

A brief history of AAHL



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Abstract. The CSIRO Australian Animal Health Laboratory (AAHL) was officially opened on 1 April 1985. After that day the laboratory switched to secure mode and has operated as such ever since. AAHL was constructed to be the primary national diagnostic facility for exotic animal diseases but has expanded its role to become a national and international reference laboratory for many diseases. AAHL has supported disease control within the region by providing training, reagents and proficiency testing, both within Australia and internationally. AAHL's role has evolved even further to include a focus on one-health which resulted in AAHL being renamed the Australian Centre for Disease Preparedness (ACDP) in March 2020.

Establishment of AAHL

In 1958 CSIRO established the Animal Health Research Laboratory in Parkville, Melbourne. Australia had little expertise in viral diseases of farm animals and depended on international advice and disease diagnosis. In 1962 an Exotic Diseases Committee of the Australian Veterinary Association recommended that a central Commonwealth Exotic Disease Laboratory be established. Over the 1960s various reports decided that the laboratory should be built as a matter of urgency, its functions determined and that it should be managed and operated by CSIRO¹. A panel was convened and agreed that its functions should be to:

- Establish techniques for the rapid diagnosis of exotic or foreign animal diseases
- Conduct research on endemic virus infections of animals and assist in their control
- Train field staff in the recognition and presumptive diagnosis of virus diseases, and laboratory staff in techniques for the isolation and identification of viruses

- Provide highly trained virologists, and maximum-security laboratory and animal accommodation

A Proposal Evaluation Team (PET) was established to visit international high security facilities, discuss operation of high security facilities and evaluate the systems used to maintain security. From 14 October to 20 December 1970 the PET visited 15 high-security laboratories in Australia, the USA, UK and Europe that handled animal and human pathogens, agents that may be used for germ warfare and vaccine production facilities. The PET concluded that it would be feasible to construct a high security laboratory and estimated the construction costs to be \$25 million \pm 25%.

Selection of a site

In 1972 the government gave in-principle support for the establishment of AAHL and 35 potential sites were evaluated. Following a change of government in 1972 plans for the development of the Geelong region were released, a further search made and the Geelong Rifle Range site selected. Government commitment for the construction of AAHL wavered over the next 5 years. In October of 1977 Bluetongue virus was confirmed as being present in Australia. In January 1978 the Prime Minister agreed that the construction of AAHL be included in the civil works program for 1977–78 and in February 1978 CSIRO signed the requisition for the Commonwealth Department of Works to construct AAHL at a cost of \$83 million. On 20 March 1978 the Prime Minister, Malcolm Fraser turned the first sod to start construction¹.

Construction

Many of the systems identified as essential for microbiological security by the PET during planning did not exist so the Commonwealth Department of Works set about their design and development. Seals for maintaining wall airtightness, airtight doors with inflatable seals, sewerage collection and treatment systems, high efficiency particulate air filter cannisters, floor finishes, ventilation system and air pressure controllers were all developed and tested in an AAHL prototype building, constructed at the CSIRO Maribyrnong Field Station. AAHL was constructed so that every system critical for biosecurity has at least 100% backup; including electricity, water, gas, generators, compressors, fuel, incinerators and air handling¹.

The construction and biosecurity were reviewed by a group of experts from the USA. Their report stated, 'The facility contains

almost every conceivable containment feature desired in a high hazard animal disease research and diagnostic laboratory. This is the world's most advanced facility of its kind. Many of its features are expected to be used over the next 25–30 years as models for high hazard biomedical and animal laboratories throughout the world¹. As at October 1977 the estimated cost of constructing AAHL was estimated at \$83 million. On completion of construction and commissioning in 1984 the cost was \$158 million. If AAHL was constructed today the cost of construction would be \$1.2 billion.

The science

In February 1984 a group of about 20 scientists from the Animal Health Research Laboratory in Parkville relocated to AAHL and began the set to work phase. A priority was the development of a foot and mouth disease (FMD) diagnostic capability and two AAHL staff were sent to the Animal Virus Research Institute, Pirbright to develop diagnostic ELISA's, confirm that the reagents contained no live FMD and send the reagents to AAHL². Validation of the reagents in the field was done by AAHL staff at the Thai Northern Veterinary Research and Diagnostic Laboratory in Lampang.

AAHL's first challenge was an outbreak of respiratory disease in commercial chickens in late 1984 in NSW, caused by a Newcastle disease virus (NDV). As the laboratory was not yet operating in secure mode the south suite of laboratories was put into Physical Containment Level 3 mode to handle samples from the outbreak, the only time at AAHL that one suite has been isolated from the rest of the facility. Although this NDV was not virulent the virus persisted in poultry for years afterwards. A virulent NDV that evolved from the 1984 respiratory virus reappeared in September 1998 to cause an outbreak of severe neurological disease in commercial chickens in NSW³ and continued to cause outbreaks until 2002, when vaccination was introduced.

Newcastle disease also caused a major political problem for AAHL when, in 1987, a laboratory technician became infected with virulent Newcastle disease virus following laboratory exposure, developing conjunctivitis and other clinical signs. A review of the incident was critical of the laboratory procedures that lead to the spill but was more critical of the management of the incident; the clean-up, on-going health monitoring, lack of movement restrictions on the infected staff member and reporting of the incident to stakeholders¹. One change in response to the review was the construction of an on-site quarantine unit to isolate staff exposed to an infectious agent. To date this has been used three times, for potential exposure to vesicular stomatitis, Newcastle disease and

Hendra viruses respectively¹. In all cases the staff did not become infected.

On 1 April 1985 AAHL was officially opened. A month later, in late May 1985, AAHL responded to an outbreak of highly pathogenic avian influenza on a Bendigo poultry farm caused by an H7N7 Influenza A virus⁴. Outbreaks caused by H7 avian influenza viruses occurred in 1992, 1994, 1997, 2012 and, at the time of writing, with another three outbreaks in Victoria in 2020. AAHL has also been central to Australia's response to the H5N1 epizootic in Asia. It has an externally funded overseas program to assist with the diagnosis and control of H5N1 in the region, which is on-going to the present.

AAHL took over the rabies diagnostic role from the Commonwealth Serum Laboratory in 1986. In 1987 AAHL confirmed a fatal case of human rabies in a young boy who had recently travelled overseas, the first recorded case of human rabies in Australia in over 100 years. In 1990 AAHL confirmed another rabies case in a young girl who arrived in Australia 5 years before and had not travelled overseas since. In both cases the viruses were sequenced and confirmed as Asian dog rabies⁵.

The transmissible spongiform encephalopathy (TSE) laboratory was established at AAHL in 1988 and did scrapie associated fibril extractions and mouse inoculations of brains from animals showing clinical disease suggestive of TSE. In 1992 samples were submitted from a cheetah in Broome Zoo, which tested positive for TSE. Its litter mate was tested and was also positive⁶. Both animals were imported from the United Kingdom so were most likely infected there. More zoo cats were tested and in 2002 a golden cat from Melbourne Zoo was found to be TSE positive⁷. These cases did not pose a risk of introduction into Australia as both animals were in indefinite quarantine.

In 1989 the Australian Fish Disease Reference Laboratory (FDRL) relocated to AAHL from the Benalla Regional Veterinary Laboratory. The FDRL have been involved in many fish disease investigations and research, including the pilchard die off, orthomyxoviruses in farmed salmon, abalone herpes virus and white spot disease in prawns amongst many others. It played a key role in the diagnosis and control of the recent white spot disease outbreak in farmed prawns in Queensland.

AAHL has proved its value to Australia on many occasions in the diagnosis of many known and unknown virus diseases. The best example of this was in 1994, when on 22 September AAHL was notified by the Queensland CVO that there was an outbreak of severe respiratory disease in horses at a stable in the Brisbane suburb of Hendra. The samples arrived on 23 September and all

tests for known agents gave negative results. On 26 September a virus was observed growing in cell cultures, which was identified as a previously unknown paramyxovirus by electron microscopy and gene sequencing. Koch's postulates were demonstrated by reproducing the disease in experimentally infected horses. By the end of that week I had developed a virus neutralisation test for antibodies and were testing in-contact animals and humans. Eventually AAHL was able to demonstrate that the infection was confined to 21 horses and two humans on a small number of properties⁸.

In 1995 AAHL confirmed another case of Hendra in a sugar cane farmer from Mackay who had died 12 months after infection with Hendra virus in August of 1994⁹. AAHL then played an important role in the 1996 identification of Pteropid bats as the reservoir species¹⁰. The subsequent increased testing of bats resulted in the identification of Australian bat lyssavirus in Australian bats¹¹. Eighteen years after the emergence of Hendra virus AAHL was central to the research and development of a Hendra virus vaccine to reduce the risk of Hendra virus infections in horses and the associated risk to attending veterinarians¹².

AAHL deals with many disease agents and is a reference laboratory for some of these agents. It is an Australian national reference laboratory for avian influenza, Newcastle disease, rabies and Brucellosis, a Food and Agriculture Organisation (FAO) and World Animal Health Organisation (OIE) reference laboratory for avian influenza and Newcastle disease and a foundation member of OFFlu, the OIE/FAO Animal Influenza network. AAHL is an OIE reference Laboratory for Hendra/Nipah, bluetongue, African swine fever, classical swine fever, abalone herpes virus, ranavirus, epizootic haemopoietic necrosis virus and yellowhead viruses. It is also an OIE Collaborating Centre for New and Emerging diseases, a Collaborating Centre for Veterinary Laboratory Capacity building, and a Collaborating Centre for Diagnostic Test Validation. AAHL's role has changed with time and it has achieved accreditation as a provider of proficiency tests to Australian and international laboratories.

Prior to AAHL opening there was more than 20 years of consultation, lobbying, laboratory visits, planning and debate with government, politicians, farmers and industry. The reasons for the longevity of AAHL (ACDP) are the attention to detail in planning, prototype testing and quality of the construction. Without the vision and leadership of Bill Snowdon the design and construction of a national animal health laboratory may have remained only a dream. Even after 35 years of operation ACDP is still one of the foremost high security infectious disease laboratories in the world and a multi-million-dollar refit and upgrade

currently underway will ensure that ACDP continues to be a centre of excellence for infectious diseases for many years to come.

Conflicts of interest

The author declares no conflicts of interest.

Acknowledgements

This research did not receive any specific funding.

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Biography

Paul Selleck has been at the Australian Animal Health Laboratory, now the Australian Centre for Disease Preparedness since 1983. In this time he was head of the Avian Disease Diagnostic Laboratory and an OIE Reference Expert for Avian Influenza and Newcastle Disease. He was also involved in the Australian equine and swine influenza outbreaks in 2007 and 2009 respectively and now works extensively in Asia on the diagnosis and control of H5N1, biosafety and biosecurity.