AJLISI
GLOBAL RESEARCH NETWORK

Information Horizons: AMERICAN Journal of Library And Information Science Innovation
Volume 2, Issue 6, 2024 ISSN (E): 2993-2777

Chemical Experiments with Cigarettes

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Abstract. *Studies on the study of metabolic processes in the body, in particular, the determination of the ability to accumulate toxic and potentially toxic elements in the body of animals exposed to nicotine were carried out in 2 stages, while at each stage the experimental animals were divided into two groups of 30 heads each (one control and one experimental group).The experimental animals were exposed to tobacco smoke for 30 minutes in the seed chamber. The control group consisted of intact animals, daily stay for 30 minutes in a seed chamber with no tobacco smoke.*

A plastic chamber with a volume of 0.3 m was used to simulate "passive smoking". The smoke of the chamber was carried out by burning cigarettes in a special holding device. As the cigarette burned, they were replaced, thereby ensuring a constant flow of smoke into the priming chamber. An even distribution of smoke was provided by a fan.

Keywords: *harmful and toxic substances, phenols and aldehydes, harmful substances.*

The calculation of the equivalent nicotine dose and the exposure time of animals to tobacco smoke was carried out on the basis of a proven model and own calculations: if, on average, the average smoker smokes one pack (20 cigarettes) per day, then 20 mg of nicotine enters the body. Based on this, the equivalent dose of nicotine for a rat, from an average human weight of 70 kg, will be 0.043 mg per day.

Cigarette tar is what remains in the body after smoking a cigarette. They settle on the lungs, thereby blocking their ability to self-clean, and reduce immunity. During smoking, tobacco smoke penetrates in the form of an aerosol in a strong concentration. In the body, it cools down, a condensation process occurs and resins are formed. And it is they who are literally stuffed with harmful and toxic substances Today, on the Internet, you can find many experiments reflecting what remains in the body after smoking a cigarette. Penetrating into the body, substances contained in resins provoke oncological and other lung diseases. It is the resins of cigarettes that are the main cause of the development of cough and chronic bronchitis in a smoker.

Tobacco smoke contains 76 chemical elements, including arsenic, cadmium, nickel, lead, chromium and others. By the way, there are currently 118 elements in the periodic table. Arsenic. Once in the body, arsenic is transported with blood to the heart, lungs, kidneys, spleen and liver. It also has a negative effect on the nervous system. Tobacco smoke contains a small amount of arsenic, but mainly in the composition of inorganic compounds, which are strong carcinogens that cause cancer. In addition, arsenic has the ability to accumulate in the body of a smoker. For example, its significant content in the thyroid gland provokes the development of endemic goiter.

Cadmium is a heavy metal that negatively affects the functioning of the nervous system, has the ability to "settle" in the liver and kidneys. Reduces bone mineral density. The content of cadmium in the body of women increases the likelihood of premature birth. Nickel is the "culprit" for the development of asthma and cancer. Nickel particles, when inhaled, cause inflammation of even the smallest bronchi.

Lead accumulates in bones and causes their destruction. In terms of its effect on the body, it is several times more dangerous for children than for adults. It can cause stunted growth and mental development, blood diseases, hearing loss, decreased attention and performance.

It is well known that smoking is dangerous for human life, because tobacco smoke contains several thousand substances, among which there are quite a lot of harmful ones. To prove that tobacco smoke and tobacco contain substances harmful to health, as well as the negative role of smoking, I conducted the following experiments.

I. Determination of the composition of tobacco smoke.

Experiment 1. Obtaining solutions of substances contained in cigarette smoke and determining the reaction of the tobacco smoke environment (Appendix)

1. Production of tobacco (cigarette) smoke and its dissolution. (The experiment was carried out under traction).

Methodology:

I inserted a glass tube into a rubber douche bag. I put a cigarette in the free end of this tube. Squeezing a pear, she lit a cigarette and, creating a craving with the pear, carefully unclenched it. At the same time, tobacco smoke fills the pear. She poured distilled water into a conical flask with a capacity of 250 ml and released smoke from the pear into the water. Some components of smoke dissolve in water. I repeated the collection of cigarette smoke 10 times.

Result:

Using this technique, I received a solution of tobacco (cigarette) smoke from cigarettes with a BOND filter, which is the most popular among students of my school.

I received a solution of tobacco smoke from cigarettes without a filter – Prima (Flask No. 1). I left the obtained solutions for subsequent experiments.

I filled flask No. 3 with tap water.

Experiment 2. Detection of phenols and aldehydes in tobacco smoke solution

Qualitative reaction to phenols ($FeCl_3$ reagent).

Methodology:

I poured 1 ml of solutions from flasks No. 2 and No. 3 prepared in experiment 1 into two test tubes and added 3 drops of 5% $FeCl_3$ solution to each tube.

Result:

The liquid turned brown-green.

Each of the phenols that make up tobacco smoke gives its own color with $FeCl_3$: phenol — purple, pyrocatechin — green, and hydroquinone - green, turning into yellow. I got a brown-green solution

The colors are due to the formation of a mixture of complex compounds of phenols of different structures.

After conducting all the experiments and processing the data obtained, we held a mini–conference at the school for students, teachers and classmates helped me with this. I gave an essay and presentation to the guys. The guys listened to my performance with great interest.

After the performance, we exchanged opinions and impressions. Some guys said that they did not know enough about the effect of various components of tobacco smoke on a living organism (experiments with saliva aroused particular interest). There were also those who said that smoking is my personal business, I want and will smoke. It was good that they were in the minority. However, most of the children said that they would not smoke if they had seen the results of such experiments with their own eyes before. This indicates that a visual experiment can make a strong enough

impression on children and form a negative attitude towards smoking in them. We came to the conclusion that it is possible to change attitudes towards smoking due to a high culture of knowledge about the dangers of smoking and that it is possible to quit smoking if a person has the desire and willpower.

My research confirms that smoking is deeply ingrained among young people. Having theoretical knowledge about the dangers of smoking, students see its danger to health only in the long term. Therefore, any recommendations, provided they are positively perceived by students, will contribute to a positive result if the teenager himself makes efforts to do so.

Experience 4. Comparison of tobacco products of different brands and identification of the relationship between permanganate oxidability and iodine number

This part of the work consisted in comparing tobacco products of various brands and identifying the relationship between permanganate oxidability and iodine number (the amount of potassium permanganate and iodine, respectively, spent on titration of a certain volume of tobacco extract) with the content of nicotine and resins in cigarettes.

For permanganometry, 10 ml of tobacco extract was taken and titrated with a solution of potassium permanganate of a known concentration until a red-pink color appeared. This method is non-indicator, since the color is given by potassium permanganate itself.

Iodometry was performed by titrating 10 ml of tobacco extract with a solution of iodine of a certain concentration in the presence of starch until a stable blue color appeared due to the formation of a complex of excess iodine with starch.

Based on the assumption that the relationship between the iodine number and permanganate oxidizability and the content of harmful substances in tobacco smoke is directly proportional, a comparative number of different brands of tobacco products were compiled according to the content of harmful substances in them: "Maxim" > "Optima" > "Winston" > "West" > "More" > "Camel" > "PallMall" > "Chesterfield".

Brand of tobacco products	ν(I2)×10-4, mole		ν(KMnO4)×10-3, mole	
	tobacco smoke	filter	tobacco smoke	filter
«Chesterfield»	8,66	30,3	7,59	22,02
«PallMall»	8,66	17,3	9,1	18,99
«Camel»	12,99	21,66	9,1	19,75
«More»	17,3	12,99	8,35	15,94
«West»	21,66	17,3	12,1	18,99
«Winston»	25,9	17,3	12,9	19,75
«Optima»	34,6	12,99	12,9	14,43
«Maksim»	34,6	12,99	14,4	12,9

Nicotine appears in brain tissues 7 seconds after the first puff. Nicotine seems to improve communication between brain cells, facilitating the conduction of nerve impulses. Brain processes are temporarily stimulated due to nicotine, but then they are inhibited for a long time. After all, the brain needs rest. Shifting the pendulum of mental activity familiar to himself, the smoker then inevitably feels its reverse course.

But the insidiousness of nicotine is not only in this. It manifests itself with prolonged smoking. The brain gets used to constant nicotine handouts, which make its work easier to some extent. And now he begins to demand them himself, not wanting to overwork himself too much. The law of biological laziness comes into its own. Like an alcoholic who has to "feed" his brain with alcohol in order to maintain normal well-being, a smoker is forced to "pamper" him with nicotine. Otherwise, anxiety, irritability, nervousness appear.

The respiratory organs are the first to take on the tobacco attack. And they suffer most often. Passing

through the respiratory tract, tobacco smoke causes irritation, inflammation of the mucous membranes of the pharynx, nasopharynx, trachea of the bronchi, as well as pulmonary alveoli. Constant irritation of the bronchial mucosa can provoke the development of bronchial asthma. And chronic inflammation of the upper respiratory tract, chronic bronchitis, accompanied by a debilitating cough, is the lot of all smokers. A link has also been established between smoking and the incidence of cancers of the lips, tongue, larynx, and trachea.

Damage to the heart and blood vessels in people who smoke a lot and systematically is a consequence of a violation of the regulation of the cardiovascular system. In tobacco lovers, hypertension is much more severe than in non-smokers: it is more often complicated by hypertensive crises, impaired cerebral circulation - stroke.

Smoking is one of the main causes of the development of such a serious disease as obliterating endarteritis. In this disease, the vascular system of the legs is affected, sometimes up to complete obliteration (closure of the lumen) of the vessels and the occurrence of gangrene. Nicotine and other tobacco components also affect the digestive organs. Scientific research and clinical observations indisputably show that long-term smoking contributes to the occurrence of peptic ulcer of the stomach and duodenum.

Smoking impairs human hearing to the same extent as aging of the body. Even 20 cigarettes smoked per day lead to a weakening of the normal perception of spoken language. Smoking has a detrimental effect on a pregnant woman. During pregnancy, the negative effects of smoking manifest themselves much faster, and especially in relation to a developing child. It has been shown that if the mother smoked during pregnancy, the newborn's weight is 150-200 grams less than normal.

Trisomy, that is, the presence of an "extra" chromosome in a person's genetic set, often leads to serious hereditary diseases. It has been proven that the risk of this phenomenon in women who smoke is significantly higher than in non-smokers.

Smokers endanger not only themselves, but also the people around them. Even the term "Secondhand smoke" has appeared in medicine. In the body of non-smokers, after staying in a smoky and unventilated room, a significant concentration of nicotine is determined. The material collected and systematized by scientists shows that in modern society there are acute problems associated with smoking, and they need to be solved not only by society, but also by each person.

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