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STUDY OF THE ACUTE TOXICITY OF "SILA KREMNIYA NANOKREMNIY"

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ABSTRACT

This study presents the results of an acute toxicity assessment of the product "Sila Kremniya Nanokremniy", based on silicon nanoparticles supplemented with microelements. The research was conducted on laboratory mice and rats under standard conditions. The findings revealed that the tested compound did not produce any signs of acute toxicity even at high doses (up to 5000 mg/kg), indicating its safety for further pharmacological research.

1. Introduction

In recent years, despite significant progress in the development of synthetic pharmaceuticals, many such drugs are often associated with adverse effects and contraindications. As a result, natural compounds remain an important source for developing new, highly effective medicines, both for treatment and as part of complex therapy for degenerative conditions of the human body. Silicon-based nanomaterials have attracted increasing attention due to their biological compatibility and potential pharmacological benefits. The product "Sila Kremniya Nanokremniy", developed jointly by the Tashkent Pharmaceutical Institute and LLC "Sila Kremniya ECO" (Uzbekistan), is a preparation containing silicon nanoparticles and microelements. The present study aimed to evaluate its acute toxicity and specific activity in an experimental model.

2. Materials and Methods

The experiments were conducted on healthy laboratory animals (white mice and rats) that had undergone quarantine for 10–14 days before testing. Acute toxicity was studied according to standard pharmacological methods. Experimental design: animals were white outbred mice of both sexes, weighing 18–22 g. Four groups of six animals each were used. The test substance was administered orally (per os) in aqueous solution (0.2 mL/20 g body weight) in doses of 1250 mg/kg, 2500 mg/kg, and 5000 mg/kg. Control animals received distilled water orally in equivalent volume. The animals were observed for 14 days to record behavioral changes, physiological responses, and mortality. The LD50 value was estimated according to standard toxicological criteria.

3. Results

After the oral administration of the test substance, animals in the 1250 and 2500 mg/kg groups showed no visible signs of intoxication. At the highest dose (5000 mg/kg), slight transient hypoactivity and clustering behavior were observed approximately 25 minutes post-administration, lasting for about 50 minutes, after which the animals' condition returned to normal. No deaths occurred in any of the groups during the 14-day observation period. Therefore, it was impossible to determine the median lethal dose (LD50), which indicates that the preparation is practically non-toxic within the studied dose range (1250–5000 mg/kg). According to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS, 2021), "Sila Kremniya Nanokremniy" belongs to toxicity class V, meaning "practically non-toxic" substances upon oral administration.

4. Discussion

The absence of mortality and significant behavioral or physiological deviations in animals indicates that the preparation does not possess acute toxic properties. The transient hypoactivity at the highest dose likely reflects an adaptive physiological response rather than a toxic effect. The inclusion of silicon nanoparticles and microelements in the formulation may contribute to the product's biocompatibility and stability. Given the essential role of silicon in connective tissue metabolism, the product shows potential for further pharmacological and biomedical applications. The statistical analysis was performed using variation statistics with Student's t-test. No statistically significant differences were found between the control and experimental groups.

5. Conclusion

The preclinical study of "Sila Kremniya Nanokremniy" demonstrated the absence of acute toxicity in laboratory animals after single oral administration in doses ranging from 1250 to 5000 mg/kg. The estimated LD50 exceeds 5000 mg/kg, classifying the product as practically non-toxic according to GHS standards. These findings support its safety for further chronic toxicity and pharmacological studies.

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