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Neurobiological bases of goal-directed behaviours: thalamocortical interactions

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Abstract

The present project aims to study the basic processes underlying decision-making in animals. Previous studies have shown that the rat’s behaviour is goal-directed as it is able to evaluate the outcome of its actions and to adapt its behaviour as a function of its consequences. In particular, devaluation as well as contingency degradation procedures highlight the medial prefrontal cortex (mPFC) as a key region for goal-oriented behaviours. This area shares dense reciprocal projections with various nuclei of the limbic thalamus. The ventral midline thalamic nuclei (rhomboid and reuniens nuclei) appear to present the unique property of sharing extensive projections with the main subdivisions of the mPFC while being the main thalamic afference to the hippocampus. These nuclei may therefore process action-related contextual information.

We will thus examine the role of thalamocortical loops centred on the ventral midline thalamic nuclei in goal-oriented behaviours in the adult rat using a functional neuroanatomy strategy. We seek to provide a comprehensive understanding of the organization of these specific thalamocortical circuits by the use of anatomical tracing (including viral vectors). To examine functionality within these circuits, the tracing strategy will be combined with neuronal activity markers. Ultimately, we will assess the behavioural consequences of the functional disconnection of the cortical and thalamic components of these circuits by mean of the combined use of viral vectors and pharmacogenetics.

Qualification required

Theoretical knowledge concerning the behavioural analysis of cognitive processes as well as the neuroanatomy of the brain is required. Prior experience of animal research with rodents is an advantage.