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Evaluation Report 8

Review of Animal Health

May 2005
Biosecurity Victoria

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Review of Animal Health

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Foreword

In 2002-03, the Victorian Government conducted a review of the State's *animal health* function managed by the Victorian Department of Primary Industries (DPI). The review focussed on the role of government in the provision of services. While centred on Victoria, the review is relevant to the future management of animal health programs in all jurisdictions, particularly given that many such programs are coordinated at a national level.

Both the review and this report, which outlines the review findings, were prepared under the direction of Gary Stoneham, Chief Economist, DPI Economics and Policy Research Branch and Terry Truscott, then Director, DPI Agricultural Industry Policy Branch. Senior staff in the DPI Agricultural Quality Assurance Branch (now Biosecurity Victoria) assisted the review.

However, because the material outlined in this report was prepared during 2002, it may not reflect some of the more recent initiatives and decisions by the Commonwealth, States and industry. For example, in May 2003, the Victorian Government announced additional funding of $24.1 million over 4 years for enhanced biosecurity and market access. In May 2005 the Victorian Government announced that $8.4 million would be provided over four years to deal with plant biosecurity threats in regional Victoria. Some minor changes have been made to increase clarity, such as updating the names of government agencies, but otherwise the report is a true and accurate record of the review at the time it was undertaken.

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Executive Summary

Animal production systems make up a large part of the Victorian rural economy.

At farm level, animal production in Victoria was worth around $3.8 billion in 1999/2000, or 56 per cent of the total value of agricultural production in Victoria.

Beneficiaries of animal health investment include:

Investment in animal health generates benefits to producers of livestock products and in some instances to society as a whole:

- *producers of affected livestock*
  - Producers of affected livestock benefit through improved animal productivity (reduced mortality/morbidity) and improved access to markets.
- *other livestock producers*
  - Other livestock producers benefit through reduced spread of diseases and improved access to markets if other herds and flocks are free of disease.
- *society.*

Society as a whole benefits from reduced incidence of diseases which can spread to humans (known as zoonotic diseases), less disruption to other sectors such as tourism and transport, improved food security and better animal welfare. Given the possibility that exotic animal diseases could be used as a tool of bioterrorism, society would expect governments to be able to adequately respond to such incidents.

Owners of livestock have incentives to invest in animal health.

Most animal health investments are made by owners of livestock in association with private veterinary practitioners. Victorian livestock producers spend around $120 million per year (ABS 2000) on veterinary supplies and services in addition to the less obvious costs associated with animal welfare, nutrition and preventative measures.

Government has a role in the provision of some animal health services because of:

This review identified the following reasons for government involvement:

- *Economies of scope*
  - Government provision (not necessarily funding) of emergency disease responses is appropriate where the overall cost of the service can be reduced because there are economies of scope. It would be costly for each animal industry (sheep, cattle, goats, chickens, etc.) to separately develop and maintain the required skills and resources. It would also be costly to separately establish surveillance and monitoring infrastructure for

exotic and endemic disease management. For efficiency reasons, government should provide *one* set of animal health infrastructure that can be used to respond to endemic and exotic diseases in all livestock industries. Cost-recovery is a separate and important issue.

- *Human health and animal welfare*
  - Some animal health investments generate spillover benefits to the community as a whole. Examples include management of diseases that can spread to humans and actions that improve animal welfare or reduce chemical use and residues in food.
- *Legislation*
  - In some instances, such as emergencies, legislation and regulations will be required to marshal resources needed to respond to disease threats. This is to enable timely responses and to encourage individuals to take actions that are in the common good but not in the private interest of individual livestock owners.
- *International and national obligations.*
  - Commonwealth and State Governments have a range of obligations including commitments to organisations such as the Office Internationale des Epizooties (OIE) and the World Trade Organisation (WTO) regarding the provision of information about the disease status of Australian flocks and herds to facilitate trade in livestock and livestock products.

Government has an important role in the *provision* of some animal health services. Society benefits from government investment in animal health.

Management of exotic diseases

The output from this component of the Victorian Government's animal health function can be defined as activities to build and maintain Victoria's capacity to monitor, detect and respond to exotic disease threats.

The key economic features of exotic diseases are:

- *Exotic diseases impose large costs on the economy.*
  - The cost of a serious exotic disease incursion is large. Exotic diseases impose costs on the economy associated with the loss of markets, disease control measures (direct costs) and indirect costs to other sectors such as human health, tourism and transport. For example, an economic study by Abdalla et al (2002) shows that the cost of an Australian outbreak of foot-and-mouth

	disease could range from $2-3 billion for a short outbreak to $8-13 billion for a long outbreak.
• *Exotic disease outbreaks are episodic.*	• The risk of outbreak is not known with certainty and outbreaks are episodic in nature. Although the probability of an outbreak may be low, the cost of management will be large.
• *Different control strategies are possible, but have cost implications.*	• The cost of disease control varies with different actions and their effectiveness. Slaughtering all animals in infected regions is expensive, as are test-and-slaughter programs. Vaccinating animals in infected regions is less expensive but may delay access to markets because of the difficulties in proving disease freedom.
• *The longer an outbreak lasts, the more expensive it is.*	• If the duration of a disease outbreak can be reduced, the cost to the economy will be smaller.
• *Containing an outbreak within a zone or region reduces the impact.*	• The extent of the exclusion zone is important. If trade partners allow zones that are free of disease to export, the overall economic impact is reduced.
• *Early detection of an outbreak is important.*	• If disease outbreaks can be quickly detected, the costs of control will be lower.
National arrangements include: • *Coordinated response to exotic disease outbreaks*	Responses to exotic animal disease outbreaks are coordinated through the National Emergency Animal Disease Management Group, which may invoke cost-sharing arrangements under the Emergency Animal Disease Response Agreement (EAD) administered through Animal Health Australia (AHA).
• *Established cost-sharing agreements*	The EAD agreement establishes pre-arranged cost-sharing between governments and industries. Exotic diseases are classified into four categories: 100% government funded: 0% industry funded; 80:20; 50:50 and 20:80.
Australian Veterinary Emergency Plan (AUSVETPLAN).	AHA manages the development of the Australian Veterinary Emergency Plan (AUSVETPLAN), which is a coordinated national response plan for the control and eradication of a range of diseases that may require emergency responses.

National arrangements encourage: • *Timely responses to exotic disease outbreaks*	The development of pre-arranged emergency response strategies, emergency funds and cost-sharing arrangements for animal health represents an improvement in public administration compared with previous approaches. The funding arrangements developed through Animal Health Australia allow decisions to be made quickly in the knowledge that funds will be available. The affected States provide the initial funds to ensure that responses to exotic health and disease threats are not impeded by lack of funds. Timing of responses, particularly to exotic diseases such as foot-and-mouth disease (FMD), is crucial. A quick response reduces the spread of a disease, lowers the cost of eliminating threats and minimises disruption to trade flows. AHA advises governments and industries on their share of the costs of an outbreak. The Commonwealth initially pays the industry share of the costs, with the relevant industries repaying the Commonwealth over an agreed period of time.
• *Prudent investment in exotic disease management.*	The approach developed between the Commonwealth and States improves scrutiny of animal health expenditure. The fund-sharing schedules ensure that industries must repay a proportion of the funds expended in accordance with the funding formula.
• *Cost sharing of emergency disease responses*	Notwithstanding the benefits of the emergency response arrangements, the cost-sharing arrangements between Commonwealth, States and industry appear generous to industry. Although the extent of cost-sharing is a significant advance over previous arrangements, there is a need to review the rationale used to determine which funding formula to use for different animal health threats.

Endemic disease management

The output from this component of the Victorian Government's animal health function can be defined as activities to build and maintain Victoria's capacity to monitor, detect, respond to and manage endemic disease threats.

Characteristics of endemic diseases:

Endemic diseases have several key features:

- *Impose economic costs*
  - Endemic diseases impose costs on the economy. These costs vary with prevalence, impact on human health, impact on animal performance, rate of spread and potential for spread.
- *Most of the benefits are to livestock producers*
  - Most of the costs and benefits of endemic disease control accrue to owners of stock through productivity improvement or to other livestock producers.
- *Do not require emergency response*
  - Unless harmful to humans (e.g. anthrax), endemic diseases generally do not require a response with the degree of emergency that is needed for exotic diseases.

Better institutional arrangements are needed for endemic disease management.

There is room to improve institutional arrangements for managing endemic diseases. DPI and Victoria's livestock industries should develop protocols including: benefit-cost analyses, pre-arranged cost-sharing agreements and mechanisms for funding endemic disease management campaigns.

Some endemic disease programs have employed strategies relevant to exotic diseases even though these were not warranted on economic grounds.

Some recent endemic disease management programs have adopted strategies developed for exotic disease control even though the characteristics of the endemic diseases and the threats posed to the economy were very different from those associated with exotic diseases. For example, Ovine Johnes Disease and bovine tuberculosis and brucellosis. The focus of endemic disease programs has been eradication of the disease even though the costs of achieving this goal may significantly outweigh the benefits of this strategy.

The infrastructure developed for surveillance and management of exotic diseases is used for endemic diseases.

For reasons to do with economies of scope (see above) and cost efficiency, it makes sense to use the exotic disease surveillance and monitoring infrastructure for managing endemic diseases as well.

Conclusions about endemic disease resources

A framework for endemic disease management is needed.

A decision-making framework for endemic disease management in Victoria should be established. Such a framework should detail the decision-making roles of key stakeholders, the objectives of disease control programs, and the mechanisms to be employed to achieve the objectives.

Before disease management actions can be taken, the following issues need to be resolved:

- *Funding guidelines are required for endemic disease management.*

- *Funding endemic disease control*
  Funding guidelines need to be developed for endemic disease management. Because individual stockowners and livestock industries are the principal beneficiaries of endemic disease control, they should fund the majority of endemic disease control activities.

- *Benefit-cost analyses identify how much investment in animal health is needed over and above that made by individual stockowners*

- *Optimal investment in disease control effort*
  Benefit-cost analyses would identify how much investment is needed over and above that made by individual stockowners. Owners of stock individually decide their optimal level of investment in on-farm disease management. In some circumstances, this level of disease control will not be enough. Diseases can spread and infect other flocks and herds, imposing costs on other farms. Over- or under-investment in disease control will impose costs on the economy. Eradication, for example, may represent an over-reaction to a disease that generates only minor reductions in animal productivity.

- *Endemic disease control programs should focus on controlling the spread rather than eradicating the disease.*

- *Identify the objective of disease control activities*
  Government/industry coordinated endemic disease control programs should focus on controlling the spread of a disease rather than eradicating the disease. With endemic diseases, market failure arises because diseases spread from farm to farm and there are external costs beyond the disease status of individual farms.

- *New policy mechanisms for encouraging the control of spread need to be investigated.*

- *Identify mechanisms that will achieve the disease management objective at least cost*

  Endemic disease control programs typically rely on regulation and enforcement (often called `command & control') and in some cases also employing fixed-rate subsidies to encourage additional investment in disease control. Disease control programs can be characterised as problems of hidden or asymmetric information and hidden actions (moral hazard) opening up the possibility of employing new intervention strategies. Hidden information refers to the situation where decision makers need certain information to make good decisions. Unfortunately, some of this information is known only by farmers not government officers. Hidden actions refers to the problem that the actions of farmers is not necessarily observable by decision makers. Economists have developed ways of dealing with information and hidden action problems.

  Organisations and government departments interested in disease and animal health programs would benefit from investigating new policy mechanisms that deal with disease control as problems of hidden information and hidden actions. Policy mechanisms that reveal information about disease status, the cost of various disease control options and the impact of these actions on the rate of spread, offer potential to reduce the cost of disease control programs. Auctions in particular have potential as a mechanism for managing disease spread in a way that reduces the costs of disease management programs.

1. Public Policy and Animal Health

Animal production systems are a very important element of the Victorian rural economy. At farm level, the value of animal production is around $3.8 billion[1] each year (ABS 2001), or 56 per cent of the total value of agricultural production. Table 1 shows the value of production and number of farms engaged in producing livestock products in Victoria. Victoria, along with other States, is regarded as a supplier of high quality animal products and currently has access to important markets such as the US and North Asia. These markets offer price premiums well above markets where lower animal health standards apply. Access to these markets is contingent on continued freedom from a range of animal diseases and compliance with strict standards for chemical residues.

Table 1: Summary of Victorian livestock agriculture 1999/2000

Industry	**Gross Value of Production at farm level ($m)**	**Number of properties that produce this product***
Dairy	1571	7926
Beef	863	17 640
Sheepmeat	410	12 816
Wool	362	
Poultry	352	415
Pigs	245	389
Other	14	-
Total	**3817**	**Not available**

*In 1999/2000 there were a total of 37 304 farms in Victoria (ABS 2001).

[1] Excluding the horse-racing industry, which is also relevant to the functions of the Chief Veterinary Officer (CVO) and Animal Health Operations (AHO).

1.1 Beneficiaries of Animal Health Investments

Animal diseases can significantly affect the value of livestock. Diseases reduce animal welfare and productivity, disrupt trade flows and limit access to certain markets. In some cases, animal diseases can spread to humans and adversely affect food security. Investment in activities that improve animal health generates benefits to livestock owners, other livestock producers and in some instances to the community in general. The characteristics of the potential beneficiaries of animal health investments are discussed below.

Livestock owners—Animal productivity is closely linked with animal health. Healthy animals more efficiently convert pasture and other fodder into animal products, generating higher returns for livestock owners. From an economics point of view, improvements in animal health shift the supply curve for animal production downwards and reduce the cost of additional units of supply (i.e. the cost of producing additional units of animal products). These supply shifts translate into increased profits for livestock owners and increased wealth for consumers of livestock products. The actual distribution of these benefits between owners and consumers depends on other characteristics of the particular supply and demand situation. Individual stockowners have strong incentives to invest in animal health where the benefits of improved productivity (through reduced mortality and morbidity) exceed the cost of the necessary treatments and management changes.

It is difficult to estimate total expenditure on animal health by livestock owners. In 2000, agricultural producers spent $411 million and $120.8 million on veterinary supplies and services in Australia and Victoria respectively (ABS 2001). For Victoria, this represents 3.7 per cent of all farm business expenses and 3.2 per cent of the gross value of production (GVP) of livestock agriculture. However, these estimates represent only the cash outlays of stockowners and do not pick up preventative, nutritional and animal welfare expenses that contribute to animal health.

Livestock industries—Livestock industries collectively benefit from investment in animal health as a result of reduced spread of diseases between farms and improved access for a country or region to markets for animal products. Where countries or regions impose exclusion zones that restrict trade in animals or animal products, significant price differentials can be observed across the relevant borders. For example, Stoneham and Johnston (1987) estimated that prices for beef would halve if Australia were denied access to the US market. Similarly, if foot-and-mouth disease (FMD) were present in Australia, this would significantly reduce the price received for Australian animal products because Australia would be denied access to major export markets.

Livestock industries collectively invest in animal health through levy and funding arrangements because some animal health issues can influence access to markets for the entire livestock industry sector. In 2001/02 in Victoria, a total of $11.1 million was

collected to fund animal health initiatives comprising $5.5 million from electronic tags, $1 million from fees and charges and $4.6 million through levies. At a national level, a total of $4.2 million in levies was collected in the 2001/02 financial year to fund animal health programs.

Community benefits—Some of the services generated by animal health investments provide benefits to the community in general. Diseases such as rabies, bovine tuberculosis and brucellosis are zoonotic, that is they are transmissible between animals and humans causing illness or loss of life. When an animal disease spreads to humans, costs are imposed on society in the form of suffering or disability inflicted on those who become infected, treatment costs, loss of income, and suffering and costs imposed on third parties such as families. The Australian Institute of Health and Welfare has made detailed estimates of the costs of medical and hospital services for a wide range for morbidities (Mathers et al. 1999). The magnitude of these costs depends on the proportion of the population at risk of contracting the disease, the impact on human health and the cost of treating the disease.

The community may also invest in animal health programs to avoid disruption and loss of income in other sectors of the economy. For example, the FMD outbreak in the UK in 2001 severely disrupted the tourism and transport sectors and imposed major costs on these sectors because of movement restrictions imposed within the country to limit the spread of the disease. Other concerns relating to matters such as animal and human welfare and food security can be avoided if high standards of animal health are maintained. Many people in the UK were psychologically affected by their experience of the widespread slaughter of diseased animals during the FMD outbreak.

In Australia, the responsibility for animal health services is divided between State and Commonwealth Governments largely on the basis of the distribution of powers identified in the Constitution. The Commonwealth Government has responsibilities through AQIS, on behalf of the States, to reduce the risk of foreign diseases entering Australia. In 2000/01, $156 million was allocated to quarantine and inspection services provided through AQIS. Under the *Quarantine Act 1908*, the Commonwealth also has powers to support the States and Territories in managing emergency disease outbreaks. Each State/Territory has operational responsibility for the control and eradication of animal diseases within its borders, regardless of whether endemic or exotic (Australian Veterinary Emergency Plan (1999)). Each State/Territory also administers its own emergency disease control legislation, backed by emergency service arrangements. State involvement in animal health includes expenditure to maintain animal health infrastructure and expenditure when disease outbreaks occur.

1.2 Benefits and Costs of Animal Health Programs

The benefits and costs of animal health programs vary with the characteristics of the particular disease or animal health problem, the response of export and domestic markets and the control measures needed to manage the problem. Table 2 provides estimates of the magnitude of benefits derived from selected animal health programs in Australia. These estimates indicate that animal health problems which threaten export markets can impose very large costs on the economy. The Productivity Commission (2002) estimated that a long outbreak of FMD would cost between $8 and $13 billion. Stoneham and Johnston (1987) estimated that exclusion from the US market would reduce producer incomes by $8.5 billion over 20 years but that consumers of Australian beef would be better off by $5 billion. Abdalla et al (2002) and Dent et al (2002) estimated that an outbreak of FMD near Brisbane would cost around $2.4 billion a year. Diseases that have a relatively minor impact on access to export markets, such as bovine Johne's disease, have a much smaller economic impact. One study of this disease in Victoria (Stoneham et al 1994) estimated the economic impact to be around $7.4 million a year.

The cost of conducting disease control programs varies significantly with the approach taken. National eradication programs are costly and require funding commitments over many years. The Brucellosis and Tuberculosis Eradication Campaign (BTEC) program, for example, cost an estimated $885 million (in 1987 values) between 1970 and 1995 and residual tuberculosis infections in cattle still exist in remote northern Australia some 30 years after the campaign started. However, Australia is recognised as free from bovine tuberculosis and brucellosis by the OIE in accordance with the International Animal Health Code.

The cost of animal health programs varies with the disease control techniques needed. Programs that rely on mass slaughter of infected animals and test-and-slaughter programs are expensive, particularly in the short term—and are even more expensive when diagnostic tests are unreliable. Programs that rely on vaccination or clinical treatments are less costly but may have other implications for market access, and may need to operate for longer periods to meet program objectives.

Table 2: Estimates of the benefits of disease control

Disease	Estimated impact	Estimated costs of disease control program
Foot-and-mouth disease • Short outbreak[a] • Long outbreak • Annual cost[b,c]	Impact of loss of market access costs under scenarios modelled: $2 billion to $3 billion $8 billion to $13 billion $0.43 billion to $2.6 billion/year	Control and compensation costs under scenarios modelled: $30 million $450 million $3 million to $857 million
2002 Newcastle disease outbreak in Meredith Victoria		$2.2 million
Bovine Johne's disease (Victoria)[d]	$7.4 million/year	Estimates available per head rather than aggregate cost.
Bovine tuberculosis and brucellosis[e] • Whole country exclusion • Zone exclusion	$8.5 billion loss to livestock producers. A net loss of $3.5 billion if gains to consumers are considered.	$200 million for Northern Australia $885 million over the whole of Australia (1987 values)

a) Productivity Commission (2002), b) Abdalla et al (2002), c) Dent et al (2002), d) Stoneham et al. (1994), e) Stoneham and Johnston (1987).

1.3 The Role of Government in Animal Health

Livestock owners make substantial investments in animal health. However, from a broader economic and social perspective, livestock owners are likely to under-invest in animal health because some of the benefits spill over to other livestock producers or to the community in general. Specifically, markets will fail to attract enough investment in animal health because of:

- ***External disease control costs***—because diseases spread, the disease status of one farm may influence the production costs of other livestock-producing farms
- ***External costs of market access***—the disease status of one farm may influence access to markets for other farms

- ***External human health costs***—some livestock diseases can spread to humans
- ***External costs to other sectors of the economy***—some exotic diseases outbreaks can cause disruption to tourism and transport sectors
- ***External welfare costs***—humans place a value on avoiding the suffering or mass slaughter of animals.

These observations suggest that some form of intervention is required to increase the total investment in animal health above that made by individual stockowners. Industry-wide or sector-wide measures to fund additional investment in animal health are useful because many of the external costs noted above will be confined to one livestock industry or the livestock sector as a whole. Even where there are community-wide spillovers, the livestock sector and individual livestock producers have strong incentives to invest in animal health. Individual livestock producers and livestock industries have commercial and private interests to ensure that animal products are safe for human consumption and that livestock owners themselves are not exposed to health risks. These arguments suggest that even if animal health investments generate benefits for human health in the general community, industries and individuals should still invest some of their own funds in animal health measures.

Government involvement in animal health can be rationalised on the following grounds:

- ***Economies of scope***—Economies of scope exist in the provision of animal health capability because it would be costly for each animal industry (sheep, cattle, goats, chickens, etc.) to separately develop and maintain the infrastructure and skills needed to monitor and respond to disease threats. Economies of scope exist where the same resources are needed for different animal health functions. Management of exotic diseases, endemic diseases and chemical residues in livestock all require the same surveillance and monitoring infrastructure. Government provision (not necessarily funding) of emergency response and animal health infrastructure is appropriate where the overall cost of the service can be reduced because there are economies of scale or scope.
- ***Emergency response capability***—In some instances, legislation and regulations will be required to marshal the resources needed to respond to disease threats, to ensure that timely responses are made and to ensure that individuals take actions that are in the common good but not in the private interest of individual livestock owners.

- ***International and national obligations***—Governments have committed to a range of obligations (for example, to organisations such as the Office Internationale des Epizooties (OIE), the World Trade Organisation (WTO) and the Food and Agriculture Organisation (FAO) regarding the disease status of Australian flocks and herds and agreed rules for applying technical barriers to trade in animals and animal products).
- ***Spillover costs and benefits***—Some animal health investments generate benefits and costs for the community as a whole. Examples include diseases that can spread to humans and actions that improve animal welfare.

2. Administration of Animal Health in Victoria

Animal health is an important aspect of animal production systems. The main inputs to animal health protection occur on-farm through private investment in preventative and clinical treatments and through government animal health programs. In Victoria, animal health is administered under the Agricultural Quality Assurance Program (now Biosecurity Victoria) through the Chief Veterinary Officer Unit (CVO) and the Animal Health Operations Branch (AHOB).

2.1 Chief Veterinary Officer Unit

The primary role of the CVO Unit is to develop Victorian policy and legislation for animal health and welfare and to monitor the operation of this policy and legislation. Other CVO duties include representing Victoria on the Animal Health Committee of the Primary Industries Standing Committee (PISC). In this regard the CVO's role is to specifically represent Victorian interests as well as contribute to the development of good policy in the national interest. The Unit contributes to forums in fisheries, the environment (e.g. pests that spread to native fauna), human health (e.g. BSE) and food safety. The CVO also manages a program to address state horse-health issues, particularly emergency equine diseases that affect the racing sector. The sector contributes funding for these activities.

The CVO has direct responsibility in the event of an emergency animal disease response. The CVO is responsible for developing and obtaining national endorsement for an appropriate disease response plan, and for the strategic management of the emergency disease response. The CVO is a member of the national Consultative Committee on Emergency Animal Diseases (CCEAD), which has responsibility for national management of the (technical) disease response. The functions of the CVO in an EAD response incident are set out in detail in AUSVETPLAN.

2.2 Animal Health Operations Branch (AHOB)

The function of AHOB is primarily operational, involving the implementation of programs in animal disease control and surveillance, chemical residue control and animal welfare. While policy and operations are separated in the Biosecurity Victoria animal health structure, the CVO and AHOB consult closely on policy and operational issues.

The resources available for policy and operational activities can be deployed to manage both exotic disease threats and endemic diseases.

The DPI manager of animal health operations (MAHO) has direct responsibilities as director of statewide emergency disease response operations in the event of an emergency animal disease outbreak. As director of state disease control headquarters, the MAHO is responsible for managing the tactical disease response, appointing incident controllers, and providing information and advice to assist the CVO in strategic and policy decisions and national stakeholder engagement.

AHOB manages five key projects, which are outlined below.

Johne's disease (JD) control—Current activities include[2]:

- Investigating all reports of suspected ovine and bovine JD, identifying properties with infected animals, maintaining records of infected properties and implementing disease control strategies for individual properties.
- Implementing a voluntary test-and-control program for bovine JD. The program is delivered by private veterinary practitioners under contract to DPI.
- Implementing a JD calf accreditation program to improve calf-rearing practices and minimise spread from adult cattle to replacement calves.
- Developing improved control strategies, diagnostic techniques and standards for JD.
- Promoting voluntary national market assurance programs (MAP) that allow producers to identify and promote their low-risk JD status.
- Providing disease certification for interstate and international authorities and working with relevant authorities to facilitate export of livestock.

The JD program represents DPI's largest single commitment to endemic animal disease control. This State program contributes to and supplements national ovine and bovine Johne's disease control programs. The national OJD program is a $40 million, six-year program that commenced in early 1999. It was developed after different state approaches had already began. NSW, SA, Tasmania and Victoria continue to implement programs complementary to the national program. The broad aims of the national program are to control the spread of JD while further research is undertaken to determine the feasibility and cost-effectiveness of eradication, including determining the distribution and prevalence of the disease. The NOJDP ceased in June 2004. Box 1 provides more information about the Johne's disease program.

[2] See Box 1, page 17 for background information on ovine Johne's disease.

Box 1. Case Study: Johne's Disease

Background
Johne's disease is a slowly developing bacterial infection (*Mycobacterium paratuberculosis*) of the intestinal tract of sheep and cattle resulting in production losses and increased mortality caused by reduced ability to absorb food (Prowse 2000). The disease appears to spread primarily through stock movement. Ovine Johne's disease (OJD) is present in virtually all sheep-producing countries around the world. It was first discovered in Victoria in 1995. OJD is incurable and, based on current knowledge, can only be eradicated from a farm by de-stocking, although this may not always be effective. NSW has the majority of OJD-infected flocks in Australia. Kangaroo Island and Flinders Island also have OJD. Most Victorian cases are in Gippsland and central Victoria, with some in western Victoria. The bacterium appears to prefer particular hosts but is not host-specific (Prowse 2000). There are separate ovine (OJD) and bovine (BJD) strains, but transmission of the strains between species appears possible though not common.

Diagnosis is difficult
JD diagnosis is complex, due to the slow development of the bacteria, the slow immune response of stock, and similarities between the bacteria that cause infection and others in the environment. Prowse concluded that current tests can detect JD in a herd or flock when used appropriately (no single test is sufficient), but are unsuitable for investigating disease in an individual animal. No tests have yet been developed to detect infection early in course of the disease.

No clear human health risk
There have been reports in the scientific literature of a possible link between JD and Crohn's disease (inflammation of the intestinal tract of humans), but there is no conclusive evidence of this link. However, because consumer concerns may develop independently of scientific evidence, some countries (e.g. UK, USA) are taking a precautionary approach (Hugh Millar and John Galvin 2002).

Productivity impact
In New Zealand, where OJD was first reported in 1952, the disease has essentially become endemic. This suggests that without any control measures, a similar situation will arise in Australia. In excess of 50% infected flocks have a death rate of 0-4 per cent from the disease. However, around 25 per cent of infected flocks have a death rate of 5-7 per cent and a further 25 per cent have a death rate of 8-15 per cent (Dergholm et al. in Prowse 2000).

Control program
In December 1996, a Victorian OJD control program was introduced with the aim of eradicating the disease from infected flocks and preventing spread to unaffected flocks. This involved a de-stocking policy for OJD-infected properties, with compensation paid to owners of de-stocked properties. The program was voluntary, but there was strong peer group pressure for participation. In November 1999, the Victorian Government placed a moratorium on compensation because the disease spread was greater than first thought, costs had escalated and farmers who were de-stocking were under considerable stress. Other elements of the program continued, including movement restrictions on suspect flocks, based on vendor declarations, in line with the National OJD Control and Evaluation Program (NOJDP). NOJDP funds control, surveillance and R&D activities with the objective of enabling an informed decision on the future national management of OJD by July 2004. This six-year, $40 million program is funded 25 per cent by the Commonwealth, 25 per cent by the States (22 per cent of which is from Victoria), 24 per cent by the national sheep industry and 26 per cent from the Victorian and New South Wales sheep industry.

A voluntary national Market Assurance Program (MAP) allows producers to identify and promote their negative JD status. This requires producers to test for the disease on their property. Producers who do not know their JD status must weigh up the potential for test results to deliver the benefits of a 'monitored negative status' under MAP or to identify a positive JD status, hence restricting stock movements.

Following the completion of a parliamentary inquiry into the program in October 2000, an advisory committee was formed to advise the Victorian Minister for Agriculture on OJD issues until completion of the national program. Cabinet agreed to a new program for OJD in Victoria in early 2002, which took a more supportive approach to OJD control and offered affected producers a range of options for managing the disease in their flocks.

Surveillance and disease control to maintain market access—This project involves:

- Monitoring and investigating livestock disease or toxicity and being prepared for rapid responses to emergency disease outbreaks. This includes meeting Victoria's national exotic disease prevention, preparedness and management commitments and maintaining disease information systems to reduce barriers to livestock exports and underpin accurate and credible health certification of livestock and livestock products for export.
- Conducting surveillance, investigation, prevention, treatment, control and eradication activities for a range of diseases including anthrax, enzootic bovine leucosis, tuberculosis, other animal diseases that affect humans, transmissible spongiform encephalopathy (including BSE or mad cow disease), ovine footrot and new and emerging diseases and toxicity problems.
- Administering animal welfare policy, promoting animal welfare research findings and developing training courses in animal welfare management. AHOB also investigates complaints of animal welfare breaches and undertakes remedial action and prosecution as appropriate.
- Maintaining assurance of Victoria's bovine tuberculosis-free status through participation in the National Granuloma Submission Program.
- Implementing the National Livestock Identification Scheme. Victoria is leading the way in this area by being the first State to implement compulsory individual identification of cattle. The comprehensive benefits offered by NLIS include the ability to trace individual animals upon detection of a chemical residue or disease incident, enabling a faster response. Another benefit is the ability to demonstrate quality assurance standards to export markets.

Product integrity and chemical residues control—This project aims to minimise chemical residue and other food safety threats in Victorian livestock and products and to develop quality assurance systems for these industries. This includes providing information and training on chemical use for farmers, veterinary practitioners and chemical agents, and monitoring the use of higher-risk chemicals. The branch monitors for chemical residues in a range of livestock and livestock products and maintains readiness to respond to residue and food safety threats. Victoria is leading Australia in the National Hormonal Growth Promotant (HGP) Program, which provides assurance to European markets that Victorian livestock exports are free from HGP.

Disease compensation—AHOB administers compensation funds for the cattle, swine, bee, sheep and goat industries. Levy monies are collected from industry to fund DPI-led response activities for diseases specific to each industry. The funds may be used for Victorian-based endemic disease response activities (for example, the Sheep and

Goat Compensation Fund paid for Victorian ovine Johne's disease compensation). Alternatively, funds may be used to support programs and activities that benefit the particular industry sector. For example, the Cattle Compensation Fund supports livestock identification schemes such as tail tags and the NLIS.

Veterinary laboratory diagnostic services—Since 1995, a private company (Gribbles Veterinary Pathology) is contracted to provide veterinary pathology services. These services are crucial for the identification of endemic and exotic diseases to support Victorian and national programs. Prior to going to tender in 1994, the Department of Agriculture (now DPI) provided veterinary pathology services through four regional veterinary laboratories (Bairnsdale, Benalla, Bendigo and Hamilton) and the Victorian Institute of Animal Science (VIAS) at Attwood. AHOB manages the contract for the private supplier (Gribbles Veterinary Pathology) to provide veterinary laboratory services to DPI. A parliamentary inquiry into veterinary pathology services was undertaken by the Environment and Natural Resources Committee (ENRC) in 2002. DPI had significant input into the review process.[3]

In addition, VIAS Attwood continues to maintain specialist veterinary and scientific expertise necessary for investigating new, emerging and emergency animal disease and toxicity issues, and provision of expert advice to the CVO and MAHO on complex diagnostic issues, including emergency animal disease diagnosis.

[3] The ENRC Inquiry Report highlighted the importance of veterinary pathology services for routine disease diagnosis, disease surveillance and the early detection of and response to new, emerging and emergency animal diseases. ENRC found that the current mix of government and private providers of veterinary pathology services was appropriate for Victoria. In its response to the Report, the Government noted that it fully supported the objectives embodied in the ENRC report and the need for world class veterinary services as part of Victoria's critical animal health and biosecurity infrastructure.

3. Exotic Disease Management and Funding

Each State and Territory has operational responsibility for the control and eradication of animal diseases within its borders, regardless of whether they are endemic or exotic. National coordination of policy and activities is essential.

3.1 Animal Health Australia

Animal Health Australia (AHA) was created in 1996 to promote collaboration and resolve funding arrangements between governments and industry. AHA is a private company owned by the Commonwealth, State and Territory governments and livestock industry bodies. It provides scope for national industry representation and involvement in national policy development and for industry to share funding of national programs. The AHA agreement is reviewed every five years and is due for review in 2008. In 2001/02, Victoria paid $257 555 for its membership of AHA and a further $87 464 for specific AHA programs.

AHA's role is to facilitate and coordinate rather than set policy. Policy decisions are made by the Primary Industries Standing Committee (PISC) based on input from AHA, which develops and explores initiatives. AHA's work includes consulting with key stakeholders and developing then brokering funding arrangements. For example, AHA was directed by PISC to negotiate the funding arrangements for the national TSE (transmissible spongiform encephalopathy) surveillance program developed by the Animal Health Committee of PISC in 1997.

The Australian Veterinary Emergency Plan (AUSVETPLAN)—AHA manages the Australian Veterinary Emergency Plan (AUSVETPLAN), which is a coordinated national response plan for the control and eradication of a range of emergency diseases and certain emerging or endemic animal diseases. AUSVETPLAN documents best practice for responding to each disease in the event of an outbreak. In many cases AUSVETPLAN calls for a 'stamping out' policy involving quarantine and movement controls, slaughter and disposal of infected and exposed animals, decontamination of infected premises, surveillance of susceptible animals and restriction of the activities of certain enterprises (Australian Veterinary Emergency Plan 1999). Vaccination, vector control, animal treatment and wild animal control may also be used.

Emergency Animal Disease Response Agreement (EADRA)—While AUSVETPLAN advises on appropriate responses to disease outbreaks, the EADRA details which groups will fund emergency responses to particular disease outbreaks, and sets out a framework for a nationally coordinated emergency response. The Agreement specifies cost-sharing arrangements for 63 diseases using four categories of cost distribution (see Table 3).

Table 3. Cost-sharing under the EAD Response Agreement

Category	Cost sharing agreement Government Industry		Description
Category 1	100%	0%	Diseases that predominantly affect human health and/or the environment (native fauna) but have minimal effect on the livestock industries (e.g. rabies).
Category 2	80%	20%	Diseases that have the potential to cause very serious international trade and national market disruptions, as well as very severe production losses in livestock industries (e.g. bovine spongiform encephalopathy—BSE, FMD).
Category 3	50%	50%	Disease that have the potential to cause moderate international trade losses, market disruptions involving two or more states and severe production losses to affected industries, but minimal human health or environmental impacts (e.g. major anthrax outbreaks, Newcastle disease).
Category 4	20%	80%	Diseases that mainly cause production losses of a magnitude that would not be expected to significantly affect the national economy (e.g. swine influenza).

The cost-sharing arrangements are based on the potential beneficiaries of control measures according to human health, socio-economic, environmental and livestock production criteria. In each disease category, 50 per cent of the 'government' component is met by State and Territory governments and 50 per cent by the Commonwealth. However, the distribution of costs between individual States and Territories depends on the disease under consideration. For example, for category 1 diseases, where human health concerns form the basis for complete government funding, cost shares are based on the human population in each state. For other diseases, cost-sharing is generally based on animal populations, taking into account which species are affected and the relative State values of production. For 'industry' funding, if a disease affects only one species, the industry dealing with that species bears the entire industry component. There are predetermined splits in cases where a single animal species is dealt with by more than one industry (e.g. wool and sheepmeat). Where diseases affect more than one species, consideration is given to the value of production and the importance of the disease for each industry (predetermined for each of the 63 diseases). Industry's share of costs is underwritten by the Commonwealth (with interest charged at the annual inflation rate).

Under the EADRA, the term 'emergency disease' refers to diseases "likely to have a significant effect on livestock potentially resulting in livestock mortalities, production loss and in some cases impacts on human health and the environment"[4]. As well as exotic diseases such as FMD, this includes unusual and severe outbreaks of endemic disease (e.g. the 1997 Victorian anthrax outbreak) and new diseases where it is not immediately apparent whether the disease is exotic or endemic (e.g. the 1994 outbreak of Hendra virus in Queensland). The current agreement commenced in March 2002.

The EAD Response Agreement sets out the arrangements for funding emergency disease responses. A national management group is set up for each response (consisting of CEOs from Commonwealth and State/Territory governments and affected industry councils) and endorses budgets for a response based on estimates incorporated by the combat State/s into disease response plans. A trigger point for reviewing expenditure is 1 per cent of GVP for the affected industries. At or approaching this point, all affected parties to the cost-sharing arrangement must agree on how the response will be managed should the expenditure review point be exceeded: for example, to continue as before, to amend the disease response strategy or to change the funding mix.

The Agreement notes that eligible expenditure for cost-sharing includes certain personnel costs, operating expenses, capital expenditure and compensation for livestock or property destroyed under the eradication program.

In practice, the agency leading the response will implement the response plan using its own resources and then receive reimbursement under the agreement. For example, if there were a category 1 outbreak in Victoria, DPI would receive a State Treasurer's advance (paid into the exotic disease compensation fund). The Commonwealth, other states and industry would later reimburse the Treasury according to national funding arrangements.

3.2 Characteristics of Exotic Disease Management

When States are required to manage outbreaks of exotic diseases they draw on highly specialised skills that must be available on short notice. Figure 1 illustrates the types of resources needed to manage exotic diseases and the different components of the process. Coordination is a difficult task, particularly when the resources are managed within different organisations. The way these resources are deployed for emergency responses and preventative measures influences the overall effectiveness and cost of providing animal health services to the livestock industries. The FMD outbreak in the UK drew attention to many important issues associated with the management of

[4] More detailed criteria are provided in AHA (2002).

exotic disease outbreaks. Prompted partly by the FMD situation, the Council of Australian Governments (COAG) sought a detailed analysis in 2001 of Australia's strategies and preparedness and each jurisdiction's capabilities with respect to exotic disease outbreaks. Although this analysis focused on FMD, the same principles apply to many other significant exotic disease risks faced by Victoria and Australia, despite variations in the specific epidemiology of each disease. Box 2, on page 24, explains significant characteristics and impacts of FMD.

Identifying the best combination of preventative, detection, control and eradication instruments to use in responding to exotic disease crises is a complex matter. For example, factors that complicate the choice of disease control strategy for FMD include:

- ***The cost of a serious disease incursion is large but uncertain***—Precisely estimating the impact of an FMD outbreak is difficult because an outbreak represents such a large shock to commodity markets that many economic assumptions are violated. Nevertheless, it is clear that the costs associated with major exotic disease outbreaks such as FMD are large. Several studies have attempted to estimate the cost to Australia of exclusion from premium markets, particularly the US and Japan. As noted in Box 2, the Productivity Commission (2002) estimates that FMD would impose costs of between $8 and $13 billion for a long outbreak and between $2 and $3 billion for a short outbreak. An outbreak of FMD in Queensland would cost an estimated $2.4 billion a year (Dent et al 2002). Abdalla et al (2002) estimates that FMD would impose costs of between $0.43 and $2.6 billion a year. Such outbreaks severely disrupt the livestock industries as well as other sectors of the economy.
- ***The domestic market response is important***—The cost of a disease outbreak is reduced if domestic consumers continue to purchase animal products. This is likely to be the case with FMD, which has no human health implications, but is unlikely with BSE, which has human health implications. For example, Japanese demand for beef dropped dramatically following a 2002 BSE outbreak in Japan, causing Australian exports to fall by around 50 per cent, even though Australian herds do not have this disease (Peter Weeks 2002). In 2001, Australian beef exports to Japan were worth around $1.7 billion.
- ***The cost of disease control varies with the actions taken***—Blanket slaughter of animals in infected regions is costly, as are test-and-slaughter programs. Vaccination of animals in infected regions is a less expensive strategy but may delay access to markets because of difficulties in proving disease freedom.
- ***The duration of the incursion is important***—If the duration of a disease incident can be reduced, the costs to the economy will be smaller.

Box 2: A Major Exotic Disease Threat: Foot-and-Mouth Disease

FMD is a highly contagious virus that affects cloven-hoofed animals such as cattle, sheep, pigs, goats and deer. Its main impact is to lower livestock productivity. It is not generally fatal to healthy animals and does not pose a threat to human health. The principal costs of an Australian FMD outbreak would arise through loss of market access to Pacific Rim countries which take around 90 per cent and 40 per cent of Australian beef and sheepmeat exports respectively (ABARE 2002) and demand FMD-free products. Significant operational costs would also be incurred in managing an outbreak.

Large impact
Several studies have investigated the impact that FMD could have on Australia under different outbreak and response scenarios. These studies also help us to understand some of the principles behind the broader issues of exotic disease management. The Productivity Commission (2002) has estimated that the average cumulative losses to GDP from an outbreak would range from $2 to 3 billion for a short outbreak to $8 to 13 billion for a long outbreak.The 'short' outbreak scenario was a small, single outbreak in the wheat-sheep zone of WA that took three months to control and eliminate. The 'long' outbreak scenario began in southern NSW, spread to Victoria and SA and took 12 months to control and eliminate. Control and compensation costs were estimated at $30 million and $450 million in each scenario.

Abdalla et al (2002) conducted a modelling analysis based on a northern Victorian outbreak. The average costs of an outbreak were estimated to range from $0.43 billion to $2.6 billion. A third study, by QDPI and Monash University by Dent et al (2002) estimated that an outbreak near Brisbane with no zoning would lower Queensland's Gross State Product by $2.3 billion in the seventh year after the outbreak alone, when market access was assumed to be regained. The effect on Gross State Product was projected to last for 15 years.

Strategy choice is very important
The particular response chosen for an FMD outbreak can have a major influence on the cost of an outbreak by affecting the time taken to regain market access (Abdalla 2002). This is because the probability that a disease outbreak will be contained varies between strategies and scenarios. The earlier an outbreak is detected, the greater the chance of the disease being controlled quickly. Control options include:

- Slaughtering or stamping out all infected herds (SO).
- Slaughtering infected herds and herds that have had direct contact with infected herds (SODC).
- Slaughtering infected herds and vaccinating surrounding herds (ring vaccination) (SORV).

The probability of the disease escaping is highest for SO and lowest—significantly so—for SORV. However, if escape can be prevented, the time to regain market access will be lowest under the SO option and highest under SORV. This is because there has been strong market aversion to accepting a disease is eradicated while vaccinated animals (that could mask the presence of infection) remain alive. The choice of strategy should be based on a risk assessment that takes into account the outbreak location and resources available, and the costs of lost trade.

Zoning may be possible
International rules specified by OIE allow the establishment of FMD-free zones, which can continue trading. Under this arrangement each State/Territory can be regarded as a separate zone, with each zone being required to prove its FMD-free status. Establishing FMD-free zones takes time (which affects market access) and resources.

Key point
From these studies, it can be surmised that the potential payoffs from preventing entry (quarantine), ensuring early diagnosis and enabling rapid and effective responses are massive.

- ***The extent of the exclusion zone is important***—If trade partners allow disease-free zones within Australia to continue to export, then the overall impact is reduced.
- ***Early detection and rapid response is important***—If disease outbreaks can be quickly detected, and a rapid response mounted, the costs of control will be lower.

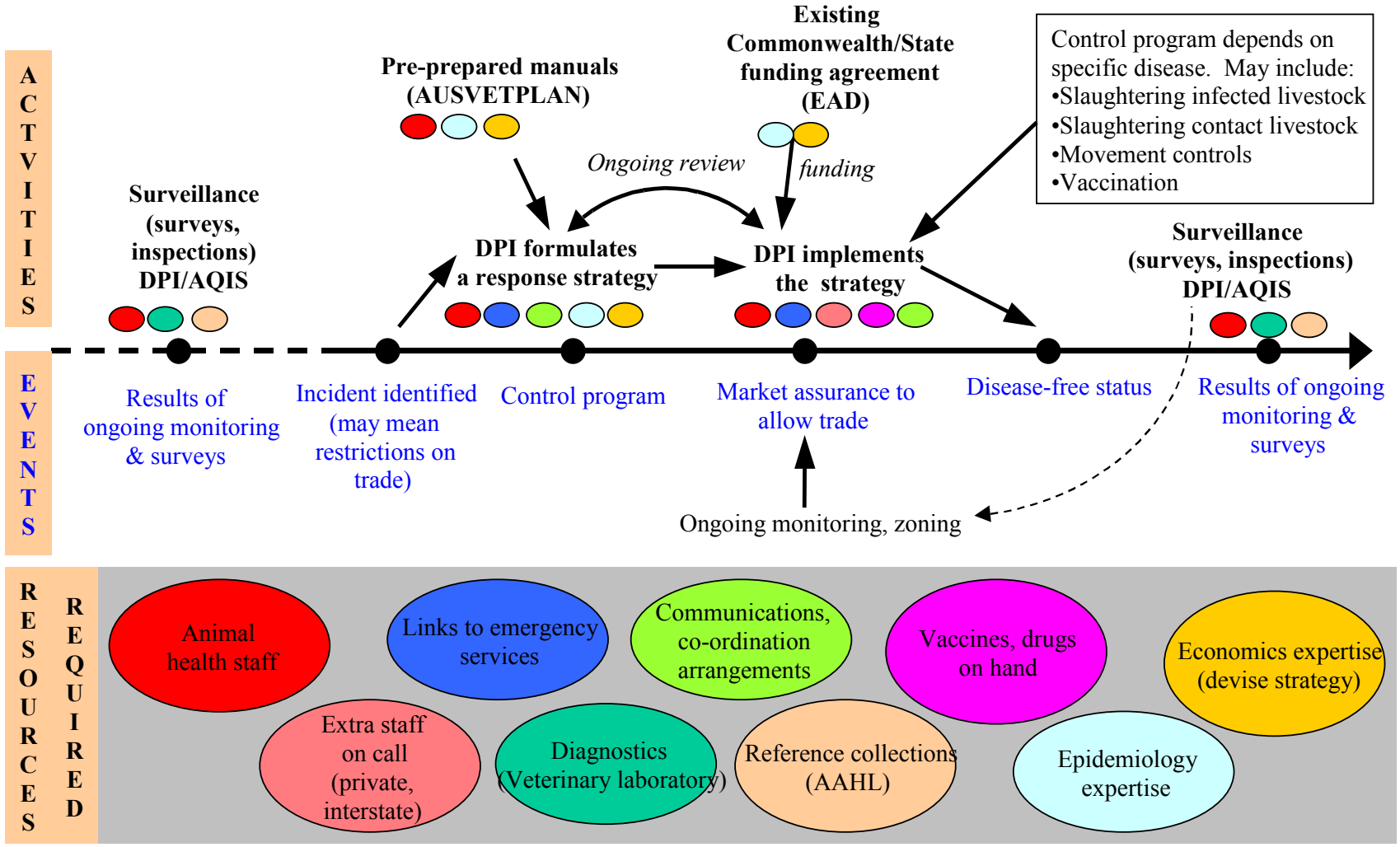
Beare and Hyde (2001) developed a method of estimating the optimal response strategy to hypothetical disease incursions. Their key findings include:

- The cost of disease management options is an important consideration in determining the optimal strategy.
- Strategies may need to change as circumstances change. The strategies that are adopted need to be adjusted as more information becomes available.
- Information about the behaviour of a disease (i.e. the incursion, spread and control of a disease) is important.

Abdalla et al. (2002) examined more specific strategies for FMD control and concluded that:

- State resources for disease control are now unlikely to be sufficient to eliminate a disease incursion using the traditional approach of 'stamping out' the disease with containment and slaughter programs. Alternative or complementary strategies such as vaccination would need to be employed if resources were insufficient to sustain successful stamping out by conventional means.
- Given the resources available for disease containment, ring vaccination would need to be used, rather than a stamping out approach. Vaccination reduces the likelihood that market access will be regained quickly but greatly increases the probability that the disease will be successfully contained.
- If a disease has been introduced and not detected quickly, or where resources are limited, ring vaccination makes particular sense.
- Zoning, (the formal recognition of free areas within an infected country), has the potential to significantly reduce disease costs by providing scope for trade to resume from at least some parts of the country before the disease is eradicated from the affected areas.

FIGURE 1: PROCESS MAP - EXOTIC DISEASE



4. Endemic Disease Management and Funding

Some animal diseases have become established in herds and flocks in Australia. As noted in Section 2.2, the Johne's Disease Program is DPI's largest single element of endemic disease management work, representing $4.2 million in direct costs (excluding corporate and divisional overheads) in 2001/02**.** The State Government met around 55 per cent of these direct costs, with a further 39 per cent coming from the Victorian sheep and goat industries through the Sheep and Goat Compensation Fund. Other diseases where significant efforts are being made include: enzootic bovine leucosis, anthrax, bovine tuberculosis, ovine brucellosis and, to a lesser extent, footrot. National programs exist for tuberculosis, Johne's disease and TSE surveillance; these are funded according to arrangements negotiated through Animal Health Australia.

Endemic diseases impose costs on the economy because they reduce animal productivity and can influence access to important export or domestic markets. With the exception of brucellosis and tuberculosis, where market access was anticipated to be a factor, endemic diseases impose much smaller economic costs. For example, the estimated cost of bovine Johne's disease in Victoria, which is around $7.4 million a year (Stoneham et al 1994), is much smaller than estimates of the economic cost of major exotic diseases. The following generalisations can be made about endemic diseases:

- ***The benefits of endemic disease control are generally smaller than with exotic diseases***—The benefits of endemic disease control depend on the prevalence of the particular disease and its effect on animal productivity, rate of spread, potential for spread and impact on markets.
- ***Livestock owners receive most of the benefits***—Most of the benefits of endemic disease control accrue to stock owners through productivity improvements.
- ***Control costs vary with the nature of the disease and the treatment required***—As with exotic diseases, the cost of managing endemic diseases depends on the availability, efficacy and efficiency of diagnostic tests and on the intervention measures needed to reduce prevalence (e.g. test and slaughter, vaccination, farm management practice changes);
- ***Endemic diseases do not require emergency responses***—Endemic diseases generally do not require the same urgent response as exotic diseases because market access is usually not threatened. Exceptions include anthrax and Hendra virus.

There are relatively few economic studies of endemic diseases in Australia. Stott (1989) examined the economic impact of footrot and Stoneham et al. (1994) completed an economic evaluation of control options for bovine Johne's disease in Victoria. General conclusions that can be drawn from these studies include:

- ***Different disease management strategies are needed for exotic and endemic diseases***—The disease control strategies that work for exotic diseases may not make sense for endemic diseases. For example, test-and-slaughter techniques are often poor investment propositions when applied to endemic diseases, where the benefits are much smaller than for exotic disease control.
- ***Government programs should not encourage excessive investment in disease control***—In designing responses to endemic disease problems, governments must be careful not to encourage excessive investment in disease control, ie where the returns do not justify the expenditure. Poorly designed disease management programs have political as well as economic costs.
- ***The objectives of endemic disease control may not involve eradication; controlling the spread of a disease may be more realistic***—The objectives of endemic disease control programs need to be carefully considered before these programs are established. Cost-benefit analysis is a useful tool in this respect. Eradication will be feasible and prudent for some diseases, but partial control may be more appropriate for other diseases.
- ***Clearer funding arrangements are needed that reflect the beneficiaries of disease control***—Funding principles can sometimes be poorly designed or inconsistently applied. Unlike emergency diseases, where a management plan must be determined before an outbreak occurs, endemic disease management plans can be modified as the situation evolves. Because of the non-emergency nature of endemic diseases, and variations in the characteristics of different diseases, there is as yet no agreed cost-sharing arrangement or consistent framework for project development in endemic disease (although these exist for exotic diseases). Instead, endemic disease issues are principally addressed through projects developed on a case-by-case basis, traditionally at the state level but increasingly also at the national level.
- ***More cost-effective intervention mechanisms would be useful***—Intervention mechanisms currently applied to private decisions about disease control measures do not use contemporary economic principles. New mechanisms are needed to adequately address the fundamental cause of industry-level disease problems (which is the external cost of diseases spreading beyond individual farms) and incentives for individual producers to reduce disease spread.

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