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Title Kainate induced theta-frequency oscillatory network activity in the medial septum/diagonal band complex.

Text

The medial septum/diagonal band complex (MS/DB) forms part of the septo-hippocampal feedback loop and is thought to have a major functional role in the generation and/or maintenance of the hippocampal theta rhythm in vivo (4 * 15 Hz). Several different mechanistic scenarios may underlie the generation of a theta-frequency EEG pattern, amongst them (1) an external pacemaker-type input (2) theta activity being an emergent property of the septo-hippocampal feedback loop and (3) theta arising in the synaptic network of the MS/DB itself. This investigation tested the latter scenario by using an in vitro slice preparation of the (deafferented) MS/DB. Longitudinal slices (0.45 mm) from 21 day old rats
were maintained at 32 deg C in an interface recording chamber perfused with oxygenated ACSF. Following the bath application of the AMPA/kainate receptor agonist kainate (25 *100 nM), extracellular recordings, using ACSF-filled micropipettes, showed rhythmic population activity with a mean peak frequency of ~6 Hz which was most prominent along the midline of the MS/DB. The higher concentrations of kainate were accompanied by corresponding increases in spectral power (amplitude).
Subsequently, intracellular recordings were obtained with QX-314 containing electrodes to prevent spiking-activity, and thus allowing IPSPs to be recorded at depolarised membrane potentials. These recordings revealed the presence of rhythmic IPSPs (~6 Hz) in the class of fast-firing cells of oscillating MS/DB slices, presumably arising in the mutually connected interneuronal network of the MS/DB and pacing the oscillation.
Moreover, these findings clearly demonstrate that the intrinsic circuitry of
the isolated MS/DB complex is sufficient to generate rhythmic theta frequency activity.
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Theme Synaptic transmission and excitability
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