

**British Journal of Anaesthesia / Royal College of Anaesthetists' Project  
Grant: 2008 Round 1**

**The thalamocortical switch and consciousness: is interruption of thalamocortical transmission the cause or a consequence of induction of general anaesthesia by propofol.**

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**Summary**

This important series of experiments has for the first time suggested a link between a specific electrophysiological measurement at the scalp (saturation of slow wave activity) and a change in neurophysiology at a network level which occurs during anaesthesia, with functional MRI evidence of loss of residual activation in the primary thalamocortical circuitry at this point. The extensive sleep literature on slow waves suggests that the imposition of hyperpolarisation (in anaesthesia, drug-imposed), drives the slow wave activity rendering cortical neurons refractory to external input. The demonstrated persistence of thalamocortical spindles beyond this point suggests that the "thalamocortical switch" is a change to isolated or internal thalamocortical dialogue rather than severance of thalamocortical communication.

The potential EEG marker of the disintegration of the processes fundamental to consciousness will form the basis for future studies of the neurophysiology of consciousness at this laboratory.

All the investigators acknowledge and are extremely grateful for the generous support of the NIAA.

**Doctoral thesis**

"The neurophysiology of sedation" PhD awarded by the University of Oxford, April 2012

**Patent application**

With the assistance of the University of Oxford's technology transfer company, Isis Innovation, a patent application has been filed based on the use of slow wave saturation during anaesthesia. The financial support of the NIAA has been acknowledged in the patent application and the NIAA will be updated on the application's progress. Further work will be needed to progress the translation of this result towards a clinical device.

**Scientific papers**

A paper reporting the main results of experiments I & II was published in *Science Translational Medicine* in 2013 - "Slow-wave activity saturation and thalamocortical isolation during propofol anaesthesia in humans."

A fuller version of this report is available from the NIAA Administrator (who can be contacted via the 'Contact Us' page on the NIAA website).