

**ODESSA NATIONAL MEDICAL UNIVERSITY  
FACULTY OF PHARMACY  
DEPARTMENT OF ORGANIZATION AND  
ECONOMICS OF PHARMACY**

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**INTRODUCTION TO PHARMACY  
Lecture book**



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**Lecture book Introduction to Pharmacy / L.M. Unhurian, O.I. Bieliaieva, I.S. Yashchuk. – Odessa Univ. ONMedU, 2022-40 p.**

Lecture book contains substantive information about the main stages of the history of medicine and pharmacy from ancient times to the present. The publication provides an analysis of theoretical concepts and specific medical practice of the Ancient World and the Middle Ages. The material contained in the manual allows students to form an idea of religious healing traditions, society's attitude to witchcraft, witchcraft, disease ordering, methods of treatment and prevention of ailments, the gender dimension of medicine, the development of medical education provided by the educational and professional program for training specialists for the master's degree in specialty 226 "Pharmacy. Industrial pharmacy".

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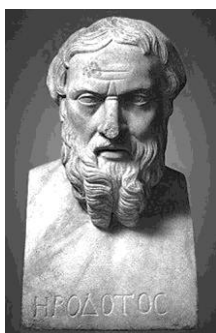
## TOPIC 1

# INTRODUCTION TO PHARMACY. HISTORICAL ASPECTS OF MEDICINE AND THE EMERGENCE PHARMACY OF ANCIENT WORLD. PHARMACY IN THE MIDDLE AGES

### *Theoretical questions:*

1. *The value and place of the history of pharmaceutical knowledge in the general history of human culture.*
2. *Periodization and chronology of the world historical process.*
3. *Sources of studying the history of medicine and pharmacy.*
4. *Medicine in primitive society.*
5. *Medicine and pharmacy in Mesopotamia, Egypt*
6. *Outstanding doctors of antiquity.*
7. *Development of alchemy.*
8. *An outstanding medieval physician Avicenna.*
9. *The first regulated pharmacy.*
10. *Prominent Arab scientists and their contribution to the development of medicine and pharmacy.*
11. *The founder of iatrochemistry Paracelsus.*

### **1. The value and place of the history of pharmaceutical knowledge in the general history of human culture.**



History is one of the oldest sciences, more than 2,500 years old. Its founder is considered to be the ancient Greek historian **Herodotus** (V century BC), which is called the "**father of history**". In ancient times, history was highly valued, calling it "**magistra vitae**" (mentor of life). The word "history" comes from the **ancient Greek** language and translates as "a story, a story about the known, explored past." In ancient Greece, the patron saint of history was

considered to be the muse of Clio.

In the modern sense, history is one of the social sciences studies the past of man and humanity in all its concreteness and diversity in order to understand the present and prospects for development.

*The **history of medicine and pharmacy** is one of the sections of the general history and culture of mankind and considers the development of knowledge related to with diseases, treatment of a person, preservation and strengthening of his health.*

The content of medicine and pharmacy, the quality of treatment, the level of preventive action, the position of medical workers have always depended and depend on the socio-economic conditions of human life, the social order, the development of natural sciences, philosophy, technology. Therefore, to study this discipline, to properly understand its development is possible only in inseparable connection with the general history of mankind.

## 2. Periodization and chronology of the world historical process

**Periodization** is an establishment in chronological order stages of social development.

Today, the periodization of world history is based on two principles: for the early periods of human development, their names are based on the material from which the main tools were made.

This is how the concepts of "Stone Age", "Copper-Stone Age", "Bronze Age", "Iron Age" appeared. With the advent of writing (about 5,000 years ago), the periodization was based on the existence of various civilizations and states in world history. Traditionally, the world historical process is divided into five main periods (Table 1).

**Periods of the world historical process**

<b>The period of history</b>	<b>Chronological boundaries</b>	<b>Duration of the period</b>
Primitive society	About 2 million years ago - V millennium BC. is.	About 2 million years (20 thousand centuries)
Ancient world	IV millennium BC. e. - 476 r. n. is.	About 4 thousand years (40 centuries)
Middle Ages	476 - the middle of the seventeenth century.	About 1200 years (12 centuries)
New time	The middle of the seventeenth century. –Early twentieth century.	About 300 years (3rd century)
Recent history	1918 - the beginning of the XXI century.	About 100 years (less than 1 century)

## 3. Sources of studying the history of medicine and pharmacy

In recent years, humanity has become more closely reviewing and comprehending its centuries-old history, its instructive lessons. All the achievements



of historical science, all the wealth of historical knowledge and experience are based on a wide base of sources. Sources for the historian are like bricks for a builder: without them it is impossible to create any scientific work.

**A historical source** is a carrier of historical information that has arisen as a product of the development of nature and man and reflects one or another side of human activity.

When studying the history of medicine and pharmacy, basic information is provided by **archeology, ethnography, paleontology, paleobotany, paleoanthropology, etc.**

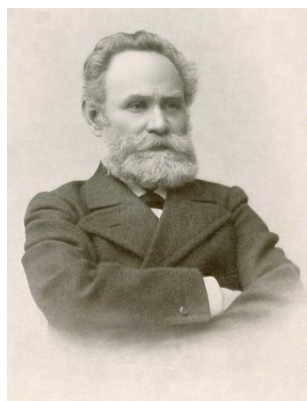
In historical science, there are five main groups of historical sources: material, visual, oral, linguistic and written.

**Material sources** store historical information about the past in the subject form and reflect primarily the production and creative activities of people (clothing, household items, architectural monuments), these sources include human remains.



**Art sources** - contain information encoded in certain healthy images (graphics, portraits, drawings, paintings, film, photo, video documents, cartographic works).

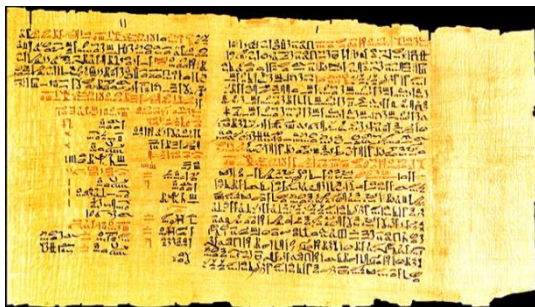
Oral sources provide information in the form of oral tradition, which is passed from generation to generation, word of mouth and stored in the memory of the people (myths, legends, legends, songs, poems).



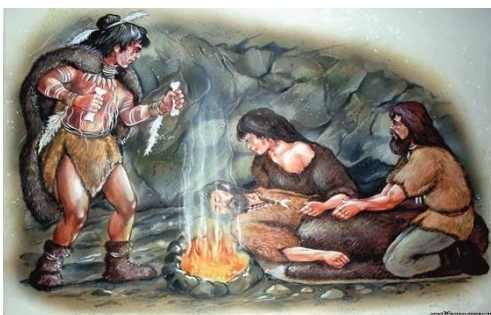
**Linguistic sources** are linguistic monuments that contain valuable information, in particular, on the history of medicine and pharmacy (names of people, geographical names, names of peoples, tribes, names of gods, names of animals, plants).



**Written sources** are considered the main in the study of the historical past, their defining feature is the written record of information (chronicles, chronicles, works of ancient authors, sources of personal origin and office documents, statistical sources, periodicals, memoirs, diaries, biographies, correspondence, scientific literature).



#### 4. Medicine in primitive society



The history of primitive times covers a long period of time, period from the emergence of man (more than 2 million years ago, the Paleolithic era) to the formation of the first class societies and states (5 thousand years ago, the Neolithic era). There are two main stages in the history of primitive society: the age of the

primitive herd and the age of the patrimonial system, which has two stages: the maternal patrimonial system (**matriarchy**) and the paternal patrimonial system (**patriarchy**).

For the era of **matriarchy** was characterized by the fact that the main way to maintain the existence of primitive man was to collect the gifts of nature: fruits, berries, nuts, herbs, roots. Searching among the surrounding nature for everything that was suitable for human consumption, primitive people noticed the poisonous or healing effects of many plants. By selecting useful from harmful, healing from poisonous people of primitive times have discovered a significant number of herbal medicines. Scientists believe that already in the era of matriarchy were discovered the first medicinal plants: nightshade - belladonna, scopolia, datura; narcotic - tobacco, poppy, hemp; plants that irritate the esophagus - wormwood; tonics - lemongrass, ginseng; exciting - coca.

The family was headed by a woman who took care not only of the nutrition and maintenance of the hearth, but also of the well-being and health of her relatives. The leading role of women in the management of the human community has been reproduced in many monuments of art created by primitive people in their places of residence, such as stone sculptures, figurines made of wood and clay.

In the process of evolution there was a change in the structure of the human body.

About 100,000 years ago, a new type of man was formed, called the Neanderthal. Neanderthals lived in large areas, moving in small groups - primary herds, only such a group could work together to maintain their existence, feed and protect themselves from wild animals. Neanderthals were a transitional link from ancient man to man of the modern physical type, which was formed about 40 thousand years ago in the process of anthroposociogenesis. Scientists have called it Homo sapiens (intelligent man).

The causes of diseases of primitive people could be natural phenomena: earthquakes, floods and droughts, wildlife attacks, disturbances normal nutrition. Remains of primitive people found by archaeologists have traces of various injuries, rickets, tuberculosis, smallpox and other diseases. Through practical experience, primitive man learned to use water, solar heat for medical purposes, to rub and knead sore spots, to stop bleeding by pressing on blood vessels, to fix fracture sites with sticks, bark.

The invention of the bow and arrow is the second great achievement of mankind after discovering ways to extract fire. The use of fire significantly reduced the dependence of ancient man on nature, primitive people were able to significantly increase their territory of residence, diversified their diet. With the help of bows it



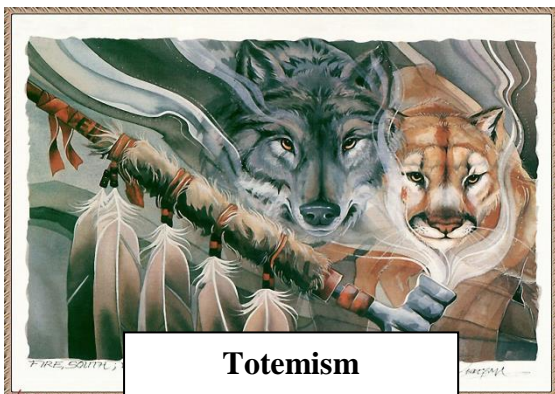
was possible to systematically hunt small animals, birds, and primitive man switched to hunting and fishing as one of the main sources of livelihood. This transition was an important factor in expanding medical knowledge. Eating along with plant foods and animals, man has discovered the healing properties of some animal organs (liver, blood, fat). Lubrication of the skin with fat protected a person from the cold. Hunters who were injured by wild animals, learned to use a kind of tires, which were applied to the damaged areas, ash, resin, clay.

During this period of their development, primitive people began to use one of the first pharmaceuticals of mineral origin - table salt because of its food and preservative qualities. Thus, already at the initial stage of development of medicine, the experience of treatment with certain drugs of plant, animal and mineral origin was accumulated.

The development of animal husbandry contributed to the increase of material prosperity of man, who ceased to depend on his kind and already she could ensure her own existence. The man who finally asserts his leading role seeks a transition from polygamy to monogamy, in which the origin is followed by the father. At the same time, the first clay figurines of men appeared. In the days of the **patriarchate**, large centers for the extraction and processing of nonferrous metals (copper, tin, silver, gold, bronze) and iron were established. Metal tools appeared: knives, axes, sickles and the first medical instruments. Thanks to the development of pottery, pottery was invented, in which food and medicines were prepared. Shepherds who observed cattle noted the therapeutic effect of plants on animals.

This experience was gradually transferred to humans. Caring for animals involved providing them with emergency care. One of the first surgeries that people began to use was a cesarean section.

The expansion of the territory inhabited by mankind in the late Paleolithic period contributed to the formation of three main races: the Negro people inhabited Africa, the European race was formed in Europe, and the Mongoloid race in Asia.



Primitive man could not immediately know the world around him, to understand the phenomena of nature, so it seemed to her that she was ruled by formidable, hostile forces, before which man felt his helplessness. At this time there were the first ideas about the causes of disease, according to which an evil spirit inhabits someone who does not respect their ancestors, and it is he who makes a person sick. Therefore, ancient people sought to attract these incomprehensible forces, to



**Magic**

make them their assistants. Thus arose the ritual of offering sacrifices, gifts, and solemn ceremonies in their honor to these forces. One of the primary forms of religion was **animism** (belief in the immortality of the soul, in the existence of spirits inhabiting the world) and **totemism** (belief in the family ties of animals).

At the same time there is **fetishism** (belief in the supernatural properties of certain things) and **magic** (belief in human ability) affect supernatural forces). Among the many varieties of magic there was also medical - treatment of wounds, injuries on the basis of cult practice.

Primitive culture made a great contribution to the development of medicine and medicine. In the primitive era, knowledge was formed, which was used in folk medicine in subsequent historical epochs, as well as today. For example, the medicinal properties of the quince tree were discovered by the Inca tribes, who were the first to use the bark and powder of this tree for malaria.

Thus, medicine and medicine in the primitive era arose and developed as a result of the activities of primitive people at all stages of their existence. Medicine and the use of medicines emerged at the earliest stages, evolving and improving along with the evolution of society. Experience has taught primitive people to use natural medicines, to collect plants to prepare various potions from them, to use poison, antidote, to find out and use the healing properties of individual animal organs. Empirically developed hygienic rules and skills began to be widely used in subsequent historical epochs, and numerous medical techniques and medicines laid the foundation of modern medicine.

## **5. Medicine and pharmacy in Mesopotamia, Egypt**

### **- Medicine and pharmacy in Mesopotamia**

The era of primitive society is over. He replaced her a new system - slavery, the cradle of which was **Mesopotamia**, the valley of two great rivers - the Tigris and Euphrates. The term "Mesopotamia" (from the ancient Greek. "Mesopotamia" was introduced by the Greek historian **Herodotus**, who visited these lands in the middle of the *V century. B.C*

At present, Iraq, Kuwait, and Syria are located in Mesopotamia. In this historical region, the first state formations emerged: Ur, Akkad, Uruk, Lagash, Sumer, Babylon, Assyria.

The sources mention **Ishtar** (goddess of love and fertility) and **Assyria** (the



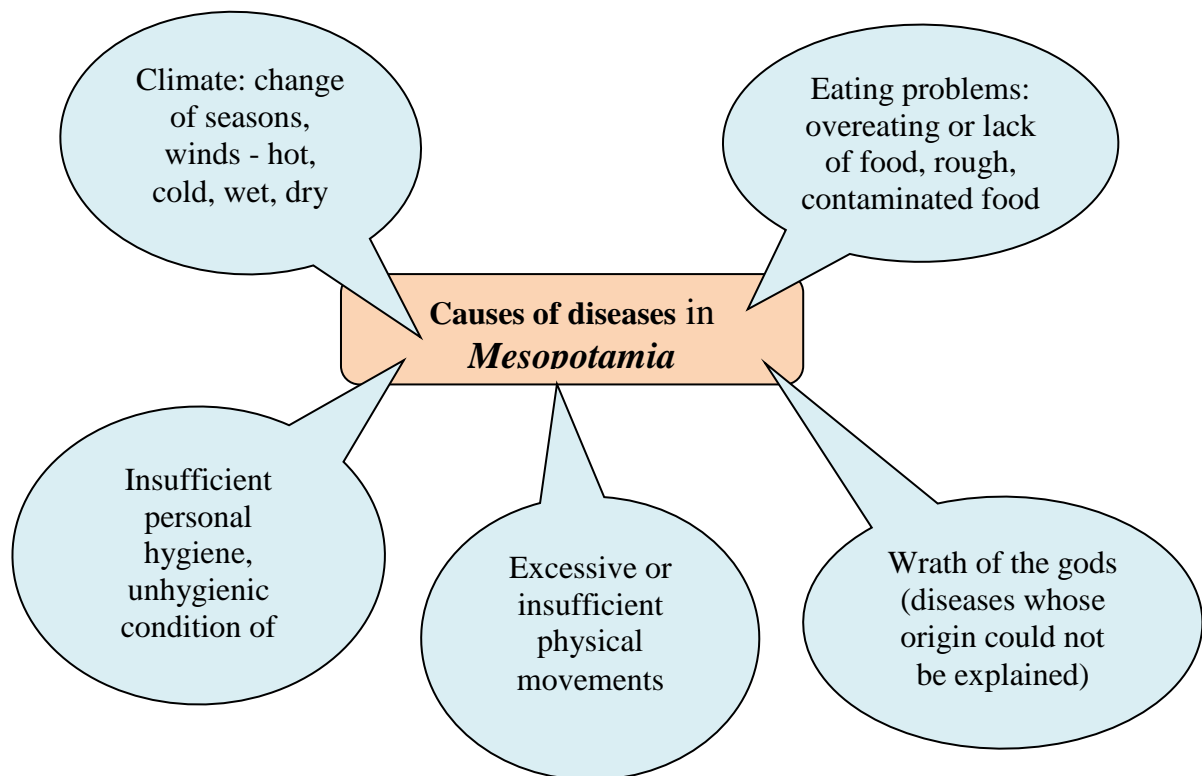
patron god of the city of Assyria), **Enlil** (god of the air), **Anne** (god of the sky), **Ki** (goddess of the earth), **Enki** (god of water), **Nanna** (goddess of the moon), **Ansu**, **Marduk** and others.

Well-known researcher of the history of medicine, Professor T.S. Sorokina to the **main achievements of medicine in the countries of the Ancient World includes:**

- invention of writing and creation of the first medical texts;
- formation of two directions of medical activity: empirical medicine, based on the practical experience of the people, and cult medicine, based on religious and mystical beliefs;
- development of ideas about the origin of diseases;
- training of the first professional doctors;
- creation of sanitary facilities, development of hygienic ones skills and traditions;
- development of a class approach to treatment;
- formation of the basics of medical ethics;
- mutual influence between different ancient civilizations in the industry medicine

In the process of transformation of the primitive communal system into a slave-owning society in the states of the Ancient East, temple medicine was gradually born. But the main form of medicine in slave-owning states continued to be folk. Medicine was distinguished from other professions, medical schools emerged, folk medicine grew into professional. The profession of a doctor occupied a significant place in society and gained recognition from the state. The doctor was responsible for the consequences of his activities before the law. Medicine was a **family affair**. The head of the family had his own secrets of making medicines and special medicines, the experience was passed on only to *family members from generation to generation*. Thus, family medical schools gradually emerged. Medical knowledge accumulated, the first medical "**advisors**" appeared, the first medical literature. Monuments of medical literature of that time - texts of **asuta and ashiputa** - were records of prescriptions of medicines, instructions of the doctor, spells; clay tablets telling about the medicine of Ancient Babylon. These sources are

collections recipes with instructions on how to prepare medicines, with a brief description of diseases, ways to use certain drugs. In ancient medical texts there were several main causes of disease:



The peoples of Mesopotamia had strict hygienic standards: do not drink contaminated water, wash your hands regularly, wash your clothes, limit yourself to certain foods. The most useful foods were beans, lentils, barley, vegetables, fruits, nuts, dates, figs, dairy products, beer, honey, fish and poultry. For medicinal purposes, used mainly of plant origin: plums, mangoes, mustard, oil, powder from pine needles, figs, dates; less importance was paid to means of animal origin: milk, internal organs of turtles, snakes; also used minerals: oil, salt, resin.

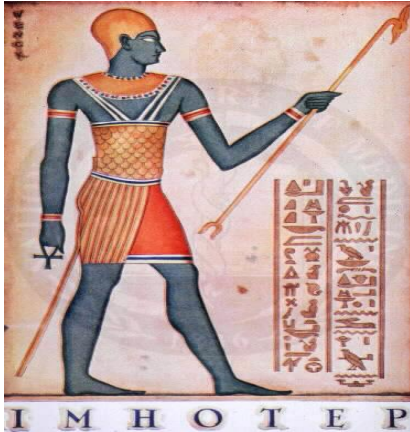
### - **Medicine and pharmacy in Egypt**



To the main sources on the history and medicine of Ancient Egypt belong medical texts of papyri (papyrus from Cahun, papyri of Smith, Ebers, Hearst, Bruges, London papyrus, Leiden papyrus, Berlin papyrus), 6 books of medical content from 42 so-called "hermetic books" in which provisions of hermeticism - religious philosophical consisting of alchemy, astrology, magic. The main gods of ancient Egypt were **Amun -Ra**



(god of the sun), **Isis** (goddess of fertility), **Thoth** (god of the moon, patron of sages and medicine), **Gore** (heavenly god), **Mount Athos** (god of the solar disk), **Osiris** (god of nature), **Tower** (goddess of the family, patroness of women, midwife), **Sokhmet** (goddess of war), **Anubis** (god of the kingdom of the dead, inventor of mummification), **Seth** (god of evil). A significant place in the beliefs was occupied by the *cult of animals*. The most popular animals were falcon, ibis, shulika, crocodile, cat, lion, cobra, bull.



In medicine and pharmacy of ancient Egypt was very common **treatment with herbs**, incense, herbal ointments, infusions, decoctions, mustard, compresses, lotions. Ancient scientists considered Egypt a treasure trove of knowledge in medicine, pharmacy and chemistry.

*The Egyptians developed the doctrine of the existence of four principles world: air, water, earth and fire, which are also the basis of the human body, and accordingly believed that the violation of the harmony of these principles caused the disease.* The embalming of the dead and the making of mummies allowed the ancient Egyptians to study well the structure of the human body. The causes of disease, they considered both natural factors (unhealthy food, intestinal parasites, weather changes) and supernatural (instilling in the human body the spirit of the deceased, who tried to expel unpleasant-tasting drugs, spells).

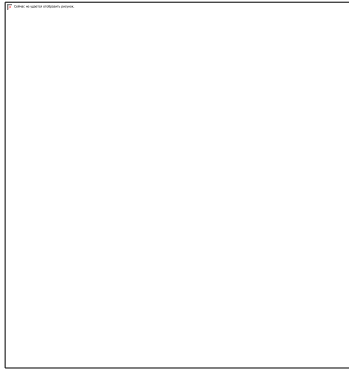
Severe **infectious and parasitic diseases**, such as malaria, smallpox, plague, and tuberculosis, were widespread in ancient Egypt.

Medicine in ancient Egypt began actively to develop with the help of **Imhotep** - a priest, supreme dignitary of Pharaoh Djoser, architect, sage, doctor. Treatment was paid, the richest were considered to be ancient ophthalmologists and dentists. Only priests of the higher caste had the right **to prepare medicines**. It was believed that medicine was under the patronage of the god **Thoth** - savior, protector, healer. Toth was credited with compiling medical texts, he was depicted as a man with the head of an ibis bird. The Egyptians called it **Farmaki or Farmaci**. Hence the words with the root "pharma": pharmacy, pharmacology, pharmacognosy, pharmacopoeia

## 6. Outstanding doctors of antiquity

The heyday of Koska Medical School dates back to the V-IV centuries. BC is and is associated with the name of a prominent ancient Greek scientist-physician,

who in ancient times was called the "**father of medicine**" - **Hippocrates** (460-372 BC).



Hippocrates was born on the island of Kos in the family of a doctor who practiced medicine for many generations. After his ordination to the priesthood (at that time it was obligatory for mastering the medical craft), Hippocrates visited Egypt, Asia Minor, Libya, and was well acquainted with the nature, culture, and science of the peoples who inhabited these countries. As a result of his observations, he wrote a treatise "On air, water and terrain", which set out the doctrine of the four main types of human physique and their temperament - sanguine (people of the East), choleric (people of the North), phlegmatics (people of the South), melancholics (people of the West).

The works of Hippocrates and his followers (Hippocrates) were combined in the collection "**Code of Hippocrates**", which covers almost all branches of modern medicine, including anatomy, surgery, embryology and internal medicine.

Hippocrates' worldview was formed under the influence of the teachings of the philosopher Democritus, according to which human nature is "made" by the physical nature that surrounds it - "physis", and society then only rebuilds human nature. In analyzing the processes occurring in the body, Hippocrates was a supporter of the humoral theory, he argued that in the human body there are **four main fluids**: blood, mucus, yellow and black bile. Changing one of them leads to disease. The drug substance must affect one of these liquids.

Thus, the scientist believed: if you give drugs that act on mucus, there will be vomiting of mucus; if you take drugs that act on the bile

When cleansing the body, drugs remove related moisture. Hippocrates shared the teachings of the Cnidus school about the predominance of two fluids: mucus and bile.

He also pointed out that depending on the predominance of one or the other body fluids distinguish four main types of constitution, or **human temperament**: **sanguine** (excess blood); **cholera** (excess yellow bile); **phlegmatics** (mucus predominates); **melancholics** (black bile). The amount of fluid varies in the human body depending on the influence of various factors and external conditions.

Hippocrates believed that the main causes of disease are the incompatibility of climate with "human nature", the "harmfulness" of soils, water and poor nutrition. Among the main social factors that affect human nature, the scientist attributed the political system, lifestyle and customs. He attached great importance to issues of hygiene, life, diet and nutrition, and was one of the first to show the unity of the

body and the environment.

The process of treatment by Hippocrates was based on the principle of "**Noli nocere**" (**Do no harm**). Followers of the scientist later formulated another principle: "Natura sanat, medicus curat" (Nature heals, the doctor observes).

### 7. Development of alchemy.

The greatest flowering of alchemy can be attributed to the period from the middle of the IV century to the middle of the XVI century. It has gained recognition in Spain, Italy, France, Germany and England. Among scientists who studied alchemy, it is necessary to mention *Raymond Lulius, Mark the Greek, Arnold da Villanova, Albert the Great, Fra Bonaventure, Roger Bacon, Vasily Valentin*.

The teachings of **alchemists** were based on philosophical, mythological and religious basis, knowledge of nature and the origin of elements of various minerals, metals and salts. **Alchemy** was based on the postulates of the unity of matter and the existence of a mysterious substance - the "philosopher's stone", which is able to turn base metals into gold and silver. Ordinary metals were considered "sick" because they easily lost their luster, turning to ash when heated.

He was credited with miraculous properties to restore youth, cure all diseases. Alchemists paid special attention to experiments on the combination of mercury and sulfur. Mercury was considered the "mother of all metals" and sulfur the "father".

There are three main periods of alchemy: Greco-Alexandrian, Arabic and Latin (in Western Europe). The term "chemistry" came to us from the countries of the Arab East, where the name "secret art" was added to the common prefix "al" (algebra, alcohol). Since then, "sacred secret art" has been called "alchemy".

Alchemists were the founders of an important scientific method of research - **experiment**. In the laboratory, they discovered a number of substances. Alchemical laboratories are the first rooms specially equipped for *scientific research and chemical experiments*. The achievement of alchemists was a significant expansion of knowledge in the field of practical and applied chemistry. They developed and improved various chemical methods: **distillation, evaporation, precipitation, filtration, crystallization**. Alchemists have obtained distilled water for the preparation of drugs, hydrochloric and nitric acids, turpentine, various essential oils. In the process of wine distillation, alcohol was obtained - wine alcohol, which was called **aqua vitae** ("water of life"). By re-distillation, the alchemists obtained concentrated essences, and by sublimation of solids - benzoic acid and sulema.

## 8. An outstanding physician of the Middle Ages



Абуали Сино - Ависенна

A prominent Tajik scientist-encyclopedist, who was called the "**prince of medicine**" and "mentor of scientists" during his lifetime, a philosopher, great physician Abu Ali al-Hussein ibn Abdullah ibn Sina, known in Europe under the name of **Avicenna** (980–1037), was born in the small village of Afshan near Bukhara.

A mother named Sitara came from the same village. When the boy was five years old, the family moved to Bukhara (now Uzbekistan). At the age of 10, Avicenna knew the Qur'an by heart and almost all Arabic literature. He studied mathematics, physics, law, logic, astronomy, geography, and philosophy.

His father, Abdullah ibn Hasan, a native of Afghanistan, was an educated, noble, wealthy man, held the position of tax collector and gave his son a good education. Avicenna studied almost all the leading sciences of his time, at the age of 12 he learned the basics of medical knowledge, treated the poor for free. At the age of 17, the young man was invited to the court of the emir, whom he cured, and as a token of gratitude received the right to use the library of the Samanid dynasty.

Ibn Sina lived and worked in Bukhara, Khorezm, Harasan, Hamadan, Izphagani. He is the author of about **450 works** on medicinal art, pharmacology, chemistry, philosophy, in which he summarized the positive experience of folk medicine. Only 238 of them have survived to the present day.

In these works the achievements of folk medicine of the medieval Arab East are generalized and developed. In Khorezm, Ibn Sina wrote his major work "**Canon of Medicine**", which consists of 5 books and covers issues of medicine, anatomy, pathology, physiology, hygiene, therapy, ethics. The second book "Canon of Medicine" is devoted to the system of simple drugs, their actions, determination of properties, it presents some external means, lists the drugs and storage conditions, describes medicinal plants: anise, wormwood, acacia, juniper, chamomile, onion. For medicinal purposes, Ibn Sina recommended the use of yarrow, pumpkin, turnip, camphor, rhubarb. The fourth book of the "**Canon of Medicine**" describes common diseases of the body, much attention is paid to poisons and antidotes. The fifth describes complex dosage forms: tablets, pills, powders, syrups, decoctions. The concepts of measure, weight and dosage are revealed.

In total, the "Canon of Medicine" presents 811 drugs, of which 526 are of herbal, 125 animal and 85 mineral origin, there are instructions on their action, use, collection rules and storage features.

The real task of medicine, the scientist saw in the preservation and restoring



human health. Avicenna called to identify the causes of disease by research, to study and analyze the facts. The causes of the disease, in his opinion, can be poor living conditions, exhausting and hard work, the harmful effects of the environment, emotional turmoil. Experiments with lambs were interesting, as a result of which the scientist proved the influence of a mental factor on the state of the organism.

### 9. The first regulated pharmacy

After the organization of hospitals in the Arab Caliphate, pharmacies began to appear. The **first regulated pharmacy was opened in 754** in Baghdad (Iraq). In Europe, pharmacies were established in Salerno, Cordoba, London, Toledo. Interestingly, pharmacists were forbidden to treat. There were different names for people who were engaged in pharmacy: herbariums (collecting herbs), pestariums (crushing roots), ointments (making ointments), specialties (spice traders). Medicines in pharmacies were manufactured according to the rules generalized in a kind of pharmacopoeia called the dispensary "Karaba-dini". The author of one of the first and best Arab pharmacopoeias was the head of doctors in Baghdad, Ibn Al-Talmit.

In the process of preparing dosage forms Arab scientists instead **honey began to use sugar**, to reduce the effect of potent drugs added **lemon juice and violet root**, a variety of floral waters and infusions. Pills, medicinal waters, medicinal vodkas, infusions, decoctions, ointments were made in pharmacies of that time. For the manufacture of pills powdered substances were mixed with sugar, to the resulting mixture was added essential oil. Pills were formed from the obtained mass and left for some time to dry.

### 10. Prominent Arab scientists and their contribution to the development of medicine and pharmacy

One of the first major Arab alchemists was **Jabir ibn Hayan (780-840)**, known in Europe as **Heber**, is considered the author of the **Book of Seventy**, a kind of encyclopedia of political, theological, and natural philosophical knowledge. Heber was the developer of the concept of the formation of metals under the influence of high temperatures in the earth's interior from sulfur and mercury, by which he meant symbolic elements (sulfur identified the principle of flammability, mercury - the principle of metallicity). To speed up the process of formation of gold ("perfect metal"), it was necessary to add a "wisdom stone" to sulfur and mercury. As a result of his chemical experiments, Geber obtained **salts, sulfuric and nitric acids, silver nitrate, and mercury chloride.**

One of the prominent thinkers-encyclopedists of the early Middle Ages, the

alchemist and physician **Abu Bakr Mohammed Zacharias al-Razi (865-925)**, known in Europe as **Razes**. He diligently studied philosophy, mathematics, astronomy, astrology and chemistry. He studied alchemy and became interested in medicine only at the age of 30. The **Book of Secrets** and the **Book of Secrets of Secrets** (or Secrets of Secrets) have come down to us.

Razes was the author of a book on the most common diseases and treatments that are accessible and easy to implement at home, even for poor people. Based on the experience of the hospital in his hometown of Ray in the book "**On Hospitals**", Razes described the organization and operation of medical institutions. On the basis of hospitals under the guidance of the scientist there were special courses on the study of medicine, after passing the exam on theoretical and practical knowledge, their graduates received an official permit for medical activities.

Razes used lead lotions to treat **smallpox**; recommended removing the cancerous tumor from as large an area of adjacent tissue and cauterize the removal site. For the first time in surgical practice, he used a **bandage**, threads from a lamb's stomach to suture wounds, and invented a special tool for removing foreign bodies from the larynx. For the first time he began to use **sulema** in the form of ointments for the treatment of skin diseases.

**Gaza ibn Abbas** (XX th century) - a follower of Razes, a representative of the Baghdad medical school, author of the scientific work "Royal Book" - a compilation of medical knowledge of Greece and Rome, supplemented by the works of doctors of a later period and his own generalizations. He developed guidelines on how to test and study the effects of drugs, pointing to the need to first test them on animals, as new tools were constantly being discovered, the effects of which were not clearly understood.

### **11. The founder of iatrochemistry Paracelsus**



In the XVI th century, alchemy has lost the significance it acquired in previous historical periods. The renewal of culture and the renaissance in art also directed scientific research in new ways, which differed from the previous scholastic ones. Chemistry was also affected by the new life: separating from the old alchemy, it gained new opportunities for research. In European chemistry and medicine, a new direction has **emerged - medicinal chemistry**, or iatrochemistry.

Founder of the school of iatrochemists who sought to supply chemistry in the service of medicine, was a prominent physician, chemist, philosopher of the Renaissance Philip Aureol Theophrastus Bombast von Hohenheim (1493-1541) -

**Paracelsus** (Latinized Para-Celsus - similar to Celsus). The scientist believed that the *body is a retort in which chemical reactions take place*. Man is taken from the earth, the main constituent elements of which are not blood, bile, mucus, but chemical elements: **mercury, sulfur, salt** - "earth particles". Chemicals react, body tissues are formed, physiological processes take place. Disruption of the balance of chemicals causes **disease**, and chemicals should be used to treat and restore balance. The main task of chemistry for Paracelsus was "not to make gold and silver, chemistry is one of the pillars on which medical science must be based."

Paracelsus developed a **classification** of metals according to their physical properties, not recognizing the division into noble and non-noble; developed the doctrine of drug dosing. He used all the metals and salts known at the time to treat diseases, including poisons. The scientist believed that "everything is poison, and nothing is devoid of poison, only one dose makes the poison invisible."

Paracelsus paid considerable attention to the training of pharmacists, the division of functions between doctor and pharmacist, the quality of drugs manufactured in pharmacies, ethical relations between doctors, pharmacists and patients. The scientist is the author of numerous **scientific works**: "Small surgery", "Large surgery", "On various diseases and their causes", "General principles of medicine", "On the causes of the origin of invisible diseases", "Ten books on the mysteries of nature", "Great astronomy, or insightful philosophy", "On the origin of the elements", etc.

The motto of Paracelsus and his followers: "Chemistry should serve not to extract gold, but to protect health." The scientist demanded high moral qualities from the doctor: "**The doctor must think about his patient day and night, observe him daily, direct all his thoughts and thoughts on how best to treat.**"

## TOPIC 2.

# THE DEVELOPMENT OF MEDICINE AND PHARMACY IN UKRAINE FROM ANCIENT TO PRESENT

*Theoretical questions:*

1. *Development of medicine in the pre-Slavic period.*
2. *Features of the development of medicine of the ancient Slavs and in the period Kievan Rus.*
3. *Medical and medical care in the Kiev-Pechersk Monastery.*
4. *The role and significance of the Pharmacy Order for the development of medicine and pharmacy.*
5. *Reforms of Peter I in the field of medicine and pharmacy.*
6. *"Pharmacy Charter", its significance for the development of pharmacy.*
7. *Pharmacy of Ukraine in the postwar period*
8. *Pharmacy during the Second World War*

### 1. Development of medicine in the pre-Slavic period



**Cimmerians**

The southern territories of modern Ukraine from the IX-VII centuries BC (in the days of the Early Iron Age) was occupied by the **Cimmerians** – Iraqi nomadic tribes, the first of the tribes known to us by their name, who lived on the territory of Ukraine. The Cimmerians lived in the steppe ions of the Northern Black Sea coast from the Danube to the Don, they mention are in the written sources of ancient Greek authors: in the "Odyssey" of Homer and in the "History" of Herodotus, in the sources of the states of the ancient East: Assyria, Babylon and Urartu. The Cimmerians were among the **first in Ukraine to process iron and make products from it**. The basis of the Cimmerian economy was nomadic cattle breeding, the leading role in which was played by horse breeding. The Cimmerians used *herbal and animal remedies for treatment*.



**Scythians**

In the **VII century BC** came to the Northern Black Sea coast from the east Iranian-speaking tribes of the **Scythians**, who were displaced or assimilated Cimmerians. The Scythians inhabited the area between the Dnieper and the Danube and the Crimea. Herodotus divided the Scythians into **three main groups**: royal Scythians, Scythians-plowmen and Scythian farmers. The religious beliefs of the Scythians are

based on polytheism. The main deities were **Papay** (lord of heaven), **Api** (goddess of



the earth), **Tabitha** (goddess of the hearth), **Oytosir** (god of the sun), **Targitai** (god - the ancestor of the Scythians), **Agrimpas** (goddess of fertility), **Tagimasad** (patron of horsemanship). The Scythians traded with the Greeks livestock products, *furs, bread, herbs, wood, and in return received various handicrafts, weapons, household items, utensils, jewelry*. The Scythians had some knowledge about the treatment of various diseases and injuries. They had their own healers. During the excavations of Chortomlytsky and Kul-Obsky mounds near Kerch, **gold and silver vases with images** of Scythians were found. One of them shows people providing *medical care (lower limb ligation, tooth extraction)*. Some Scythians were familiar with the medicine of the ancient Greeks, had extensive medical practice in Athens. The most famous doctors of Scythian origin were **Anacharsis** and **Thomsaris**.

The most important basis of Scythian medicine was **medical herbal remedies**, including mustard, licorice, rhubarb, plantain, onions, garlic and many others. They also used many potent and poisonous plants. And to reduce the toxic effects, various impurities and decoctions were added to them - honey, legumes, etc.

Widely used in Scythian medicine are also rooms of animal origin (**beaver stream, fats, brain**). These tribes knew antlers - a valuable medicine made from dried antlers of young spotted deer. Regarding sanitary and hygienic measures, it is necessary to emphasize you are of special importance to the steam "**Scythian bath**".

**Operations** such as dislocation correction, fracture treatment, abscess cutting, skull trepanation, and limb amputation, not to mention tooth extraction, were common among the Scythians. During surgery, the Scythians used painkillers such as intoxication, opium, mandrake, and so on. Snake venom was used for treatment. It should be noted that the Scythian physicians and their remedies and methods had their influence on Greek physicians, possibly on Hippocrates.

**Mummification and embalming** of the dead were performed Scythians for a short time and, most likely, to transport the body of the deceased king to the subject tribes for at least forty days. The Scythian method of embalming was original and developed without significant outside influences.

## **2. Features of the development of medicine of the ancient Slavs and in the period of Kievan Rus**

Medicine of the ancient Slavs, in contrast to the Arabic and Western European, had its own characteristics, which were surprised to write foreign travelers. The ancient Slavs were pagans, they believed in power nature. The basis of the **Slavic pantheon** of gods was **Perun** (god of thunder and lightning), **Svarog** (god of the sky), **Stribog** (god of wind), **Dajgdbog** (god of the Sun), **Veles** (god of cattle-breeding, trade, wisdom), **Mokosha** (goddess of the earth-mother), **Yarilo** (god of

fertility), **Kupala** (god of summer weeds), **Carol** (winter deity).



The Slavs used the **bath** to treat and prevent diseases. The water in the bath was heated with hot stones, the body was rubbed with juniper branches or "lip" - wood mushrooms, whipped with brooms of birch, wormwood, heather. After the bath, they were immersed in **cold water** and put on **clean clothes** (for the prevention of skin diseases and from a hygienic point of view).

The arsenal of dosage forms was quite rich. Powders ("powders"), ointments ("ointments", "ointments"), infusions and decoctions ("drink", "potion") were used then. "Doctors" (doctors) prepared "peas" (prototypes of pills), which were to be placed under the patient's tongue; used stones for cauterization; attributed to baths of various herbs. Medicinal "potion" was stored in special "cellars" (then pharmacies). The daily dose was divided into two or three doses - morning, afternoon, evening.

**Bee honey** was considered a panacea for all diseases in ancient Russia. It has been used for anemia, rabid dog bites, to treat purulent wounds and ulcers, and skin diseases.

**Honey** was mixed with butter, roasted onions, minerals, decoctions of medicinal herbs. There is a known case of healing with oxidized fermented honey.

Medicine of the times of Kievan Rus had several directions, in **particular surgery** flourished, primarily due to frequent wars. Surgeons of that time possessed the technique of operation on the skull in epilepsy, performed amputation of limbs. Also known orthopedic techniques, massage, ulcer treatment.

During surgery, a miniature sharp knife was used - a "**breech**", for sharpening which there were special sharpeners. Wounds were treated with extracts of onion, garlic, washed with birch sap, applied cabbage, hellebore, hazel. Plasters and ointments made from bear, goose, lard and flaxseed oil have been widely used in the treatment of wounds. Broken limbs wrapped in the animal's raw skin; drying, the skin acquired the desired shape, thus obtained tire was strong, sufficiently mobile and breathable. For faster recovery, the wounded were prescribed the use of



Eupraxia Mstislavivna

dandelion leaves (modern research has shown that dandelion contains significant amounts of iron, phosphorus, calcium, protein). As a remedy against scurvy used branches of coniferous trees, rose hips. Fish oil was used to improve eyesight, and the secret of the muskrat was used to treat heart disease, epilepsy, and mental disorders.

A kind of encyclopedia of medical knowledge of the XII century. was a truck Tat "**Ointment**", which was composed in Greek by **Eupraxia Mstislavivna** (1108–1172) - Kyiv princess, granddaughter of Vladimir Monomakh, who married the Byzantine emperor, receiving at the wedding and coronation in the Church of Sophia in Constantinople (now - Istanbul) the name Zoe.



The treatise "**Ointments of Her Majesty Princess Zoe**"

Eupraxia received her medical knowledge in Kievan Rus and continued to acquire it in Constantinople (Byzantium), Rome, Greece, and Egypt.

The treatise "**Ointments of Her Majesty Princess Zoe**" made a significant contribution in the development of medicine, it consisted of **5 parts** and 29 sections. This work contained information about body hygiene, the effects of climate on the body, sleep, maternal and child hygiene, nutrition, various diseases and methods of rapid wound healing, as well as recipes for the treatment of skin diseases, oral cavity, heart and stomach diseases. **The first part** of the treatise contains a general overview of ideas about hygiene. **The second part** provides advice on the hygiene of marriage, as well as during pregnancy and child care. **The third part** of the treatise provides recommendations on food hygiene. **The fourth** focuses on external diseases and prescriptions for dental and skin diseases. **The fifth section** focuses on heart and stomach diseases, as well as tips for their prevention.



Ruska Pravda

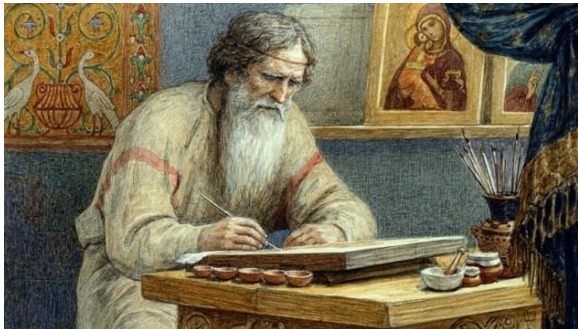
In the days of Ancient Russia, the doctor (magician) was fully responsible for the damage caused by unsuccessful treatment, as a premeditated crime. After the introduction of the laws of Yaroslav the Wise, **Ruska Pravda**, the doctor was fined (to the treasury and in favor of the victim). Also, according to Ruskaya Pravda, the

doctor's right to be **paid for his work** was legalized.

### 3. Medical and medical care in the Kiev-Pechersk Monastery

After the adoption of Christianity in 988, two new directions appeared in medicine and pharmacy of Kievan Rus: church-monastery and secular.

**Kyiv-Pechersk** became the main center of church medicine monastery (later Kiev-Pechersk Lavra). During the reign of Abbot Theodosius (1062-1074), the monastery had large tracts of land, a lot of cattle, which allowed to provide **free medical** care to all who needed it. Those who sought help were examined by the abbot of the monastery, and then, depending on the nature of the disease, sent them to one of the **doctors-monks**.



**Olympiy**

In the "Kiev-Pechersk Paterik" (XII century), the real facts of the achievements of medicine are described. Here we find information about doctors **Peter Sirian, Damian, Gregory, Agapit**.

The famous old man **Olympiy** treated acute and chronic skin diseases with **paints with which he painted icons**. He lubricated the affected areas with paint, then the patient washed them with water. The therapeutic effect was ensured by the fact that the paints included healing elements: green paint - **diamond green**, yellow - **rivanol**. Indigo paint, sandalwood, vat paint, ancient Russian doctors successfully cured malaria, fever.

The monastery was equipped with special hospital wards, monks provided care for the sick; aggressive mental patients kept in solitary confinement. The fame of doctors was such that they were invited for consultations and treatment in other countries.

An outstanding physician who enjoyed among contemporaries deserved- **Agapit** was the most revered. **He did not take money for treatment** and did not leave the patient's bed until his full recovery. For treatment he used both medicines made from local raw materials and those imported from other countries.



**Apothecary's Order**

### 4. The role and significance of the Apothecary's Order for the development of medicine and pharmacy

For a long time the body for the



management of all medical affairs in the Moscow state, which included in the second half of XV II century. part of modern Ukrainian lands did not exist, its absence was to some extent compensated by the Apothecary Chamber (formed in the second half of the XV I century), later renamed the **Apothecary's Order**.

The exact date of the Apothecary's Order has not been documented, but researchers date this event to the **1580** and **1590** . Initially, the purpose of the Apothecary's Order was solely to monitor the **treatment of the king and his family, the drugs that were prescribed to him**. Subsequently, this was accompanied by observation of all the activities of foreign doctors, their selection and invitations to work.

In 1670 a new **pharmacy yard** was built. Yards were industrial enterprises, they procured food and at the same time produced medicines - plasters, ointments, oils, extracts, syrups, tinctures, juices and more; all this was made in large quantities. Drying, grinding, and also storage of medicines and raw materials took place in drugstores.

During the period of unrest at the beginning of the XV II century in the activities of the Apothecary's Order there was a long break, and only in **1620** it was restored. One of the important functions of the restored Apothecary's Order was the **collection of medicinal plants**. The voivodes were sent royal decrees - to collect and present a certain amount (by weight) of herbs and berries, "suitable for medical use." Voivodes distributed this duty through special heralds who went to cities and villages and involved the population in the collection of raw materials. The collection was led by specialists - "herbalists". Beginning with the second half of XV II century pharmacy order also controlled the sale of vodka, guided by this "price book", ie the established tax. Due with this the budget of the Apothecary's Order at the end of the XV II century was 10 thousand rubles a year - a colossal amount at that time.

Pharmacists prepared medicine **for the king and members of his family** according to doctor's prescriptions. The pharmacist's responsibilities also included taking drugs that were delivered to the pharmacy. Two or three times a year, pharmacists conducted an **audit** of the pharmacy's drug stocks to identify unusable drugs and destroy them.

In 1714, Peter I renamed the Apothecary's Order to the Apothecary Kara Chancellery, and from 1721 it became known as the Medical Chancellery. From 1714, the Apothecary's Office, instead of the boyar, was headed by a physician-architect (life physician).

### **5. Peter I's reforms in medicine and pharmacy**

At the beginning of the XVIII century, the **colonial policy of the Russian**

**Empire towards Ukraine intensified.** The peculiarity of the presence of the Left Bank and Slobozhanshchina in Russia was the total continuous, albeit wavy, attack of the autocracy on the rights of Ukraine. The essence of this offensive was to try to eliminate Ukrainian autonomy and incorporate these lands into the Russian Empire. The tsarist offensive intensified especially after the revolt against Peter I and the transition in **October 1708** of Hetman Ivan Mazepa with part of the Cossack army to the side of the Swedish King Charles XII and the conclusion of an agreement with him, which provided for the restoration of Ukraine's independence.

Peter I, creating a regular army, building new cities, creating digging the navy, developing the education system, reorganizing the management of the state, also paid considerable attention to the organization of medicine and pharmacy. **In 1700** he issued a decree "On the Punishment of Ignorant Medical Sciences", which regulated the relationship between doctor and patient. In 1701, in accordance with the decree "On the establishment of eight pharmacies, so that they do not sell any wines, and the destruction of green shops", "green" and "Muscovite" shops were closed, prohibited illegal, spontaneous sale of drugs in markets and streets, opened free (private) pharmacies.

The state pharmacy monopoly protected the rights of pharmacy owners:

in each district or city was allowed to open **only one pharmacy**, all subsequent - in **consultation** with the owner of the existing one. The pharmacy monopoly eliminated competition among pharmacies, promoted their even distribution, and the owners received high profits. To search for and study medicinal plants were organized special scientific expeditions to all regions of the Moscow state.

The imported plants were grown in gardens; and in **1713** the **Apothecary Garden** was opened in St. Petersburg. Foreign specialists were involved to work in pharmacies, but the stakes were on the training of domestic specialists. Pharmacy students studied theory and practical skills from alchemists, distillers, gardeners - employees of the Pharmacy Office and in coctories, laboratories for the manufacture of drugs.

## **6. "Pharmacy Charter", its significance for the development of pharmacy**

"Pharmacy Charter" - a regulatory document, the first The Apothecary Statute of the Russian Empire, which regulated the activities of pharmacy establishments at the time, was introduced on September 20, 1789 by order of Empress Catherine II and consisted of 23 articles. The charter set quite serious requirements for pharmacists and strictly regulated the release of drugs.

The "Pharmacy Charter" was used up to and including the approved on December 23, 1836 by Emperor Nicholas I "Pharmacy Statute" (consisting of 47 paragraphs, grouped into five sections), which became the main document governing the work of pharmacies throughout the nineteenth century.

The main provisions of the "**Pharmacy Charter**" have not lost their relevance to this day:

- The pharmacy should be headed by a person "tested and honored Medical Board in the pharmaceutical rank";
- the pharmacist must be "skillful, honest, prudent, diligent" and perform "his title to the common good, respectively";
- the pharmacist must have "usable supplies suitable for consumption" so that they "do neither harm nor harm to others";
- drugs "retail sale to anyone and nowhere, except pharmacies, is prohibited";
- The pharmacist "both outside and in the container containing the medication must adhere to exemplary cleanliness";
- The pharmacist must "store materials and make medicines according to the pharmacopoeia";
- The pharmacist must make the medicine exactly as ordered a doctor "not to endanger the health and life of the patient, and the doctor's good name - infamy";
- "according to an obscure prescription or one in which the weight of the medicine seems questionable", the pharmacist should not prepare the medicine until he receives a proper explanation from the doctor";
- for the released drugs, the pharmacist must take the price "specified in the taxa laborum";
- the pharmacist must "keep poisonous substances under his own storage behind a lock and seal";
- pharmacists "are forbidden to prescribe drugs to patients and treat them";
- a pharmacist, "performing his / her title correctly and correctly, will use the appropriate patronage from the State Medical Board, and the negligent one will feel the exact severity of the law."

In order to strengthen control of the pharmaceutical industry in 1789 for the first time in Russia, a single pharmacy tax on existing medicines was published, as well as a fee for the preparation of medicines (**taxa laborum**).

### **7. Pharmacy during the Second World War**

On September 1, 1939, World War II began. Under the Molotov-Ribbentrop Pact, Soviet troops occupied the rhetoric of Western Ukraine. Transcarpathian, Lviv, Ternopil, Volyn, Rivne regions reunited with the USSR. For a short time, all pharmacies in these areas were also nationalized.

In this area, they were distributed very unevenly: larger **some pharmacies were located in large cities**, in rural areas one pharmacy served from 40 to 106 thousand people, and some of them did not have pharmacies at all.

The activities of pharmacy were increasingly focused on the needs of the war: a reserve of medicines, dressings, and surgical instruments was created. The war made adjustments to the organizational principles of medicine supply, it was carried out according to the scheme "**center-front-army-division-regiment**". The nomenclature of the basic medical property which included 104 names was defined. The front and the population of the rear needed **bandages and antiseptics, vitamins and tonics**.

During the war, pharmaceutical units did not have a permanent one locations, were mobile and deployed in adapted rooms or tents. Many pharmacists had to carry out evacuation measures or revive the destroyed pharmacy network.

Part of the pharmacy workers who remained in the enemy's rear, provided medical property guerrilla units. This was mainly done by expanding the production of herbal medicines in the field (infusions, ointments). Property and products of economic activity of the local population were actively used.

Military mobilization of the pharmaceutical industry **has reduced the range** of drugs and medical equipment. At the same time, the volume of pharmaceutical products produced in 1942-1943 at chemical plants evacuated from Kyiv, Moscow, Leningrad to Western Siberia and the Urals, almost doubled, and at the end of the war - **more than 5.5 times** .

During the occupation, the national economy of Ukraine was complete destroyed, the pharmacy service of Ukraine also suffered damage. At the time of the liberation of the USSR, there were only **612 pharmacies** (25% of the pre-war number), 5,360 pharmacies, almost all warehouses and control and analytical laboratories were destroyed.

Personnel was lost - only 13% remained in the pharmacy network from the pre-war number of pharmacists and pharmacists, ie there are only **1085 specialists** in this field.

In 1942 - the first half of 1943, immediately after liberation Luhansk, Kharkiv and Donetsk regions from the occupiers, work began on the organization of medical **care for the population**. In February 1942, the Pharmacy Department of Ukraine, consisting of four people, returned from evacuation to Luhansk to manage the pharmacy network and rebuild it.

## **8. Pharmacy of Ukraine in the postwar period**

In the process of reconstruction of Ukraine after the Second World War,

changes were introduced in the organization and management of pharmaceutical business: *a system of separate material responsibility, a bonus system of remuneration was introduced, the share of finished drugs in the prescription increased; pharmacies were built according to special standard projects, the condition of the restored pharmacies has significantly improved, in particular, they were equipped with furniture, necessary equipment and inventory.*

The development of pharmacy in the country in the 60s of last century involved the coordination of efforts of scientists and practitioners of pharmacy, therefore, the **First Congress** was convened to resolve all relevant issues Pharmacists of Ukraine, which took place on **April 3-5, 1963** in **Kharkiv** on the basis of the Kharkiv Pharmaceutical Institute. The delegates of the congress considered the state and prospects of development of the pharmaceutical industry, in particular, among the positive changes was the opening of a significant number of new pharmacies and pharmacy outlets, improving the supply of medicines and medical devices, increase in the number of members of the Scientific Pharmaceutical Society, which improved the quality of training of pharmaceutical workers by organizing seminars for pharmacists. The Congress approved the resumption of the issue of the Pharmaceutical Journal, which was the main publication for research in scientific and practical pharmacy in Ukraine.

**From May 30 to June 1, 1972**, the **Second Congress** took place in **Lviv** pharmacists, organized by the Faculty of Pharmacy of the Lviv State Medical Institute. The Congress outlined the task of improving the medical supply of the population for the future.

The achievements of the pharmaceutical industry for the period 1972–1979 were considered at the **III Congress of Pharmacists of Ukraine**, which took place in **Kharkiv** in **1979**. Congress delegates analyzed

achievements of pharmaceutical science in Ukraine in recent years, identified trends in the training of qualified personnel, the effectiveness of the pharmacy service, the quality of postgraduate training of pharmacy specialists. For the first time, in order to control quality in pharmaceutical, analytical and toxicological chemistry, much attention was paid to the improvement and development of new physicochemical methods of analysis (UV, IR spectrophotometry, chromatography, polarography, application of ion-selective electrodes).

**In October 1984**, the **IV Congress of Pharmacists of Ukraine** took place in Zaporizhia. The delegates of the congress called on all pharmaceutical workers of the republic to make efforts to ensure the fullest and uninterrupted satisfaction of the population's demand for medicines and identified ways to further develop the pharmaceutical sector of the healthcare sector.



### TOPIC 3

## THE DEVELOPMENT OF PHARMACEUTICAL SCIENCE AND PHARMACEUTICAL PERSONNEL TRAINING

*Theoretical questions:*

1. *Medical schools of ancient Greece.*
2. *Salerno Medical School.*
3. *Activities of European universities.*
4. *Historical aspects of the formation of pharmaceutical education in Ukraine in the XVIII - first half of XX century.*
5. *Pharmaceutical education in the independent Ukraine.*

### 1. Medical schools of ancient Greece

The glory of ancient Greek medicine brought medical schools, among the most famous of which were **Croton, Pythagorean, Cnidian, Koska, Alexandria, Rhodes, Sicily** and others.

**Croton Medical School** glorified the city of Croton (Greek colony in southern



**Alcmaeon**

Italy), the school flourished at the end of VI - beginning of V century. BC The founder of the school was the philosopher and physician **Alcmaeon**, who believed that the human body consists of opposites: wet and dry, cold and warm. The body is healthy with a balance of power, and the predominance of one of the opposites is the cause of disease. According to the teachings of Alcmaeon, if one of the opposites is harmful, the other is a cure. The

principle of "**Contraria contraries curantur**" (the opposite is cured by the opposite) was laid down the basis of practical therapy of all followers of Alcmaeon.

The outstanding philosopher and mathematician **Pythagoras (580–500 BC)**



**Pythagoras**

founded a school for gifted youth, which was designed not only to provide knowledge but also to educate the youth. Pythagoras believed that **human health is the harmony of all elements of the body**. The path to a healthy and virtuous life Pythagoras advised to start with proper nutrition, and therefore he attached great importance to unpretentiousness in food and drink, as well as maintaining a moderately joyful mood. Pythagoras knew and widely used a variety of medicinal herbs and plants, from which he made poultices and ointments. Pythagoras used music and songs to treat diseases: for each of the diseases he selected a piece of

music performed on stringed instruments.



He considered poppies, sesame seeds, sea onions, barley, peas, and honey to be the best foods in the treatment of patients.

**Cnidus Medical School** was founded by a prominent physician, contemporary of **Hippocrates, Euryphon** in the V century. BC e. The school developed the doctrine of the four bodily juices (blood, mucus, light bile and black bile), the symptoms and diagnosis of diseases.

**The Sicilian Medical School** was founded by the philosopher and politician **Empedocles** in the 5th century. BC e. School doctors recognized the heart as the main organ of consciousness, four body juices were identified with four states (hot, cold, wet, dry).

#### **Empedocles**

### **2. Salerno Medical School.**

In the Middle Ages, schools taught "seven liberal arts" - a set of basic disciplines, which were divided into two groups:

- **the first stage** - *trivium* - included the following subjects: grammar, rhetoric, dialectics;
- **the second stage** - *quadrivium* - involved the study of mathematics, geometry, astronomy, music.

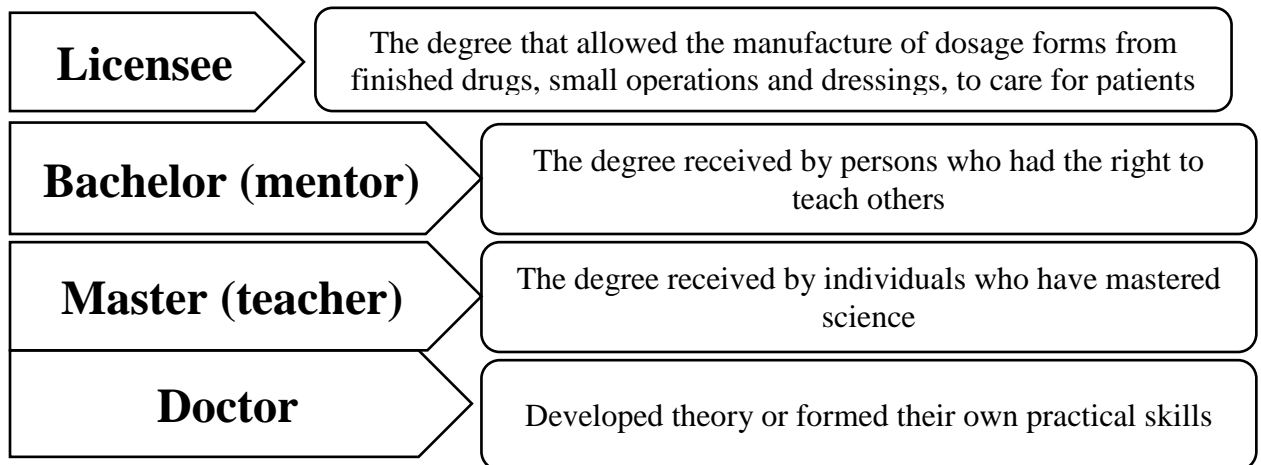
Students aged 10-12 were admitted to schools, and education lasted 5-7 years. In the IX century in Italy in the city of Salerno (near Naples) Greek doctors founded **the first secular medical school in Europe**. The school was maintained at the expense of the city and students' tuition fees, it continued the best traditions of ancient medicine. A hospital was founded in Salerno, the first civilian hospital in Western Europe.

The Salerno school had the **right to confer the title of doctor**. It was forbidden to engage in medical activities without a school license. Prominent doctors and masters of that time worked in Salerno: **Johann Platearius, Cofo, Ferrari, Moor, Urso, Muzandin**. All of them left behind famous medical works, which were later combined into a treatise "On the treatment of diseases." Women doctors also worked in Salerno: **Abella, Trotula, Constanta Kalenda** and others.

The school reached its highest development in the twelfth century, when the **first pharmacopoeia** was compiled - "**Collection of antidotes**".

The Salerno school published a textbook describing various medicinal plants, their uses and methods of cultivation.

For those who graduated from school, **4 degrees were established**



At the beginning of the XIII century. the school became part of the University of Salerno university as a faculty, so significant that the entire university for a long time it was called "**Collegium Hippocraticum**".

### 3. Activities of European universities



**Arnold da Villanova**

The medical school in the city of **Montpellier** (France) has achieved significant success. this school, like Salerno, was famous for teaching practical medicine at a high level. In the Middle Ages, the level of medical science in Western Europe was much lower than the medicine of Byzantium and the countries of the Arab East. In the **twelfth and thirteenth centuries**, medical schools opened in **Bologna** and **Paris**. They existed at the expense of students. Universities in the cities of Salerno, Bologna, Paris and Montpellier were centers of medicine in medieval Europe.

**Arnold da Villanova (1235–1311)**, a prominent scientist, physician, alchemist, and master of the University of Montpellier, wrote the "**Salerno Code of Health**" on diet, nutrition, and disease prevention. It also provided brief information about the structure of the human body, quality and therapeutic effect of food, fruits and plants, highlighted four temperaments of people (sanguine, phlegmatic, choleric, melancholic). The work was first published in 1480 and translated into many European languages.

In the **Ukrainian lands** in the XI century in Kiev opened the first secular school for the upper classes, in which medicine was taught. Funds for the maintenance of the school were allocated by the prince's court.

**In Europe** during the XII-XIII centuries, secular schools gradually merged into a corporation.

With the development of the pharmacy network in Europe in the XV century.

The term "pharmacist" (from the Latin "**provisor**" - foresighted) first appeared and became widely used to describe a highly qualified specialist with higher medical education - this indicates the important role of the pharmacist in the treatment process.

#### **4. Historical aspects of the formation of pharmaceutical education in Ukraine in the XVIII - first half of XX century**

In the XV III century in Ukraine, as well as in the Russian Empire, to the composition which included most of the Ukrainian lands, special pharmaceutical schools did not yet exist. Remnants of the medieval guild system were kept in the pharmacy business. The pharmacy included young people with a four-grade education who, after three years of experience as a pharmacy student, **passed the exam** for the title of **gezel (pharmacy assistant)**.

The first center of pharmaceutical education in Russia was the **Apothecary's Order**, which in **1654 opened a pharmacy school** for doctors, nurses, medical and pharmacy students, who provided medical care during hostilities and cholera and plague epidemics. This school taught medicine, pharmacy, bone law and alchemy. The theoretical course of study consisted of **botany, pharmacology, pharmacy, anatomy, surgery, bandaging techniques**.

In 1883, new "**Rules for testing medical, veterinary and pharmaceutical officials**", according to which to obtain the title of pharmacist's assistant and pharmacist it was necessary to listen to a two-year theoretical course of lectures on special professional disciplines and pass a state exam. Such a system of training pharmacists existed until the early 1920s.

The development of the pharmacy network has raised the issue of training highly qualified pharmaceutical personnel. **In 1917**, the training of pharmacists at pharmacies was abolished. For a time, the management of the health care system used the services of pharmaceutical personnel who had been educated since the days of the Russian Empire and had not emigrated from the country.

It was at the 1st All-Ukrainian Conference on Medical Education developed the main provisions on pharmaceutical education, in which emphasis was placed on the training of pharmacists with higher education. There are the following main events in the development of pharmaceutical education in Soviet Ukraine:

- 1921 - Pharmaceutical institutes were founded with a 4-year-old training (Kharkiv, Odessa) and pharmaceutical colleges with 3-year training (Kyiv, Vinnytsia, Kharkiv);
- 1923 - training of specialists at chemical and pharmaceutical faculties at Kharkiv and Odessa universities was introduced;
- 1930 - Pharmaceutical schools were transferred from the subordination of the system of the People's Commissariat of Education to the People's Commissariat Health Care. Odessa Institute was reorganized in medical-analytical, and pharmaceutical technical schools - in institutes with a five-year term of study;
- 1937 - the academic titles of candidates and doctors of pharmaceuticals sciences;

- 1940 - pharmaceutical faculties were established near Lviv medical institute and Kyiv institute of improvement of pharmacists;
- 1945 - early 1950's - after the end of World War II, the work of pharmaceutical schools was resumed.

### **5. Pharmaceutical education in the independent Ukraine**

The process of reforming the training system for the pharmaceutical sector of the health sector of Ukraine in the late twentieth - early twenty-first century. was due to changes in the global socio-economic, legal, educational and scientific space, the integration of which into the education system required a reorganization of the educational process. The system of higher education in Ukraine provides for the training of specialists at the following qualification levels: junior specialist, bachelor, specialist and master.

Training of specialists in pharmaceutical universities and faculties in the Soviet period was carried out only in the specialty "Pharmacy", and after 1991 the training of students in the specialty "Industrial Pharmacy" was started, later - "Technology of pharmaceuticals". In modern conditions in the educational and qualification direction of training "Pharmacy" the following specialties are provided: "Pharmacy", "Clinical Pharmacy", "Technology of pharmaceuticals", "Technology of perfumes and cosmetics".

Training of junior specialists for the pharmaceutical industry is carried out in Ukraine in the specialties "Pharmacy", "Manufacture of pharmaceuticals", "Analytical quality control of chemical drugs".

The training of specialists in the pharmaceutical industry is carried out as follows leading pharmaceutical and medical universities of Ukraine: **National University of Pharmacy (Kharkiv), Zaporizhia State Medical University, Odessa Medical National University, Ternopil State Medical University, National Medical University. O.O. Bogomolets (Kyiv), Vinnytsia National Medical University. E. Pirogov, Lviv National Medical University, Ivano-Frankivsk National Medical University.**



## TOPIC 4

### HEALTH AND MEDICINE IN FOREIGN COUNTRIES

*Theoretical questions:*

1. *Modern forms of pharmaceutical supply to the population in world practice.*
2. *Features of providing the population with medicines and medical supplies in the world.*
3. *Features of the health care system and pharmaceutical service in European countries.*
4. *US and Canadian health and pharmacy systems.*

#### 1. Modern forms of pharmaceutical supply to the population in world practice.

The most important component of the pharmaceutical market is the pharmacy network, which, in turn, affects the quality of pharmaceutical care. The organization of pharmacies in European countries is subject to regulation in accordance with current pharmaceutical legislation, namely:

- a clearly regulated mechanism for obtaining a license for this type of activity;
- establishing criteria for the ownership of a pharmacy (usually the owner of a pharmacy in the European Union can only be a pharmacist or pharmacist);
- certain conditions for opening new pharmacies (geographical and demographic restriction criteria);
- clearly defined rules for merging pharmacies and creating pharmacy chains.

All European countries own the pharmacy can be divided into two groups:

- ❖ **Only a pharmacist can own a pharmacy:** Denmark, Finland, Latvia, Lithuania, Slovenia, Turkey, Italy, Spain, Austria, Cyprus, France, Germany, Greece and Luxembourg.

In this group of countries, only a qualified pharmacist with at least 5 years of professional experience in pharmacy and belonging to the European Union (EU) or the European Economic Area can apply to the government for a license to open a pharmacy;

- ❖ **The ownership of the pharmacy can be obtained by any individual or legal entity** - pharmacist, non-pharmacist, group of persons, companies: Belgium, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Ireland, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Sweden, Switzerland, Great Britain.

There is an ambiguous situation in some countries regarding the establishment of pharmacy chains. For example, in **Cyprus** and **Turkey**, the creation of pharmacy chains is prohibited by law, i.e. it is possible to operate only **some independent pharmacies**.

In addition, in some countries there are certain restrictions on the number of

pharmacies that are grouped into pharmacy chains. For example, in Bulgaria and Portugal, pharmacy chains can unite no more than **4 pharmacies**, in Germany - **no more than 3**.

In **Greece**, there were no restrictions on the creation of new pharmacies until 1997, but a new law passed in the country sets the following criteria:

- issuance of only one license for a pharmacy in municipalities and municipal and communal districts with a population of up to 1,500 people;
- setting a limit on the service of the population by one pharmacy per 1,500 people in municipalities and municipal and communal districts;
- mandatory distance from newly created pharmacies to existing ones is: 100 m - with a population of up to 5000 inhabitants; 180 m - with a population of 5001 to 100,000 inhabitants; 200 m - with a population of 100,001 and up to 200,000 inhabitants; 250 m - with a population of over 200,001 inhabitants.

In **Italy**, there are demographic and geographical restrictions for pharmacists intending to open a new pharmacy to obtain licenses that require new pharmacies to be located at least **200 m** from any existing ones. For cities with up to **12,500** inhabitants, local authorities issue a permit to open new pharmacies for every **5,000** people, while for cities with a population of more than **12,500**, a license is issued for every 4,000 people. At the same time, local authorities may violate the general principle of having only one pharmacy in the city in some cases, depending on the topography of the territory and road conditions.

## **2. Features of providing the population with medicines and medical supplies in the world.**

According to international experience, there are various forms of providing the population with medicines (drugs) and medical supplies. Thus, in most countries of the world drugs can be sold only in pharmacies (**France, Portugal, Finland, Greece, Italy, etc.**). In **Ukraine**, medicines can also be sold only in pharmacies, but today there is a gradual penetration of drugs, mostly over-the-counter, on the shelves of supermarkets. In such pharmacies, the entire territory of the trading hall is open for free access of visitors, thanks to which they have the opportunity to get acquainted with the range, compare prices, choose the necessary drugs and get expert advice if necessary.

Also today in some countries around the world are being implemented in practice, new forms of sale of medicines and medical devices to the population, which include, first of all, **online trade in drugs, sale of drugs by mail, sale of drugs and medical devices through supermarkets**, etc.

From the point of view of state regulation, the online trade of drugs deserves attention. According to this type of drug sales, the countries of the world are divided mainly into two groups: countries where e-commerce is allowed, and countries where this type of drug sales is prohibited.

The **sale of drugs through Internet** services is allowed in the **United States**.

Legislation “*The Ryan Haight Online Pharmacy Consumer Protection Act of 2008 (Ryan Haight Act)*” regulates the practice of online drug sales at the federal level. There are about 300-400 legal online pharmacies in the US, Canada, and other countries. Such companies have licenses for the relevant activities and, in addition to the Internet resource, are provided by local pharmacies. As a rule, online pharmacies when accepting orders from customers ask for a **doctor's prescription** for drugs, belonging to the **RX group**. In this case, a doctor's appointment can be obtained during a personal or remote consultation. It should be noted that not all online pharmacies in the United States provide a remote doctor's consultation service and, accordingly, accept such prescriptions. Most legal online pharmacies ask for the original prescription obtained during a personal appointment. Usually, the cost of drugs in such online pharmacies is lower compared to online pharmacies that provide online medical advice.

**Denmark** is an example of a country where **e-commerce of medicines is enough developed**. The drug is sold using Internet resources through the website of the Danish Pharmaceutical Association. At the same time, the delivery service of drugs is provided only within the country. In addition, an order issued by the Danish Medicines Agency allows the use of online pharmacy services registered in the EU and countries that are parties to the Agreement on the European Economic Area. In the case of purchasing drugs abroad, they are usually not subject to reimbursement, however, patients can expect to purchase drugs at lower prices. In Denmark, the same prices are set for retail sales of drugs. Yes, the same drug has the same value in all local pharmacies in the country.

With regard to **Germany**, it should be noted that by January In 2004, any form of distance trade in drugs (both prescription and over-the-counter) in the country **was banned under the Drug Law**. However, as part of the health care reform, such a rule was abolished. Thus, in accordance with the provisions of the Guidelines on the rules of sale of drugs via the Internet (2005) regulate the nature of information published on sites that carry out this type of activity, and introduced some exceptions, such as a ban on the sale of certain anticancer drugs and drugs for chemotherapy. The rules also contain requirements for the **transportation and storage of drugs**. In Germany, the delivery of drugs is allowed only with the permission of the country's regulatory authorities or the European Medicines Agency (EMA).

Quite widespread e-commerce is practiced in the **Netherlands**. The country's legislation gives a lot of freedom in this area, and over-the-counter drugs are sold in supermarkets and drugstores (so-called **drogists**). Prescription drugs can also be ordered at an online pharmacy. According to the *Law on Supply of Medicines*, distance selling of medicines through online pharmacies located in the Netherlands must be carried out in accordance with the same requirements as for local pharmacies.

In **Poland**, the sale of drugs via the Internet was banned for the first time the lower house of parliament in 2007, but the decision was overturned by the upper

house a few months later on the grounds that it was not in line with EU law. In line with EU requirements, the country's Ministry of Health has developed rules under which this type of business can be carried out if certain rules are followed. Yes, a 24-hour helpline must be provided, drugs must be transported in conditions that provide temperature control, and the name and information about the drug must be indicated on the outside of the package for transportation.

Retail e-commerce of medicines in **Sweden** is common: unlike other European countries, 7% of Sweden's population buys medicines online. One of the features of e trade is that all pharmacies, including the online service for the sale of drugs, are subordinated to one government organization, called "**Apoteka**".

**Switzerland** is a European leader in e-commerce in many areas, as today 16% of prescription and over-the-counter drugs are sold via e-mail or online. The first online pharmacy in Switzerland was founded in 1997, but this business was legalized only in 1999, when the federal government amended Article 27 of the Law on Medicinal Products and Medical Devices (Heilmittelgesetz), which allows the delivery of prescription drugs provided compliance with their safety requirements.

Unfortunately, along with legal online pharmacies, many countries there is a problem of illegal sale of drugs using Internet services, which significantly increases the risk of **distribution of counterfeit products**, as well as the illegal sale of controlled substances. In this regard, the FDA, EMA and other governmental and non-governmental organizations are conducting outreach among drug users and developing appropriate regulations to reduce the number of illegal Internet services.

### **3. Features of the health care system and pharmaceutical service in European countries.**

**United Kingdom.** National Health Service - The National Health Service (NHS) is the best known universal medical care system (covering the entire population of the country).

It is a state system that is financed mainly by taxes. NHS medical services are provided free of charge, unless the patient requires special conditions or additional treatment that is not clinically necessary. For some groups, there is also a certain co-payment for dental care, as well as a fee for pharmaceuticals - for one package prescribed by a doctor. Patients have the freedom to choose their doctors. About 7 million people in the UK benefit from voluntary health insurance schemes. **The main problem** with the British health insurance model and the entire health care system is the lack of resources and the administrative nature of their allocation.

All medicines in the country are divided into prescription and over-the-counter, which, in turn, **are divided into groups:**

- 1) licensed in the List of products for general sale;
- 2) licensed for sale only in pharmacies;
- 3) not licensed.

**In Germany**, there is a budget-insurance model of the health care system.

Insurance premiums are made centrally to a special state fund as a fixed percentage of wages. Insurance funds are formed by both individuals and legal entities (employers). Control over the use of centralized insurance fund funds is exercised by state bodies and independent social institutions. In total, health insurance services cover more than 80% of the German population. Funding for the participation of unemployed citizens in compulsory health insurance is provided by the federal government department of labor.

German health insurance funds pay a set list of guaranteed services, namely: *early diagnosis of diseases, medical and pharmaceutical care* (outpatient care, dental treatment, hospital care during pregnancy and childbirth, care for the sick at home, rehabilitation, provision of aids, such as time of care for the seriously ill, provision of medical and pharmaceutical care in health care facilities).

**France** has a complex mix of private and public sectors in both funding and health care. The system is based on a mandatory state health program, which is largely complemented by voluntary insurance.

As in most Western countries, medicine in France is insurance. Payment for service is made through the so-called "cash registers", ie insurance companies. Every working inhabitant of the country is deducted a certain percentage from his salary, so that in the future it will be possible to pay for medical care and receive funds for the purchase of medicines.

A wide range of medical services is provided both in the hospital, and at the outpatient level, and patients have the freedom to choose a service provider. The people of France are satisfied with their health care system. The average life expectancy and mortality rates here are better than the European average. Universal access to health care is guaranteed by the national health insurance system, which is part of the compulsory social security system. Insurance is provided through various programs depending on the professional affiliation of the person.

**Austria.** The fundamental principle of the Austrian system health care is the right of citizens to receive quality medical services. The healthcare industry in Austria focuses on the prevention, early diagnosis and treatment of diseases in the early stages, which is the most cost-effective. The state health insurance system provides medical services to all workers, pensioners, the unemployed, ie almost all citizens, and includes emergency medical care, outpatient and inpatient care, as well as social protection. The level of medical care is the same for all citizens, but the amount of personal payments is different in different insurance companies. Almost all types of outpatient services are provided by the national health care system to those who need it, at no extra charge. Emergency care is guaranteed to all persons in Austria. Funds for health care are distributed mainly through the funds of the national insurance system.

The country has public pharmacies, independent pharmacy-led companies, hospital pharmacies and distributors.

**The Danish healthcare** system has a number of features. Its financial base is formed at the expense of taxes to state and local budgets. It is decentralized - local



and secondary authorities are responsible for local government. The dominant sector of the system is the state. The country has high standards of health care and the world's highest health care index. The health care system is managed at three levels: national (parliament, government, agencies), regional (regional) and municipal.

The number of pharmacies in Denmark and their location are regulated by law. The staff of the average pharmacy - from 14 to 20 people with secondary and higher pharmaceutical education (of which, as a rule, 2-3 pharmacists). Each pharmacy serves an average of just under 20,000 people.

#### **4. US and Canadian health and pharmacy systems.**

The basis of drug supply in the United States are mainly market mechanisms. All medical and pharmaceutical services are sold as a commodity for maximum profit.

US insurance companies pay special attention to the regulated lists of drugs and standard treatment regimens. In each insured event, the doctor follows a scheme approved by the insurance company, which covers the costs associated with using the only correct method of treatment with a high rate of positive outcome.

Medicare state health care programs have been created for the **MEDICAL CARE** of low-income social groups and **MEDICAIDE**.

The federal **Medicare program** helps the elderly (**older 65 years old**) and incapacitated due to illness. The program is funded directly from the federal budget and the Department of Social Insurance through the previous contributions of its participants.

The **Medicaid** program provides medical care to the needy and is run jointly by the federal government and the state government.

There *are privately owned pharmacies* in the country, owned by independent pharmacists, pharmacy chains or non-pharmaceutical companies. Pharmacies owned by independent pharmacists, in addition to the sale of medicines, provide additional services: quality information support, parapharmaceutical service (vaccinations, tests), offer nutritional supplements.

In the vast majority of states, prescriptions are allowed only by doctors. In Florida, a limited number of drugs are allowed to be prescribed independently by pharmacists, with the practitioner being responsible for the treatment.

The **Canadian health** care system is funded by the state. Management and provision of health services is the area of responsibility of each individual province or territory of Canada. The provinces have approved a **National three-tier list of drugs**:

- 1) non-narcotic controlled drugs that are available in prescription pharmacies;
- 2) drugs for sale in pharmacies without the patient's choice;
- 3) over-the-counter medications.

Over-the-counter drugs are sold in the pharmaceutical sections of stores in the presence of a pharmacist in the staff.

The Medicare system provides free or virtually free medical care and medical services to all citizens of the country.

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