The laboratory containment of wild poliovirus in Australia

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In September 1988, the thirty-ninth session of the World Health Organization's (WHO) Regional Committee for the Western Pacific adopted a resolution calling for the eradication of poliomyelitis in the Region by the year 2000.[1] Australia, along with other countries of the Western Pacific Region, is now moving rapidly towards the certification of poliomyelitis eradication. If all countries within the Region provide evidence consistent with the absence of indigenous wild poliovirus for three consecutive years under conditions of high quality surveillance, the Region can be certified as poliomyelitis-free.

The last case of indigenous acquired poliomyelitis, an 18 month old girl from Cambodia, occurred in the Region in March 1997.[2] Over three years have passed and it is therefore anticipated that the WHO will declare the Western Pacific Region free of poliomyelitis in the second half of 2000.

Because circulation of wild poliovirus in the region has been interrupted, the only known sources of wild poliovirus remaining are within the region's laboratories. These laboratories may store specimens from known poliomyelitis cases or store other materials that are potentially infected with wild poliovirus (Box 1). Therefore, the task of polio-myelitis eradication will not be complete until all known and potential sources of poliovirus are properly contained.

The Commonwealth Department of Health and Aged Care, with the assistance of the Victorian Infectious Diseases Reference Laboratory (VIDRL), is conducting a national laboratory survey that targets all Australian diagnostic, biological, environmental, reference, research, teaching, manufacturing and regulatory laboratories. The national survey is the next stage in Australia's efforts to eradicate poliovirus and aims to identify and produce an inventory of all wild poliovirus stocks and potentially infectious materials that are stored in Australian laboratories.

The development of a wild poliovirus inventory is part of the first phase of a larger world wide containment process that consists of three phases (Box 2). Phase two will commence one year after the last case of poliomyelitis is detected and phase three will commence at least three years after the global certification of polio eradication. In phase three oral polio vaccine will no longer be used.

In February 2000 VIDRL appointed a national coordinator of laboratory poliovirus containment. The role of the national coordinator includes writing a national plan for laboratory containment, coordinating the implementation of the plan and preparing the final national inventory for submission to the WHO Regional Office.

A national workshop on wild poliovirus containment

Six weeks following the appointment of the national coordinator, a workshop was held to discuss the concept and logistics of a national survey. Senior microbiologists were invited from each Australian State and Territory and, with the exception of two, all were able to attend. These microbiologists also represented many of the different classes of laboratories that could store poliovirus. The State/Territory representatives who were unable to attend provided comment on the outcome of the workshop.

Participants at the workshop discussed the optimal approach for identifying and communicating with laboratories and institutions, potential problems associated with identifying and locating infectious material, and specific technical problems relating to the containment and disposal of relevant material. In particular, a clear communication strategy was identified as critical for the smooth running of the national survey. Having reviewed the WHO national laboratory survey information pack and survey form, participants expressed concern with the complexity of the laboratory survey and speculated that laboratories may not be keen to participate. It was therefore decided to conduct two pilot surveys to evaluate the effectiveness of the standard documentation. A summary of the pilot surveys is outlined below.

At the conclusion of the workshop, a national advisory committee of six members was formed. Members of this committee included representatives from private diagnostic, research, reference, environmental regulatory laboratories

Box 1. Biological materials potentially infectious for wild poliovirus

1. **Materials known to be infected with wild poliovirus**	1.**Materials *potentially* infected with wild poliovirus**
• **Clinical/diagnostic specimens:** throat, faecal, blood, CSF, or unfixed autopsy specimens from polio cases.	• Materials stored in a manner known to preserve virus survival.
• **Environmental specimens:** water or sewage samples + polio (controls).	• AND collected in a place and during a time when wild poliovirus was circulating.
• **Research material isolates:** genetic material, cell lines, infected animals.	

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Box 2. Phases of laboratory containment of wild poliovirus

Phase	Actions	Timeline
I. Pre-regional certification of polio eradication	Safe handling of all wild poliovirus (or potentially infectious) materials in PC2/polio laboratory or above. Option to destroy wild poliovirus (or potentially infectious) materials or transfer to regional repository. Substitute Sabin vaccine or non-polio enteroviruses for wild polioviruses where possible.	Year 2000
II. Pre-global certification of polio free status	Increased containment in PC3/polio laboratory or above. Destroy wild poliovirus (or potentially infectious) materials or transfer to regional repository.	One year after the last case of polio reported globally.
III. Pre-cessation of OPV immunisation	Maximum containment in PC4/polio laboratory. Sabin polioviruses to be handled in PC3/polio laboratory.	At least three years after global certification of polio eradication.

Box 3. Members of the National Advisory Committee

- Dr David Anderson, Macfarlane Burnet Centre for Medical Research
- Dr John Andrew, Gribbles Pathology
- Professor Lyn Gilbert, Westmead Hospital
- Dr Gary Grohmann, Therapeutic Goods Administration
- Mr Greg Sam, Department of Health and Aged Care
- Dr Greg Smith, Queensland Health and Scientific Services

Box 4. State/Territory representatives

ACT	Dr Gary Grohmann, Therapeutic Goods Administration
NSW	Professor Lyn Gilbert, Westmead Hospital Dr Dominic Dwyer, Westmead Hospital
NT	Dr Gary Lum, Territory Health Services
QLD	Dr Greg Smith, Queensland Health and Scientific Services Dr Ted Gardner, Department of Natural Resources
SA	Dr Geoff Higgins, Institute of Medical and Veterinary Science
TAS	Dr Jan Williamson, Royal Hobart Hospital
VIC	Dr David Anderson, Macfarlane Burnet Centre for Medical Research Dr John Andrew, Gribbles Pathology
WA	Dr Gerry Harnett, PathCentre

and the Commonwealth Government (Box 3). The national advisory committee continues to work closely with the national coordinator to develop and refine the national survey. In addition to the national advisory committee, representatives from each State and Territory have been appointed to act as local spokespersons and facilitators for the containment process (Box 4).

A national plan for containment

Following the workshop, a draft national containment plan was developed and circulated to members of the national advisory committee. The plan outlined the progress of Australia's containment efforts and plans for implementing the national survey and development of a national inventory. The national plan is summarised in Box 5.

Developing a database of laboratories and institutions that manage laboratories

Before the national survey can be conducted it is necessary to identify every laboratory that could store poliovirus or material that may be infected with wild poliovirus (Box 1). Therefore, a database of laboratories and institutions that manage laboratories has been created. As of July 2000, the database included more than 700 diagnostic, reference,

Box 5. National Plan for Poliovirus Containment - Key Components

- **Coordination** - all States and the Commonwealth represented.
- **National workshop** - to develop a national plan.
- **National Advisory Committee** - to assist with refinement of the national plan.
- **State/Territory representatives** - to support the process at the State level.
- **National database of laboratories /organisations/institutions** - to compile a database of all institutions that may store wild poliovirus or biological materials potentially infectious for wild poliovirus.
- **Pilot surveys** - to evaluate the effectiveness of the planned approach to contacting and surveying institutions on the national database.
- **National laboratory screening survey** - to determine specific institutions that may store wild poliovirus or biological materials potentially infectious for wild poliovirus. These institutions will be surveyed a second time in order to develop a database of all wild poliovirus or biological materials potentially infectious for wild poliovirus.
- **National laboratory freezer clean up** - to encourage all laboratories to identify all biological material in storage and consider option to destroy wild poliovirus (or potentially infectious) materials or transfer to the regional repository.
- **New "enteroviruses for old" scheme** - exchange uncharacterised enteroviruses or non-Sabin polioviruses used for teaching, challenge or control work for prototype enteroviruses supplied by VIDRL.
- **National inventory** - a database of all wild polioviruses or biological materials potentially infectious for wild poliovirus in Australia.

research, regulatory, environmental and manufacturing laboratories, as well as all Australian hospitals, universities and independent research institutes.

Refining the survey form

As discussed above, the participants at the national workshop identified problems with the information pack and national survey form; therefore, it was decided to undertake two pilot surveys. The first survey was conducted during April 2000 and involved surveying a reference laboratory, two teaching hospitals and two universities. The second pilot survey was undertaken in May 2000 targeting the institutions of the national advisory committee members.

The first pilot study used the documentation provided by the Western Pacific Regional Office of WHO.[3] Interviews with managers contacted in the first pilot survey indicated that the documentation was too involved; documentation for the second pilot survey was therefore simplified.

The results of the pilot surveys confirmed some of the problems anticipated by the participants of the national containment workshop. In particular, both the lack of enthusiasm by laboratory staff to participate, and the difficulty for staff in larger institutions to survey all their laboratories within the nominated four-week period, were highlighted. The feedback collected from both surveys was used to modify further the background material, survey form and reporting mechanism that will be used for the national survey.

Implementing the national survey

The lack of compliance with the pilot surveys indicated that a direct and active survey method would be required to ensure an adequate survey response. With the assistance of the Department of Health and Aged Care's Social Marketing Unit, a marketing strategy for the national laboratory survey was developed.

It is planned that in August 2000, a letter and short questionnaire will be posted to all laboratories and institutions on the national database. The aim of the first mail out is to inform laboratories of the national survey and enable VIDRL to identify all relevant laboratories in Australia that could store poliovirus or potentially infectious material. Laboratories identified from the questionnaire will be contacted by telephone and sent an information pack and national laboratory survey form. During this time a telephone information line will operate to answer any queries related to the national survey. The information line will also follow up laboratories that do not return the national laboratory survey form in the nominated time frame.

The information pack will outline what laboratories need to do to complete the national survey. In short, laboratories will be asked to conduct a search for poliovirus infectious or potentially infectious materials and complete the national laboratory survey form, providing details of any poliovirus stocks or potentially infectious material.

The information collected from the laboratory survey form will be used to develop the final national inventory. Once complete the national inventory will finalise Australia's contribution to Phase I of the certification of global polio eradication.

At the completion of phase I, laboratories that store wild poliovirus must comply with PC2/polio containment conditions. These enhanced physical containment level 2 conditions are equivalent to Australian/New Zealand Standard AS/NZS 2243.3:1995[4] with the following added precautions for handling wild polioviruses:

- all staff are to be vaccinated against poliomyelitis; and
- an inventory and dedicated storage area for wild poliovirus stocks is to be established; and
- the substitution of wild poliovirus with attenuated vaccine polioviruses, inactivated antigens or non-polio enteroviruses is to be undertaken.

It is therefore recommended that potentially infectious materials be destroyed if no longer required and only viruses that are readily identifiable by molecular methods be used.

Prior to the activation of Phase II, laboratories whose collections are included in the national inventory will be

contacted to ascertain their proposed containment policy. These laboratories will be required to:

- destroy their polioviruses and poliovirus potentially infectious materials; or
- work with their poliovirus material in a PC3/polio containment laboratory; or
- transfer their poliovirus material to the WHO Western Pacific regional repository at the National Institute of Infectious Diseases, Tokyo, Japan.

Phase III will commence when immunisation using oral polio vaccine ceases. At this stage wild poliovirus must be handled in PC4 containment laboratories and Sabin vaccine virus in PC3/polio containment.

The final results of the national laboratory survey will be published later in 2000. For further information regarding the National Survey please contact the National Coordinator of Laboratory Poliovirus Containment, Nittita Prasopa-Plaizier, on (03) 9342 2603.

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New publication

The first comprehensive report on the recent epidemiology of vaccine preventable diseases and vaccination coverage in Australia is now available.

The National Centre for Immunisation Research and Surveillance of Vaccine Preventable Diseases (NCIRS) has prepared a report entitled *Vaccine Preventable Diseases and Vaccination Coverage in Australia, 1993–1998* which provides a comprehensive national picture of the recent epidemiology of vaccine preventable diseases (VPDs). The report reviews notifications (1993-8), hospitalisations (1993/4-1997/8), and deaths (1993-7) for eight diseases on the routine childhood vaccination schedule (diphtheria, *Haemophilus influenzae* type b, measles, mumps, pertussis, poliomyelitis, rubella, tetanus), and four other diseases potentially preventable by childhood vaccination (hepatitis A, acute hepatitis B, invasive pneumococcal disease, varicella). It also examines vaccination coverage data from the Australian Childhood Immunisation Register (ACIR) and Australian Bureau of Statistics (ABS) for the same period.

The report brings together for the first time all three national sources of routinely collected data about vaccine preventable diseases, for all age groups in Australia, together with information about vaccination coverage. It is a valuable resource for health professionals providing evidence of the impact of changes in vaccination practice over the six years, particularly notable for measles and *Haemophilus influenzae* type b, and a baseline against which further changes can be measured.

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