

SLOW KINETICS OF THE RETRIEVAL PROCESS OF AN ACETYLCHOLINE-DEPENDENT POTENTIATION OF RESPONSES IN THE RAT BARREL CORTEX.

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Similar endogenous neurochemical contexts during induction and testing phases of a cellular pairing protocol facilitate the expression of neuronal plasticity. We have previously shown that pairing a whisker stimulation at a given frequency with iontophoresis of acetylcholine (ACh) induced response changes revealed only during subsequent ACh applications in the barrel cortex of anaesthetized adult rats (Shulz et al., *Nature* 403:549-553, 2000). Here we describe the kinetics of the retrieval process of the ACh-dependent potentiation of the response to the paired frequency. We recorded up to 8 units simultaneously from 1 to 3 barrels using combined electrodes (CE) for recording and iontophoresis, and tungsten-in-glass recording electrodes (TE). Temporal-frequency tuning curves (TFTC) were obtained by stimulating one whisker at 2 to 14 Hz, first without and then with ACh. During pairing, stimulation at a single frequency was paired with ACh iontophoresis. The tuning curves were then re-determined with and without ACh. At the single cell level, 30% of the cells recorded with the CE showed a statistically significant modified response (usually potentiation) when tested with ACh, whereas without ACh changes in TFTC did not exceed spontaneous fluctuation. On average, for those cells showing a potentiation of response to the paired frequency with ACh, the activity level increased with a particularly slow kinetics: although ACh was continuously iontophored during the retrieval phase, the response potentiation reached statistical significance only after ten to fifteen seconds of stimulation at the paired frequency. In contrast, the response rapidly decreased from its potentiated level when the frequency of stimulation of the whisker was changed to a different non-paired frequency. This slow build-up might reflect the restoration of the network's 'set point' which was associated with the conditioned frequency.

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