Newborn screening innovation ramps up at Murdoch Children's in Australia

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As interest and investment in newborn bloodspot screening (NBS) grows across Australia, the Murdoch Children's Research Institute in Melbourne is gaining momentum as an important centre for NBS research and innovation in the country.

Based at the Royal Children's Hospital in Melbourne, the capital of the State of Victoria in south-eastern Australia, Murdoch Children's is one of the largest child health research institutes in the world. It manages a portfolio of research programmes that generate knowledge and drive benefits for children in Australia and around the world. It also hosts some clinical services, including Victoria's NBS programme.

While Murdoch Children's is known for much more than NBS and clinical genetics, its impact in this specific space is noteworthy and growing. From expansion of its existing NBS panels to developing novel approaches for detecting rare genetic diseases in newborns, Murdoch Children's is running projects that showcase both the power of NBS as a public health tool and its potential for delivering even more benefits in the coming years.

Expanding existing NBS panels

Murdoch Children's provides NBS services through Victorian Clinical Genetics Services (VCGS), a non-profit subsidiary that offers prenatal, childhood and adult genetics services. All NBS services at VCGS are publicly funded by the Victorian Department of Health and offered free of charge to state residents.

In its standard NBS panel, VCGS currently screens for 26 conditions. Last year, it added congenital adrenal hyperplasia, and in keeping with federal efforts to expand and standard dies NBS panels across the states, it is now in the process of adding NBS tests for spinal muscular atrophy (SMA) and severe combined immunodeficiency disorder (SCID), two tests that were recently made available in the neighboring state of New South Wales.

Expanding the panels by even one condition requires considerable effort, notes Dr. Ronda Greaves, Deputy Head of Biochemical Genetics at VCGS. The SMA/SCID tests will require them to use molecular methods in first-tier analysis for the first time, but Greaves says that implementing the technology is the easy part. The harder part is training the staff to adapt to changing workflows without compromising the integrity of the existing NBS programme.

Educating and engaging the community in research

In addition to managing NBS services, Murdoch Children's also supports community outreach efforts that ensure high uptake of NBS services and help maintain public trust. These efforts have increased in recent years, according to Monica Ferrie, head of the Genetic Support Network Victoria, an organisation that works with rare disease patient groups and families across the state.

Proactive community engagement also drives support for NBS research programmes. Dr Meg Wall, CEO of VCGS, estimates that roughly 85-90% of parents who receive NBS services will consent to sharing DE identified newborn blood spot data with Murdoch Children's investigators.

Some of this NBS data is also linked with the Generation Victoria (Gen V) initiative, a $55 million whole-of-state natural history study that aims to enroll 100,000 newborns by late 2023 [1]. Through Gen V, parents of newborns will share longitudinal data about various health, social and developmental parameters. This will facilitate many types of research, including better understanding of the clinical utility and economic impacts of NBS programmes.

Developing and testing novel NBS methods

Murdoch Children's also supports researchers who focus on creating and assessing new NBS modalities. One of these researchers is Dr David Godler, a molecular geneticist who leads the Diagnostics and Development Laboratory at Murdoch Children's. Godler is currently developing a low-cost diagnostic method called **EpiGNs**, which uses a combination of DNA methylation testing and genomic workflows to expand NBS panels.

In prior studies, EpiGNs showed promise as a cost-effective method for expanding NBS panels to cover numerous conditions, including Fragile X, Prader-Willi, Angelman and Dup15q syndromes [2]. In 2022, Godler won a $3 million grant from the Medical Research Future Fund (MRFF) [3] and an additional $1.8 million from the National Health and Medical Research Council Ideas Grants to develop this work further [4].

For next steps, Godler intends to use these two grants to test his EpiGNs method on an expanded panel that includes 8 conditions, generating further data on its potential cost effectiveness and clinical utility. Some of this research will leverage the GenVprogramme, allowing Godler to assess the impact of early detection of genetic disease on longer-term clinical and health economic outcomes.

Assessing the power of Whole Genome Sequencing (WGS)

Another MRFF-funded researcher at Murdoch Children's is Dr. SebLunke, who serves as Head of the Division of Genetics and Genomics at VCGS, where he runs one of the largest clinical genetics labs in Australia. Last year, Lunke won an AUD $3 million grant from MRFF to assess the role of whole genome sequencing (WGS) for NBS.

In the first phase of this project, which will be called **Baby Screen+**, Lunke will trial a WGS model of NBS on a thousand babies in Victoria. Although WGS enables screening for potentially thousands of conditions, Lunke will start with a panel of several hundred conditions that are well validated, clinically actionable and meet predetermined bioethical criteria. The ultimate goal is to better understand how to use WGS data responsibly at birth and over the life of care.

Lunke and colleagues are careful to point out that WGS is not a silver bullet for genetic disease detection and is unlikely to replace traditional NBS methods anytime soon. In fact, running both methods in parallel may eventually allow NBS labs to detect a broader array of conditions with greater accuracy, notes Dr. David Amor, a clinical geneticist and research group leader at Murdoch Children's who serves as a co-investigator on both the EpiGNs and WGS grants.

Building the broader ecosystem of rare disease diagnostics

Beyond NBS, Murdoch Children's and VCGS are working to drive improvement in the broader array of rare disease diagnostics that facilitate early and rapid detection of genetic diseases. This includes work in carrier screening, non-invasive prenatal testing, and acute care genomics (they are among the fastest providers of whole genome sequencing services in Asia Pacific).

Advances in these areas may shape the future of NBS, and as Australia continues to drive research and innovation in this exciting field, Murdoch Children's and VCGS will be places to watch.

This article was written by Will Greene, Healthcare Engagement Manager at Roche Diagnostics Asia Pacific and co-lead of Project Strong bow, an initiative to drive best practices in NBS through educational content and community building. Other articles and videos that were produced as part of this project can be found on our Newborn Screening page.

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