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Effects of an extracellular, calcium ions chelator and of some inorganic calcium channel blockers on the centrogenic cardiac arrhythmias in anaesthetized rats

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Our previous investigations, Cuparencu et al (1985, 1992) have shown that the micro injection of some chemicals into the lateral cerebral ventricle (icv) of the anaesthetised or conscious rats can induce cardiac arrhythmias (sinus pauses, sino-atrial blocks, atria-ventricular blocks, ventricular extrasystoles) and other cardiac rhythm disorders, Cuparencu et al (1996). The arrhythmogenic stimuli are transmitted from the brain to the heart via vagi (vagal stimulation) and spinal cord (sympathetic inhibition).The ionic mechanisms which govern the central arrhythmogenesis are still not elucidated. In order to clarify the role of extra cellular calcium ions on the central arrhythmogenesis, we used substances which act more selectively on the calcium ions movements across the channel : an extra cellular calcium chelator-EGTA and two inorganic calcium channel blocks: $NiCl_2$ and $CdSO_4$.The arrhythmias were induced by sodium glutamate and isoprenaline. The experiments were carried out on Wistar rats, anaesthetised with ethyl urethane (1.56/kg i.p.).We located the lateral cerebral ventricle according to Groot's stereotaxic atlas and we recorded the following parameters: EEG and ECG, maintains the rat in artificial respiration (Ugo Basile). The scheme of the experiment was as follows: the arrhythmogenics (sodium glutamate-6000μg/20μl and isoprenaline-500μg/20μl)- antiarrhythmic agent (EGTA-200μg/20μl, $NiCl_2$-400μg/20μl, $CdSO_4$-200μg/20μl)- the arrhythmogenics were readministered in the initial dose. The arrhythmogenic activity was appreciated by the „arrhythmogenic index" (AI), calculated according to the formula: AI= number of ectopic beats/total number of beats x 100. Our results demonstrated that EGTA a chelator of the extra cellular calcium ions as well as the inorganic calcium channels blockers, $NiCl_2$ and $CdSO_4$ abolished completely the induced arrhythmias. Sodium glutamate acts by releasing acetylcholine. Calcium channels are indispensable for exocytotic release of this neurotransmitter. The calcium channels blockers stop the release of acetylcholine and so the sodium glutamate induced arrhythmias but they abolish the isoprenaline induced arrhythmias, too. As isoprenaline acts by direct stimulation of central beta- adrenoceptors are coupled with calcium channels. In conclusion, if the hypothesis was correct the calcium channels will pertain to the receptor operated channels (ROC).

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