ePathWay
THE ROYAL COLLEGE OF PATHOLOGISTS OF AUSTRALASIA

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IN THIS ISSUE

INTERESTING FACTS

16m

The estimated number of children which have been spared lifelong disability due to the success of the polio eradication program[1]

1988

The year the Global Polio Eradication Initiative (GPEI) was launched.

9–12 days

The typical incubation period for polio.

Source:

[1] http://polioeradication.org/news-post/nigeria-three-years-free-from-wild-

Welcome to the October issue of ePathWay

ePathway is an e-magazine designed for anyone interested in their health and wellbeing and the integral role pathology plays in the diagnosis, treatment and management of diseases.

This month's issue of *ePathway* looks at the following:

- Polio: The Endgame
- Toads that can tell if you're pregnant: History of the pregnancy test
- The power of fine needle biopsy in the developing world
- Promoting pathology in developing communities

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Polio: the endgame

poliovirus/

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In 1988, the Global Polio Eradication Initiative (GPEI) was launched with the goal of achieving and sustaining a world free of polio. We speak to Doctor Clare Heney and Doctor Anna Hume to discuss the current efforts to prevent polio, and to understand why eradication is biologically feasible.

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Toads that can tell if you're pregnant: History of the pregnancy test

As recently as the 1920s, baby rabbits, mice, rats or even toads were used to determine whether or not a woman was pregnant. We speak to Doctor Lee Price to discover more about the weird and wonderful methods used for pregnancy testing.

read more »

The power of fine needle biopsy in the developing world

Since 2007, Associate Professor Andrew Field has been part of a team running tutorials in places such as Uganda, Tanzania, Nigeria, Kenya, Ethiopia and Botswana. Here, we learn more about their work and find out why they have been teaching Fine Needle Aspiration (FNA) biopsy in developing communities.

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Promoting pathology in developing communities

The RCPA is actively engaged in an initiative called Pathology Education Outreach which has the aim of promoting pathology education and training in the South Pacific and South-East Asia. We speak to Doctor Clare Heney who explains more about the provision of training and education in the Solomon Islands.

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Polio: the endgame

In the 30 years since the launch of the Global Polio Eradication Initiative (GPEI), reported worldwide cases of paralytic polio have fallen from more than 350,000 in 1988 to 33 in 2018[1]. This is largely due to the success of a global vaccination program to immunise individuals and protect communities against the poliovirus[2]. To tie in with Polio Awareness month, we spoke to Doctor Claire Heney and Doctor Anna Hume, Microbiologists at Pathology Queensland, to discuss the current efforts to prevent polio.

“Poliomyelitis or polio is a systemic viral infection caused by the poliovirus. It is highly contagious and is transmitted by faecal-oral routes with a typical incubation period of 9 to 12 days. Transmission is highest in areas with high population densities, poor sanitation and hygiene in/and tropical or subtropical conditions,” said Doctor Heney.

Infection with the virus can cause infection of the central nervous system (CNS), leading to paralysis. Although less than 1% of poliovirus infections result in paralysis, it is estimated that, since 2000, 16 million children have been spared lifelong disability due to the success of the eradication program[4].

“Diagnosis is based on a combination of clinical presentation and detection of the virus in a patient’s faeces, a throat swab or cerebrospinal fluid. The laboratory will use polymerase chain reaction (PCR) or cell culture to detect the virus. Serology [measuring antibodies to the virus in blood serum] may help make the diagnosis, especially if a patient has not been immunised, but comparison of 2 samples of blood collected at least 3 weeks apart is needed, which makes this method slow and hard to accomplish,” said Doctor Heney.

In 1988, the Global Polio Eradication Initiative (GPEI) was launched with the goal of

achieving and sustaining a world free of polio. Because humans are the only natural reservoir of poliovirus, eradication is biologically feasible.

“For a country to be declared polio-free there needs to be no evidence of ongoing polio transmission. Typically, the duration required for no new cases within a country is 12 months, but this depends on adequacy of surveillance and known recent patterns of transmission. Since polio infection does not usually cause paralysis, even one case of paralysis can be indicative of ongoing endemic infection with perhaps 200 clinically inapparent infections. Certification of a region therefore requires the absence of poliovirus transmission for at least three consecutive years,” said Doctor Hume.

As recently as 2012, Nigeria accounted for more than half of all polio cases worldwide. A significant reduction of cases was then achieved through extensive coordination of services with a focus on increased childhood vaccination, and in 2015 Nigeria was declared polio free. In 2016, however, wild poliovirus was detected in Northern Nigeria for the first time in two years, prompting Nigeria and neighbouring countries to hold multiple vaccination campaigns to raise population immunity and prevent spread of the virus [3].

“At this point in time, there are three countries where polio is considered still endemic- Nigeria, Afghanistan and Pakistan. If Nigeria can be determined as free of wild type polio transmission for greater than three years, this would enable the African continent to be certified as wild polio free, which could happen as early as mid-2020, [4] said Doctor Hume.”

Significant gains continue to be made in the reduction of polio cases through a combination of immunisation, active surveillance and outbreak management. The ongoing GPEI strategy aims for complete elimination of circulating poliovirus, along with progressive changes to vaccination strategies.

References:

[1] http://polioeradication.org/who-we-are/our-mission/

[2] https://www.sahealth.sa.gov.au/wps/wcm/connect/Public+Content/SA+Health+Internet/Health+topics/Health+conditions+prevention+and+treatment/Infectious+diseases/Poliovirus+infection/

[3] http://polioeradication.org/where-we-work/nigeria/

[4] Breaking the Last Chains of Poliovirus Transmission: Progress and Challenges in Global Polio Eradication http://polioeradication.org/news-post/nigeria-three-years-free-from-wild-poliovirus/

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Toads that can tell if you're pregnant: History of the pregnancy test

Today, the pregnancy test is a straight-forward procedure which can be performed by a nurse or doctor, or it can be done at home with a kit bought from a pharmacy. Here we take a quick look at the interesting history of the pregnancy test and speak with Doctor Lee Price, Pathologist-in-Charge of the Sullivan Nicolaides Pathology Department of Biochemistry to learn more.

"A pregnancy test works by checking a woman's blood or urine for the presence of human chorionic gonadotropin (hCG), which is a hormone made by the placenta. The modes of testing for pregnancy can be dated back hundreds of years, with some methods a lot stranger than others. It wasn't really until the beginning of the 1920s, when people realised that pregnant women produced something that could be found in the urine, that pregnancy testing methods were revolutionised," said Dr Price.

The history of the pregnancy test can be dated back as far as the ancient Egyptians when techniques involved mixing urine with various grains to determine if a woman was pregnant. If the grains germinated, this meant a positive result and, depending on which grain germinated, the gender could be identified.

New and varied techniques evolved into the Middle Ages when physicians would analyse a urine sample based on its appearance and would also mix the sample with wine or alcohol in order to determine a result. These methods did not generate much success, and it wasn't really until around 100 years ago that the first major steps were taken in developing the pregnancy test.

In the 1920s, scientists discovered that there is a specific hormone, now known as hCG,

which is only found in pregnant women. This marked the first time a single compound could be used for pregnancy testing purposes, but was not good news for baby rabbits, mice or rats. In order to determine the presence of hCG, a sample of a women's urine would be injected into the animals – if hCG was present then the animal would go into heat, indicating that the woman was pregnant. It was later found that injections of hCG in rabbits, rats and frogs would cause ovulation. This "rabbit test" was surprisingly considered to be around 98 percent accurate but the tests were expensive, required the sacrifice of several animals, and often took days to get results.

"Due to the similarity between hCG and luteinizing hormone (LH), at this time most bioassays were unable to distinguish between the two except at extraordinarily high levels of hCG. A major breakthrough was reached in 1972 when scientists reported a radioimmunoassay pregnancy test that could distinguish between these two hormones in a woman's urine, therefore making it potentially useful as an early test for pregnancy. Soon after, the pregnancy test could be purchased and used in the privacy of one's home.

"Further advances have really been quite recent. Up until not long ago, you had to wait up to two-weeks after a missed period before beginning to test for pregnancy. Modern laboratory tests, however, are highly sensitive and can detect pregnancy before missed periods - even as early as eight to ten days after ovulation. In the majority of cases now, we perform a blood test around the time of a missed period or in the first week after, when hCG levels will be increasing rapidly," said Dr Price.

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The power of fine needle biopsy in the developing world

Cytopathology is the diagnosis of diseases by looking at single cells and small tissue fragments of cells. Compared with surgical tissue biopsy, it is more acceptable to patients, is rapid and less expensive with fewer complications and less discomfort, and is more cost effective. We spoke with Associate Professor Andrew Field to discuss how these techniques are being applied in developing countries.

A Fine Needle Aspiration (FNA) biopsy is a simple procedure that involves passing a thin needle through the skin to sample fluid or tissue from a cyst or solid mass, which will then be analysed under the microscope. Since 2007, A/Prof Field has been part of a team which has been organising and teaching tutorials on FNA biopsy cytopathology in sub-Saharan Africa and in low middle-income countries. The team conducting the tutorials has mainly included Dr William Geddie from University Health Network in Toronto, and Dr Matthew Zarka from the Mayo Clinic in Scottsdale, Arizona.

“We have been going to places such as Uganda, Tanzania, Nigeria, Kenya, Ethiopia and Botswana and have also been using Cape Town and Johannesburg in South Africa as they are very accessible to most of sub-Saharan Africa. When we visit these countries, we run a tutorial for 4 to 4.5 days where we not only teach a diagnostic approach to what you see down the microscope, but also how to perform a FNA biopsy and make high quality direct smears. We also offer demonstration clinics where we perform the FNA biopsy and supervise the pathologists and trainees closely so they can then perform the procedure on their own.

“The reason FNA biopsy is so important in these developing countries is because it

requires minimal infrastructure. It simply involves a very thin needle which we put into palpable lesions of the breast, thyroid, lymph nodes and skin with very minimal preparation required. These small needles can also be put anywhere, particularly when ultrasound guidance is available - into the liver, lung, soft tissue tumours in muscle etc. The benefit of taking these procedures to the developing world is that instead of performing a surgical biopsy which includes local or general anaesthetic, operating time, surgeons, anaesthetists, nurses, an operating suite and equipment, we can perform a simple FNA biopsy, therefore decreasing the load on the medical system.

“The emphasis in developing countries used to be on infection, for example, malaria, tuberculosis (TB) or AIDS, but now it’s becoming relatively more important to diagnose non-infectious diseases such as cancers. Big steps have been made in terms of managing infections and now there is an increased focus on diagnosing breast cancer, cervical cancer, lung cancer, lymphoma etc. which is where the FNA biopsy can become a major tool.

“Until recently, if a patient presented with a lump in the neck, the clinician wouldn’t know if it was TB, metastatic cancer, a benign lump or a high- or low-grade lymphoma, for example. The fine needle biopsy gives the opportunity to triage and make a diagnosis – and sometimes a very specific diagnosis without the need for an invasive procedure. Sometimes we can’t say definitively “you have low grade lymphoma” but if the test is inconclusive then that’s only one patient requiring a surgical incision out of perhaps 20 who would usually need a surgical biopsy. A fine needle biopsy dramatically reduces the number of cases that need an incisional biopsy. That’s the power of it.

“Over time we have been seeing the long-term benefits of running these tutorials. Often, we will come into a place where things are not being done well and we have a huge impact by introducing FNA biopsy. I sometimes speak with people who tell me they were a resident who attended our previous tutorials back to January 2009 and are now running three FNAB clinics a week. This demonstrates the increasing use of FNA biopsy and it potential to improve patient care.”

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Promoting pathology in developing communities

The RCPA is actively engaged in an initiative called Pathology Education Outreach which has the aim of promoting pathology education and training in the South Pacific and South-East Asia. With the help of volunteers who visit countries in these regions, the initiative has the overarching goal to improve the lives of the people that they visit, and to make communities more supportive, connected and inclusive. Here, we discuss what's involved, and speak to Doctor Claire Heney, Microbiologist at Pathology Queensland to learn about her work with a small team in the Solomon Islands.

The Pathology Outreach Program promotes pathology in countries such as Fiji, Papua New Guinea, Vanuatu, Western Samoa, Tonga, the Solomon Islands, and other Pacific and South-East Asian nations. The program is supported by the Pathology Education Outreach Committee (PEOC) which provides training and education to people in those countries to complement pathology service delivery and build clinical capacity. The training and education is provided by pathologists working in these developing communities on a voluntary or self-funded basis.

Different initiatives are put in place, depending on the region. In the Solomon Islands for example, training and infection control workshops are provided, and recently a new Pacific Region Infectious Diseases Association (PRIDA) was established. PRIDA focuses solely on the currently neglected areas of infectious disease management including bacteriology, sepsis and life-threatening infection, antimicrobial resistance and hospital infection prevention.

"PRIDA was formally established in 2017 with the aim to improve diagnosis, management and prevention of infectious diseases in the Pacific Region. For the past three years, I have been involved with a small team of people who have been going into

a laboratory at a hospital in Honiara in the Solomon Islands to provide antibiotic guidelines, information on infection control and anti-microbial resistance, and also to be hands on in the laboratory.

“The team is made up of an infectious disease physician, a microbiologist, a laboratory scientist, an infection control practitioner and a pharmacist who assists with pharmacy surveys. Each year, with suport provided by the College, this team provides around three days of workshops with a different theme each year. On 4th November a team will fly in for 1-2 weeks to provide blood culture workshops. They will teach emergency doctors the basics, such as when to take blood for cultures etc. In the laboratory, they will assist with the processing of blood cultures, making sure the methodology and quality control is good, and ensuring that the people there can read them properly in order to get results which are accurate and reliable,” said Doctor Heney.

To provide support, the RCPA Foundation Pathology Education Outreach Fellowship was established by the College in order to access funding to assist College Fellows and Trainees such as Doctor Heney to volunteer their time to promote pathology in developing countries. Funding is made possible through voluntary donations from Fellows and Trainees, and goes towards costs including teaching and assessment of pathology training in a tertiary institution or laboratory, assistance with training of staff, setting up of a laboratory, purchase of training material or laboratory equipment, and the travel and accommodation of the volunteers.

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