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Analysis of models for involving experimental liver poisoning in rats

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Abstract: In recent years, chronic liver diseases have become a significant cause of death and disability [2], there is a trend towards an increase in the number of patients with chronic liver disease. It is widespread mainly among people of working age [3], which is explained by the living conditions of modern humans and the presence of a large number of chemical compounds in the environment. This leads to changes in metabolic processes in the liver and its toxic damage.

According to WHO data, over the past 20 years, there has been a trend towards an increase in the number of liver diseases leading to high mortality worldwide. Today, the number of patients with various hepatobiliary pathologies in the world exceeds 2 billion people. In the CIS countries alone, between 500,000 and 1 million people with various liver diseases are registered annually [4].

A sharp increase in the number of patients with chronic liver diseases was facilitated by an increase in the incidence of viral and toxic (alcoholic and drug) hepatitis, as well as a significant increase in the number of patients with obesity and diabetes mellitus.

The hepatoprotective properties of drugs improve metabolism, inhibit peroxidation, activate lipid metabolism, and protect mitochondrial and microsomal enzymes from damage to varying degrees [1].

Keywords: Hepatitis, experimental hepatitis, paracetamol hepatitis, hepatitis induced by 40% ethyl alcohol, galactosamine hepatitis induction model, carbon tetrachloride (CCl4).

Introduction: Today, despite the wide range of preparations with hepatoprotective properties, the demand for this group of preparations remains high. Scientific research aimed at solving this problem is based on the correct choice of the hepatitis model and the correct conduct of the experiment. Therefore, we began our research with the analysis of models of experimental hepatitis induction.

Currently, the following methods are used in the study of experimental liver poisoning:

1. Citing a model of carbon tetrachloride (CCl4) poisoning in the liver

Calculating a model of liver poisoning using carbon tetrachloride (CCl4) is a widely used method in toxicological and biomedical research. When creating

this model, the following steps are carried out:

Experiment design

For this purpose, groups are created for white male laboratory rats. At least 4 groups are taken, with no less than 6 white male laboratory rats in each. The 1st group is the "intact" group, in which the disease is not caused. The 2nd group is the "control" group, where carbon tetrachloride (CCl4) causes liver poisoning and is not treated. The 3rd group is the experimental group, where carbon tetrachloride (CCl4) causes poisoning in the liver, and before this, the studied drug was administered in a certain dose. The 4th group is the comparison group, where carbon tetrachloride (CCl4) causes poisoning in the liver, and before this, the drug, which is widely used in medical practice today, is administered in a certain dose.

Experiment

These groups were cut 0.5 cm from the tip of the tail of all laboratory rats, blood was taken to obtain preliminary biochemical results, and a preliminary analysis was conducted. After this, the "Intakt" group was given distilled water for 6 days, corresponding to body weight. The control group was also given distilled water for 6 days. The experimental group was given the studied drug at 1 mg/kg or at a certain dose for 6 days. The comparison group is given a drug that has been used in medical practice for 6 days. On the 7th day, all groups, except the intact group, were administered 50% carbon tetrachloride (CCl4) 0.3 ml for every 100 g of body weight 3 times a day. Blood was taken from the tail of laboratory rats of all groups for biochemical analysis.

Monitoring and evaluation

Monitoring for several hours or days after administering the drug.

Researchers evaluate changes occurring in the liver, blood enzyme levels, and other biological indicators. This process helps to understand the mechanisms of liver poisoning.

Health metrics

Observe the general health of rats, in particular their activity and behavior.

` Liver function assessment

Taking blood samples to assess liver function and measuring ALT (alanine aminotransferase), AST (aspartate aminotransferase), and bilirubin levels.

2. Eliciting a model of liver poisoning in laboratory rats using paracetamol.

Citing a model of liver poisoning in laboratory rats using paracetamol (acetaminophen) mainly uses the ability of paracetamol to damage liver cells at high doses. This model is widely used for the study of liver diseases and the testing of new treatment methods. Below is the process of creating a model of liver poisoning using paracetamol:

Experiment design

For this, 180-220 g of laboratory rats (for example, Sprague-Dawley or Wistar rats) are selected and grouped. For this, at least 4 groups of white male laboratory rats are taken, with no less than 6 in each. The 1st group is the "intact" group, in which the disease is not caused.

The 2nd group is the "control" group, where paracetamol causes liver poisoning and is not treated. The 3rd group was the experimental group, where paracetamol induced liver poisoning, and the studied drug was previously administered in a specific dose. The 4th group is the comparison group, where paracetamol causes liver poisoning, and before this, the drug, which is widely used in medical practice today, is administered in a certain dose.

Experiment

Before starting the experiments, the rats intended for the experiment are weighed and grouped. Blood was taken from all groups of rats and the initial biochemical blood parameters were determined.

Modeling of liver damage using paracetamol was carried out as follows: laboratory white male rats weighing 180-220 g were given the studied preparation at various doses once a day for 14 days.

For the next two days, 1000 mg/kg of paracetamol is administered orally once.

- The rats of the control group were given distilled water under the same conditions, and they were also injected with paracetamol at 1000 mg/kg for the last 2 days.

The intact group is given distilled water under the same conditions.

The drug of comparison (placebo or another drug) is also administered for 14 days and paracetamol 1000 mg/kg once a day for the last 2 days.

Monitoring and evaluation

Monitoring for several hours or days after administering the drug.

On the last day of the experiment, blood was taken from all groups of laboratory rats, biochemical indicators were analyzed, and the results were evaluated by comparison with the initial blood test.

Health metrics

Observe the general health of rats, in particular their activity and behavior.

Liver function assessment

Taking blood samples to assess liver function and measuring ALT (alanine aminotransferase), AST (aspartate aminotransferase), and bilirubin levels.

Calculation of a liver poisoning model in laboratory rats using 40% ethyl alcohol.

With the help of this model, it is possible to study the mechanisms of ethanol leading to liver poisoning and test potential antidotes or treatment methods.

Experiment design

For this purpose, groups are created for white male laboratory rats. At least 4 groups are taken, with no less than 6 white male laboratory rats in each. The 1st group is the "intact" group, in which the disease is not caused. The 2nd group is the "control" group, where poisoning of the liver with 40% ethyl alcohol is induced and is not treated. The 3rd group was the experimental group, where poisoning of the liver was induced with 40% ethyl alcohol, and before this, the studied drug was administered in a certain dose. The 4th group is a comparison group (placebo or another drug), in which poisoning of the liver is induced with the help of 40% ethyl alcohol, and before this, the drug, widely used today in medical practice, is administered in a certain dose.

Experiment

Before starting the experiments, the rats intended for the experiment are weighed and grouped. Blood was taken from all groups of rats and the initial biochemical blood parameters were determined.

Modeling of liver damage using paracetamol was carried out as follows: laboratory white male rats weighing 180-220 g were given 40% ethyl alcohol 1 time a day for 7 days, 2 hours before administration, in various doses.

On the last 7 days of the experiment, 40% ethyl alcohol is administered orally once for 7 days, 2 hours before administration.

- The rats of the control group were given distilled water under the same conditions, and on the 7th day, 2 hours after the injection of distilled water, they were also injected with 7 ml/kg of 40% ethyl alcohol using a probe.

The intact group is given distilled water under the same conditions.

The comparison drug (placebo or another drug) is also administered for 7 days, and 7 ml/kg of 40% ethyl alcohol is administered 2 hours after the last drug was administered.

Monitoring and evaluation

Monitoring for several hours or days after administering the drug.

On the last day of the experiment, blood was taken from all groups of laboratory rats, biochemical indicators were analyzed, and the results were evaluated in comparison with the initial blood test.

Health metrics

Observe the general health of rats, in particular their activities and behavior.

Liver function assessment

Taking blood samples to assess liver function and measuring ALT (alanine aminotransferase), AST (aspartate aminotransferase), and bilirubin levels.

3. Experimental model for inducing galactosamine hepatitis

The galactosamine hepatitis induction model is a widely used experimental method for studying liver diseases. With the help of this model, it is possible to study the processes of inflammation and liver damage. This method is closest to viral liver disease (Vengerovsky A.I. et al. 1999-2002). Below is information about the process of creating a model of galactosamine hepatitis:

In this method, the experimental design and analysis methods are almost identical, differing in the method of causing poisoning agent and disease.

Galactosamine was administered orally to laboratory rats of all groups, except the intact group, at a dose of 500 mg/kg for 4 days.

During the experiment, observation of the general health and behavior of the rats, assessment of liver function: taking blood samples and measuring the levels of ALT, AST, bilirubin, histological analysis: taking liver tissue, microscopic examination: microscopic examination is carried out to identify changes in liver cells (for example, inflammation, necrosis, fibrosis).

The obtained results were subjected to statistical analysis and the influence of galactosamine on liver poisoning was determined.

In any experiment, it is important to observe ethical standards. It is necessary to obtain permission from the ethics committee before using animals.

CONCLUSION

Each of the experimental models we studied is of particular importance, and the preparations planned for study should be studied in all four ways.

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