigations)
	Equine	VIC	Feb	3	negative (8 unrelated investigations)
	Equine	VIC	Mar	3	negative (2 unrelated investigations)
	Equine	WA	Feb	2	negative
Foot-and-mouth disease	Ovine	NSW	Feb	3	contagious ecthyma (2 unrelated investigations)
Transmissible gastroenteritis	Porcine	SA	Feb	2	negative
Tuberculosis in any mammal	Bovine	NSW	Feb	2	pneumonia
West Nile virus infection — clinical	Avian	VIC	Mar	3	negative

Key to response codes
1: Field investigation by government officer
2: Investigation by State or Territory government veterinary laboratory
3: Specimens sent to the Australian Animal Health Laboratory (or CSIRO Entomology)
4: Specimens sent to reference laboratories overseas
5: Regulatory action taken (quarantine or police)
6: Alert or standby
7: Eradication

NAHIS CONTACTS

The National Animal Health Information System (NAHIS) collects summaries of animal health information from many sources. Please contact the relevant person below if further details are required. NAHIS is on the internet (http://www.animalhealthaustralia.com.au/status/nahis.cfm).

Name	Role	Phone	Fax	email
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Iain East	Australian Government NAHIS Coordinator	02 6272 3106	02 6272 3150	iain.east@daff.gov.au
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Ron Southgate	National Granuloma Submission Program	02 6272 3101	02 6272 5442	ron.southgate@aqis.gov.au
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Jim Derrick	National Residue Survey	02 6272 4019	02 6272 4023	jim.derrick@daff.gov.au
Jenny Hutchison	National Surveillance Coordinator	02 6287 4483	02 6287 4468	jenny@ausvet.com.au
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EMERGENCY ANIMAL DISEASE WATCH HOTLINE — 1800 675 888

The Emergency Animal Disease Watch Hotline is a toll-free telephone number that connects callers to the relevant State or Territory officer to report concerns about any potential disease situation. Anyone suspecting an exotic disease outbreak should use this number to get immediate advice and assistance.

For information about the Emergency Animal Disease Watch Hotline, contact Scott Porteous, Animal Health Australia.

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