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# DNA damage to nervous tissue due to lead intoxication combined with glucose loading

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# Introduction

According to observations from 2008 to 2017, many localities in the Russian Federation are included in the list with moderately dangerous and dangerous categories of lead contamination of soil, air and water bodies. The effects of heavy metals on various organs and systems, including DNA damage and apoptotic processes, have been studied. Studies of diabetes mellitus on experimental models are relevant, but its genotoxic effects on the nervous system are not well understood. There is also a lack of genotoxicity data for lead intoxication combined with metabolic disorders. Research on these aspects is important for improving preventive measures and early diagnosis of health problems caused by aggravating factors in the workers and the population.

# Methods

**The experiment:**
Adult male rats

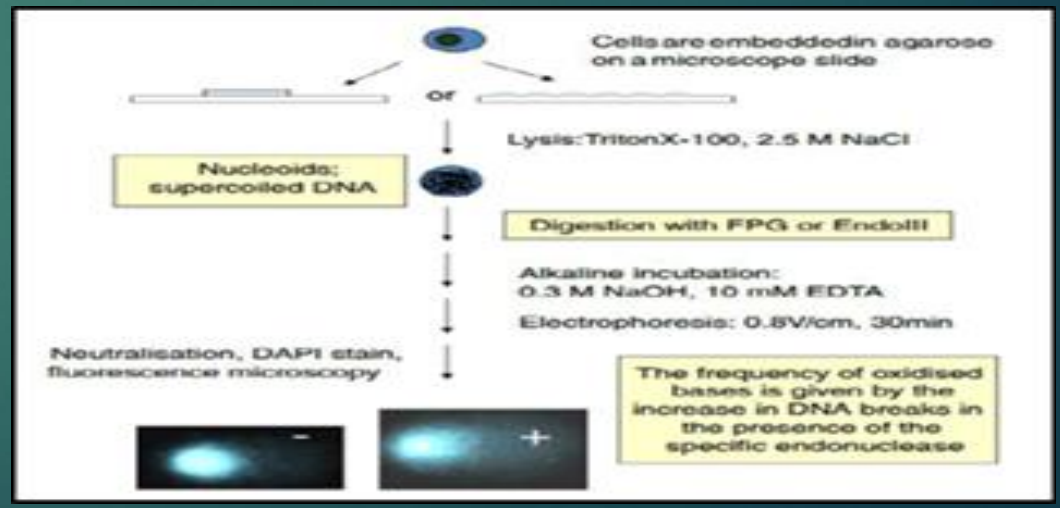
3 groups (of the 12 animals in the which)

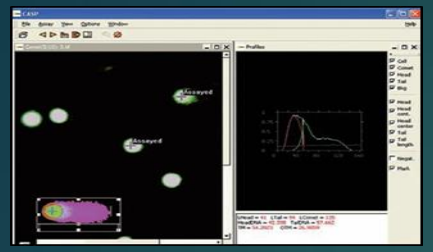
- group 1 -the control individuals.
- group 2- lead acetate daily at a dose of 50 mg/kg bw with drinking water for 30 days.
- group 3 - lead acetate intoxication under similar conditions

and simultaneously injected glucose at a dose of 6000 mg/kg bw twice a day at an interval of 6 hours for 30 days.

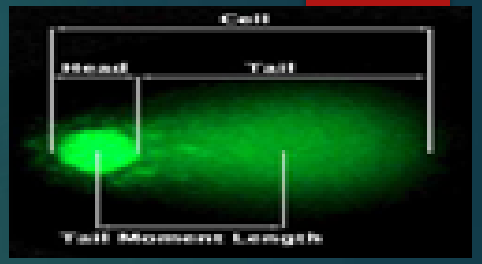
Behavioral reactions were studied by means of the test “open field”.

The DNA damage in the brain tissue was evaluated using the “DNA comet” method. The images from the fluorescent microscope were analyzed using Comet Score.





# Methods




The DNA content of the comet's tail reflects the extent of DNA damage. Depending on this indicator, cells were allocated according to characteristics:

1 (b) - Cells without damage were those containing 0 to 1 percent of the DNA damage in the comet's tail.

2 (c) - cells with minor damage had 1.1 to 10 percent of the DNA damage in the tail.

3 (d) - cells with significant damage had 10.1 to 30 percent. 4 (e) - cells counted apoptosis-positive cells if the amount of damaged DNA in the tail exceeded 30 percent.

# Results and conclusion

In animals of the group 3 that received lead acetate and were given glucose loading, the latent period of the first performance of the act of “locomotion at the periphery” significantly increased in the first minute of observation in the “open field” to 9.8 (7.3-15.8) seconds compared to 2.6 (1.6-4.7) seconds in the rats of group 2 receiving lead acetate (p=0.013). This indicator in the group 2 rats showed a downward trend from 8.4 (4.8-13.5) seconds in the control group (p=0.028). In the interval of the second minute of testing in the rats of the 3 group statistically significant (p=0.002) the total duration of the act of “sniffing” has decreased to 15.8 (9.6-19.8) seconds compared to 23.1 (22.9-23.2) seconds in the animals of the 2 group. The same rats showed a downward trend (p=0.045) in the number of acts to 4.0 (3.0-7.0), compared to 10.0 (7.0-11.0) in group 2, which were consumed by lead.

The most genotoxic damage to nerve tissue cells was caused by lead acetate from glucose loading, as more than 60 percent of all cells were apoptosis-positive. In the group 3 of the animals, the number of apoptosis-positive cells in brain tissue was 62.8 (54.7-70.9) percent exceeding 18.7 (12.2-25.2) percent of the control group (p=0.0001), and exceeding 48.4 (38.4-58.5) percent in the group 2 (p=0.035).

# Thank you for attention!