How brain 'wiring' develops in babies

January 13 2011

Scientists funded by the Medical Research Council (MRC) have shown, for the first time, how our brain 'wiring' develops in the first few months of life. Using a new imaging technique, the scientists monitored the formation of insulating layers around nerve cells, a process called myelination, which is vital for normal brain function. Damage to the myelination process is believed to contribute to a range of neurological and psychiatric disorders, including autism and intellectual disability.

In very premature babies, myelination can be particularly prone to damage. The researchers hope that their new imaging technique will allow doctors to directly measure whether the treatments given to premature infants encourage normal brain development, while also shedding light on the biological roots of a host of neurological and psychiatric disorders.

The MRC-funded scientists based in the NIHR Biomedical Research Centre at the Institute of Psychiatry, King's College London, scanned 14 healthy babies born at full term. The babies were scanned while asleep using a specially-modified, quiet, baby-friendly MRI scanner. To build up a picture of their myelin development, the researchers scanned the infants monthly between 3 and 11 months. By the age of nine months, myelination was visible in all brain areas and in some regions had developed to a near adult-like level.

Lead author, Dr. Sean Deoni, from King's College London, said: "We already know that insulating myelin sheaths form the cornerstone of our neurodevelopment. Without them, messages to and from the brain would

be in disarray. Our new imaging technique opens up an exciting new avenue to investigate early-stage brain development which could be pivotal in understanding devastating disorders such as autism, intellectual disability and developmental delay. By understanding exactly how myelin develops and when this process breaks down, we hope to be able to tailor treatments for vulnerable patients, such as premature babies, and understand what differentiates those that develop normally from those who have some delay or disability."

Professor Declan Murphy, from King's College London, who oversaw the research, said: "Until now, we've not been able to show how myelination develops in babies but this new MRI technique allows us to do just that. We are extremely grateful to the families who volunteered for our study to make this happen. Their contribution has provided the crucial first step towards a model for healthy brain development. We can now use this model to understand how differences in the way our brains 'connect up' relates to neurological and intellectual disorders that may not become apparent until later in life. For example a next step is to scan premature babies and see how their myelin development differs from babies born full term; and how connections in the brains of babies who are at greater risk for developing autism differ from others."

More information: Sean Deoni, Declan Murphy et al., Mapping Infant Brain Myelination with Magnetic Resonance Imaging, *Journal of Neuroscience*.

Provided by Medical Research Council