UDC 577.1: 615.28: 615.076.9

DOSE-DEPENDENT ACTION OF POLYHEXAMETHYLENE GUANIDINE HYDROCHLORIDE ON RELEASE OF L-[^{14}C]GLUTAMATE FROM RAT BRAIN NERVE TERMINALS

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Introduction. Polyhexamethylene guanidine hydrochloride (PHMG-Cl) is a polycationic compound that exerts surface-active effect on different biological membranes. Now it is intensively studied for safety as disinfectant. PHMG-Cl is considered to act predominantly on bacterial and fungal membranes, because of negative charge on their cells surfaces. However, there was an evidence of its harmful effect on human health, e.g. bronchiolar disorders. This research is devoted to assessing the influence of PHMG-Cl on glutamate transport in the rat brain nerve terminals (synaptosomes).

Methods. Synaptosome preparations in the standard salt solution were diluted up to the end concentration of 0.5 mg of protein/ml per sample; after pre-incubation at 37 °C for 10 min the synaptosomes were loaded with radiolabeled L-[^{14}C] glutamate (238 mCi/mmol, 1 nmol/mg of protein) and incubated at 37 °C for 10 min. Water solution of PHMG-Cl was added to synaptosomal suspension separately at the end concentrations of 1, 5, 10, 25, 50 and 500 mg/ml. After 8 min incubation, samples were rapidly sedimented in a microcentrifuge (20 s at 10,000 g). L-[^{14}C]glutamate release was measured using liquid scintillation counting with scintillation cocktail ACS (1.5 ml).

Results. Extracellular level of L-[^{14}C]glutamate in the synaptosomal suspension increases in a dose dependent way with the increase of end concentration of PHMG-Cl. At the final concentration of 500 mg/ml PHMG-Cl caused complete release of the preloaded glutamate.

Discussion. We can suggest that the effect found may be caused by membrane disruption, inducing pore formation. Or, despite positive charge on synaptosomal surface, PHMG-Cl penetrates into cell and breaks down proteins functioning directly or veiledly, thereby producing L-[^{14}C]glutamate leakage.

Conclusions. Starting from concentration of 1 mg/ml PHMG-Cl per 0.5 mg of protein, it might be potentially toxic for the mammalian brain tissues, inducing overbalance in extracellular level of neurotransmitter.

Acknowledgments. We would like to thank Prof. T.A. Borisova for supervision, Dr. A. V. Lysytsya and Dr. O. Ya. Shatursky for material support.