THE AUSTRALIAN NATIONAL ANIMAL HEALTH INFORMATION SYSTEM

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Summary

An Australian National Animal Health Information System has been established to provide an objective assessment of Australia's animal health status. Good quality information is essential to support Australia's exports of animals and animal products, and to satisfy Australia's international reporting obligations on animal health. The system is based on routine monitoring of a selected number of diseases, supplemented by special studies and surveys. Long-term resourcing is currently under consideration by a high level government-industry group reviewing arrangements for the delivery of essential animal health service functions.

Résumé

Un système national australien d'information en santé animale a été créé en vue de fournir une évaluation objective de l'état sanitaire des animaux australiens. Une bonne qualité de l'information est essentielle pour aider les exportations australiennes d'animaux et de produits d'origine animale, ainsi que pour satisfaire aux obligations de l'Australie de déclaration internationale en santé animale. Le système est fondé sur une surveillance régulière d'un certain nombre de maladies, complétée par des études et des enquêtes spéciales. Un financement à long terme est en cours d'étude, impliquant un contact industrie-gouvernement au plus haut niveau en vue de la mise en place des principales activités d'un service de santé animale.

1 - INTRODUCTION

Australia has a very favourable animal health status. It remains free of the major livestock diseases that cause severe production losses, interfere with international trade in livestock and livestock products, and cause public health concerns in many other regions of the world [Nunn and Thornber, 1994]. This favourable animal health status, together with the efficiency of livestock production in Australia, has had enormous benefits for livestock production, not only through avoidance of serious losses associated with these diseases, but also through the facilitation of development of major industries such as meat and wool [Carroll, 1988 ; MacAulay and McCausland, 1989].

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Exports play a major and in some cases a dominant role in these industries. Some 62% of beef and veal, 60% of mutton, 15% of lamb, 26% of dairy produce, and 98.7% of wool production are exported. Exports of animals and animal products are worth around $A8000 million annually [ABARE, 1994]. To protect and enhance this trade, it is essential that Australia has good quality information on its animal health status. Epidemiological surveillance is thus of major importance in maintaining Australia's role as a significant exporter of livestock, livestock products, and livestock genetic material.

II - HISTORY

Australia is a federation of six States and two Territories (see Figure 5). Under the federal system the Commonwealth government is responsible for quarantine and export certification, and the State and Territory governments are responsible for animal health programs within their borders. Historically, the States and Territories have developed animal health surveillance and reporting systems to meet their own needs. These needs have included :

- Reporting from and management of State and Territory animal health laboratories
- Management of Government-sponsored disease control programs
- Monitoring regional disease occurrence
- Epidemiological studies

A considerable amount of data on animal health is collected by a range of government and non-government organisations, much of it routinely [Nunn and Garner, 1991]. These sources include Commonwealth and State/Territory animal health authorities, diagnostic laboratories, records of eradication or control programs, herd monitoring systems, universities, research programs, veterinary practitioners, and special programs and surveys. However, much of this information has a regional focus, is fragmented, and can be difficult to access. Australia has long recognised the need for an integrated approach to the management of animal health information to provide a national overview of the occurrence of animal diseases. In 1975, the Australian National Animal Disease Information System (ANADIS) was proposed as a computer-based aid to help record and distribute timely information on animal diseases, at levels ranging from the herd or region, to the State or nation [Andrews, 1988]. The National Brucellosis and Tuberculosis Eradication Campaign (BTEC) that had started in 1970 was considered a suitable subject for the initial stages of such a system. However, although it met the information needs of the brucellosis program, ANADIS itself never progressed beyond servicing BTEC.

In 1989, animal health authorities in Australia formed a working party to review animal health information needs from a national perspective and to make recommendations on appropriate system(s) to meet present and future requirements. The Working Party reviewed and reported on national requirements for animal health information in Australia, reviewed systems in use overseas, undertook a pilot trial, and made recommendations on the type of system suitable for Australia. The focus of the Working Party was on collecting relevant information in a cost-effective way. It concluded that Australia should develop a national animal health information system (NAHIS) primarily to collate and report animal health information necessary to underpin Australia's trade in animals and animal products, and to meet Australia's international animal health reporting obligations [Anon., 1990].

III - GENERAL OBJECTIVES OF THE SYSTEM

The NAHIS has been set up to provide improved information on animal health in Australia for a number of purposes [Garner and Nunn, 1991]. From a national perspective, information is required to :

- Support Australia's exports of animals and animal products ;
- Provide high quality information to satisfy Australia's international reporting obligations on animal health ;
- Aid decision-making in relation to policies on imports of animals and animal products ;
- Assist in the assessment and setting of research priorities ;
- Assist in planned allocation of State/Territory, Commonwealth and industry resources to animal disease control activities and programs ; and
- Monitor the effectiveness of disease control programs.

To meet these objectives, both government and industry require a comprehensive body of simple disease data that is readily accessible. In many cases, the demand is not so much for a definitive record of disease prevalence or incidence, as for information on whether the prevalence - in broad terms - is increasing or decreasing. For particular disease situations, a capability for detailed assessments may also be required .

The objectives of the NAHIS are to :

- Provide a better understanding of the occurrence of diseases within Australia ;
- Provide evidence to support freedom from diseases, either nationally or regionally ;
- Demonstrate, in the international marketplace, that Australia has a capable and effective animal health service with effective monitoring and surveillance systems able to detect, diagnose and respond to animal disease and residue issues.

Identified users of the information are Commonwealth, State/Territory and industry agencies, particularly those involved in trade negotiations, exports of livestock and livestock products, providing reports to international agencies, and in setting priorities for research and disease control. The Australian Quarantine and Inspection Service (AQIS), as the Commonwealth agency responsible for export health certification and regulation of the import of animals, their genetic material and their products, is a major user.

IV - GENERALITIES AND DESCRIPTION OF STRUCTURES

A - DISEASES

Australia is free of the major - Office International des Epizooties (OIE) list A - livestock diseases and is relatively free of other serious animal pests and diseases. Historically, the relative freedom from major epidemic animal diseases can be attributed to Australia's geographic isolation from other livestock raising countries. Before European settlement in the 18th century, Australia had no livestock species and marsupials dominated its fauna. In the early colonial period, the long sea voyage from Europe was itself an effective quarantine barrier. In more recent times, application of sound quarantine procedures has been successful in preventing the entry of disease with imported livestock, genetic material, and animal products. Nonetheless, Australia has a number of diseases that limit animal production and have the potential to interfere in livestock trade within Australia and overseas.

The disease monitoring activities of the NAHIS are specific and targeted to a list of nominated diseases. This list is small but flexible, and is based on existing and emerging trade issues and concerns as identified by the system's users. In 1993, a Commonwealth-State task force met to nominate diseases for inclusion in the NAHIS. The task force, after careful consideration and in consultation with the major users of the system, identified a program of monitoring and surveillance to meet Australia's needs. The program is based on :

- Disease issues of trade concern identified by AQIS for animals and animal products in a range of markets ; and
- Disease issues of concern to the Asia-Pacific region, as required for reporting to the OIE Regional Office in Tokyo. This region is a significant and growing destination for Australian exports.

The program targets 36 diseases - 21 endemic and 15 exotic (see Table I). The diseases covered and the type of information collected will change as new issues and priorities emerge.

Table I : Diseases recommended for routine monitoring in the national animal health information system by a Commonwealth/States Task Force

A. ENDEMIC	B. EXOTIC
Akabane	Aujeszky's disease
Anthrax	Avian influenza
Babesiosis/anaplasmosis	Bovine brucellosis (*B. abortus*)
Bovine ephemeral fever	Bovine spongiform encephalopathy
Bovine tuberculosis (*M. bovis*)	Equine influenza
Bluetongue	Foot-and-mouth disease
Cryptosporidiosis	Japanese encephalitis
E. coli (veratotoxagenic strains)	Maedi-visna
Echinococcosis	Newcastle disease
Enzootic bovine leucosis	*Brucella melitensis*
Equine infectious anaemia	PRRS
Equine rhinopneumonitis virus (abortogenic strain)	Rabies
	Rinderpest
Equine viral arteritis	Scrapie
Footrot	Trichinellosis
Infectious bovine rhinotracheitis	
Johne's disease	
Meliodosis	
Mucosal disease/BVD	
Ovine brucellosis (*B. ovis*)	
Porcine brucellosis (*B. suis*)	
Salmonellosis	

B - ANIMAL SPECIES

Australia has about 22 million beef cattle, 2.5 million dairy cattle, 161 million sheep, 2.6 million pigs, 52.5 million poultry and smaller numbers of goats, buffalo and other domesticated species [ABS, 1994].

Although Australia has well-organised and efficient intensive pig and poultry industries, animal production is largely based on extensive grazing and is dominated by wool, sheepmeat, beef and dairy production.

The NAHIS includes diseases of all major livestock species in Australia, including horses.

C - GEOGRAPHICAL AREA

Australia is a large continent spanning a number of climatic and ecological zones. The livestock industries extend from the beef cattle areas of tropical north Queensland to the sheep areas of southern Tasmania, and from the dairying areas

of coastal New South Wales to the merino wool-producing areas of Western Australia. Only in parts of the dry centre of Australia is permanent livestock production not possible. This region has low and erratic rainfall and contains large tracts of sandy and stony deserts, but cattle are grazed even there in good seasons. Figures 1 and 2 show the distribution of sheep and cattle in Australia.

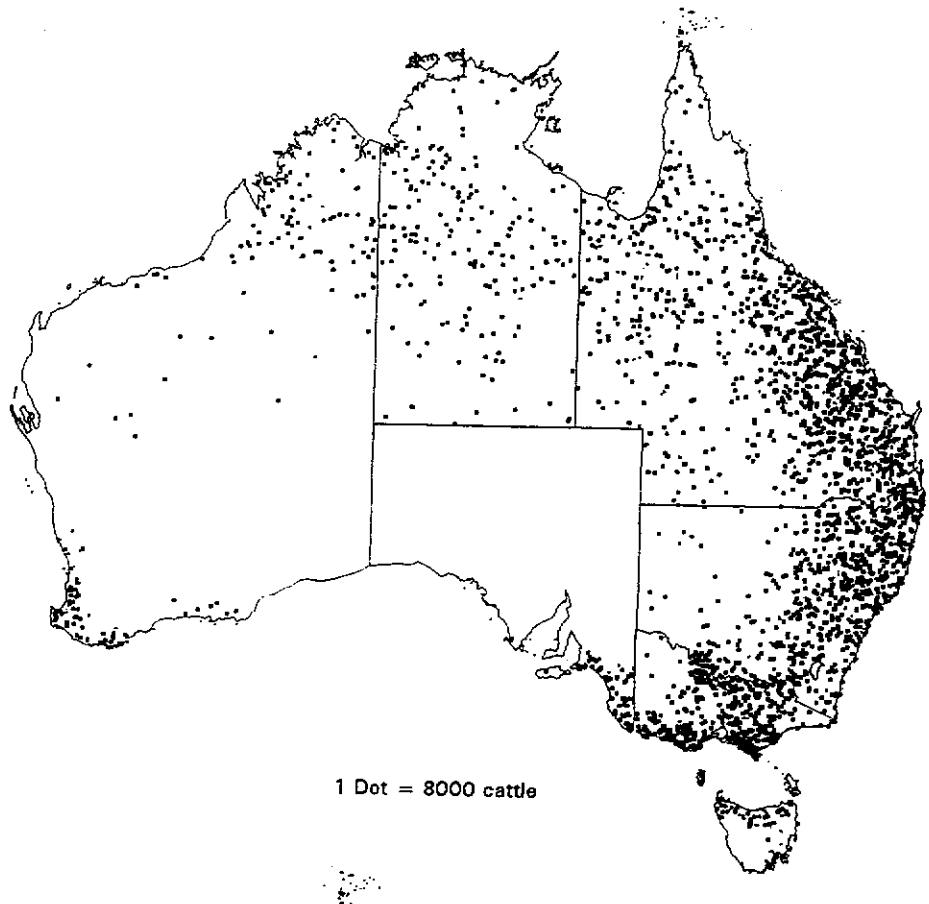


Figure 1 : Distribution of cattle in Australia (no. per km², based on local government areas)

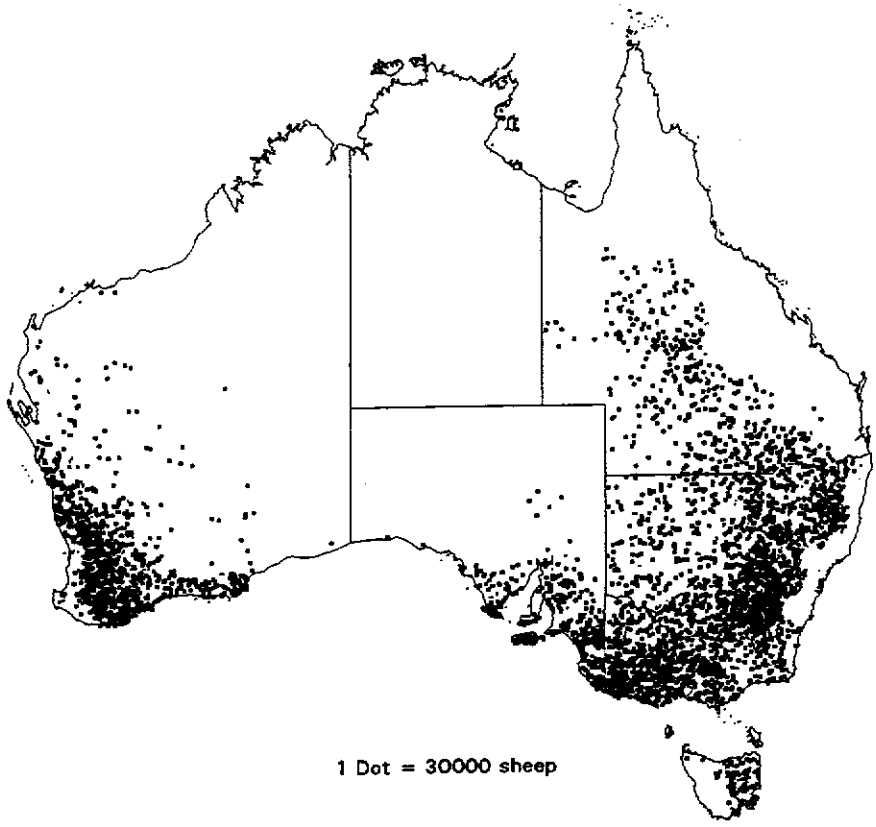


Figure 2 : Distribution of sheep in Australia (no. per km², based on local government areas)

The size and different environmental and ecological systems found across Australia mean that the occurrence of many diseases is quite variable. Because of the importance of defining disease distributions, it was recognised that disease reporting should include spatial components. The NAHIS reports disease to the regional level. Local government areas (LGAs) or their equivalents as used except for rare or sporadic conditions for which map coordinates are used. These reporting areas can be seen in Figure 6.

The spatial units are based on those used for the cattle tail-tag system. In Australia all cattle sent for sale or slaughter are required to have a tail-tag bearing identification details before leaving the farm. Each State and Territory maintains a computer register of owners and property details. This allows rapid identification of an animal or carcase, and traceback to the area it came from, and even to the property of origin [Nunn and Thornber, 1994]. The system has been used for both disease control programs and for traceback following the detection of chemical residues.

D - NETWORK APPROACH

As a considerable amount of data on animal health is already being collected in Australia by a range of government and non-government organisations, much of it routinely, it was agreed that the national system would function primarily by coordinating and aggregating data from existing sources. Thus the NAHIS depends on a network approach, with coordinators in each State and Territory responsible for supplying agreed data according to defined requirements. The functions of coordinators include :

- Collating relevant animal health data from various activities and programs ;
- Providing quality control of the data ;
- Providing feedback to providers to improve accuracy, collection and transmission of data ;
- Providing summary reports to the Commonwealth for national collation, and to industry bodies as appropriate ;
- Undertaking retrospective searches and planning active surveys as required in support of trade negotiations ; and
- Liaising with private sector providers of data

A national coordinator collates the data and is also responsible for establishing linkages with national programs and other information sources.

To assist reporting by States and other organisations, a Windows-based data collection program - CICAD (Collecting Information Concerning Animal Diseases) - has been developed [Garner and Cannon, 1994]. This program facilitates downloading data from various sources and from a variety of computer systems. The program provides specifications on the data required, stores relevant data and prepares them for transfer.

E - TYPE OF DATA COLLECTED

The NAHIS stores both textual and numerical information. It makes as much use as possible of existing data sources. The aim is to store summary information, not to duplicate existing databases. Hence in most cases, rather than individual case records, data are aggregated to the regional level. For rare or sporadic conditions (e.g. exotic disease investigations) specific outbreak information is stored.

Existing information sources will not provide all the information required for all the targeted diseases. To provide specific information on selected diseases, *passive* data collection (using existing sources) will be supplemented by *active* data collection, in the form of special projects and surveys. Active data collection will largely be determined by requirements for high quality data by overseas markets and will be considered on an as-needed basis.

Sera collected as part of these surveys will also be stored in the National Animal Serum Bank (NASB). The major function of a serum bank is to enable retrospective analysis of exotic or newly recognised agents, and the NASB is thus an important component of the national disease surveillance system. The NASB has recently been reviewed, and recommendations have been made concerning improved collection and storage procedures [Anon., 1990].

In addition to specific disease findings, the NAHIS will also contain a range of background material. This includes brief histories and descriptions of diseases ; information on the international animal health situation (through OIE reports) ; summary information on residue and microbial surveillance ; and information on livestock populations, numbers of stock slaughtered and relevant environmental data.

Thus the NAHIS stores a range of information :

1. Background information on a disease

Description of the disease
Epidemiology
Regulations that apply in Australia
Control measures
Key references

Much of this information is descriptive and textual in nature, and based on existing documents such as the *Animal Health in Australia* series.

2. International disease situation

OIE is moving towards electronic transfer of disease information between member countries and is developing an electronic international disease information package ('Handistatus') that will facilitate entry and updating of this information.

3. Ancillary data

Environmental information
Livestock numbers and distributions
Numbers of animal health personnel
Details of surveillance effort

4. Results of passive collection of data

The system will summarise information available from existing programs. The emphasis is on making use of data already being collected for other purposes. The sources of data may include the following :

State/Territory laboratory accessions
State/Territory field veterinary service reporting
Eradication/control program records
Private practitioner records
Abattoir inspection records
Other national programs (e.g. Northern Australian Quarantine Strategy, National Arbovirus Monitoring Program, National Granuloma Submission Program, National Residue Survey)

5. Results of active data collection

Specific projects will be designed to collect high quality data to address particular animal health issues and will be undertaken on an as-needed basis. Active surveillance will take the form of :

- Short-term, targeted studies (e.g. to address specific trade issues) ;
- Comprehensive surveys (e.g. to demonstrate freedom from a specific disease) Currently, a national serological survey of the pig industry is underway to demonstrate that Australia is free of porcine reproductive and respiratory syndrome.

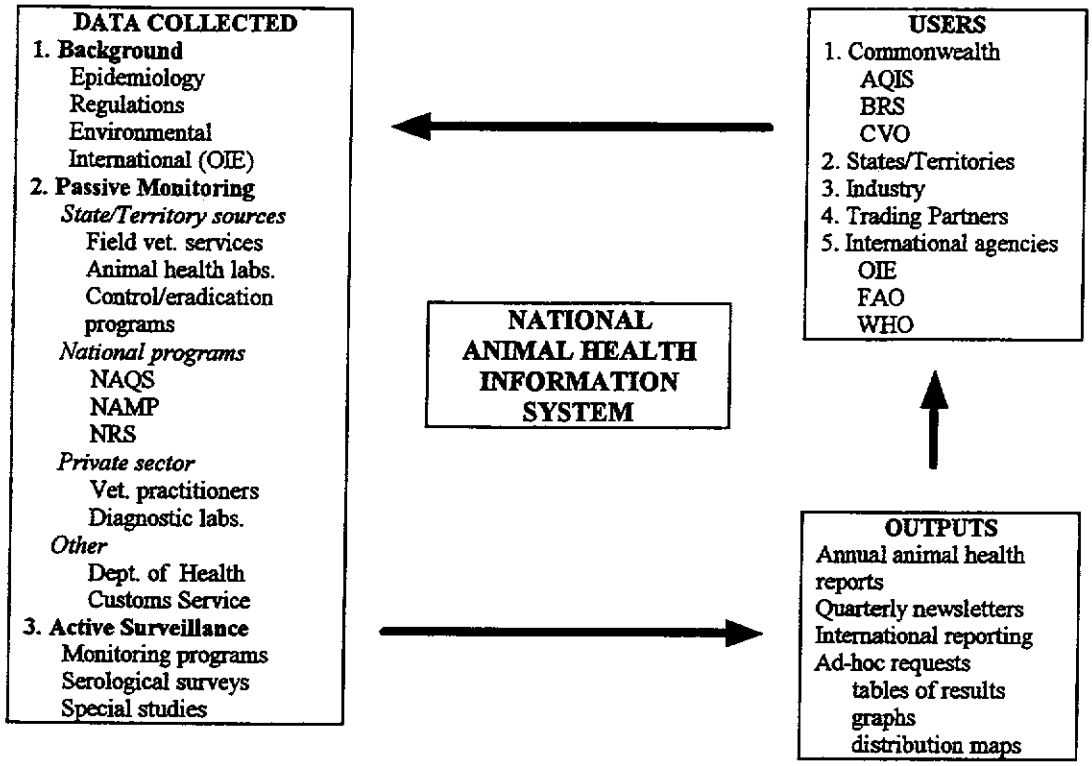
V - DESCRIPTION OF THE SYSTEM

The aim of the NAHIS is to provide users with timely information on Australia's animal health situation. Major users, including States and Territories and AQIS will have direct access to the system.

A - DATA STORAGE

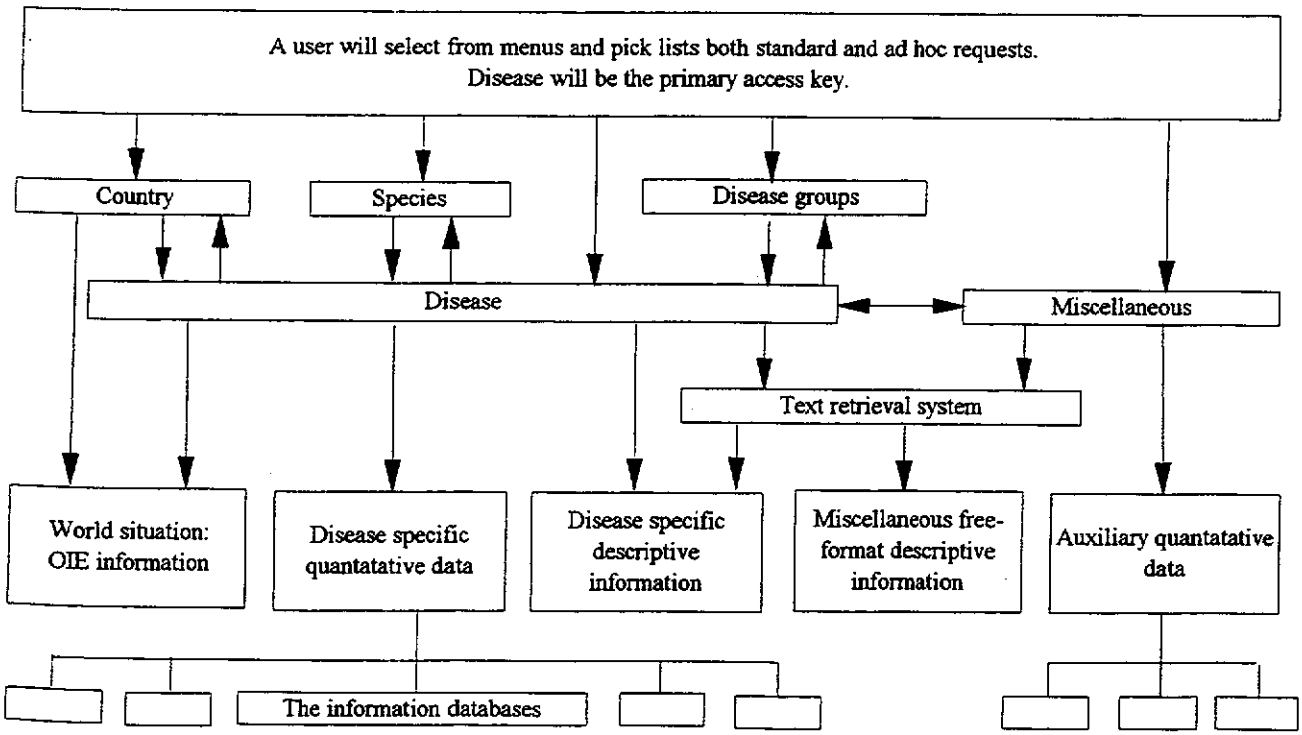
The NAHIS stores summary data on identified diseases from a range of sources, as outlined in Figure 3. Data from State and Territory sources are collected and forwarded by coordinators on a quarterly basis. National coordination, database development and maintenance, information access, and reporting will be done centrally. The Bureau of Resource Sciences is developing the data storage and analytical facilities. Information will be accessible through a user-friendly, Windows-based interface.

Figure 3 : Conceptual outline of the NAHIS



Conceptually, the system will consist of a series of datasets. These datasets will be both textual and numerical. Primary access will be by disease (see Figure 4). Initially, the system will be microcomputer-based with links to statistical, spreadsheet and mapping software.

Figure 4 : Access to data in the NAHIS



In addition to information routinely forwarded from State and Territory sources, the NAHIS makes use of data collected by several national programs. These include :

Northern Australian Quarantine Strategy

In recognition of the special quarantine risks associated with Australia's sparsely populated northern coastline, AQIS developed the Northern Australian Quarantine Strategy (NAQS). This strategy includes both offshore and onshore surveillance activities. The offshore program is designed to provide a better understanding of the animal health status of neighbouring countries and to provide early warning of new threats. It involves joint programs with Papua New Guinea and Indonesia that include sentinel herd programs and periodic investigations by field teams. Diseases that are targeted include foot-and-mouth disease, arboviruses and their vectors, Newcastle disease, avian influenza, classical swine fever, trichinellosis, *Taenia solium*, surra, and old-world screw-worm fly (*Chrysomya bezziana).*

Onshore activities include regular inspections of remote sites and collection of samples, community awareness, sentinel programs for poultry diseases and arboviruses, and a trapping program to check for incursions of screw-worm fly.

National Granuloma Submission Program

After a 22-year eradication program, Australia was declared 'impending free' from bovine tuberculosis (all cattle herds having been assessed with no known infected herds) in December 1992.

Because of the nature of the disease, tuberculosis breakdowns will still occasionally occur. Tuberculosis surveillance is based on the inspection of carcases at abattoirs. AQIS manages a National Granuloma Submission Program, which has been in place since March 1992 at all export and domestic abattoirs. All granulomas from the thorax and those suggestive of tuberculosis from other parts of the body are submitted for laboratory analysis.

National Arbovirus Monitoring Program

Several arboviruses, including bluetongue, Akabane and bovine ephemeral fever, are considered to be potentially important in Australia. The National Arbovirus Monitoring Program (NAMP) provides data on the distribution of these arboviruses and their vectors to facilitate trade (e.g. the export of live ruminants and ruminant genetic material), assist with preparedness for bluetongue, and assist endemic arboviral disease control. The program is based on sentinel herds and vector monitoring sites located to cover the areas of high vector activity, areas close to northern ports used for livestock exports, and the margins of the vector distribution and vector-free areas.

Sentinel herds are sampled monthly throughout periods of likely virus or vector activity. This program provides data on the distribution of agents of interest and on periods of relative inactivity to support livestock movements from ports within vector areas. Serological testing is undertaken for bluetongue, Akabane and bovine ephemeral fever. Viruses are also isolated in the Northern Territory as part of the bluetongue preparedness strategy. Serology for additional agents (epizootic haemorrhagic disease of deer, Palyam and Simbu serogroup viruses) is also undertaken. Entomological surveillance is based on a system of monthly light trap collections supplemented at critical points by other trapping methods.

National Notifiable Diseases Surveillance System

Information on human cases of important zoonoses in Australia is available from medical sources. The National Notifiable Diseases Surveillance System was established in 1990 under the auspices of the Communicable Diseases Network of Australia and New Zealand, and is the continuation of the national compilation of notifiable diseases that has been published since 1917 [Hargreaves et al., 1995]. The NAHIS, through links with this system, stores summary information on cases of leptospirosis, listeriosis, ornithosis, Q fever, brucellosis and hydatidosis.

National Residue Survey

The National Residue Survey (NRS) is a monitoring program for chemical residues in agricultural commodities [Bureau of Rural Resources, 1992]. The NRS provides an unbiased estimate of the frequency of residues in meat and other commodities. Primary producers fund the operating costs by a

livestock transaction levy on meat, or by similar means for other foods. Sampling is stratified to reflect different classes of stock, the geographical location of abattoirs and seasonal variation in throughput. Requests for the submission of samples are generated at random by a computer and posted direct to the officer-in-charge of inspection at each abattoir. Sampling is on a 'test and release' basis and the NRS requires all participating laboratories to undergo proficiency testing before and during contracted performance of tests.

Results of all tests are entered in a computer database. The NAHIS stores and reports summary NRS data by chemical-commodity combination and area.

B - OUTPUTS

The ability to provide timely information in an appropriate format is an essential component of any information system. The formats available from the NAHIS include tables, graphs, statistics and distribution maps. It is planned that major users, including States/Territories and AQIS, will have dial-up access to the system. This will facilitate a prompt and accurate response to queries regarding Australia's animal health status.

Specific outputs from the system will be produced by analysing the information in the NAHIS. These include :

- Quarterly newsletters on the animal health situation ;
- An annual animal health status report on Australia ;
- Reports for international agencies such as OIE, World Health Organisation (WHO) and the United Nations' Food and Agriculture Organisation (FAO) ; and
- Ad-hoc briefings, information notes and position papers as required.

VI - RESULTS

The NAHIS has been endorsed by all States/Territories and commenced operating in July 1993. Findings from the NAHIS are reported periodically, through quarterly *Animal Health Newsletters* and the annual report *Animal Health in Australia.* To date, several quarterly newsletters have also been prepared and an inaugural annual animal health report, covering the 1993 calendar year was released [Nunn and Thornber, 1994]. The 1994 report is currently under preparation.

The following examples demonstrate the types of information available from the NAHIS.

RESULTS OF ROUTINE MONITORING

Results of routine monitoring include data on targeted diseases according to specified criteria. This information is based on quarterly reporting by State and Territory animal health agencies. Three main types of information are collected, depending on the disease - the results of laboratory testing, outbreak investigations, or control activities. For example, the collated results of routine monitoring activities, for the period from 1 July 1994 to 30 September 1994 are summarised in Table II.

Table III shows numbers of livestock inspected and slaughtered at export abattoirs, by major category and State/Territory, for the same period.

Table II : Summary of routine disease monitoring activities for the period 1 July 1994 to 30 September 1994

(a) Laboratory testing

DISEASE	NO. SUBMISSIONS	NO. POSITIVE
Akabane	704	0
Bovine ephemeral fever	366	0
Bluetongue	701	1
Bovine brucellosis	2430	0
Cryptosporidiosis	29	2
Enzootic bovine leucosis*	2548	3
Equine infectious anaemia	180	0
Equine viral arteritis	93	0
Hydatidosis	-	5
Johne's disease*	2986	16

(b) Outbreak investigations

DISEASE	NO. HERDS	NO. POSITIVE
Abortions (*Brucella abortus*)	44	0
Anthrax	0	0
Bovine tuberculosis	0	0
Infectious bovine rhinotracheitis	36	9
Meliodosis	0	0
Pestivirus (sheep)	222	166
Salmonellosis (clinical)	47	3
Suspected exotic diseases	5	0
Tick fever**	0	0

(c) Control activities

CONTROL ACTIVITIES	TOTAL†	NEW††
Enzootic bovine leucosis	-	-
Footrot (ovine)	1110	143
Johne's disease (bovine)	1310	1081
Brucella ovis accreditation‡	956	-

KEY
* testing of stock in free areas ** outside endemic areas † total no. of herds under restrictions
†† no. of new herds this quarter ‡ no. of flocks accredited free

ARBOVIRUS MONITORING

The results of serological surveillance of selected arboviruses for 1993 is shown in Figure 5. Although transmission occurred over a large geographical area, infection was still confined to known vector areas. Seroconversion in sentinel cattle occurred as far south as the mid-north coast of New South Wales.

BOVINE TUBERCULOSIS MONITORING

Tuberculosis monitoring is based on inspection of carcases at abattoirs. In 1994, there were 793 submissions made under the program with 18 confirmed cases of tuberculosis (see Table IV).

Table III : Livestock slaughterings (1 July to 30 September 1994)

Species	NSW	NT	Qld	SA	Tas.	Vic.	WA	Total
Cattle	399 655	26 761	714 083	65 317	13 675	166 725	51 966	1 438 312
Calves	46 916		11 307		5 728	206 150	373	270 474
Sheep	1 087 868		104 763	652 931	915	454 128	161 737	2 462 342
Lambs	287 842		73 325	328 535	12 214	257 670	131 150	1 090 646
Goats	214 549		2 735	79 360			14 216	310 860
Pigs	186 097		124 695	37 496		154 434	29 178	531 900
Feral pigs	25 175		30 575					55 750

Figure 5 : Results of serological surveillance of sentinel herds for blue tongue in 1993, under the National Arbovirus Monitoring Program

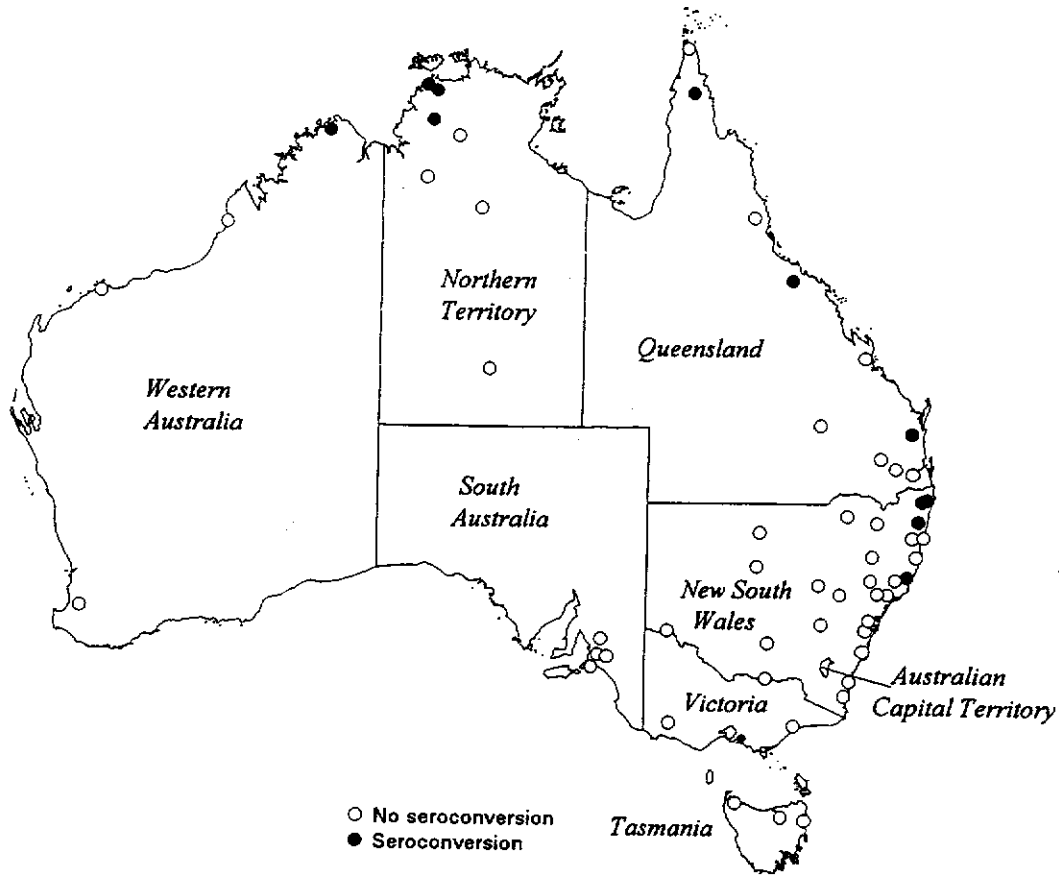


Table IV : Results of the National Granuloma Submission Program, 1994

DIAGNOSIS	NUMBER	%
Tuberculosis	18	2.3
Actinobacillosis/actinomycosis	313	39.5
Mixed infection	30	3.8
No diagnosis	93	11.7
Rhodococcus equi	89	11.2
Tumour	90	11.3
Fungal	30	3.8
Parasitic	44	5.5
Miscellaneous	86	10.9
Total	793	100

ZOONOSES

Table V shows the numbers human cases, by State/Territory, of several important zoonoses.

RESIDUE SURVEILLANCE

Table VI summarises information on residue testing in meat by the National Residue Survey. Samples are collected at slaughtering establishments. The data are presented by the State or Territory of the establishment collecting the sample.

Figure 6 is an example of distribution maps based on reporting areas used in the NAHIS. In late 1994, as a result of detection of chlorfluazuron residues in beef in eastern Australia, a surveillance program was implemented in Queensland and New South Wales. The figure shows the distribution of properties sampled.

EXOTIC DISEASE INVESTIGATIONS

A continuing awareness program encourages farmers and veterinarians to report any disease problems in which an exotic disease incursion is considered a possible diagnosis. These investigations provide Australia with a widespread passive monitoring system for early detection of exotic disease. Table VII summarises exotic disease investigations undertaken in Australia during 1994.

Table V : Human case notifications - zoonoses (1 July 1994 to 30 September 1994)

Disease	ACT	NSW	NT	Qld	SA	Tas.	Vic.	WA	Total
Leptospirosis	0	2	0	8	0	0	4	0	12
Listeriosis	0	2	0	1	0	0	2	0	5
Ornithosis	0	0	0	0	1	0	12	0	13
Q fever	0	50	0	67	11	0	11	1	140
Brucellosis	0	2	0	5	0	0	2	0	9
Hydatidosis	0	6	0	1	1	0	2	2	12

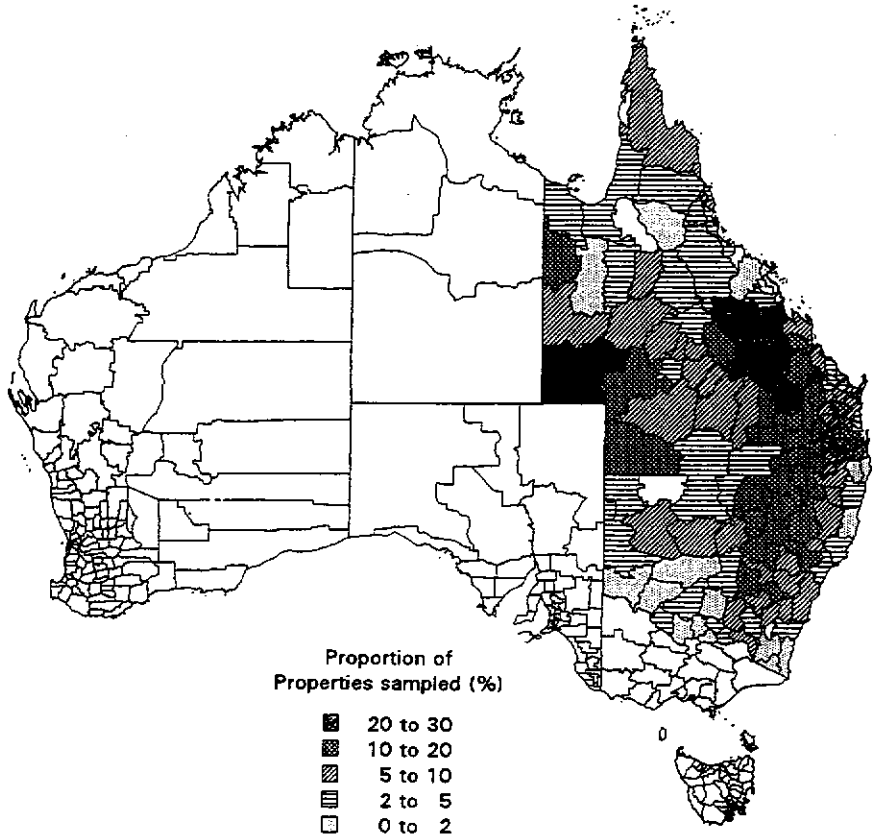
Table VI : Results of residue surveillance (1 July 1994 to 30 September 1994)

Residue	NSW	Vic.	Qld	WA	SA	Tas.	NT	Total	>Limit
19-Nortestosterone	5	1	13	2	2	3	0	26	0
Antimicrobials	109	109	122	34	36	2	13	425	15
Avermectin/ivermectin	47	56	35	11	18	4	0	171	0
Benzimidazoles	47	27	42	11	12	3	1	143	0
Chloramphenicol	8	3	22	1	2	1	0	37	0
Clenbuterol	21	15	45	5	8	1	3	98	0
Closantel	25	13	4	12	8	1	0	63	0
Dimetradazole	6	4	5	1	3	0	0	19	0
Levamisole	77	53	69	16	16	5	1	237	0
Melengestol acetate	4	11	11	7	3	2	3	41	0
Metals	75	48	65	28	16	2	2	236	12
Nitrofurans (furazolidone)	9	9	8	1	4	0	0	31	0
OC and OP (OCOP)	204	133	199	78	61	25	23	723	4
OCOP and synthetic pyrethroids	245	185	233	54	78	8	12	815	1
Stilbenes	3	3	11	0	1	0	0	18	0
Sulphonamides	80	82	102	20	14	5	1	304	0
Tranquillisers	12	7	5	1	2	0	0	27	0
Trenbolone	11	3	19	4	1	0	0	38	0
Triclabendazole	13	23	34	3	3	1	1	78	0
Zeranol and stilbenes	39	32	61	6	6	6	2	152	0
Total samples	1040	817	1105	295	294	69	62	3682	32

Note :

>Limit = number exceeding the maximum residue limit or maximum permitted concentration
OC = organochlorine ; OP = organophosphate
NSW data include ACT

Figure 6 : Proportion of properties sampled for chlorfluazuron residue testing 1994-1995



VII - ANALYSIS OF STRENGTHS, WEAKNESSES AND FUTURE PROSPECTS

Morris [1976, 1991] has identified a number of issues that need to be considered when designing disease information systems. In particular, when developing an integrated national system a balance needs to be struck between a comprehensive, all embracing approach that is expensive, unwieldy and risks losing the interest and cooperation of the participants, and a system that is so specific that it cannot adapt to changing needs and risks losing its usefulness and becoming irrelevant. It is essential that the system should be dynamic and able to be expanded or redirected as circumstances demand. With the NAHIS, the aim is for a flexible approach which can be used for a variety of purposes. The list of targeted diseases will be kept small (about 20 endemic diseases) but will be regularly reviewed to ensure that the information being collected is relevant to the users, and that new or emerging issues are picked up.

A major strength of the NAHIS is that it is capable of incorporating information from a variety of sources [Nunn and Garner, 1991]. This ensures that currently collected information is used more effectively, and that costs are minimised. However, it is important to recognise that there are limitations in using data for purposes other than that originally intended. Such data are of variable reliability and rarely subject to quality control. Hugh-Jones [1973] pointed out that much of this type of surveillance data will support only the simplest of statistical analyses - although, in many cases, this will be adequate to meet the needs of the users.

A key issue that has to be considered in any disease surveillance system is data integrity, which has two components. First is *comparability* of data between reporting agencies. The NAHIS avoids many of the inherent problems of aggregating data from different sources by defining standardised reporting formats for the nominated diseases. As information requirements vary, each disease has to be considered separately, and specific reporting criteria defined (i.e. what constitutes a case) and agreed by State/Territory and other agencies. This means that each agency is collecting and reporting the samedata fields. To provide a degree of quality control over the data collected, State/Territory coordinators have a responsibility to liaise with and provide feedback to providers of the data. For laboratories, the Australian National Quality Assurance Program ensures that laboratory testing at all 21 government animal health laboratories in Australia and New Zealand is to the highest quality. The program involves standardisation of serological test procedures, production of national standards for antigens and antisera, preparation of quality control panels of antisera, biannual inter-laboratory quality control testing, and provision of computer software for intra-laboratory quality control.

The second concern is the *reliability* of the data - i.e. that the data reported accurately reflect the true situation in the field. Data collected through passive monitoring systems are opportunistic and will have biases. For example, records of disease in an area may reflect the special interest of the collecting agency rather than the real occurrence. Diagnostic laboratory reports can provide good evidence for the presence of disease in an area, but because of the lack of statistical sampling do not provide good information on the absence of a disease. Because many passive sources rely on voluntary notification and submission of samples, the number of reports tends to fall with distance from the laboratory or field office. The number and distribution of laboratory submissions is also likely to be affected by varying levels of cost-recovery by government animal health laboratories.

The reliance on passive monitoring as the basis of the NAHIS presupposes animal health staff have sufficient contact with livestock producers to know what is going on in the field. Clearly, if the number and extent of these contacts falls, the reliability of the information extracted from passive sources decreases and the need for active surveillance increases.

Table VII : Exotic disease investigations in Australia in 1994

State or Territory	Month	Species	Disease suspected	Diagnosis	Response
NT	February	Domestic fowl	Newcastle disease (ND)	Negative for ND and avian influenza (AI)	1, 2, 3
NT	December	Horses	Unknown — high mortality	Malnutrition	1, 2
NSW	January	Person	Salmonellosis	*Salmonella enteritidis*	3, 5, 1
NSW	January	Sheep	Bluetongue	Toxic hepatopathy	2
NSW	February	Sheep	Bluetongue	Plant poisoning	1, 2
NSW	March	Human	Screw-worm fly	*Dermatobia hominis*	2, 3
NSW	March	Alpaca	Vesicular disease, bluetongue	Nil exotic disease	1, 2, 3
NSW	March	Duck	Duck virus enteritis	Nil exotic disease	2, 3
NSW	March	Finch	Tuberculosis	*Mycobacterium genavonse*	2,3
NSW	April	Alpaca	*Brucella melitensis*	Nil exotic disease	2
NSW	April	Horse		Botulism	2, 5
NSW	April	Human, sheep	*Salmonella abortus-ovis*	*Salmonella abortus-ovis*	3, 4
NSW	April	Sheep	*Salmonella abortus-ovis*	Negative	1, 2, 3, 5
NSW	May	Fox	Rabies	Negative	1, 2, 3
NSW	May	Sheep	Screw-worm fly	*Lucilia* spp.	1, 2
NSW	May	Cattle	BSE	Blindness	1, 2
NSW	June	Macaw	Macaw wasting syndrome	Probable	5
NSW	June	Cat	Rabies	Cryptococcal meningitis	2
NSW	September	Horse	Acute equine respiratory syndrome (AERS)	Nil exotic disease	1,3,5,6
NSW	September	Horse	AERS	Nil exotic disease	1, 3, 5
NSW	October	Horse	AERS	Nil exotic disease	1, 2, 3
NSW	November	Horse	AERS	Crofton weed poisoning	1, 2, 3
NSW	November	Horse	AERS	Nil exotic disease	1, 2, 3
NSW	November	Horse	AERS	Nil exotic disease	1, 2
NSW	December	Horse	AERS	Nil exotic disease	2, 3
Qld	January	Poultry	AI	Peritonitis, leucosis	2, 3
Qld	February	Poultry	AI	Marek's disease	1, 2
Qld	February	Poultry	ND	Infectious laryngotracheitis	1, 2, 3, 5
Qld	March	Cattle	Vesicular disease	Gunshot wound	1
Qld	June	Sheep	Bluetongue	Photosensitisation	1, 2, 3
Qld	August	Poultry	AI	Fowl cholera	1, 2
Qld	August	Pigs	Classical swine fever (CSF)	Pneumonic pasteurellosis	1, 2, 3, 5
Qld	September	Horses	African horse sickness	AERS*† ##	1, 2, 3, 4, 5, 6
Qld	October	Cattle	Ibaraki disease	Ephemeral fever	1, 2, 3
Qld	November	Cattle	FMD	Trauma (prickles)	1, 6
Qld	November	Human	Screw-worm fly	*Dermatobia hominus**	1, 2, 6
Qld	December	Horses	AERS	Crofton weed poisoning	1, 2, 3
Qld	December	Poultry	AI	AI*	2, 3, 5, 6
SA	January	Horses	Vesicular stomatitis	Rhinovirus	2, 3, 7
SA	January	Cattle	High mortality	Shipping fever (not confirmed)	2, 7
SA	March	Horses	Equine viral arteritis (EVA)	EVA (not confirmed)	2, 3
SA	April	Cattle	Contagious bovine pleuropneumonia (CBPP)	Pneumonia, not CBPP	1, 2
SA	April	Cattle	Dysentery, suspect rinderpest	Nil exotic disease. Mucosal disease (not confirmed)	2
SA	May	Cattle	High mortality	Clostridial disease	2
SA	September	Fish	Monitoring	Barramundi picornavirus*	2
SA	September	Cattle	Vesicular disease, mouth erosions	Herpesvirus Infectious bovine rhinotracheitis.	1, 2
SA	September	Poultry	High mortality	Marek's disease	1, 2
SA	October.	Cattle	High mortality	Bacterial pneumonia	2
SA	November	Fish	Fin lesions	lymphocystis	2
Tas.	April	Cattle	Bovine spongiform encephalopathy (BSE)	Nil exotic disease	1, 2, 3
Tas.	June	Cattle	Vesicular disease	Mucosal disease	1, 2, 3
Tas.	July	Cattle	BSE	Nil exotic disease	1, 2
Tas.	September	Cattle	BSE	Nil exotic disease	1, 2, 3
Tas.	October	Cattle	Vesicular disease	Mucosal Disease	1, 2
Vic.	March	Ostrich	ND	Negative ND	1,2,3
Vic.	March	Ducks	AI	Nil exotic disease	2
Vic.	April	Human	Screw-worm fly	Human bot fly	1, 2, 3
Vic.	July	Turkeys	AI	Acute pasteurellosis	1, 2, 3, 5, 6
Vic.	October	Horse	AERS	Nil exotic disease	1, 2, 3
Vic.	October	Horse	AERS	Nil exotic disease	1, 2, 3
Vic.	October	Bees	*Varroa* mite	Negative	1, 2
Vic.	October	Ducks	AI/ND	Pasteurellosis	1,2,3
Vic.	October	Cattle	BSE	Nil exotic disease	1, 2
Vic.	November	Pigs	CSF, transmissible gastroenteritis	Probable enterotoxaemia	1, 2, 3, 5, 6
Vic.	December	Horse	AERS	Nil exotic disease	1, 2, 3
WA	March	Pig	Vesicular disease	Trauma	1, 2
WA	March	Sheep	Bluetongue	Scabby mouth	1, 2
WA	April	Cattle	CBPP	Pasteurella pneumonia	1, 2, 3
WA	May	Cattle	Vesicular disease	Bacterial pneumonia secondary to infectious bovine rhinotracheitis	1, 2
WA	September	Sheep	Bluetongue	Photosensitisation, Se and Co deficiency	1, 2
WA	October	Horse	AERS	Anaphylactic reaction	1, 2, 3
WA	October	Horse	AERS	Congestive heart failure	1, 2, 3

KEY

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 Division of Entomology)
4	Specimens sent to reference laboratories overseas
5	Regulatory action taken (quarantine or police)
6	Alert or standby
7	Specimens handled by private or university laboratory
*	Exotic condition confirmed
†	Numerous investigations were conducted in Queensland after the initial diagnosis of AERS

NSW = New South Wales ; NT = Northern Territory ; Qld = Queensland ; SA = South Australia ; WA = Western Australia ; Vic. = Victoria ; Tas. = Tasmania

Feedback to providers of information is recognised as an important part of maintaining interest and cooperation [Hugh-Jones, 1975, Morris, 1991]. Any animal health information system should provide feedback to the providers of information, and provide timely and relevant information to the users. The NAHIS, through its quarterly newsletters and annual reports, is providing an effective mechanism not only for providing information to users, but also to providers of the data. As the system develops, major users of the system will have direct access via computer networking. Currently, consideration is being given to using the internet as a means of disseminating reports.

For any surveillance system, long-term funding can be an important issue. There has been a recent trend in Australia to reduce government inputs into animal health services in some States/Territories and to introduce cost-recovery in others. As the volume of data from traditional government sources falls, consideration is being given to greater use of private sector sources of information, such as veterinary practitioners and private laboratories. The alternative is to move to more active forms of surveillance such as surveys, which provide high quality data but can be relatively expensive.

A high level government-industry working group, chaired by the Secretary of the Department of Primary Industries and Energy, is currently reviewing animal health services in Australia. This review is seen as a key step in to the establishment of long-term arrangements for the delivery of essential animal health services. A National Animal Health Council (NAHC) an advisory role and a small program capability has been proposed to improve linkages between the eight State/Territory animal health services, Commonwealth services, and industry to ensure the most effective use of available resources for animal health services in Australia. Establishment of an animal health information system is seen as essential component of the NAHC. Funding arrangements for the NAHC, including the NAHIS, are currently under consideration.

VIII - CONCLUSION

The principal objective of a national animal health information system for Australia is to provide accurate quantitative information, through monitoring and surveillance, on the animal disease situation. Although this information is able to be used for a variety of purposes, it is particularly important in the areas of disease reporting, trade and market access.

Recognising that large amounts of data on animal health in Australia are already being collected by a range of agencies, Australia's NAHIS is primarily based on passive monitoring. This has necessitated the identification of priority diseases, standardisation of data collecting and reporting formats, and the nomination of State/Territory and national coordinators to collate the information.

Active surveillance will become increasingly important, particularly if present trends to reduce the traditionally high level of government involvement in animal health services continue.

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