

**CHANGES OF AMMONIA AND pH IN BLOOD OF RATS
UNDER THE INFLUENCE OF NICOTINE
FROM CIGARETTES SMOKE AND HOOKAH SMOKE**

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Introduction. Today there are various ways of smoking, like conventional cigarettes or hookah smoking. Many people believe that the use of hookah is less harmful than cigarette consumption. But how hookah influence on human health veracious unknown. The cigarettes smoke is fine-system consisting of solid particles. The hookah smoke unlike cigarettes is a fine-system (aerosol) that consisting liquid particles. Therefore hookah smoke can penetrate deeper and condense on the surface of the lungs.

Aim. The aim of the study was to study the influence of nicotine from cigarettes and hookah on the pH and ammonia levels in blood serum.

Materials and methods. The study was carried out on 18 rats weighing 220 ± 30 g for 15 days. Animals were divided on three groups of 6 animals each: 1st – intact control, 2nd – rats that have been subjected to cigarette smoke aspiration, 3rd – rats that have been subjected to hookah smoke aspiration. Rats of 2nd and 3rd groups placed to aspiration chamber volume of 0.08 m³ and subjected to influence cigarette or hookah smoke, respectively for 30 minutes. The dose of nicotine was calculated based on the equivalent dose for the rat from of average man's weight 70 kg, which receives daily 20 mg nicotine, which amounted to 0.043 mg per day for rat.

Blood pH was determined by using pH-meter "pH-150ma" in the 1st day before and after the "passive smoking" and on the 15th day of the experiment. The determination of the state of the blood buffer systems was carried out by determining the free ammonia in blood plasma using a photometric method with Nessler reagent on the 1st day before and after "passive smoking" and on the 15th day of the experiment.

All intervention and euthanasia of animals was performed according to the requirements of the Commission on Bioethics of the National University of Pharmacy (Kharkov, Ukraine) and "General ethical principles of experiments on animals", which are consistent with the provision of the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (Strasbourg, 1986) and the I-st National Congress on Bioethics (Kyiv, Ukraine, 2001).

Statistical analysis included material using standard methods of variation

statistics, calculating average values (M) and the average error (m). Statistical significance was assessed using one-way ANOVA test, the difference was considered to be reliable at $p \leq 0.05$. The data processing was performed using Statistica 7.0 and Excel software.

Results and discussion. It was found that under the influence of nicotine both from cigarette and hookah smoke after the first 30 minutes of aspiration the blood pH shifts to the alkaline side and rises by 1.2 % – from 7.52 to 7.61 against the background of cigarette smoke, and by 1.1 % – from 7.53 to 7.61 against the background of influence hookah smoke. After 15 days of daily "passive smoking", the pH blood in rats exposed to cigarette smoke was 7.56, which was 0.04 more than the initial data (7.52) and 0.02 more than the pH value of blood rats of the control group – 7.54. In rats that inhaled the hookah smoke, the changes between the pH blood of the control and experimental groups were not established.

The obtained data show that alkalosis, arising as a result of compensatory hyperventilation after the first 30 minutes of inhaled smoke, disappears against the background of a daily 15 days "passive smoking". It indicates a decrease in the excitability of the respiratory center, the adaptation of the organism to the conditions of chronic hypoxia and the development of depletion of buffer systems. In this case, the influence of hookah smoke on blood pH is more than that of a cigarette.

When determining the concentration of ammonia in the serum is found that under influence of cigarette smoke ammonia concentration decreased on 8 % at the first 30 minutes from 0.274 ± 0.021 mg/l to 0.251 ± 0.01 mg/l ($r \geq 0.05$) and decreased on 7 % ($r \geq 0.05$) after 15 days of the experiment – to 0.255 ± 0.017 mg/l. In rats under the influence of hookah smoke there was a reduction in the concentration of ammonia by 7 % during the first measurement from 0.257 ± 0.011 mg/l at the beginning of the experiment to 0.239 ± 0.009 mg/l after 30 minutes "passive smoking" and by 9 % on 15th day to 0.234 mg/l ($r \geq 0.05$). Therefore, hookah smoke leads to more noticeable changes in the concentration of ammonia in the serum within 15 days compared to cigarette smoke. It indicates on existence additional burden on the liver function.

Conclusions.

1. The results indicate that nicotine from hookah smoke and cigarette smoke influence on the pH and on the concentration of ammonia in the serum.
2. At the daily smoking the concentration of blood pH is lowering, that indicate on decrease in activity buffer systems.
3. Reduction of ammonia in the serum is the indicant loads on the liver function.