Biosensor-based monitoring of ethanol toxicokinetics in the brain of freely-moving animals

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Alcohol has been a continuous presence in the evolution of mankind and indeed, nowadays, represents the most widespread psychotropic agent in Western societies. As many substances of abuse, ethanol activates the mesolimbic pathway, so alcohol addiction has become one of the most important health issues. Given these implications, it has become of primary importance the real-time monitoring of ethanol toxicokinetics and its effects in definite brain regions. Recently, implantable amperometric biosensors have offered a valid alternative to microdialysis for monitoring brain metabolites. In this study, we present the characterization of an implantable amperometric biosensor for the real-time measurement of brain ethanol by improving a prior implantable design and integrating it in a biotelemetric device, to consent freely movements to the animals. The biosensor was then implanted in in the Shell of the Nucleus Accumbens by stereotaxic procedures in rats already conditioned to carry ethanol self-administration. After the surgery, we waited for the animal's recovery with water and food ad libitum. The night before the experiments, the animals were left without water for 12 hours. The following day the biosensor was polarized and amperometric signal from ethanol was monitored and recorded up to its stabilization. At this stage, the animals had at their disposal, for 30 minutes, a solution containing 10% of ethanol. In this period, we were able to detect a significant increase of the current derived from ethanol when the animal swallowed the ethanol solution.

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