Underpinning clinical measurements for inherited metabolic disease monitoring

Summary statement

Supporting greater certainty for diagnosis, treatment and monitoring of inherited metabolic diseases.

Background

More than 700,000 babies are screened each year for a number of inherited metabolic disorders in the first 5 days of life; it is a vital process that identifies infants with inherited disorders, that can be controlled and managed by dietary or drug interventions before they suffer significant morbidity or mortality. For the 1 % of families where their babies screen positive for one of the conditions, including cystic fibrosis, congenital hypothyroidism, and sickle cell disease, they will be referred to a specialist for more tests. This is a very stressful and challenging time for the families and false positives have been shown to have significant long-term effects on the entire family, with new parents showing increased stress scores and greater numbers of hospital admissions in the first few years of the child's life.

The correct laboratory diagnosis is a key factor for successful management of patients. Testing laboratories use a variety of different protocols in their screening tests and so ensuring harmonisation between them is vital.

Impact

The NML partnered with Dr Rachel Carling, Consultant Clinical Scientist, Director of Service and Clinical Lead, Viapath, Guys & St Thomas' NHS Foundation Trust, as part of the NHS England CSO's Knowledge Transfer Partnership (KTP) programme to investigate potential measurement improvements to support the Newborn Blood Spot Screening programme. During this project our mass spectrometry expertise helped further improve the methodology underpinning the Newborn Blood Spot Screening programme. These improvements, leading to greater harmonisation of the methods used by the 14 laboratories across the UK involved in the screening programme, are aimed at reducing the possibility of false positives occurring. This will ensure parents are given the correct results, minimising unnecessary stress, and clinical resources are not wasted on unnecessary testing.

Following on from this successful collaboration the NML have collaborated on two further European-wide studies: with European testing laboratories through ERNDIM (European Research Network for evaluation and improvement of screening, diagnosis and treatment of inherited Disorders of Metabolism) and, in parallel, with global measurement institutes (through CCQM, Consultative Committee for amount of substance: Metrology in Chemistry and Biology) to provide direct traceability from measurement institutes to the clinic.

The goal of ERNDIM is to reach a consensus between European Biochemical Genetics Centres on reliable and standardised procedures for diagnosis, treatment and monitoring of inherited metabolic diseases. This is achieved through provision of quality control schemes. Using our mass spectrometry expertise the NML characterised and supplied a traceable value assigned standard for the scheme. Engagement with the scheme from the clinical community across Europe has been excellent, and

analysis using our value assigned standard has been conducted by participants from 89 laboratories that offer amino acid analysis, in 19 countries, testing 24 different amino acids. The data collated is offering a vast amount of information and insight into sharing best practice and providing guidance to the clinical community for the interpretation of measurement uncertainty in routine hospital measurements. The use of traceable standards and interpretation of results is critical to ensure results of the screening tests are of the appropriate quality and reliability for the correct diagnosis and successful management of patients with inherited metabolic disorders.

On the basis of this KTP, the advisory board for the national Inherited Metabolic Disorders (IMD) screening programme, that provides independent advice to Public Health England (now UK Health Security Agency, UKHSA), are discussing a national procurement of traceable standards to underpin the screening programme with the clinical commissioner.

Conclusion

The outcomes of this project have provided a framework for national procurement of traceable standards and a framework within which more analytes can be added to the UK's screening programme to increase the range of diseases that can be tested for at birth.

Together, we are helping to deliver greater certainty for the Newborn Blood Spot Screening programme and the monitoring of inherited metabolic diseases, impacting on every child born in the UK.

The HCS Knowledge Transfer Partnership Programme offers a unique opportunity for healthcare scientists from across the UK to build long term partnerships between clinical, research and industry teams at leading centres of excellence in science and technology through collaboration at a senior level with partner organisations across the UK's National Measurement System (NMS) and the United Kingdom Accreditation Service (UKAS).

Through facilitating early interaction and knowledge exchange, the programme aims to speed up the identification and dissemination of high value new approaches to improving patient outcomes and increasing efficiency, whilst promoting economic growth and inward investment in the life sciences.

The eighteen-month programme is designed to enable senior healthcare scientists to remain in clinical service whilst exchanging skills and expertise with NMS scientists to create, expand, test or implement innovative ideas to improve patient care.