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Comparative Characteristics of The New Domestic Drug Sytargin for Acute Toxicity in Experimental Animals

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Abstract

The problem of hypoxia has been extremely relevant for many years and has attracted the attention of physiologists and clinicians from the point of view of the mechanisms of development of various pathological conditions. In the world, especially in regions with high birth rates and life expectancy, special attention is currently being paid to a number of targeted scientific studies on the use of pharmacological compounds with various antihypoxic properties. Nootropics can stimulate mental activity, activate cognitive functions, improve memory and increase learning ability. It is assumed that nootropics increase the brain's resistance to a variety of harmful influences, such as excessive exercise or hypoxia.

Keywords: nootropic drugs, hypoxia, acute toxicity.

Introduction

In recent decades, the interest of researchers and doctors of various specialties in the problem of cognitive dysfunction in neurological diseases has increased significantly. It is known that the so-called associative zones of the cerebral cortex, involved in cognitive activity, significantly exceed the area of the primary cortical fields. Therefore, most organic diseases affecting the brain are accompanied by cognitive impairment [1]. Cognitive impairments develop as a result of vascular pathology, traumatic brain injuries, neuroinfections, intoxications, neurodegenerative and other neurological diseases [2]. Every year, about 10 million people worldwide suffer a stroke [3,4]. After a vascular accident, approximately half of the patients experience cognitive disorders, which lead to social and everyday maladjustment [5]. One of the main directions of adequate pathogenetic therapy of diseases caused by organic brain damage, including cerebrovascular diseases, is the use of drugs with nootropic and neuroprotective properties. In addition, given the ability of nootropic drugs to improve learning and memory processes, intellectual abilities, their use is possible not only for various diseases, but also in practically healthy individuals to increase creative activity and increase the resistance of the central nervous system to extreme conditions [6]. In pediatric practice, nootropics are used to restore mental retardation in children and pharmacotherapy of attention deficit hyperactivity. In this regard, the relevance of searching for new drugs with nootropic effects that are harmless to the body is beyond doubt. One of these drugs is “Citkornite” (solution for infusion), created by TEMUR MED FARM LLC, Uzbekistan, which contains citicoline and levocarnitine [7].

Purpose of the study

To study the acute toxicity of the new domestic nootropic drug “Sytargin”.

Material and Methods

The acute toxicity was studied by the generally accepted method described in the literature, the administration of drugs with determination of the toxicity class.

Type and number of animals: for the experiment, we used 36 white outbred male and female mice, weighing 19–21 g, quarantined for 14 days. Before and during the experiments, the mice were kept in a vivarium at an air temperature of +20-22ºC, humidity - no more than 50%, air exchange volume (exhaust: supply) - 8:10, in a light mode - day-night. The mice were housed in standard plastic cages and fed a standard diet.

Conducting the experiment: acute toxicity of drugs was carried out in two series. In the first series of the experiment, mice were injected intraperitoneally (fractionally throughout the day) with the drug "Sytargin" - a solution for infusion as follows:

1 gr. dose - 7800 mg/kg;

2 gr. dose - 10400 mg/kg;

3 gr. dose - 13000 mg/kg.

In the second series of the experiment (3 groups of 6 mice), mice were injected intraperitoneally with diluted comparison drugs “Tivortin®” and “Somazina®” (at the rate of 96 ml - Tivortin® + 4 ml Somazina®):

1 gr. dose - 7800 mg/kg;

2 gr. dose - 10400 mg/kg;

3 gr. dose - 13000 mg/kg.

Next, the mice of all groups were observed hourly during the first day of the experiment in the laboratory, while survival during the experiment, general condition, possible convulsions and death were used as indicators of the functional state of the animals. From the second day, observation was carried out daily, for 2 weeks in a vivarium, while monitoring the general condition and activity, behavioral characteristics, reaction to tactile, pain, sound and light stimuli, frequency and depth of respiratory movements, heart rate, the condition of the hair and skin, the position of the tail, the amount and consistency of fecal matter, the frequency of urination, changes in body weight and other indicators. All experimental animals were kept in the same conditions and on a common diet with free access to water and food. After completion of the experiment, the LD50 and toxicity class of the drug were determined.

The obtained data were statistically processed using the STATISTICA program using the paired Student's t test.

Results and Discussion

When studying the acute toxicity of the drug "Sytargin" we obtained the following data:

Group 1 (dose 7800 mg/kg): after administration of the drug, mice remained active throughout the day, no changes in behavior or functional state were observed. The condition of the fur and skin was normal without changes, food and water were not refused, and no death of mice was observed. On the second and subsequent days of observation there were no pathological changes in the behavior and physiological parameters of the mice. Water and feed intake were normal, and no growth or developmental retardation was observed. There was no death of mice within 14 days.

Group 2 (dose 10,400 mg/kg): after administration of the drug, the mice were active throughout the day, and no visible changes were observed in behavior or functional state. The condition of the fur and skin was normal without changes, food and water were not refused, and no death of mice was observed. On the second day and during the subsequent observation period, there were no pathological changes in the behavior and physiological parameters of the mice. Water and feed intake were normal, and no growth or developmental retardation was observed. There was no death of mice within 14 days.

Group 3 (dose 13,000 mg/kg) after administration, mice experienced short-term lethargy and inactivity, which disappeared after 30 - 40 minutes. After an hour, the mice returned to their previous state, their behavior was active, and their physical indicators did not deviate from the norm. On the second day and all 14 days of observation, no changes were observed in the mice’s behavior and other physical indicators, the mice willingly consumed food and water, reactions to light and sound stimuli remained normal, the fur and skin were clean, urination and fecal excretion were normal, the weight and height of the mice did not lag behind in development. No mouse death was observed (Table 1).

Table 1

Determination of acute toxicity of the drug "Sytargin" and diluted reference drugs "Tivortin®" and "Somazina®"

Groups	« Sytargin»			«Tivortin®» + « Somazina®»		
	dose mg/kg	route of administration	results	dose mg/kg	route of administration	results
1	7800	в/б	0/6	7800	в/б	0/6
2	10400	в/б	0/6	10400	в/б	0/6
3	13000	в/б	0/6	13000	в/б	0/6
LD_{50}	> 13000mg/kg					

Similar data were obtained when studying the acute toxicity of diluted reference drugs Tivortin® and Somazina®. The LD_{50} of the drug "Sytargin" compared to the drugs "Tivortin®" and "Somazina®" is a dose of > 13000 mg/kg.

Conclusion

Thus, based on the data obtained, the following conclusions can be drawn:

1. This drug belongs to the class of non-toxic compounds, LD_{50} is more than 13,000 mg/kg and does not differ from foreign analogues.
2. The drug Sytargin is 2 times cheaper than the drugs Somazin and Tivortin, is accessible to the population and can be used to correct hypoxic conditions of various origins.

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