



**Materials of XI abstract (anniversary) conference of first-year students**

***"Chemistry. Ecology. Medicine"***

**Харків**

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МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ  
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КАФЕДРА МЕДИЧНОЇ ТА БІООРГАНІЧНОЇ ХІМІЇ

**Materials of XI abstract (anniversary) conference of first-year  
students**

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and Research Institute for Foreign Nationals

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## ***ENVIRONMENTAL CHEMISTRY(MEDICAL ASPECT)***

***Animawun Adebimbayo Kabirat.***

***SCIENTIFIC ADVISER : Svetlana Kozub***

Environmental chemistry is the study of chemical processes that occur in water, air, terrestrial and living environments, and the effects of human activity on them. It includes topics such as astrochemistry, atmospheric chemistry, environmental modeling geochemistry, marine chemistry and pollution remediation. Environmental chemistry is interdisciplinary science that includes atmospheric, aquatic and soil chemistry, as well as heavily relying on analytical chemistry and being related to environmental chemistry and other areas of science. Several methods and preventive procedures have been developed with the help of environmental chemistry to reduce the release of hazardous substances into the water bodies which leads to clean and recreational drinking water. Environmental chemistry helps to develop methods and procedure to reduce the contaminants or the chemicals in the air ,which improves the quality of air. Cleaner air with fewer chemicals leads to less damage to lungs. The study also helping in reducing the risk for workers working in chemical industries by inventing procedures which minimize the use of chemical in manufacturing products.

Safer products with fewer chemicals are available for consumption purposes resulting in reduced chemical waste which result in less environmental pollution. This branch of chemistry also helps in introducing new ways of farming using fewer chemicals and more organic compounds to make safer food available for people across the world . it also helps to eliminate toxic chemicals from entering the food and food chain with the help of pesticides that are degradable and are toxic only to specific pest. many chemicals are introduced into the environment from various sources which include pesticides, harmful emission from factories and vehicles, in the form of chemical waste from industries and many others.

Environmental chemistry researches into the core cause and develops methods, techniques and tools that reduce the chemical disposal into the environment.

The chemistry has also contributed to developing green chemicals that either degrade compounds into innocuous product or to recover them for further use. Reduced chemicals in the environment help plants and animals to suffer less from harmful chemicals. It also helps to reduce global warming by lowering the rate of ozone depletion and pollutants deposit in thickly populated places it also contribute a lot to less use of hazardous landfills that are persistent. Under this we have pollution, environmental pollution is the effect of undesirable changes in environment due to introduction of contaminants that have harmful effect on plants, animals, and human beings. A substance which causes pollution is called the pollutant, pollutant can be solid liquid or gaseous substance present in greater concentration and are produced due to human activities there are four types of pollution ; air pollution, water pollution, soil pollution and noise pollution

Global warming is the steady increase of earth's average surface temperature due to effect of green house gases. Effects of pollutant on food web; introduction to food web, risk versus benefits, development of safer chemicals, food chain are dependent on upon primary producers which input energy, primary energy input is derived from photosynthesis converted to complex carbohydrate utilizing sun's energy, no process involving an energy transformation will spontaneously occur only if there is a degradation of energy from a concentrated form to a dispersed form. Urbanization; this refers to the increasing number of people that live in urban areas it predominantly results in physical growth of urban areas be it horizontal or vertical. Smog; this word is derived from the combination of smoke and fog. Biochemical oxygen demand: It is the amount of oxygen required by bacteria to carry out the decomposition of the organic matter present in a certain volume of a sample of water. It gives us an idea of the amount of organic matter present in water. Carbon monoxide gas is more dangerous than carbon dioxide gas because carbon monoxide gas is a poisonous gas which reacts with the haemoglobin of blood to form carboxy-

haemoglobin complex, which reduces blood's capacity to supply oxygen to various organs and tissues in the body. This results into headache, nervousness, cardiovascular disorder, and if inhaled in large amount, can even cause the death. Quantitative chemical analysis is a key part of environmental chemistry, since it provides the data that frame most environmental studies.

Common analytical techniques used for quantitative determinations in environmental chemistry include classical wet chemistry, such as gravimetric, titrimetric and electrochemical methods. More sophisticated approaches are used in the determination of trace metals and organic compounds. Metals are commonly measured by atomic spectroscopy and mass spectrometry: Atomic Absorption Spectrophotometry (AAS) and Inductively Coupled Plasma Atomic Emission (ICP-AES) or Inductively Coupled Plasma Mass Spectrometric (ICP-MS) techniques. Organic compounds, including PAHs, are commonly measured also using mass spectrometric methods, such as Gas chromatography-mass spectrometry (GC/MS) and Liquid chromatography-mass spectrometry (LC/MS). Tandem Mass spectrometry MS/MS and High Resolution/Accurate Mass spectrometry HR/AM offer sub part per trillion detection. Non-MS methods using GCs and LCs having universal or specific detectors are still staples in the arsenal of available analytical tools.

Other parameters often measured in environmental chemistry are radiochemicals. These are pollutants which emit radioactive materials, such as alpha and beta particles, posing danger to human health and the environment. Particle counters and Scintillation counters are most commonly used for these measurements. Bioassays and immunoassays are utilized for toxicity evaluations of chemical effects on various organisms. Polymerase Chain Reaction PCR is able to identify species of bacteria and other organisms through specific DNA and RNA gene isolation and amplification and is showing promise as a valuable technique for identifying environmental microbial contamination.



## *Effects of oil products on the human body.*

*Аль Саїд Мунтассір. Науковий керівник: Тишакова Т.С.*

Each year, several billions of crude oil is produced, and at each stage of production: production, storage, transportation and processing of oil, about 50 million tons fall into the ground. oil and oil products. Environmental problems arise at the stage of extraction of crude oil and its delivery to the enterprise: major accidents and oil spills, getting into water bodies, loss of life, large material losses. The result: colossal pollution of land and water. Petroleum products are part of many products: gasoline, propane, kerosene, plastic, paints, pesticides, solvents and cosmetics, some tissues and medicines.

Oil and gas founded the global economy in the last century. However, to date, there is not enough data on the effects of differences and the targeted discharge of oil waste on living organisms. Several good, short-term studies have been carried out, however, and what they tell us is troubling.

Oil and petroleum products have a harmful effect on the human body. on human skin of a liquid oil product, and by inhalation of its vapor. Oil and gas deposits of oil and gas have a particularly large amount of hydrogen sulfide, which has strong toxic properties. Petroleum products irritate the mucous membranes and eyes.

It should be noted that in some cases, some plants and animals can withstand a certain level of oil pollution.

Gas poisoning. Often intoxication occurs when inhaled vapors. The poison can get inside when pumping it from one container to another with the help of a rubber tube when gasoline is sucked in by mouth, for example, when it is necessary to drain gasoline from a car tank into a canister. The ingestion of even a small amount into the oral cavity and further into the stomach provokes the development of signs

of acute poisoning. When inhaling vapors of high concentration oil products, direct contact with the mucous membrane of the respiratory tract leads to destructive processes. This condition is fraught with the occurrence of toxic bronchitis. With local effects on the skin, various dermatitis develops, the course of which is similar to the manifestations of eczema. The destruction of the cellular elements of the skin is accompanied by damage to the small circulatory network of the dermis, through which the poison is absorbed into the blood.

### ***WATER POLLUTION AND HUMAN HEALTH.***

***Муруган Кіцар Кант. Науковий керівник: Тішакова Т.С.***

The increase in world population leads to the fact that the environment is seriously affected. Global environmental climate change contributes to negative consequences for the population and technological expansion. Environmentalists, environmental activists who seek to better understand themselves in the environment.

Water is the foundation of a healthy life. Up to 30% of diseases on Earth are due to poor drinking water and sewage malfunctions. Water quality is one of the global challenges facing humanity in the 21st century. Today, all over the world, the greatest danger to land waters is pollution. Pollution refers to all kinds of physical and chemical deviations from the natural composition of water: frequent and prolonged turbidity, temperature increase, rotting organic substances, the presence of toxic substances in water. Wastewater, which often contains oil products, cyanides, salts of heavy metals, chlorine, alkali, acids, detergents, etc., makes a big contribution to pollution. We should not forget about the infection of water with herbicides, fertilizers and radioactive substances. Also today, water is everywhere contaminated with dumped garbage.

Water can have not only a positive, but also a negative effect on people's health. First of all, this is due to the quality of the water used: its organoleptic properties, determined by

color, taste and smell, as well as the chemical and bacterial composition. The influence of water quality on human health was noted in ancient times. For example, Hippocrates recommended drinking boiled water.

These problems are going to be more aggravated in the future by climate change, resulting in higher water temperatures, melting of glaciers, and an intensification of the water cycle .

## ***AIR POLLUTION.***

***Діб Фарах. Науковий керівник: Тішакова Т.С.***

In the 21st century, during the technological and revolutionary technological process, with its advantages and disadvantages, the occurrence of serious harm to normal human health leads to air pollution, which can contribute to the development of lung diseases. Air pollution is one of the main environmental problems; This mortality is caused by the influence of particles with a size of 2.5 or less microns, which lead to the development of cardiovascular, respiratory and oncological diseases. The effects that air pollution has on our lungs and the human body in general depends on the type and mix of pollutants in the air, their concentrations and how much of the pollutants get into the air.

The main substances affecting health are: nitrogen oxides, sulfur oxides, ozone and particulate matter, the latter - especially particulate matter less than 2.5 microns in size - are the most disturbing, as these tiny particles penetrate deep into the lungs, affecting both the respiratory and so on the vascular system. Both the degree and duration of exposure to polluted air affect health.

One gas that is a major pollutant causing COPD is **CARBONMONOXIDE**. A major source of these gas in the homes include; Clothes dryers, water heaters, boilers, gas stoves and ovens, motor vehicles, grills, generator, etc. In general, concentration of such gases is higher indoors than outdoors and also higher in urban areas than rural areas.

**CO** is essentially an odourless, colourless and tasteless gas. Meaning it cannot be detected by our senses as such most of the time when we are exposed to high concentration of **CO**, we are not aware. When inhaled, it prevents the blood system from effectively carrying oxygen around the body, specifically to vital organs such as the heart and brain.

### ***OCEANS POLLUTION.***

***Голе Кусутима. Науковий керівник: Левашова О.Л.***

The oceans contribute to the well-being of people. Increasingly recognized as valuable mental health by reducing vulnerability to depression. Improving physical and mental health also through exercise such like swimming, walking and sailing.

The ocean is the most important component of the Earth's ecosystem; it is a source of biodiversity, food and life. According to the FAO, over 40% of the world's population lives within 100 kilometers of the coast. Therefore, to ensure food security around the world, better management of ocean resources is needed.

The development of civilization has led to increased existence of the oceans. This was due to the development and refining industry. Today, there are several types:

- physical. Garbage, and especially plastic, which practically does not decompose, is a huge problem for the ecology of the oceans. Millions of tons of plastic waste drift along the surface of the oceans, and, according to experts, 80% of this garbage fell into the ocean from land and only 20% was dumped or washed off ships. Garbage harms more than 250 species of marine animals and birds and releases toxic substances into the water;
- biological. Pollution of the waters of the oceans by foreign bacteria and various microorganisms, as well as organic waste, steadily leads to disruption of the fragile ecological balance;

- chemical. Chemicals and heavy metals are used in a wide variety of industries. Together with sewage, they fall into the ocean, and in huge quantities. Mercury, which accumulates in living organisms, as well as pesticides, is especially dangerous. However, not only large plants are guilty of chemical pollution of the ocean: a lot of chemicals get into the water and from the sewage system, because we constantly use synthetic detergents;
- oil. Oil and oil products are the main source of pollution of the oceans. Oil falls into the water as a result of technological disasters, tanker crashes and well drilling, but many marine oil products also dump a lot of oil products. Oil spills lead to the death of a huge number of marine animals, fish and birds, and in addition, they interfere with normal heat transfer between layers of water;
- thermal. Wastewater, which is discharged into the oceans by power plants, locally raises the temperature of the water, which leads to the mass death of creatures that are unable to survive at such high temperatures. This disrupts the food chain and leads to the extinction of many animal species. At the same time, some types of algae begin to multiply too actively, resulting in blooming water;
- radioactive. The ocean has long turned into a cemetery of radioactive waste. According to research estimates, today there are so many radioactive substances in the World Ocean that they would be enough for 30 (!) Chernobyls.

### ***ENVIRONMENTAL POLLUTION.***

***Анімавун Адебімбайо. Науковий керівник: Козуб С.Н.***

Environmental pollution, which also refers to the natural environment and the biosphere, is an increased content of physical, chemical or biological reagents that are not characteristic of this environment, are introduced from the outside, which lead to negative consequences.

Initially, human activities affected only the living matter of land and soil. In the 19th century, when industry began to develop rapidly, significant masses of

chemical elements extracted from the bowels of the earth began to be involved in the sphere of industrial production. In this case, not only the outer part of the earth's crust began to be exposed, but also natural waters and the atmosphere.

In the middle of the 20th century, some elements began to be used in such quantities that are comparable with the masses involved in natural cycles. The low profitability of most modern industrial technology has led to the formation of a huge amount of waste that is not disposed of in adjacent industries, but discharged into the environment. The mass of polluting waste is so great that it creates a danger to living organisms, including humans.

For several decades now, scientists have been sounding the alarm about a near environmental disaster. Studies in various fields lead to the conclusion that we are already facing global changes in climate and the environment under the influence of human activity. The pollution of the oceans due to leaks of oil and oil products, as well as garbage, has reached enormous proportions, which affects the decline in the populations of many animal species and the ecosystem as a whole.

## ***PESTICIDES.***

***Карібат. Науковий керівник: Козуб С.Н.***

Pesticides are used to protect crops from insects, weeds, molds and other pests.

Pesticides are potentially toxic to humans and can have both acute and chronic toxic effects depending on the dose and route of entry into the human body.

Some of the old, cheap pesticides can be stored in soil and water for many years. In developed countries, the use of such pesticides in agriculture is prohibited, but in many developing countries they are still used.

The greatest health risks from exposure to pesticides are those who are in direct contact with these substances at work, at home or in the garden.

In particular, sulfur and arsenic as insecticides have been known since ancient times. Plant insecticides (for example, feverfew, garlic, tobacco) are still used in agriculture and storage. Inorganic compounds of many elements (arsenic, selenium, thallium, fluorine, boron, antimony, copper) have long been widely used as pesticides, the first three of which are ordinary poisons. Studies of arsenic compounds led to the introduction in 1867 of the preparation of Parisian herbs - crude copper arsenite. In the USA, for example, it was used already at the end of the 19th century to limit the Colorado potato beetle.

The toxicity of pesticides depends on their purpose and other factors. So, insecticides, as a rule, are more toxic to humans than herbicides. The same chemical compound can have different effects depending on the dose (i.e., on the amount of a substance that affects a person). Toxicity also depends on the method of exposure to humans (ingestion through the gastrointestinal tract, respiratory system or skin as a result of direct contact). To date, none of the pesticides approved for use in the protection of food products in international trade is genotoxic (i.e., capable of damaging DNA, which can cause mutations or cancer). Adverse events resulting from exposure to these pesticides occur only when a certain dose is exceeded. Exposure to large amounts of pesticide can cause acute poisoning or long-term negative health effects, including cancer and reproductive problems.

### ***RADIOACTIVE ISOTOPES IN MEDICINE.***

***Землер Хайдар. Науковий керівник: Козуб С.Н.***

At the beginning of the first millennium AD, the Romans sought and found healing in the Oos Valley. They built the springs of Civitas Anurelia Aquensis - the so-called Baden-Baden then, large bathing facilities for their soldiers. In 214, imperial baths were built under the emperor Caracalla. After the Romans left, the springs were forgotten for a while. In 1306, they were rented by the rulers of the

city, and the resort of Badon (later Baden) became popular again, as it remains to this day.

In 1903, J. Thomson made a discovery. He recorded the well's radioactivity. Later it turned out that the waters of many well-known spa sources are also radioactive. The healing power of water was explained by its radioactivity due to the "emanation of radium" (a radioactive gas that we call today radon).

Radonotherapy is a section of alpha therapy. In alpha therapy, short-lived or rapidly released from the body isotopes (radon, thorium daughter products) are used. Radon baths are usually used in alpha therapy, in addition, they drink radon water, inhale air enriched with radon, and gauze applicators with daughter products of thorium decay are applied to the patient's skin areas. Radon therapy is indicated for many diseases of the nervous and cardiovascular systems, musculoskeletal system, skin diseases. Radonotherapy is a section of alpha therapy. In alpha therapy, short-lived or rapidly released from the body isotopes (radon, thorium daughter products) are used. Radon baths are usually used in alpha therapy, in addition, they drink radon water, inhale air enriched with radon, and gauze applicators with daughter products of thorium decay are applied to the patient's skin areas. Radon therapy is indicated for many diseases of the nervous and cardiovascular systems, musculoskeletal system, skin diseases, etc.

## ***RADIATION AND MAN.***

***Оконво Емамануелла Іфеома. Науковий керівник: Козуб С.Н.***

Radiation is a constant companion of human life. We live in a world in which radiation is present everywhere. The light and heat of nuclear reactions in the sun are necessary conditions for our existence. Naturally occurring radioactive substances are present in the environment. Our body contains radioactive isotopes  $^{14}\text{C}$ ,  $^{40}\text{K}$ ,  $^{210}\text{Po}$ . The origin of life on Earth and its subsequent evolution proceeded under conditions of constant exposure to radiation.



The phenomenon of radioactivity is widely used in science, technology, medicine, industry. X-rays and radioactive isotopes are used in medical research. However, it immediately became clear that radiation is a potentially dangerous source for living organisms.

Alpha radiation - represents helium nuclei that are emitted during the radioactive decay of elements heavier than lead or are formed in nuclear reactions.

Beta radiation is the electrons or positrons that are produced during beta decay of various elements from the lightest (neutrons) to the heaviest.

Cosmic radiation. Comes to Earth from space. It mainly consists of protons and helium nuclei. Heavier elements make up less than 1%. Penetrating deep into the atmosphere, cosmic radiation interacts with the nuclei that make up the composition of the atmosphere and forms streams of secondary particles (mesons, gamma rays, neutrons, etc.).

Neutrons. They are formed in nuclear reactions (in nuclear reactors and in other industrial and research facilities, as well as in nuclear explosions). Fission products. Contained in the radioactive waste of reprocessed fuel from nuclear reactors.

Protons, ions. Mostly obtained at accelerators.

## ***PLASTIC OCEAN POLLUTION.***

***Сезер Мехмет Акіф. Науковий керівник: Козуб С.Н.***

According to the forecasts of the World Economic Forum, by 2050 there will be more plastic than fish in the oceans. Plastics production grew from 15 million tons in the sixties to 311 million tons in 2014 and is expected to triple by 2050. Already, plastic accounts for 80% of all debris floating in the oceans.

Although the prevention of marine pollution by waste is provided by several legal instruments at the international, regional and national levels, the effectiveness

of such initiatives remains open to question. To date, there is no convention directly addressing the problem of plastic pollution of the seas. Thus, at the international level, neither unified regulatory mechanisms, nor control mechanisms in this area are provided. Due to the fact that both land and water sources are the causes of sea pollution, this article will discuss measures directly against sea pollution and more general measures to reduce the production, sale and consumption of plastic, which undoubtedly play a role in reducing marine pollution.

The protection of the oceans from pollution is a priority today. Even in the last century, various international acts and laws began to be adopted by world communities in order to protect the water part of the planet from environmental disaster.

However, even in spite of all efforts, pollution of the ocean causes great concern among ecologists from all over the world. In this regard, the Ocean Cleanup project decided to install special devices that are capable of absorbing waste and debris located on the territory of the Great Pacific garbage spot. This site is an accumulation of plastic and other waste in the Pacific Ocean.

### ***CARBON MONOXIDE ANTIDOTES.***

***Патра Бібекндра. Науковий керівник: Левашова О.Л.***

Carbon monoxide (carbon monoxide, carbon monoxide) is considered a "silent killer." Such insidiousness of this substance is primarily due to the fact that it is colorless, not odorless and tasteless, non-irritating gas, has approximately the same density as and air mixes well with it. A bit lighter than air. It burns with a blue flame. A mixture of carbon monoxide and oxygen (2: 1) explodes on ignition. Carbon monoxide is formed during the incomplete combustion of almost any carbon-containing substances, including fuel for space heating, as well as in large

quantities in case of fires in buildings. Carbon monoxide poisoning is possible in the following situations:

A working car engine in a poorly ventilated garage (exhaust gas poisoning).

Premature closing of the chimney damper in rooms with stove heating (“burning”).

Inhalation of smoke in fires when in smoky rooms.

Ammunition explosion (military operations or warehouse accidents). For example, the explosion of trinitrotoluene produces gaseous products containing up to 60% carbon monoxide.

The use of methylene chloride (as a result of metabolism in the liver) in the paint and varnish and pharmacological industry.

In case of untimely provision of medical assistance to the victims, carbon monoxide poisoning ends in death. First aid - remove a person from a zone with a high concentration of carbon monoxide, provide oxygen access to the respiratory tract, call an ambulance. Give warm tea, wrap in a blanket to prevent hypothermia.

## ***MORPHINE.***

***Саджу Негха Мері. Науковий керівник: Левашова О. Л.***

Opioids stimulate opioid receptors. Opioids include:

1) opiates - plant alkaloids that make up the components of opium (milk of green poppy heads). These include phenanthrene (including codeine and morphine), as well as isoquinoline (including papaverine) alkaloids;

2) endogenous opioids - neurotransmitters, namely endorphins, enkephalins and dynorphins;

3) semi-synthetic opioids (chemically modified opiates) - heroin, oxycodone;

4) synthetic opioids - pethidine, fentanyl and its analogues, methadone, diphenoxylate, loperamide.

Due to the euphoric effect, opioids in most cases lead to the development of addiction. Mixed poisoning with opioids with ethanol, sedative-hypnotic drugs and psychotropic drugs enhances the depressive effect on the central nervous system.

Morphine is rapidly absorbed from the gastrointestinal tract after oral administration and its bioavailability is ~40%, since it undergoes extensive first-pass metabolism in the liver and gut. Oral morphine is about one-sixth as potent as morphine administered parenterally.

The lethal dose for a person (not a morphinist) is 0.2-0.4 g. Severe forms of poisoning are manifested by a deep coma. Blood pressure drops, bradycardia and respiratory depression (often an irregular rhythm) develops. In this case, there is an increase in spinal reflexes (knee), which is a differential sign of barbiturate poisoning. The second differential sign of morphine poisoning is a sharp narrowing of the pupils, twitching of skeletal muscles may occur.

Remedy:

- repeated gastric lavage with a 0.05% KMnO<sub>4</sub> solution capable of oxidizing morphine. You can use a suspension of activated carbon;
- in / in or in / m enter 0.4-0.8 mg (1-2 ml) of a solution of naloxone (opiate antagonist);
- normalize the oxygen regimen, increase the excitability of the respiratory center — inhalation of O<sub>2</sub> or carbogen (a mixture of 5-7% CO<sub>2</sub> and oxygen), introduce respiratory analeptics — bemegrid, cordiamine, etimizol; if necessary, connect an artificial respiration apparatus; s / c 0.5-1 ml of a 0.1% solution of atropine to relieve vagal effects.

## ***LEAD POISONING.***

***Свейн Ачютанда. Науковий керівник: Тішакова Т.С.***

Lead is a toxic substance, the accumulation of which affects a number of body systems and which is especially harmful to young children. In the body, lead enters the brain, liver, kidneys and bones. Over time, lead builds up in the teeth and bones. Exposure to humans is usually determined by determining blood lead levels.

Lead poisoning occurs when lead accumulates in the body, often over several months or years. Even a small amount of lead can cause serious health problems. Children under 6 years old are especially vulnerable to lead poisoning, which can seriously affect their mental and physical development. At a very high level, lead poisoning can be fatal.

Symptoms. Initially, lead poisoning can be difficult to detect - even people who seem healthy can have high levels of lead in their blood. Signs and symptoms usually do not appear until dangerous amounts of the substance have accumulated in the body.

In all patients, the lead source must be excreted. If lead crumbs are visible during abdominal x-ray examination, the entire intestine should be washed with polyethylene glycol in an electrolyte solution in the amount of 1-2 l / h for adults and 25-40 ml / kg per hour for children until a repeated x-ray examination shows the absence of lead. For delivery of such large volumes, it may be necessary to administer using a nasogastric tube, and with medical care measures must be taken to protect the respiratory tract; intubation may be necessary. If the source of lead is a bullet, it must be removed surgically. Children with  $PbCr > 70 \mu g / dL$  ( $> 3.4 \mu mol / L$ ) and all patients with neurological symptoms should be hospitalized. Patients with acute encephalopathy are placed in the ICU.

## ***HYDROGEN CYANIDE – POISON.***

***Таманна Таманна. Науковий керівник: Тішакова Т.С.***

Hydrocyanic acid (hydrocyanic acid, HCN) and other cyanides (mountain almond oil, wild cherry syrup, potassium cyanide, sodium cyanide) are some of the most powerful and fast-acting poisons of general toxicity (lethal dose of about 0.05 g). Etiopathogenesis. Cyanide anions form complexes with ferrous ions, the cytochrome oxidase system, which act on the transferred electrons in the cytochrome a-a3 system, which leads to the blocking of the transferred oxygen in the tissues and causes cytotoxic tissue hypoxia.

Poisoning can occur in case of ingestion, inhalation and through the skin. The rapid development of symptoms of intoxication is characteristic. It has a neurotoxic effect, blocks cellular respiratory enzymes (tissue hypoxia). It can accumulate in foods containing a large number of apricot kernels, plums, almonds (jam, stewed fruit, cooked at home). The lethal dose of hydrocyanic acid is 1 mg / kg body weight (50-100 mg).

Clinical picture - Dizziness, severe headache, general weakness, severe shortness of breath, tachycardia, arterial hypotension, psychomotor agitation, convulsions, loss of consciousness, coma. First aid:

- gastric lavage;
- glucose of 20–40 ml of a 40% solution is used intravenously as an antidote (the role of sugar consists not only in antitoxic action, but also in stimulating effect on intracellular respiration and on the state of the cardiovascular apparatus);
- activated carbon inside;
- resuscitation measures;
- urgent hospitalization.

## ***MERCURY POISONING***

***Шіл Вінай. Науковий керівник: Тішакова Т.С.***

One of the first lines in the list of environmental pollutants is mercury. Mercury itself, its inorganic and especially organic compounds are extremely toxic substances of the first hazard class.

Mercury is a unique substance: at ordinary temperature it is a silver-colored liquid metal with peculiar physical properties, with a specific gravity of 13.5. In ancient times it was called "living silver" or "silver water." The metal easily forms compounds with organic and inorganic substances. Alloys of mercury with other metals - copper, silver, gold, zinc, lead - are called amalgams.

Signs of poisoning will be the same in children and adults. Pay attention to the following symptoms:

- Weakness throughout the body;
- Lack of appetite;
- Sore throat when swallowed;
- Headache;
- Taste of metal in the mouth, bleeding gums;
- Profuse salivation;
- Swelling;
- Chills;
- Vomiting
- Heat.

If it is precisely known that mercury has become the cause of intoxication, it is necessary to go out into the fresh air or in some other way move away from the source of poisoning. First aid for mercury poisoning begins with washing the mucous membranes of the eyes, mouth, nose and exposed skin with running water

or a weak solution of potassium permanganate in the absence of impaired respiratory and cardiovascular activity. If there are any, then first, as far as possible, they eliminate life-threatening conditions by conducting cardiopulmonary resuscitation, stopping, or at least slowing the bleeding and so on.

Lavage of the stomach with potassium permanganate dissolved in cold water through a tube only. Thus, the cauterizing effect of mercury can be reduced. Washing is done several times a day. After the procedure, sorbents are additionally prescribed 4 times a day.

The introduction of an antidote intravenously. Subsequently, solutions and diuretics are administered to flush the poison out of the blood. For the same purpose hemodialysis is used, if necessary. Symptomatic treatment for the development of ulcerative lesions of various organs.

### ***ARSENE COMPOUNDS AND THEIR ANTIDOTES***

***Говда Манодж. Науковий керівник: Тішакова Т.С.***

Ingestion - metallic taste, burning and dry mouth, throat, difficulty and pain when swallowing appear after 30 minutes or several hours.

Gastrointestinal disturbances are detected in any way the muscles enter: colic in the abdomen, accompanied by profuse sweat, nausea, a rocket that can become invincible, diarrhea, stool in the form of drawn poison mixed with blood. Loss of fluid leads to a sharp dehydration of the body and loss of salts. headaches, headache, dizziness. Body temperature and blood pressure in vascular collapse

Often there is periorbital edema, dysarrhythmia of the heart, visual impairment. Myocardial dysfunction is up to shock. Cramps of skeletal muscles, oliguria, proteinuria, hematuria may appear, a coma will develop.

After 8-15 days from the onset of the disease, sharp pains in the limbs, paresthesia, paresis, with a primary lesion of the extensors, trophic disorders appear. The paralytic form of intoxication is expressed by a sharp weakness, drowsiness,



severe headaches, dizziness, a decline in cardiac activity, convulsions, and a coma.

#### TREATMENT:

With mild intoxication - treatment on an outpatient basis

With moderate intoxication - in a hospital

At employment exclude contact with toxic substances.

In case of arsenic poisoning, the patient needs to rinse the stomach. To accelerate the extraction of toxicogen, oral administration of activated carbon and laxatives, for example, magnesium sulfate, is indicated. Elimination of hypovolemia and correction of electrolyte balance is carried out by means of infusion therapy. With convulsions, anticonvulsants are used. In order to reduce pain, prescribe antispasmodics and analgesics. In severe cases, it may be necessary to transfer the victim to a ventilator and ensure titrated delivery of vasopressors.

To neutralize the action of arsenic, the introduction of unithiol will be required. The drug is prescribed in a course of 5-6 days. In its absence, the patient should receive N-acetylcysteine, acting as a donor of monothiol groups. The patient needs active detoxification methods, for this the patient is prescribed intestinal lavage with 8-10 liters of saline enteral solution introduced into the intestine, he also needs hemodialysis and repeated gastric lavage.

Prevention of arsenic poisoning consists of caution when working with pesticides and other substances containing arsenic. It should be borne in mind that even its insignificant amounts, with regular penetration into the body, can cause intoxication.

#### ***RICIN.***

***Анто Мамен. Науковий керівник: Козуб С.Н.***

A source plant of ricin called castor bean grows around the globe. Castor oil plant is somewhat reminiscent of a palm tree, has large, similar to maple leaves, and the seeds ripen in boxes, completely covered with thorns. The plant has a bright color, usually has a red-green or brownish color. Castor oil plant is undemanding and pleasant in appearance, the plant is often chosen for planting on personal plots for decorative purposes.

The main application of the annual shrub is the manufacture of castor oil. The poison is obtained from the “waste” of production - processed castor beans. Beans themselves, as well as derivative plants that are manufactured on an industrial scale and end up on pharmacy shelves, from where they are sold over-the-counter, are completely harmless to human health. But damaged seeds pose a serious threat to the life of the animal or person who swallows them.

In addition to ricin itself, beans contain a small amount of a similar substance. Castor bean poisons are two substances: toxalbumin ricin and alkaloid ricinin  $C_8H_8N_2O_2$  (Tuson, 1864). Ricin is deposited only in seeds (mainly in the seed coat). Its amount can reach 0.1% or more. Ricinin alkaloid is found in all parts of the plant - in seeds up to 0.15%, in young leaves up to 1.37%, in oilcakes up to 0.15-0.18%; by the time of flowering, the content of ricinin in the leaves decreases, while increasing in flowers. The main toxicological value is ricin.

General symptoms of ricin poisoning do not occur immediately, but after a certain incubation period of approximately 18-24 hours. They manifest as severe hemorrhagic gastroenteritis: colic and bloody diarrhea; further signs of general weakness, stunning, weakening of cardiac activity, convulsions appear. The action of ricin on red blood cells is especially characteristic; already in very small dilutions, he agglutinates them (glues them into lumps visible with the naked eye).

The presence of one milligram of ricin in food or water may be deadly to an adult.

Three hours after inhalation ricin cough begins, followed by nausea, diarrhea and pains lasting for 18 - 24 hours. If the dose is enough great then within

36 - 72 hours in the result of heart damage and blood vessels and presence fluid in the lungs death occurs.

## ***BARBITURATE POISONING***

***Ануїе Шарон. Науковий керівник: Козуб С.Н.***

In most cases, barbiturate poisoning is the result of taking high doses of drugs of this drug group. Sometimes the development of a poisoning clinic is associated with therapeutic doses of these drugs. The psychiatrist and toxicologist are responsible for identifying the causes of barbiturate poisoning. In the event that it turns out data indicating the criminal component, this is reported to law enforcement agencies. Experts have identified a number of reasons that can cause poisoning with drugs of this medicinal group.

Basically, the clinic has poisoning with barbiturates of long and medium duration. This is due to the much greater availability of the former, their ability to cumulate, significantly lower metabolism and often admission without the supervision of a doctor.

Short-acting poisoning is found in the clinic, it usually develops quickly in the form of respiratory disorders (see below) during operations, but it is quite easily eliminated by the present medical staff. This is due to the fact that short-acting drugs undergo a rapid metabolism in the liver and poisoning easily passes by itself if it is possible to provide ventilation of the lungs during the acute period of poisoning (15-30 minutes).

If more than 6 hours have elapsed since the intake of barbiturates, gastric lavage is not performed so that the lavage water through the open pyloric sphincter does not enter the intestine and does not contribute to the dissolution and absorption of the poison. In this case, it is better to suck the contents of the stomach, followed by the administration of enterosorbents.

## ***STRYCHNINE***

***Даршан Дивеш. Науковий керівник: Козуб С.Н.***

As you know, many drugs are toxic to the body. It all depends on what dosage to use this or that drug. There are also substances that are poisons. Their use is very dangerous. Nevertheless, some of them are used in medicine. For example, drugs created on the basis of bee and snake venom, strychnine. The dose of such medications must be strictly observed. After all, if you exceed the amount of active substance, you can cause not only severe poisoning, but also death. An example is the drug strychnine. The poison contained in this substance is very toxic to humans and animals.

Among the many toxic substances and poisons of different types and origin strychnine occupies a special place. Even if it is inferior in terms of "popularity" to potassium cyanide, it is significantly superior to toxicity. Strychnine venom is one of the deadliest substances in nature. This is common knowledge. But few people know that at the dawn of professional sports, it was widely used as doping, British bartenders added it to beer, and today with strychnine they treat a number of very serious diseases. Strychnine is an alkaloid that is a derivative of indole. Represents colorless needle crystals with strong gloss. It has a pronounced bitter taste. This substance has a powerful stimulating effect on our nervous system. Under its influence, all the reflex functions of the body become more generalized.

First of all, the spinal cord and the medulla oblongata are stimulated. Strychnine improves the functions of auditory, visual and olfactory analyzers, parts of which are located in the cerebral cortex. Therefore, it is not surprising that after taking small doses of the substance, visual acuity, hearing and smell increase markedly.

## ***CHLORINE POISONING.***

***Кумар Адитья. Науковий керівник: Козуб С.Н.***

Chlorine vapor irritates, cauterize the mucous membranes of the respiratory tract and can cause reflex respiratory arrest, pulmonary edema. Chlorine does not have a resorptive effect.

Clinic. Initially, symptoms of irritation of the mucous membranes: pain in the eyes, lacrimation, cough, shortness of breath, sharp chest pains, then reflex psychomotor agitation, although the patient may also experience an oppressed state. Headache, dyspeptic disorders, abdominal pain, in the lungs, the phenomena of edema increase against the background of laryngitis, tracheitis, bronchitis. Tachycardia, cyanosis of the skin and mucous membranes. Concentrated vapors can cause a deep chemical burn of the respiratory tract.

Chlorine is a heavy gas with a characteristic pungent odor. Vapor poisoning can lead to serious consequences. There are known cases of chlorine leakage at enterprises and factories, as a result of which people living in the vicinity suffered.

Immediate removal of the victim to fresh air, oxygen therapy, morphine, 0.1% atropine solution - 1 ml, ephedrine under the skin, calcium chloride, aminophylline solution in the vein, diphenhydramine under the skin, hydrocortisone - 250 mg into the muscle or into the vein, soda inhalation with antibiotics, atropine, ephedrine.

When pulmonary edema begins, inhalation of oxygen with antifoam agents (alcohol, antifomsilan), bloodletting (200 - 300 ml); eye washing with a 0.25% solution of novocaine, followed by instillation of either petroleum jelly or fish oil, antibiotics: penicillin, streptomycin, cardiovascular drugs, if indicated. With increasing phenomena of pulmonary edema, appropriate treatment.

## ***METHANOL POISONING.***

***Нидхи. Науковий керівник: Козуб С.Н.***

Methyl alcohol (methanol, carbinol, wood alcohol) is a colorless, transparent, volatile liquid that resembles ethyl alcohol in taste and smell. Domestic poisoning is often associated with the use of substitutes for alcoholic beverages (not necessarily due to a lack of funds for high-quality alcohol: methanol poisoning is common in the United States among people whose age does not allow legally purchasing alcoholic beverages).

The most frequent cases of methyl alcohol poisoning, often massive, were noted with the use of counterfeit alcohol, as well as with thefts from railway tanks and industrial warehouses. The situation is aggravated by the fact that according to the organoleptic properties of these two alcohols it is almost impossible to distinguish. Since the first symptoms of poisoning appear an hour later after ingestion, a person often manages to take the amount of poisonous fluid several times higher than the lethal one.

### **SYMPTOMS OF EASY AND MEDIUM POISONING**

Manifest after 12-18 hours after use:

- Dizziness or headache.
- Nausea, constant vomiting.
- Gastric cramps and cramps.
- A mild visual disturbance. They can last from two to seven days, then disappear. With an average form of poisoning, the symptoms are more pronounced. As a rule, on the second day, vision disappears. In 85 percent of victims, it returns.

### **SYMPTOMS OF SEVERE POISONING**

Depending on the amount drunk, symptoms can appear after 7-12 hours, and after two days.

- Abrupt onset of all symptoms characteristic of mild poisoning.

- Feeling stunned.
- A sharp drop in blood pressure.
- The skin turns blue.
- Breathing becomes rare.
- Painful cramps begin.
- There is a pungent smell of acetone from the mouth.
- Literally 12 hours after poisoning, a person falls into a coma. Fatal outcome is possible by the end of the day. If the patient has time to save, then in 80% of cases a person loses his sight.
- At very large doses, death can occur within 2-3 hours after ingestion of the poison.

## ***NICOTINE***

***Синг Шарван. Науковий керівник: Козуб С.Н.***

Until recently, nicotine poisoning was a relatively rare occurrence and is usually associated with exposure to insecticides containing a chemical. Nevertheless, the popularity of vaping and electronic cigarettes has significantly increased the number of recorded cases of poisoning. Nicotine enters the brain along with tobacco smoke. In just a few seconds, the central nervous system and peripheral. In this case, the reaction in each person will be individual, since all organisms have different susceptibilities and sensitivities. It should be understood that the dose for poisoning can be very different - acute poisoning occurs even from small doses of nicotine, not to mention significant ones. As a rule, two different forms of poisoning are distinguished: mild and severe.

A mild form usually occurs in those who only first tried cigarettes. The body even in this case can manifest all the symptoms characteristic of intoxication,

dizziness, tinnitus, vomiting, rapid pulse, excessive salivation, esophageal or laryngeal cramps, and others.

A severe form of poisoning, as a rule, overtakes when a person smoked a lot of cigarettes in too short a period of time. This can happen to both experienced smokers and tobacco novices. The same symptoms occur as with a mild form of poisoning, but they manifest themselves at times more. If it is a headache, then it is severe, if there is a disturbance in the heartbeat, then it is very sharp, if vomiting, then non-stop.

***CHEMICAL POISONS AND ANTIDOTES IN MEDICINE*** Бішар Саха.

***Науковий керівник: Левашова О. Л.***

A feature of the present is the presence of a large number (about 6 million) of chemicals that are used from cosmetics to nuclear energy. They pollute water, air and food, and with them can enter the human body. Among them are many highly toxic substances that have not previously been encountered in the biosphere that can cause poisoning, and chemical products can pollute the biosphere of both individual regions and affect humanity of the entire planet, as evidenced by the increasing incidence of mass destruction recorded recently, for example, dramatic events, associated with thalidomide in pregnant women.



Poisonous substances that are contained or excreted by living organisms work as a self-defense mechanism or weapon for the extraction of food. For centuries, people used poisonous substances for their own purposes - with the help of poisons they got rid of unwanted political opponents or simply from jealousy.

In clinical toxicology, as in other areas of practical medicine, symptomatic, pathogenetic, and etiotropic therapeutic agents are used as therapeutic agents (table 1). The course of toxicokinetics Poison. Symptomatic and pathogenetic substances that are prescribed, focused on the manifestations of intoxication, while the same drug can be administered with completely different toxicants.

Toxicity is the property of a substance to cause poisoning.

The minimum lethal dose is the dose of the poison that caused the death, although would be one person.

The minimum toxic dose is the smallest amount of poison capable of causing a clinical picture of poisoning without a fatal outcome.

A pathological condition that develops as a result of interaction poison with the body is called intoxication, or poisoning.

## ***CHEMISTRY & FOOD***

***Амит Кумар. Науковий керівник: Левашова О. Л.***

Food is a combination of inorganic and organic substances obtained by the human body from the environment and used for nutrition. The main components of human food are: proteins, fats, carbohydrates, as well as trace elements and vitamins. Proteins and partially fats are plastic substances, they are also used in the body to build new and replace old cells and tissues. Some mineral substances containing phosphorus, calcium, iodine, and iron also belong to them. Scientists examined all products and compiled a list of those that do not contain chemistry.

And you know what? This list is empty, because the chemistry in food is exactly 100%. It all depends on whether these chemical elements are taken from nature or synthesized in the laboratory. For example, many plant substances that we used to consider useful contain real poisons.

Nutritional supplements are not the invention of our high-tech age. Salt, soda, spices have been known to people since time immemorial. But the real flowering of their use began all the same in the twentieth century - the century of food chemistry. High hopes were placed on additives. And they met expectations in full. With their help, it was possible to create a large assortment of mouth-watering, long-stored and at the same time less labor-intensive products. Having gained recognition, “improvers” were put on stream. The sausages became pale pink, the yogurts were freshly fruit, and the muffins were lushly non-curvy. “Youth” and the attractiveness of the products were provided precisely by additives that are used as dyes, emulsifiers, sealants, thickeners, gelling agents, glaziers, flavor and odor enhancers, preservatives.