## Premature birth alters brain connections

Premature birth can alter the connectivity between key areas of the brain, according to a study published in *Proceedings of the National Academy of Sciences*.[1]

Led by researchers from King's College London, the study used functional magnetic resonance imaging to look at specific connections between the thalamus and the cortex in the brains of 66 infants, 47 of whom were born before 33 weeks' gestation and were therefore at high risk of neurological impairment.

Researchers found that those born at 37-42 weeks' gestation had a similar network of connections to adults. However, premature infants were found to have less connectivity between areas of the thalamus and particular areas of the brain's cortex known to support higher cognitive functions, but greater connectivity between the thalamus and an area of primary sensory cortex that is involved in processing signals from the face, lips, jaw, tongue and throat. The greater the extent of prematurity, the more marked were the differences in the pattern of brain connectivity.

The authors suggest that the stronger connections involving face and lips in babies born preterm may reflect their early exposure to breastfeeding and bottle feeding, while the reduced connectivity in other brain regions may be linked to the higher incidence of neurodevelopmental problems seen in later childhood.

### Reference

1. **Toulmin H. et al.** Specialization and integration of functional thalamocortical connectivity in the human infant. *Proc Natl Acad Sci USA* 2015 http://dx.doi.org/10.1073/pnas.1422638112.

## RCPCH publishes criteria for diagnosing death in infants less than two months of age

The Royal College of Paediatrics and Child Health (RCPCH) has set out recommendations to diagnose death by neurological criteria (DNC) in infants less than two months old in the UK.

Previous UK guidelines excluded this age group because it was rarely possible to confidently diagnose DNC in a comatose and unresponsive child aged between 37 weeks' gestation and two months old. Therefore, neonatal teams in the UK do not currently diagnose DNC although other countries around the world do accept determination of death in young infants by certain neurological criteria in the presence of persisting cardiac function.


Compiled by a working group after careful review of existing evidence, the updated RCPCH guidance recommends that the same neurological clinical examination for children younger than two months is appropriate as for older children and adults and that there should be an observation period of at least 24 hours where the clinical state of complete unresponsiveness should be present.

This means:

- The patient is comatose and has to be ventilated because they cannot breathe
- Structural brain damage has been established, or the cause of irreversible coma is known.

The clinical diagnosis of DNC should be made using the following criteria:

- Absence of basic brain reflexes
- Absence of motor responses
- No respiratory response to hypercarbia but a stronger hypercarbic stimulus should be used to establish respiratory unresponsiveness in view of the immaturity of the newborn infant's respiratory system.

The report on the diagnosis of DNC in infants less than two months old does not include recommendations for the management of preterm infants below 37 weeks' gestation, nor does it cover broader issues around withdrawal or withholding medical treatment in children, or issues surrounding organ donation and transplantation. However, if the guidance is widely adopted, UK doctors will be able to diagnose death in babies under two months old without waiting for the heart to stop, which will increase the potential that organs could be saved for donation.

## Babies feel pain 'like adults'

A brain scanning study carried out at Oxford University revealed that the brains of babies 'light up' in a similar way to adults when exposed to the same painful stimulus. The findings suggest that not only do infants experience pain much like adults but that they also have a much lower pain threshold.

The study looked at healthy infants aged between one and six days old recruited from John Radcliffe Hospital, Oxford. MRI scans were taken of the infants' brains as they were 'poked' on the bottom of their foot with a special retracting rod. The researchers found that 18 of the 20 brain regions active in adults experiencing pain were active in babies too. The scans also showed that infants' brains had the same response to a weak poke as adults did to a stimulus four times as strong.

A painful sensation of being 'poked with a pencil'. *Image courtesy of Oxford University.*

The research, reported in the journal *eLife*,[1] highlights the need to review pain relief for infants.

### Reference

1. **Goksan S. et al.** fMRI reveals neural activity overlap between adult and infant pain. *eLife* 2015;4:e06356.