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Meeting abstract

New method for detecting ATP release from rat hippocampal slices

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Chemical signaling has a key role in neural and non-neural function; however, only a few techniques are available to measure the concentrations of neurotransmitters and modulators directly in the extracellular space. A recent advance in this area is the development of the multi-enzymatic microelectrode biosensor technique whereby we can measure the concentration of different neurotransmitters and modulators around single neurons or synaptic structures in the brain with high temporal and spatial resolution. Micro-biosensors are also ideal for detecting real-time neurotransmitter release in the central nervous system in vivo because they are minimally invasive. The ATP biosensor is formed by coating a Pt microelectrode with an ultrathin biolayer containing glycerol kinase and glycerol-3-phosphate oxidase, which results in the production of electroactive H_2O_2, detected by amperometry. The null sensor, which possesses the silicate layer but lacks the enzymes, shows near-identical responses to the interferences potentially allowing the use of differential recordings to remove almost all of the interfering signals. We used the ATP microelectrode biosensor to demonstrate the release of ATP from rat hippocampal slices in vitro. The basal ATP levels have been estimated to be as low as a few nmol/L (25 ± 5 pA). The ATP sensor exhibited a rapidly increasing current during K^+ depolarization which reached 341 ± 170 pA (peak concentration 0.79 ± 0.2 μmol/L). This effect was significantly decreased by the Na^+ channel blocker TTX (0.17 ± 0.08 μmol/L) and by Ca^{2+}-free medium (0.22 ± 0.1 μmol/L).

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