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Information transfer in the auditory thalamocortical system

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There are extensive changes in encoding that occur between the thalamus and auditory cortex which take place over only 1 or 2 synpases. Thus far little about these information transfers is truly understood beyond the anatomical connectivity that has been well mapped with anterograde and/or retrograde tracers. In addition studies addressing the functional connectivity have primarily been conducted under anaesthesia or using very basic acoustic stimulation.
Hence, in our study we developed a technique to record from the auditory thalamus (median geniculate body (MBG)) and the primary auditory cortex (A1) simultaneously in awake, head-fixed mice and compared these to recordings obtained under anaesthesia.
As a proof of concept spectrotemporal response fields and responses to click trains were recorded as both local field potentials and multiunit activity. We found that both multiunits and LFP from MGB could phase lock to rates up to 480Hz while A1 could only follow much lower rates. An analysis method of directed coherence (Saito et al, 1981) was subsequently applied to determine directional correlated spontaneous activity between the two regions. Here we
were able to distinguish between feedforward and feedback low frequency rhythms that were transfered between the MGB and A1 and that also differed along A1 cortical layers.
This technique opens up opportunities to explore the functional connectivity, determine the overlap in spectrotemporal features and ultimately better understand the nature of information relay between these two areas of the auditory pathway in an awake state. Understanding of this functional connectivity will hugely improve our ability to predict feedforwad and back propogation responses to complex sounds.

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