

TOXICITY OF HOUSEHOLD CHEMICAL PRODUCTS AND THEIR EFFECT ON THE BODY

Rakhmanova Alina Khurshedovna
Student of TMA,

Kurbanova Mohira Abduvakhobovna
Associate Professor, Scientific Supervisor, Department
Tashkent Medical Academy, Tashkent, Uzbekistan.

Tukhtasinova Malika Ilkhamovna
Student of TMA,

Sarafnoz Saidakhmatova Assomidinovna
Student of TMA,
e-mail: mohira_1974@mail.ru

Abstract

In the modern world, the relevance of clean housing, premises and workplaces is more than ever a priority for the majority of the population, which is why the development of less aggressive household chemicals and their safe use currently has valuable weight. In this article we will analyze the use of chemically toxic substances in our lives, in particular its effect on the human body. We will also consider research and experiments conducted to study the safe concentration and composition of the cleaning product, including treatment methods in the event of pathogenic processes occurring upon contact with household chemicals.

Keywords: Household chemicals, frequent use, toxicity, research methods, effects on the body, treatment.

Introduction

The relevance of the work. Currently, household chemicals are an indispensable tool in human life. Using it both in the care of the house and other premises, and in the fight against pests, we do not think about the possible effects of their constituent compounds on our body. Despite their effectiveness in the field of hygiene and elimination of bacteria, researchers have identified significant disadvantages such as environmental pollution and the development of chronic diseases, including bronchitis, asthma and allergic reactions, which generally indicates harm to the health of consumers [1-5].

It is for this reason that scientists at Imperial College in London in 2016 classified cleaners to the list of professions with an increased risk of developing chronic lung diseases. But not only people who work with these drugs every day may be the only ones at risk [6-8].

One example is the weekly cleaning of the house, during which a person inhales detergent particles, and so in prolonged contact for decades it manifests itself in a significant change in the body.



So, years earlier, in 1996, scientists from the University of Bergen conducted an experiment in which about 6,235 housewives and cleaners aged 34 were regularly examined. More than half of the subjects were female, 44% of the participants had never used tobacco, which means their lungs were not constantly exposed to cigarettes [9-12]. But everyone often cleaned their own or someone else's apartment several times a week using standard cleaning products from supermarkets. The scientists monitored the health of the subjects for 20 days. And the more they cleaned, the more often they encountered various respiratory diseases: from asthma to inflammation of the respiratory tract.

While a person is cleaning the kitchen or washing the bathroom, the smallest particles of chemicals get on the mucous membranes of his respiratory tract. Over time, this leads to irritation and swelling. As a result, the volume of healthy lungs is reduced, the work of the entire respiratory system is disrupted. The effect is comparable to the effect of cigarettes. In fact, every cleaner is no different from an avid smoker who smoked a pack of cigarettes for many years after [13-15].

Researchers compare detergents to long-term poisons. If chemicals disinfect surfaces, killing germs and viruses, their effect on the functioning of internal organs will be irreversible. Gradually settling on the walls of the lungs, they reduce the processes of organ function [16].

It is known from studies that hydrocarbon propellants can cause an attack in people with asthma - and if inhaled in large quantities, they can cause cardiac arrhythmias and even cardiac arrest [17-18].

The purpose of the study. The essence of the disclosure of this problem is to familiarize the population with the effects of household chemicals and recommendations for its safe use, in order to avoid cases of abuse of cleaning products and detergents containing aggressive factors that increase the risk of developing diseases. As well as finding an alternative method of replacement or treatment for existing consequences.

Experimental methods. We assess the degree of danger to the population from the use of synthetic substances in cleaning, created on the basis of anionic and nonionic surfactants.

Material and methods. To determine the average lethal dose (LD50), a sample of detergent was injected into the stomach of 6 male rats at a dose of 5000 mg per 1 kg of body weight.

The irritant effect on the skin was determined by applying a single working solution (1.25%) to 6 rats and 3 rabbits on a fur-free area of the side at exposure for 4 hours, followed by flushing and into the conjunctival sac of the eye to 6 guinea pigs and 3 rabbits. The observation period is 14 days.

A single skin-resorptive effect of the working solution was studied on 20 rats divided into 2 groups of 10 animals in the control and experimental groups. The observation period is 14 days. After monitoring the condition of the animals, we determine the peripheral blood parameters. The sensitizing effect was studied on 20 guinea pigs (10 animals each in the experimental and control groups) by a combined method.

Results. According to the parameters of acute toxicity, the studied detergent sample belongs to low-hazard compounds ($LD_{50} > 5000$ mg per 1 kg of body weight). When applied once to the skin of rats and rabbits, the mucous membrane of the eyes of guinea pigs and rabbits, the detergent sample does not cause irritation, does not have a skin-resorptive (rats) and allergenic effect (guinea pigs). Conclusions. The results of the conducted toxicological and hygienic



studies allow us to conclude that there is no risk of using the studied sample of household chemicals for the population.

In treatment methods, with prolonged ingestion into our holistic system, toxic compounds of cleaning products can negatively affect the physical condition. Taking into account the type of substance and the path of penetration into the body, we will divide them into such subgroups:

1) Poisoning by chemical vapors through the respiratory tract. Superficially demonstrates itself as the initial stage of damage to the upper respiratory organs and is complemented by such a set of symptoms as: shortness of breath and difficulty breathing, cough, acute respiratory failure – slowing or stopping breathing, chemical burn of the upper respiratory tract, noticeable pallor or bluish tinge of the skin, lacrimation or, conversely, dryness of the mucous membrane of the eyes, disorientation, hallucinations, loss of consciousness, changes in the rhythm of the heart (slowing or accelerating the heartbeat).

2) Chemical poisoning through the esophagus. When toxic chemicals get inside, the lesions depend on the nature of the chemicals themselves: alkalis and acids produce a chemical burn, the remaining compounds are absorbed in the stomach and intestines, triggering the mechanism of toxic effects when they enter the blood. In these cases, the following symptoms are observed: severe pain in the throat and stomach, chemical burn of the oral mucosa, upset stomach and diarrhea, black mushy stools with internal bleeding of the larynx, esophagus, stomach and intestines, nausea, vomiting, including black with internal bleeding in the stomach or intestines, dehydration due to loss of fluid during vomiting and diarrhea.

Pre-medical care depends on the type of chemical taken:

If acid gets into the esophagus, you need to give the victim a large amount of water to drink to reduce the concentration and soapy water to neutralize acidic effects [6-10].

If alkali gets into the esophagus, we also use water to reduce the concentration or acidic drinks. It is also a good solution to take enveloping substances to protect intact areas of the mucous membranes.

3) Poisoning by chemicals that have got on the skin or mucous membranes. When poisons get on the skin, the nature of the lesion also depends on the nature of the chemicals: alkalis and acids leave a burn, highly toxic damaging substances are absorbed and penetrate into the blood through the skin, already directly affecting the work of internal organs and systems. The following symptoms may occur: burn marks of varying degrees at the site of contact with the substance on the skin (from redness to blisters or skin corrosion), allergic manifestations: redness, rash, spots, etc., severe pain, respiratory and heart rhythm disorders.

Classification of skin burns. The features of the lesion depend on the structure of the substance that got on the skin. Based on this feature, three types of lesions are distinguished:

Acid burns. The concentrated composition instantly causes denaturation of the protein that forms the skin. A dry scab forms at the site of contact with an aggressive liquid and we can observe characteristic bands of hyperemia along the edges. Next, a protective mechanism is triggered. The hardened layer blocks the penetration of acid deep into the tissues, so the injury will be superficial. Such burns often occur in cosmetologist's offices if the doctor overexposed the peeling on the client's face or incorrectly selected the concentration of the solution.

Burns with alkalis. These substances are more dangerous than acids. A loose scab with uneven edges forms on the skin, collagen is destroyed and wet necrosis is formed. The alkali easily



penetrates deep into the tissues, causing extensive damage. The affected areas of the skin do not heal for a long time.

Burns with heavy metal salts. As a rule, they are easier to carry. Aggressive substances remain on the surface and have an effect only on the epidermis — the upper layer of the skin.

Emergency measures also depend on the class of the chemical compound. In case of salt burns, it is important to rinse the wound under cold, but not icy water and only then neutralize the medium. In contact with acids, compresses with a slightly alkaline soap solution are allowed. In case of an alkali burn, the affected areas of the body must be treated with dilute citric or boric acid.

There are also other clinical manifestations and symptoms of chemical poisoning, common regardless of the method of penetration of the poison: toxic shock, anaphylactic shock, disorders of the central nervous system, loss of consciousness (coma is also possible), difficulties in the work of the heart until it stops, destruction of red blood cells and acute anemia, acute renal failure, acute liver failure, pancreatitis.

There is an assessment of the severity of the lesion according to the following criteria.

Various prognostic indices are used to assess the severity of the lesion and predict the further development of the disease. They are based on the area and depth of the lesion, and some of them take into account the age of the victim. One of these indices is the lesion severity Index (ITP).

When calculating the ITP, each percentage of the burned area gives from one to four points in the depth of the lesion, a burn of the respiratory tract without respiratory impairment — 15 points, with a violation — 30, etc. ITP is interpreted as follows:

< 30 points — the prognosis is favorable;

30-60 — conditionally favorable;

61-90 — doubtful;

> 91 — unfavorable.

At the end of this article, an analysis of the comparison of the pros and cons of using toxic substances in everyday life is proposed. On the positive side, household chemicals are able to eliminate complex pollutants in a short amount of time and, having an antibacterial effect, are actively used to create a safe environment from pathogenic bacterial pathogens and harmful microorganisms.

Among the disadvantages, we should not forget about the composition of the chemicals used and their effect on the body. Having toxic properties, household chemicals can aggressively affect not only the skin, but also the respiratory tract as a result of passive transmission from the external environment. In addition to these factors, there are cases of developing a certain dependence in people when using these substances, called substance abuse. This pathogenic process develops against the background of frequent absorption of drugs and compounds that are not classified as narcotic, but also affect the mental state of a person and his mental health. The object of this addiction is both medicines and technical solvents and household chemicals. By limiting the use of these funds in moderation and taking precautions, we preserve our health without putting it at risk. Among the disadvantages, we should not forget about the composition of the chemicals used and their effect on the body. Having toxic properties, household chemicals can aggressively affect not only the skin, but also the respiratory tract as a result of



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