Exploring a Novel Electrochemical Method for Detecting Glutamate Concentration in Body Cerebrospinal Fluid in a Model of Cerebral Ischemia

Li, Yuqing (School: Beijing No. 35 High School)

Excessive glutamate release in the brain leads to neuronal death in severe neurological diseases of ischemic stroke, while glutamate levels in cerebrospinal fluid are more favorable for reflecting the extent of brain damage, but there is currently no rapid real-time detection method. This study used electrochemical methods to detect and study the changes of glutamate in the mouse model of cerebral ischemia. We have improved the manufacturing method of electrochemical electrodes - through a series of processes such as platin plating, plating membranes, fixed specific enzyme coatings, etc., and the high signal-to-noise ratio, good repeatability, high selectivity and high sensitivity were obtained. At the same time, it was suitable for the new electrode for in-vivo implantation detection, and the experiment of detecting glutamate in the body cerebrospinal fluid was carried out on the mouse "ischemic stroke" model. The experimental results confirmed that it is feasible to implant electrodes in the living lateral ventricle of the mouse model of stroke to perform real-time detection of glutamate concentration in vivo. The new method can obtain glutamate concentration data quickly, accurately, directly and continuously, instead of the traditional method, avoiding the incomplete results and possible errors caused by intermittent measurement in the experiment, and obtaining more comprehensive brain damage evaluation. And It can provide a faster, more accurate, safer, and more real-time detection protocol reference for therapeutic strategies targeting neurotoxic excitotoxicity, which will help to further explore and test new treatment options.

Awards Won: