APRIL | 2021

BIO-BABBLE

Newsletter of the Australasian Biospecimen Network Association

LIVING DANGEROUSLY – BIOBANKING AND BIO-PRESERVATION OF DEADLY PATHOGENS

Georget Reaiche-Miller

Biobanking has played a role in infectious disease eradication and vaccine development for centuries. One of the earliest examples demonstrating the importance of sample collection for vaccine development, is Smallpox. The smallpox vaccine, developed by Edward Jenner in 1796, was the first successful vaccine to be developed, however, many would be surprised to know that immunity against this awful disease was achieved centuries earlier.

It is believed that as early as the 1500's, samples from smallpox scabs were collected and stored for use in immunisation during epidemics. 'Technicians' would grind the collected smallpox scabs, aerosolise the matter and administer into the patient's nostrils. A little later this method of delivery was refined and patients were inoculated by scratching the matter from the smallpox scabs directly into the skin of the patient – a method we now know as variolation. Variolation was a highly controversial method. While it demonstrated high levels of protection, 2-3 % of those variolated died of smallpox as opposed to 20-30% who died from natural smallpox infection. In addition to this, as variolation actually caused mild infection in the patient, those variolated could pass the disease on to others, further spreading disease.

Continued on page 2

UPDATES

ABNA 2021 Conference Poll

Given the changing nature of border closures and availability of conference travel options, the 2021 Conference Organising Committee is reassessing the feasibility of a face-to-face event in Perth. Combined with the feedback from our members we will be in touch soon with information regarding the format of this year's ABNA conference.

CSIRO 2021 Polio Survey

Thank you to our members who have already taken part in CSIRO's call on all facilities to complete a short 5-minute survey to identify or exclude facilities that may have samples containing Poliovirus potentially infectious materials.

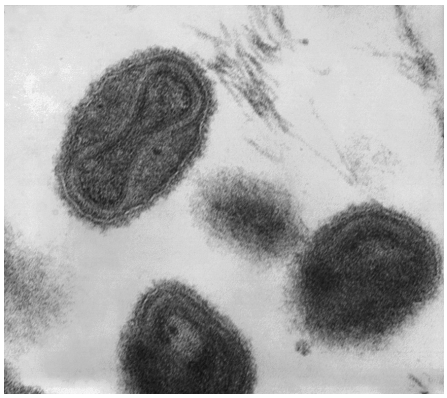
While the survey is voluntary, to ensure the accuracy of the information – completing the survey is important even if the facility does not hold any biological samples or potentially infectious material.

A reminder that you have a few more days if you intend to complete the survey, it closes on April 30th.

Click **HERE** to access the survey information.

In the late 1700's Edward Jenner tested the hypothesis that infection with cowpox could protect a person from smallpox infection, without the risk of becoming contagious. Cowpox, could be spread from cows to humans with dairymaids having sores on their hands. These dairymaids were thought to be protected from smallpox naturally after having suffered from a cowpox infection. In 1796, Jenner inoculated James Phipps, an 8 year old boy, with material collected from cowpox sores. Phipps became unwell for several days but made a full recovery. After Phipps had made a full recovery Jenner challenged Phipps with material that had been collected from a human smallpox scab. Phipps remained healthy and showed immunity to human smallpox. Following this, Jenner proceeded with the collection and biobanking of additional cowpox scabs which were then used to produce dried vaccine material. This material was later inoculated into 22 other individuals and demonstrated the same level protection. From this point on, vaccine development advanced, resulting in the development of second and third generation smallpox vaccines. These vaccines used the same original strain and a more attenuated strain developed with modern cell culture techniques adhering to current health standards. The collection and storage of the early smallpox matter as well as the 1st generation smallpox vaccines allowed the eradication of smallpox by 1980 as declared by the World Health Organisation. Smallpox was able to be eradicated due to a number of reasons; the infection is very visible (very distinctive rash), it has a very small incubation period so it doesn't give the virus much chance to spread and more importantly, humans are the only known hosts of smallpox. If a disease has an animal reservoir the eradication becomes more complex despite the development of effective vaccines.

Smallpox samples, both of the virus and the vaccines are still stored in specialised facilities. Virologists remain unsure whether smallpox virus samples should be stored or destroyed. Those in favour of the virus being stored live believe it may help preparations should we ever face biological warfare. As such, the Smallpox Vaccine Emergency Stockpile was created – biobanked at the WHO headquarters in Switzerland. There are other stockpiles banked by donor countries which have pledged their stock in time of need. These allegedly consist of 31.01 million doses of smallpox vaccine held by the United States, New Zealand, Germany, France and Japan. Those in favour of the live smallpox virus being destroyed believe that accidents and human errors post a threat and that a small mistake could lead to an outbreak of the virus. What is more concerning is that in 2014, there were 327 vials of smallpox that were unaccounted for in a biobank at the National Institutes of Health.



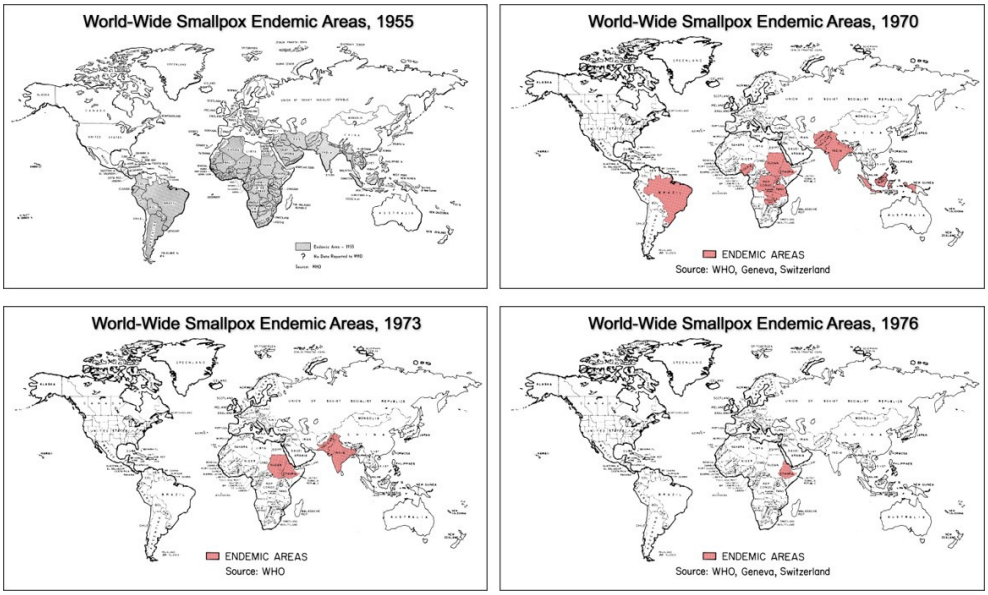
Under a magnification of 370,000X, this transmission electron microscopic image depicts a number of smallpox virus virions. These organisms display an internal, dumbbell-shaped structure that represents the viral core, which contains the viral DNA.

Image courtesy of CDC Public Health Image Library.
Content provider: Dr. Fred Murphy; Sylvia Whitfield, 1975

The CSIRO's Australian Centre for Disease Preparedness (ACDP, formerly known as the Australian Animal Health Laboratory) helps protect Australia's multi-billion dollar livestock and aquaculture industries, and the general public, from emerging infectious disease threats. It is a high-containment facility designed to allow scientific research into the most dangerous infectious agents in the world.

As one of only six high-containment animal research centres internationally, the ACDP works with national and international human and animal health organisations as part of a global One Health network.

In addition to Smallpox there are other infectious diseases which are on the road to eradication, examples being Polio and Measles. However, these have proven to be more challenging for various reasons. In the case of Polio, though it has been eliminated in most countries through widespread vaccination, there is still circulating vaccine derived poliovirus (cVDPV). Outbreaks of the cVDPV only occur in an area where the population are under immunised. These outbreaks are usually controlled with 2-3 rounds of stringent vaccination campaigns. In addition to this, Polio infections do not show highly recognisable symptoms which means an infected person can spread the virus to others unknowingly. Two of the three wild type strains have been eradicated worldwide with only 2 countries having the remaining polio wild type strain circulating. Since the Global Polio Eradication Initiative (GPEI) was developed in 1988 it has reduced polio cases by 99%. Its goal is to complete the eradication of all wild type and vaccine-related poliovirus. In the case of Measles, other aspects of the virus have proven challenging, although an infected person has a highly visible rash, the incubation period is quite long – up to 14 days between exposure and the development of the rash. This means that an individual can be contagious before the rash appears, spreading the virus far and wide.



Maps from 1955, 1970, 1973 and 1977 revealed the reduced distribution of smallpox and the countries in which it was still endemic. The world's last reported case of endemic smallpox occurred in Somalia in October 1977. Subsequently, in December 1979, the WHO's Global Commission for the Certification of Smallpox Eradication certified that the world was smallpox-free.

Image courtesy of CDC Public Health Image Library.

Complete eradication of the infectious diseases mentioned above and control of others such as Influenza can only be achieved with increased surveillance and vaccination in order to increase herd immunity. There are many reference laboratories and affiliated biobanks for infectious diseases worldwide which are responsible for rapid identification of new cases, outbreaks and new strains. These reference laboratories are invaluable biobanks as they are responsible for the collection, storage and analysis of specimen collections not only for immediate diagnostic purposes but also for research programmes. Ultimately these biobanks are responsible for vaccine development and infection control. Having a network of biobanks that work closely with these reference laboratories has proven beneficial for investigation into the areas of population immunity, changes in epidemiology, drug susceptibility/resistance and molecular characteristics of particular infectious diseases.

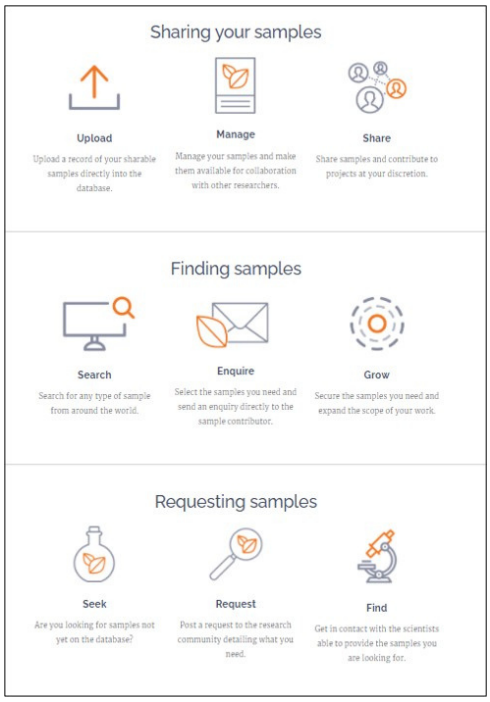
Although Biobanks are key to infectious disease control and eradication, the question still remains; can complete eradication of an infectious disease occur if samples containing the infectious agents continue to be stored? In the case of Smallpox, samples are stored in various locations around the world with a number already unaccounted for. In the case of Polio, patient samples collected during the time of outbreaks remain a potential source of renewed infection. In the case of SARS-CoV-2, are samples collected during a pandemic being regulated, stored and used appropriately to avoid a re-release of the infectious agent? Human errors do occur and based on our current experience of SARS-CoV-2, are we one small human error away from a more devastating outbreak?

Only time will tell…

OTLET - AN ONLINE NON-HUMAN BIOBANK

Lauren Meyer

We never set out to build a company, much less an online biobanking system. However, back in 2013 at the beginning of our research careers, the samples we needed were difficult to access and required costly field expeditions. This was true for nearly all our colleagues collecting samples from wild animals across the globe. For decades, billions of valuable samples built up in university freezers, storerooms, and sheds (my colleague has >2,000 bags of seal poop in his unairconditioned shed), while research teams continued to collect the samples they needed with no knowledge of what was already available. It wasn't until I was in desperate need of shark livers and overheard an offhanded comment at a conference coffee cart (pre-covid of course) that the penny dropped. My colleague in Brisbane had just disposed of 20 tiger shark livers, the exact samples I had spent three months searching for. Even within the relatively small circle of shark researchers in Queensland, we somehow failed to communicate, with costly ramifications. It took less than an hour to realise the natural sciences needed an online sample sharing "biobank", and we gave ourselves two months to build one. Five years later, in 2018, we launched Otlet – enabling researchers to share and request plant, animal, or spoil samples directly from their colleague's collections.



A summary of how Otlet works. Click on the image to go to their website.

Unlike most biobanks, Otlet does not physically house any samples. Instead, it is an online database where users can register their samples, thus making them available to colleagues upon request, just like a specialised version of Gumtree. This facilitates sample sharing globally, without Otlet bearing the cost of housing physical samples. It also leaves sample curation, storage, and management in the hands of researchers. Additionally, this ensures that contributing researcher retains ownership, and can decide what projects they want to contribute towards, and what level of co-authorship they require in return.

With no other online biobank for non-human samples, Otlet is working to reach and accommodate the needs of millions of natural science researchers globally. To do so, the Otlet process is lean by biobanking standards, with limited necessary information to facilitate sharing. Membership is also free. Researchers from all disciplines, countries, academic levels, and institutions are encouraged to join. By fostering global communication about existing samples and projects, Otlet saves researchers time and money while growing the capacity for large-scale, high impact projects.

If you have not already, sign up to Otlet.io today and start uploading your research samples to get involved with more projects around the world.

Contact information
Dr. Lauren Meyer
Co-founder and CEO
Lauren@otlet.io

Otlet.io;
Info@otlet.io
@OtletResearch

Otlet

REGISTER NOW: https://www.isber.org/store/viewproduct.aspx?id=17664285

PRICING

Registration includes access to the complete webinar series, including all live sessions, session recordings, and on-demand webinars.

ISBER Member: USD $187 / series

Non-Member: USD $231 / series

Bulk Discount*

Organization members may purchase the webinar series for their staff using a bulk discount for registering more than two staff members. The discounted rate is USD $125 per staff registration. Please email info@isber.org to take advantage of the bulk rate.

DESCRIPTION AND SCHEDULE

The ISBER Best Practices: Recommendations for Repositories Fourth Edition presents the most effective practices for the management of biological and environmental specimen collections and repositories. These are either evidence-based or consensus-based practices for collection, long-term storage, retrieval and distribution of specimens. They promote the availability of high-quality biological and environmental specimens for future research.

The Best Practices webinar series will include 1-hour live sessions, each presenting a different topic in the ISBER Best Practices, with time included for question and answer. Each live session will be recorded and available for on-demand viewing if you are unable to attend the live session. In addition to the live sessions, the series includes a number of pre-recorded sessions available for on-demand viewing as well.

The live session schedule is as follows:

1.March 24, 2021: Planning Considerations
2.April 14, 2021: Specimen Collection, Processing, Receiving and Retrieval
3.June 2, 2021: Storage and Equipment
4.June 23, 2021: Legal and Ethical Issues - Consent/IRB
5.July 21, 2021: Legal and Ethical Issues - Non-Human
6.August 18, 2021: Repository Information Management Systems
7.September 22, 2021: Quality Management with Method Validation and Quality Control
8.October, 2021: Quality Management
9.November 17, 2021: Specimen Access, Utilization, and Disposition

The following topic presentations will be available for on-demand viewing in April, 2021:

1. Facilities
2. Safety
3. Training
4. Cost Management
5. Packaging and Shipping