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STUDY OF ACUTE TOXICITY OF NOOTROPIC DRUG SAMPLE NO. 2 ON LABORATORY ANIMALS

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Relevance of the topic. In recent decades, there has been a significant increase in interest in nootropic drugs, driven by the increasing prevalence of diseases associated with cognitive impairment. Modern lifestyles, stress, environmental degradation, and an aging population are leading to an increasing number of patients with memory, attention, intellectual, and emotional impairments [1].

Nootropic drugs, which primarily exert metabolic and neuroprotective effects, improve energy metabolism in nerve cells, increase neuronal resistance to hypoxia and toxic effects, and stimulate neuroplasticity and interneuronal transmission. This makes them widely used in the treatment and prevention of various neurological and mental disorders—from the consequences of traumatic brain injury and stroke to asthenic and cognitive syndromes of various origins[4].

Despite the widespread use of nootropics in clinical practice, questions regarding their evidence-based efficacy, pharmacodynamic properties, and individual differences in response to therapy remain unresolved. Therefore, research into the mechanisms of action and clinical effectiveness of nootropic drugs remains a pressing issue in modern medical science.

Purpose of the study:to study the acute toxicity of the new domestic nootropic drug "Sample No. 2".

1. STUDY OF SPECIFIC ACTIVITY

Study design and experimental material

Experiments were conducted in a pharmacotoxicology laboratory on 108 mice. The experiments were conducted in accordance with WHO recommendations, adhering to the rules for the humane treatment of laboratory animals (principles of the Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes, Strasbourg, 1986). Three series of experiments were conducted:

The acute toxicity of new drugs was studied using the generally accepted method of single administration and determination of the toxicity class [8].

For this purpose, 108 white mongrel mice of both sexes, weighing between 19 and 27 grams, were used. They were quarantined for 14 days. Throughout the study, the animals were kept in a standard vivarium environment: air temperature 20–22°C, humidity no higher than 50%, ventilation airflow rate of 8:10, and day/night lighting.

Mice were placed in a standard plastic cage and maintained on a standard vivarium diet.. We identified 18 groups of 6 mice each.

Acute toxicity of the drugs was determined in 6 series.

In the first series of experiments, mice were injected intraperitoneally with Sample 2, an infusion solution. Three groups of mice (6 each) were divided into three groups, each administered the following doses:

1 group (6 mice) – i.p. at a dose of 7800 mg/kg (0.1 ml);

mouse	weight	dose mg/kg	ml
1	20	7800	0.1
2	19	7800	0.095
3	20	7800	0.1
4	21	7800	0.105
5	19	7800	0.095
6	19	7800	0.095

Group 2 (6 mice) – i.p.at a dose of 10400 mg/kg (0.3 ml);

mouse	weight	dose mg/kg	ml
1	21	10400	0.315
2	20	10400	0.3
3	20	10400	0.3
4	19	10400	0.285
5	21	10400	0.315
6	20	10400	0.3

Group 3 (6 mice) – i.p.at a dose of 13,000 mg/kg (0.5 ml).

mouse	weight	dose mg/kg	ml
1	19	13000	0.475
2	20	13000	0.5
3	21	13000	0.525
4	20	13000	0.5
5	19	13000	0.475
6	19	13000	0.475

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

Group 1 (6 mice) – intraperitoneally at a dose of 7800 mg/kg (0.1 ml);

mouse	weight	dose mg/kg	ml
1	19	7800	0.095
2	21	7800	0.105
3	20	7800	0.1
4	19	7800	0.095
5	20	7800	0.1
6	20	7800	0.1

Group 2 (6 mice) – intraperitoneal at a dose of 10400 mg/kg (0.3 ml);

mouse	weight	dose mg/kg	ml
1	20	10400	0.3
2	19	10400	0.285
3	20	10400	0.3
4	19	10400	0.285
5	21	10400	0.315
6	21	10400	0.315

Group 3 (6 mice) – intraperitoneal injection at a dose of13000 mg/kg (0.5 ml).

mouse	weight	dose mg/kg	ml
1	21	13000	0.525
2	19	13000	0.475
3	21	13000	0.525
4	20	13000	0.5
5	19	13000	0.475
6	19	13000	0.475

In the third series of the experiment (similar groups and number of mice), the drug Citcornite, an infusion solution, was administered intraperitoneally:

Group 1 (6 mice) – intraperitoneally at a dose of 4500 mg/kg (0.1 ml);

mouse	weight	dose mg/kg	ml
1	20	4500	0.1
2	21	4500	0.105
3	19	4500	0.095
4	21	4500	0.105
5	20	4500	0.1
6	20	4500	0.1

Group 2 (6 mice) – intraperitoneal at a dose of 6000 mg/kg (0.3 ml);

mouse	weight	dose mg/kg	ml
1	21	6000	0.315
2	21	6000	0.315
3	20	6000	0.3
4	19	6000	0.285
5	19	6000	0.285
6	20	6000	0.3

Group 3 (6 mice) – intraperitoneal at a dose of 7500 mg/kg (0.5 ml).

mouse	weight	dose mg/kg	ml
1	21	7500	0.525
2	21	7500	0.525
3	20	7500	0.5
4	20	7500	0.5
5	19	7500	0.475
6	19	7500	0.475

In the fourth series of the experiment (3 groups of 6 mice), mice were injected intraperitoneally with diluted comparison drugs Almiba and Somazin® (10 ml Almiba + 4 ml Somazin® + water for injection up to 100 ml):

Group 1 (6 mice) – intraperitoneal at a dose of 4500 mg/kg (0.1 ml).

mouse	weight	dose mg/kg	ml
1	20	4500	0.5
2	21	4500	0.525
3	20	4500	0.5
4	19	4500	0.475
5	21	4500	0.525
6	19	4500	0.475

Group 2 (6 mice) – intraperitoneal at a dose of 6000 mg/kg (0.3 ml).

mouse	weight	dose mg/kg	ml
1	19	6000	0.475
2	21	6000	0.525
3	19	6000	0.475
4	20	6000	0.5
5	21	6000	0.525
6	20	6000	0.5

Group 3 (6 mice) – intraperitoneal at a dose of 7500 mg/kg (0.5 ml).

mouse	weight	dose mg/kg	ml
1	21	7500	0.525
2	20	7500	0.5
3	21	7500	0.525
4	20	7500	0.5
5	19	7500	0.475
6	19	7500	0.475

In the fifth series (similar groups and number of mice), the drug Nootrotem – a solution for infusions, was administered intraperitoneally to mice:

Group 1 (6 mice) – intraperitoneal at a dose of 3375 mg/kg (0.1 ml).

mouse	weight	dose mg/kg	ml
1	20	3375	0.5
2	21	3375	0.525
3	20	3375	0.5
4	21	3375	0.525
5	20	3375	0.5
6	19	3375	0.475

Group 2 (6 mice) – intraperitoneal at a dose of 4500 mg/kg (0.3 ml).

mouse	weight	dose mg/kg	ml
1	20	4500	0.5
2	21	4500	0.525
3	20	4500	0.5
4	21	4500	0.525
5	20	4500	0.5
6	19	4500	0.475

Group 3 (6 mice) – intraperitoneal at a dose of 5625 mg/kg (0.5 ml).

mouse	weight	dose mg/kg	ml
1	20	5625	0.5
2	21	5625	0.525
3	20	5625	0.5
4	21	5625	0.525
5	20	5625	0.5
6	20	5625	0.5

In the sixth series of the experiment, three groups were administered Mexidol® and Piracetam. A solution identical to Nootrotem was prepared (1 ampoule of Mexidol® – 5 ml + 1 ampoule of Piracetam – 5 ml + 90 ml of 0.9% NaCl):

Group 1 (6 mice) – intraperitoneal at a dose of 3375 mg/kg (0.1 ml).

mouse	weight	dose mg/kg	ml
1	20	3375	0.5
2	21	3375	0.525
3	20	3375	0.5
4	21	3375	0.525
5	20	3375	0.5
6	20	3375	0.5

Group 2 (6 mice) – intraperitoneal at a dose of 4500 mg/kg (0.3 ml).

mouse	weight	dose mg/kg	ml
1	21	4500	0.525
2	21	4500	0.525
3	20	4500	0.5
4	20	4500	0.5
5	21	4500	0.525
6	20	4500	0.5

Group 3 (6 mice) – intraperitoneal at a dose of 7500 mg/kg (0.5 ml).

mouse	weight	dose mg/kg	ml
1	21	5625	0.525
2	20	5625	0.5
3	21	5625	0.525
4	20	5625	0.5
5	19	5625	0.475
6	19	5625	0.475

From the second day, observations were carried out daily, under the given conditions of the vivarium laboratory, for 2 weeks. As an indicator of the functional health of animals, the survival rate of animals in the experiment, general conditions, possible convulsions, and death of animals were assessed.

Invigilation was performed starting on the second day, and continued for two weeks in a vivarium. General condition and activity, behavioral characteristics, responses to tactile, pain, sound, and light stimuli, respiratory rate and depth, heart rate, skin and hair condition, hair position, fecal amount and consistency, urine frequency, changes in body weight, etc. were recorded.

All experimental animals were kept in the same environment and on the same diet, and had unlimited access to water and food.

After the experiment was completed, LD50, the toxicity class of the drug, was determined.

When studying the acute toxicity parameters of the drug "Sample 2", we obtained the following information:

Group 1: after taking the drug in the proper dose - 7800 mg/kg for 24 hours, the mice remained active, no changes in behavior or functional state were observed.

Skin and fur condition generally remained unchanged, mice refused food or water, and muscle loss was not observed. No pathological changes in behavior or physical performance were observed on the second or subsequent days of observation.

Water and food consumption were normal, and there was no reduction in growth or development. No mice died over 14 days. The second group received a dose of 10,400 mg/kg. Following administration, the mice were active for 24 hours, and no visible changes in behavior or functional status were observed.

The condition of the fur and skin was normal and unchanged. The mice did not refuse food or water, and no deaths were observed. On the second day and during the subsequent observation period, no pathological changes in the mice's behavior or physiological parameters were observed.

Water and food intake were normal, and no growth or developmental delays were observed. No mice died over the 14 days.

After Group 3 received the drug at a dose of 13,000 mg/kg, short-term muscle weakness and stiffness were observed, which resolved within 30-40 minutes. Within an hour, the mice returned to their previous state, their behavior was active, and physical activity indicators were normal. (see table 3.7).

Table 3.7 Determination of acute toxicity of the drug Sample 2 and diluted comparison drugs Tivortin® and Somazina®.

Group	Sample 2	
	dose mg/kg	path introduction
1	7800	v/b
2	10400	v/b
3	13000	v/b
LD50	> 13000 mg/kg	

Group	Tivortin® + Somazina®	
	dose mg/kg	path introduction
1	7800	v/b
2	10400	v/b
3	13000	v/b
LD50	> 13000 mg/kg	

During the second day and throughout the 14 days, no changes in behavior or other physiological parameters were observed in the mice. The mice readily consumed food and water, their response to light and sound stimulation remained normal, their fur and skin were clean, urination and feces were normal, and weight and growth were normal. There were no deaths.

The same data were obtained in a study of the acute toxicity indices of the diluted comparison drug Tivortin® and Somazin®. The LD50 of Sample 2 compared to Tivortin® and Somazina® is > 13,000 mg/kg.

A study of the acute toxicity of the drug Citcornite - infusion solution showed the following:

After administration of the drug to group 1 at a dose of 4500 mg/kg during the day, the mice remained active, no changes in behavior or functional state were observed.

The condition of the skin and coat usually did not change, they did not refuse food or water, and no muscle death was observed.

During the second day and during the following days, there were no pathological changes in the behavior of mice and physiological parameters.

Water and food consumption were normal, and there was no reduction in growth or development. No mice died over the 14 days.

The dose of the 2nd group was 6000 mg/kg: after taking the drug, the mice were active, no visible changes in behavior or functional state were observed.

Water and food intake were normal, and no growth or developmental delays were observed. No mice died over the course of 14 days.

The condition of the fur and skin was generally unchanged, the mice did not refuse food or water, and no muscle loss was observed. During the second day and the subsequent observation period, no pathological changes in the mice's behavior or physiological parameters were observed. The condition of the fur and skin was normal and unchanged, the mice did not refuse food or water, and no deaths were observed over the course of 14 days.

In the third group, the drug dose was 7500 mg/kg. After administration, short-term muscle weakness and immobility were observed, lasting 30-40 minutes. Within an hour, the mice returned to their previous state, their behavior became active, and physical activity did not exceed normal levels.

During the observed 2nd day of the study, as well as during the entire 14-day experiment, no changes in the behavior of mice or other physical parameters were observed.

The mice readily consumed food and water, their response to light and sound remained normal, their fur and skin were clean, their urination and feces were normal, and their weight and growth were normal. There were no mouse deaths. (see table 3.8).

The same data were obtained in a study of the acute toxicity indices of diluted Almiba and Somazin® drugs; the LD50 of citcornite and diluted drugs is 7500 mg/kg.

A study of the acute toxicity of Nootrotem, an infusion solution, revealed that after administration of 3375 mg/kg to Group 1 mice for 24 hours, the mice remained active, with no changes in behavior or functional status. Their fur and skin were unchanged, and they continued to consume food and water, with no deaths observed.

Table 3.8 Determination of acute toxicity of the drug Citcornite, Almiba injection solution and Somazin®

Group	Citcornite	
	dose mg/kg	path introduction
1	4500	v/b
2	6000	v/b
3	7500	v/b
LD50	> 7500 mg/kg	

Group	Almiba + Somazina®	
	dose mg/kg	path introduction
1	4500	v/b
2	6000	v/b
3	7500	v/b
LD50	> 7500 mg/kg	

During the second day and the subsequent observation period, no pathological changes in the mice's behavior or physical performance were observed. Water and food consumption were within normal limits, and there was no reduction in growth or development. No deaths were recorded in any of the experimental animals over the 14 days.

In the 2nd group, the dosage of the drug was 4500 mg/kg: after taking the drug, the animals were active, no visible changes in behavior or functional state were observed.

The condition of the fur and skin remained normal, the mice did not refuse food or water, and no muscle loss was observed. No pathological changes in the mice's behavior or physiological parameters were observed throughout the 14 days.

Water and food consumption were normal, and there was no reduction in growth or development. There were no mouse deaths during this period.

In the third group, at a dose of 5625 mg/kg, short-term muscle weakness and inactivity were observed after administration, which subsided within 30-40 minutes. Within an hour, the mice returned to their previous state, with active behavior and physical activity not exceeding normal levels.

During the second and all subsequent 14 days, no changes in behavior or other physiological parameters were observed in the animals. The mice readily accepted food and water, their response to light and sound remained normal, and their fur and skin were clean. During the second and all subsequent 14 days, the mice consumed food and water in the normal dose, their response to light and sound remained within normal limits, and their fur and skin were clean. Urination and feces were normal, and the weight and growth of the mice did not lag behind in development. No deaths of the mice were observed. (see table 3.9).

Table 3.9 Determination of acute toxicity of the drug Nootrotem and the comparative drugs Mexidol and Piracetam.

Group	Nootrotem	
	dose mg/kg	path introduction
1	3375	v/b
2	4500	v/b
3	5625	v/b
LD50	> 5625 mg/kg	

Group	Mexidol + Piracetam	
	dose mg/kg	path introduction
1	3375	v/b
2	4500	v/b
3	5625	v/b
LD50	> 5625 mg/kg	

Thus, the study of acute toxicity of the drugs Sample 2, Citcornite and Nootrotem showed the absence of toxic effects; in terms of pharmacological toxicity, they are classified as safe medicinal compounds.

List of used literature:

1. AlexandrovaA.E. Antihypoxic activity and mechanisms of action of some synthetic and natural compounds // Experimental and clinical pharmacology. - 2005. - Vol. 68. No. 5. - P. 72-78.
2. Aminov A. S. Relationships between peripheral blood values and vitamin content in 12-15 year old adolescents with microsocial pedagogical neglect during social adaptation in foster families // Man. Sport. Medicine. - 2012. - No. 21 (280). - P. 26-32.

3. Andreev A.I., Kozhimyakin L.A., Kishkun A.A. Modification of the method for determining lipid peroxides in a test with thiobarbituric acid // Laboratory work. - 1989. - No. 1. - P. 13-17.
4. Akhapkina V. I., Voronina T. A. Spectrum of pharmacological effects of phenotropil // Pharmateka. - 2005. - V. 13, - No. 108. - P. 19-25
5. Bagmut I. Yu. Structural and metabolic disorders and their mechanisms under the influence of oligoesters on the body and pathogenetic substantiation of the principles of their early diagnosis and correction: diss. - Kharkiv Medical Academy of Postgraduate Education, 2015. - P. 157-158.
6. Balabokhina T. V., Rudakova Ya. O. Comparative characteristics of the effectiveness of systematic classes in classical (basic) aerobics and step aerobics based on indicators of the functional state of the body // in medicine, education and physical education (materials of the scientific seminar within the framework of the festival "Look to the Sky" on April 28, 2018). - 2018. - P. 9.
7. Balykin M. V., Karkobatov Kh. D. Systemic and organ mechanisms of oxygen supply to the body in high-altitude conditions // Russian Physiological Journal named after I. M. Sechenov. - 2012. - Vol. 98. - No. 1. - P. 127-136.
8. Basareva O. I., Lazurina L. P. Technological approaches to the production of nootropic drugs // Modeling and forecasting the development of industries of the socio-economic sphere. - 2017. - P. 222-224.
9. Belyaev V.R. Increasing the resistance of sailors to gravitational loads by training in hypoxia-hypercapnia conditions // Vest. Russian Military Medical Academy. - 2011. - Vol. 34, No. 2. - P. 147-149.