KCCG NEWS

An update from the Kinghorn Centre for Clinical genomics

KINGHORN CENTRE FOR CLINICAL GENOMICS

GARVAN INSTITUTE OF MEDICAL RESEARCH

Issue 1, August 2015

Our inaugural newsletter

Welcome to the new bimonthly newsletter from the Kinghorn Centre for Clinical Genomics (KCCG). There has been growing interest in our activity and we're excited to update you on our progress. At our inception in October, 2012, we had just six staff and two instruments generating up to 750 Gb per week. We have now grown into an interdisciplinary Centre of almost 40 staff and 12 instruments, generating up to 50,000 Gb per week. We hope you enjoy the update.

Clinical Accreditation

Our centre is in the process of seeking NATA accreditation (see reverse), which will allow clinicians to sequence the genomes of their patients for diagnostic purposes. July 1st 2015 saw the achievement of a key milestone towards gaining NATA accreditation. The process by which samples are received, analysed and interpreted has been put in place, allowing us to enter into a stabilised testing period in preparation for the submission of a formal application to NATA later this year. The Centre is expected to be the first clinically accredited whole genome service in the Southern Hemisphere, arising from a fruitful collaboration with St Vincent's SydPath Pathology Service and NSW Health.

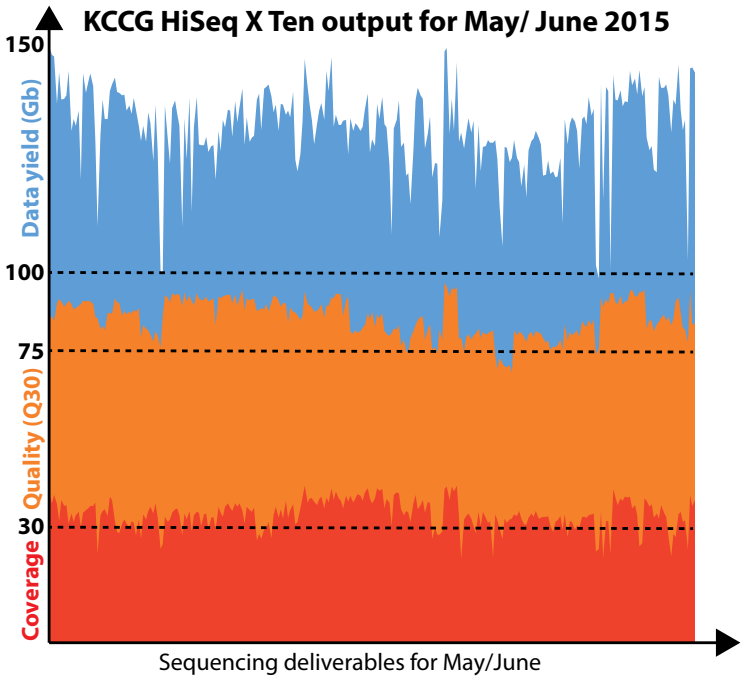
Sydney Genomics Collaborative kick-off

In 2014, the NSW State Government announced the funding of a genomics research collaborative, comprising three programs to support the expansion of genomic research and medicine in NSW. The 2015 recipients of the NSW Health Collaborative Genomic Medical Research Grants Program were announced in March. Four teams of NSW-based researchers will share $2.72 million to explore better treatments for cancer, mitochondrial disease, inherited heart disease in babies and schizophrenia. Sequencing is well underway with more than 600 samples received.

Associate Professor Murray Cairns, one of the Sydney Genomics Collaborative grant holders, visited KCCG in May 2015.

KCCG Production News

Throughout May and June, 560 genomes were sequenced on Illumina's HiSeq X Ten platform. The quality and quantity of data generated for each research genome returned to our customers far surpassed Illumina's guidelines (Figure 1).



KCCG Deliverables for May / June 2015

Performance metric	KCCG performance	Illumina specification
Average data yield / lane (Gb)	129.3	>100
Average quality / lane (%)	81.6	75
Average coverage / lane (X)	32.2	30

The average coverage (red) per genome achieved was 32X, exceeding the 30X minimum specification. This corresponded to an average of 129 Gb per genome, far exceeding the Illumina-guaranteed 100 Gb specification. The quality of the research data, as determined by the Q30 metric (orange), averaged at 82%, exceeding Illumina's minimum 75% specification. Finally, we received 1055 samples from around the world for whole genome sequencing, reflecting an increase in interest and reputation of KCCG.

Publications

Phenomics team leader, Dr Tudor Groza was first author on a paper published 2 July 2015 in the *American Journal of Human Genetics (AJHG)*. The paper described how the Human Phenotype Ontology — a set of terms used to consistently describe observable traits associated with human disease — could be extended from rare disease to common human disease. This ontology is already a valuable resource for translational bioinformatics and underpins work at KCCG.

Profile: Dr Leslie Burnett, Genetic Pathologist

NSW Health Pathology is providing advice to the Garvan Institute to help it achieve accreditation by NATA (the National Association of Testing Authorities, Australia) as a diagnostic pathology lab.

NATA accreditation is mandatory for all Australian laboratories wishing to perform diagnostic tests. The accreditation program itself is a hybrid – not a standard regulatory body, but one that works in collaboration with the professions, giving it a combination of regulatory and professional rigour.

This accreditation is a vital step in putting the full functionality of high-throughput whole genome sequencing to work in Australia. "The diagnostic possibilities that will result from the collaboration between NSW Health and Garvan will make enormous contributions to increased knowledge as patients present for testing," said Dr Leslie Burnett, Genetic Pathologist with NSW Health Pathology. Dr Burnett also expects the technology will lead to an explosion of knowledge in the next decade or so that he likens to the discovery of the microscope – it will fundamentally change how medicine is done.

In most branches of medicine, knowledge develops incrementally, with occasional breakthroughs like antibiotics or vaccination. But genomics is different because of its interdisciplinary nature. In bringing together such a range of minds from medicine, biological sciences and information technologies, it creates a cauldron of talent that means we're only limited by our imaginations in understanding the meaning of the flood of information we're now gaining.

"In a very short time, our knowledge has changed dramatically. Where once we thought inherited disease was all about just a single gene, then combinations of genes. We now have the whole genome to explore," said Dr Burnett.

The challenge is to sift out what we know, and contribute to new knowledge that will emerge as we learn more and try to match different diseases to different genetic variations. Gradually a diagnostically-accurate pattern will emerge.

"It's somewhat humbling that even now, with the power of genomic medicine to work with, we can only identify the causes of disease in about 30 per cent of cases where diagnosis had previously been impossible. But as we begin to see new patterns in our growing databases, that 30 per cent will rise to 35 and 40 and beyond."

Dr Burnett believes the people entering science and medicine now are going to be part of a new golden age of discovery. "This, to me is profoundly exciting," said Dr Burnett."I wish I could be born again now. It's going to keep me young until I drop off – there's so much exciting stuff to be discovered," he said.

"Previously, we lacked the knowledge to know what it was that we didn't know. Now, however, we have the foundation of understanding how little we have yet learned, and that will encourage learning a great deal more. "There will still be huge gaps for the next generation of scientists to fill in, but we're now in a position to cover a lot of missing ground very quickly."

KCCG Showcase

KCCG hosted a Capabilites Showcase on the 8 April 2015, when the Centre's Team Leaders presented an update on the capabilities to key stakeholders, including representatives from NSW Health, the Garvan Board, other institutes, and key supporters. The event included a welcome by Professor John Mattick and presentations focused on translating genomic medicine into the clinic by Associate Professor Marcel Dinger (Head of KCCG, pictured below), David Miller (Team Leader, Genome Sequencing), Dr Warren Kaplan (Chief of Informatics) and Dr Mark Cowley (Team Leader, Translational Genomics).

Our next public event will be on 20 August, 2015, when Stanford University's Professor Kelly Ormond will explore the potential and pitfalls of genomic information.

Associate Professor Marcel Dinger, Head of KCCG, presenting at the Capabilities Showcase in April 2015.

New Staff

The KCCG has continued to expand, with five new staff members starting in the last two months. Dr Aaron Statham (Manager, Informatics Pipelines) will head up our new Informatic Pipelines team. Senel Idrisoglu (Genomics Research Assistant), Joice Kuroiwa-Trzmielina (Genomics Research Assistant) are new members of our Genome Sequencing team, and Craig McNamara (Web Developer), and Edwin Zhang (Software Developer) have joined our Phenomics team.

Connect with us online

We are continually extending our online presence and resources for clinical, research and public stakeholders. Updated information about our research projects, team structure and whole genome sequencing services, as well as links to recent literature in clinical genomics, can be found at http://www.garvan.org.au/kccg. You can also follow our newsfeed on Twitter @kinghorngenomes or email us at kccgenquiries@garvan.org.au.

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