Medicinal material of animal origin

Pharmacognosy as a science comprehensively studies medicinal plants and medicinal raw materials of mineral and animal origin.  A medicinal raw material of animal origin is the whole animals, their parts or the products of their vital activity approved by Ministry of Health Medicinal raw material of animal origin is presented by a small number of species. For example, snake venom, bee venom, leech, sponge, spanish fly and oth.

Snake venom, a product of the vital activity of the honeybee, as well as the medicinal preparations based on it, sponge, leech, animal fats and deer antlers are used for the treatment and prevention of various diseases.

A medicinal raw material of animal origin has long been used in traditional and folk medicine, the most frequently used raw materials are the products of the vital activity of the bee and leech.

Pharmacognosy involves the search and study of biologically active substances of plant origin and their source – plants, but in a modern stage of its development, there is a need to obtain information on biologically active substances of animal origin. A medicinal raw material of animal origin has been used for the treatment of most diseases by people from ancient times. A medicinal raw material of animal origin has long been used for the treatment of various diseases by a human.

Ibn Sina has described about 150 medicinal preparations of animal origin.

Organs, tissues and various products of animal origin were used for the treatment of different diseases in folk Chinese, Tibetan, Pakistan medicine.

A medicinal raw material of animal origin is used in modern medicine, for example, a product of the vital activity of the bee, snake venom, leech, antlers, sponge and marine organisms.

In the modern world, raw material of animal origin is widely used for the treatment of various diseases in eastern medicine, China, Pakistan, Tibetan and oth.

There are a lot of venomous creatures and according to the statistics three of 10 venomous animals are snakes:

1. *Dort poison Frog* –Poison frog

2. *Blue Ringed Octopus* –Blue-ringed octopus

3. *Cone Snail*- Cone shells

4. *Box Jelly Fish* –  box jellyfish

5. *İnland Taipan* – İnland Taipan

6. *Death Stalker* – Deathstalker

7. *Sydney Funnel* –sydney funnel-web spider

8. *Heloderma Suspektum* –Gila monster

9. *Dendroaspis polylepis*- Black mamba

10. King cobra

Poisonous products are particularly interesting among the raw materials of animal origin, for example, snake, bee and scorpion venom.

Scorpion venom

Scorpions are medium to large-sized chelicerates, usually 5-10 cm, some of them– 20 cm. Their body is covered with a chitinized cuticle**.**  Chitinized cuticle contains calcium carbonate, which gives it strength. A scorpion's body is divided into two parts, the cephalothorax, and the abdomen.  The cephalothorax is covered dorsally by the carapace**.**  The carapace is formed by the fusion of acron and tergites of six cephalothoracic segments. On the cephalothorax are two larger median eyes and to 5-pairs of small lateral eyes. The chitinized plate called sternum is located in the cephalothorax.

The abdomen consists of 12 segments and telson. According to the structure of segments the abdomen is divided into anterior and posterior portions. The anterior part (mesosome) is wider and consists of 7 segments. The metasoma or postabdomen is narrow and consists of five cylindrical segments. The last segment of the abdomen bears a swollen telson. The telson contains a pair of venom glands. Venom is injected via a sting located in telson.

The abdomen doesn’t have distinct visible extremities. Some organs have arisen from a modification of limbs. These organs include genital operculum, comb-like appendages (pectines) and lungs.

Scorpions are effective predators and widely distributed in the warmer countries of the world. They hide in burrows, under stone, bark during the day, and hunt at night. Scorpion venom causes a headache.

There are about 6000 scorpion species. A small yellow Crimean scorpion (Euscorpius tauricus) can reach 4 cm in length. Italian scorpion (Euscorpius italicus) is widespread on the Black Sea coast of Caucasus, a motley scorpion (Buthus eupeus) – in Transcaucasus and Middle East. African scorpion (Pandinus imperator) can reach sizes up to 18 cm in length, lives in the tropics.

The most venomous species of scorpions are distributed in Australia. The venom of australian scorpions is different from the venom of scorpions distributed in other countries.

Among the uses for scorpion venom is its ability to identify pain receptors in humans.

The results of numerous studies indicate that the scorpion venom represents a great effect against tumors. Several studies of American Chemical Society have demonstrated that the venom of deathstalker scorpion has a high toxicity and impact on brain tumors. The chlorotoxin leads to the emergence of anticancer genes. This study was conducted by scientist Miqin Zhang and colleagues from the University of Washington and the anticancer genes were discovered in the brain cells.

Scorpion venom, combined with iron oxide nanoparticles, creates a double therapeutic effect. The deathstalker scorpion, also known as the Palestine yellow scorpion, is found in the Middle East, Africa.Its poisonous sting causes a painful burning sensation. Despite this, its sting has an effect which can revolutionize the treatment of brain tumors.

Snake venom

There are more than 3000 species of snakes in the world.58 snake species belong to the fauna of the USSR, 11 species of them are poisonous and dangerous to humans.

Snakes belonging to various families are different by its biology, poisonous apparatus structure, the chemical composition of venom and mechanism of its toxic action.

Snake venom is a liquid which is produced by the poison gland of the poisonous snake.  Snake venom thus produced is a viscous and transparent or yellow-colored liquid, heavier than water (the specific gravity of cobra venom is 1,046, lebetine viper -1,030-1,032). It gives an opalescence with water. Cobra venom is neutral in reaction, viperidae and crotalinae venom is acid in reaction. A venom quickly loses toxicity in water, ether, chloroform, under the UV-rays, permanganate potassium. It is well preserved by freezing (-5-10°С) or lyophilization. The venom thus produced is usually dried and stored in the dark.

The extracted venom, when dried, forms yellow crystals, in this form the constituents of snake venom can be preserved for longer period.

 Snakes are held in specially equipped serpentarius. In some places snakes are held in open aviaries with natural conditions. Snakes do poorly in captivity: in captivity lebetina viper lives about two years, sand echis – about 6 months, viper – 3-4 years; in aviaries – about 1,5 years. The snake is captured and venom is extracted and then they are returned to the wild. The snake venom can be obtained in field conditions.

Native venom is a turbid yellowish odorless fluid. Native venom quickly loses activity and during the storage it gets moldy. Snake venom loses water 5 times when lyophilized and it is dried. Dried venom is yellow-colored crystals, easily dissolved in water, glycerol, salt solutions. The venom is inactivated by alcohol. The cobra venom is neutral in reaction, the venom of vipera berus and rattlesnake – acid.

Snake venoms are the complex mixtures of biologically active compounds: enzymes, toxic polypeptides, some proteins and inorganic components.

The elapid snake venom contains toxic polypeptides (neurotoxins); post- and presynaptic toxins and also membranoactive polypeptides.

Post-synaptic neurotoxins are classified into 2 types: short and long. Short neurotoxins consist of 60-62 amino acid residues and include 4 disulfide bridges, their molecular weight is 7000. Long neurotoxins comprise 71-74 amino acid residues with 5 disulfide bonds.

Pre-synaptic toxins consist of polypeptide chains. Notexin is a single polypeptide chain, consisting of 119 amino acid residues with 7 disulfide bonds (molecular weight is 13574). α-bungarotoxin consists of 2 subunits with 120 amino acid residues (the molecular weight is 13500) and 60 amino acid residues (the molecular weight is 7000); taypoxin consists of 3 polypeptide chains, some of them contain 119 (the m.w. – 13000), 135 (m.w. – 18300) amino acid residues.

Pre-synaptic toxins include taypoxin from taipan venom, mulgotoxin and α-bungarotoxin from banded krait, notexin from tiger snake. The presence of phospholipase activity is a characteristic feature of these toxins. Phospholipase A2 from the central asian cobra Naja oxiana has a presynaptic action.

 The molecular weight of membranoactive polypeptides is 6000-7000, they are resistant to heat in acid medium. The membranoactive polypeptides contain the residues of lysine and hydrophobic amino acids (valine, leucine, methionine). They possess hemolytic, cardiotonic, cytotoxic action.

The elapid venom contains other biologically active substances – enzymes: hyaluronidase, acetylcholinesterase and phospholipase. Cobra venom contains the factor which stimulates the growth of sympathetic nerve cells.

Anti-complement cobra venom factor is used in immunological studies.

Viperid and elapid venoms affect blood coagulation system.

Viperidae and crotalinae venoms are similar in chemical composition and action.

Crotoxin, a rattlesnake toxin, is a mixture of a basic A2 phospholipase and an acidic protein (A crotoxin), it doesn’t exhibit the enzymatic activity and it is not toxic. Crotapine and phospholipase A2 forms a complex in which a high toxicity is recovered.

Hyroxine (molecular weight – 33000) doesn’t exhibit enzymatic activity and damages the vestibular apparatus.  Crotamine is a polypeptide composed of 42 amino acid residues with a molecular weight of 4880, it causes convulsions.

Vipoxin from nose-horned viper is a polypeptide with a molecular weight of 14350, it exhibits a post-synaptic blockade activity. Vipotoxin is the major lethal component of venom. Crotalinae and vipera berus venoms contain serine endopeptidase and metalloproteinase.

In ancient according to some sources along with a small amount of snake venom times people tried to treat some diseases by snake bite. In 1908 Velf was observing the following: an epileptic was bitten by a rattlesnake and it causes the poisoning, however after recovery the epileptic attacks were ceased.

In 1894 the famous scientist A. Kalmet explains the analgesic action of snake venom by the combination of neurotoxin along with lecithin, containing in nervous cells.

Snake venoms are known to affect the phenomenon of blood coagulation, that’s why it is used to stop the bleedings of various origin.

According to Fon Clobuzishky the snake venom was firstly used to stop the bleeding by Pek and Frank.

Some snake venoms conversely possess anticoagulant activity. Venom doesn’t affect the integrity of thromboplastin, it just inhibits it. These substances with anticoagulant acitivity exert fibrinogen-fibrinolytic action and can cause afibrinogenemia.

All species of snakes are classified into 11-13 families. Just 5 of them are interesting for us, because they contain or entirely consist of venomous species.

 1. Colubrid snakes (Colubridae) - 1700 species

 2. Elapid snakes (*Elapidae*) - 180 species

 3. Pit vipers ( *Crotalidae*) - 120 species

 4. Sea snakes (*Hidrophidae*) - 49 species

 5. Vipers (*Viperidae*) - 58 species

The colubrids are the largest and most widespread snake family.

Elapid snakes are widespread in subtropical regions except in Europe. All types of snakes in this family are venomous. The most venomous snake in the world – taipan belongs to this family. The snakebite of this family doesn’t manifest itself locally (swelling and redness). Neurotoxins predominate in the venom of elapids. The death occurs in relation to respiratory failure.

Pit vipers are distributed in south and east Asia and South America.

Sea snakes family is a specialized group of typical sea inhabitants. Sea snake venom is 2-8 times more toxic than those of the indian cobra. Sea snakes possess the most powerful venom. Because they feed exclusively on marine organisms which are resistant to snake venom, than mammal and birds. Sea snakes aren’t considered dangerous because they produce small amounts of venom. Its bite is painless. [*Aipysurus duboisii*](http://tr.wikipedia.org/w/index.php?title=Aipysurus_duboisii&action=edit&redlink=1) is the most venomous snake.

The composition of sea snake venoms is much simpler than this of land snakes. The venom contains postsynaptic neurotoxins. They bind irreversibly to N-cholinoreceptors and block neuromuscular transmission. In addition, phospholipase A2 with a myotoxic effect, is found in other sea snakes.

Viperidae are distributed in Africa and Eurasia. The largest number of species of this family inhabit Central Africa.

The snakes are captured for scientific research and extraction of venom. Special licenses are required which are issued by environmental protection agency.

Snakes are held in specially equipped serpentarius. In some places, snakes are held in open aviaries with natural conditions. Snakes do poorly in captivity: in captivity, lebetina viper lives about two years, sand echis – about 6 months, viper – 3-4 years; in aviaries – about 1,5 years.

Snake venom is the fluid secretions from the modified salivary glands. This liquid - zootoxin was formed as a result of modifications of the excretory gland, in other vertebrates – of the salivary glands (the parotid). The glands are situated on both sides of the head, behind and below the eyes. Their excretory ducts open into the poisonous teeth.

 Snake venoms are a complex mixture of biologically active compounds: enzymes (mainly hydrolyzes), toxic polypeptides, some proteins with specific biological properties and inorganic components. The most common snake venom enzymes include phospholipase A2, hyaluronidase, oxidase L-aminoacid, phosphodiesterase, 5-nucleotidase and oth.

Snake venoms contain 25 enzymes, 10 of them are common to all types of snakes, rest of them is different depending on the snake species. It reflects a close phylogenetic relationship between venomous glands and exocrine glands of the digestive tract.

Phosphodiesterases reduce blood pressure. Phospholipase A2 causes hemolysis of red blood cell and muscle necrosis. Snake venom blocks the action of cholinesterase and disrupts the movement of muscles.

Hyaluronidase facilitates the adsorption of other enzymes. Hyaluronidase cleaves the connective tissue, destroys the walls of small capillaries, increases the permeability of tissues to water and ions. Oxidase and proteinase carry out the process of digestion. Oxidase provides also the elimination of other enzymes and gives green colour to the venom of some snakes. Snake venom contains ATPases which are used for breaking down ATP to disrupt the prey’s energy fuel use.

 In addition to that snake venoms contain inorganic cations such as sodium, calcium, potassium, magnesium and small amounts of zinc, nickel, cobalt, iron, manganese.

The other components of snake venoms are glycoproteins, lipids, and biogenic amines, such as histamine, serotonin, and neurotransmitters.

The venoms of elapid and sea snakes include toxic polypeptides (neurotoxins), which cause a failure of the transmission of excitation in neuromuscular synapses, that leads to a partial relaxation of skeletal and respiratory muscles. Death of poisoned animals and humans occurs due to the respiratory arrest. The venom from these snakes contains the enzyme acetylcholinesterase, which relaxes the muscles.

Viper venoms contain hyaluronidase and phospholipase. It violates the heart, liver function, and water-salt metabolism. Venom spreads mainly through the lymphatic system, bloodstream and nerve fibers.

Bites by vipers result in swelling and violation of blood coagulation system. Viper venom of Azerbaijan fauna causes disseminated intravascular coagulation (DVS-syndrome).

The venom is excreted by mucous membrane, kidneys and mammary glands.

The essential field of the use of snake venoms is the production of anti-ophidic serum. A small amount of snake venom is injected into a mammal, mainly horse or sheep. The resulting [antibodies](https://en.wikipedia.org/wiki/Antibodies) are then harvested from the animal's blood which is extracted and used for prevention of poisoning by snake venom. Snake venoms are widely used in scientific research.

The demand for snake venom is high, however, its production is difficult and time-consuming. The amount of venom which could be extracted from one snake depends on its dimensions, species, season, the interval between the venom collection, physiological condition of the snake and the method of snake collection. Collection of snake venom is carried out by the following methods: pull the teeth of a snake into rubber or plastic material and provide it to release venom into a container, mechanical milking - massaging the venom glands and electric stimulation. 250-300 snakes are required to obtain 1 g of venom. For example, 2 572 mg of native venom or 374 mg of dried residue can be obtained from vipera lebentina with a length of 150 cm by electrical stimulation. From vipera berus (70cm) – 31 mg and 4-5 mg, from cobra (145 cm) – 2 320 mg and 724 mg.

The study of snake venom is carried out under 4 directions:

Cytotoxic action. Cytotoxins are positive Cytotoxins are positively charged polypeptides. They connect to membrane lipids and proteins of certain cells or organs. Some of them cause the cell necrosis, others- apoptosis (systematic cell death). These substances start digesting prey before it is even swallowed.

Miotoxic: Myotoxins are found in Crotalinae and Viperidae. Myotoxin-A, one of the best-known myotoxins, is a small, basic protein devoid of enzymatic activity, which binds specifically to the sarcoplasmic reticulum of muscles, causing a change in ion permeability.

Hemorrhagic. Hemorrhagic venom of the Crotalinae cause the death of prey due to internal bleeding.

Neurotoxic: Neurotoxins in snake venom block transmission from nerve to muscle causing the prey paralysis. Despite the fact that a high dose of snake venom is lethal or causes severe poisoning, low doses have a great medical value.

Snake bites are dangerous to human, and in any case, the first and medical care is required. A common symptom of a bite from a venomous snake is the presence of one- two [puncture wounds](https://en.wikipedia.org/wiki/Puncture_wound) and severe pain. This may result in redness, swelling, and bruising. [Vomiting](https://en.wikipedia.org/wiki/Vomiting), nausea, drowsiness, and cold sweating may result. The patient should see a doctor immediately. Keep the patient lying down with his legs elevated and keep at rest. Keep the patient immobile.  Put the patient on a stretcher or bring transportation to the patient. Clean with pure water and treat with iodine and hydrogen peroxide and cover with a sterile bandage.  On the bite superimposed compressive bandage, which is periodically necessary to weaken with the development of edema. it is necessary to fix the damaged limb, bandage to a healthy leg. Keep the affected limb (leg and hand) immobilized.  it is necessary to fix the damaged limb, bandage to a healthy limb. It significantly prevents the venom from spreading throughout the body. Apply an ice pack over the sting site to slow absorption of the venom. Drinking plenty of fluids helps to remove the poison from the body; antihistamine and analgesic preparation should be given. Anti-venom serum should be injected.

During a long-term impact of venom and lack of proper medical assistance excitement, followed by lethargy, skin discoloration, cardiac acceleration, dizziness, sharp weakness, reduction of blood pressure till shock – respiratory and cardiac arrest are observed.

During the evolution, the venomous apparatus of snakes allowing to swallow immobilize large prey has developed. The ingestion of prey entirely caused significant rearrangement of jaw apparatus. A snake's upper jaw is attached to its braincase by muscles, ligaments, and tendons, allowing it some front-to-back and side-to-side mobility. Due to this, the snake is capable of swallowing the prey several times bigger in diameter than their own heads.

Colubrid snakes (*Colubridae*). The colubridae family is the largest snake family and includes more than 60% of all known snake species. It includes the spotted whip snake, tiger keelback, smooth snake, boiga, european cat snake and oth.

The most popular - cobra belongs to the family Elapidae. Elapids have fangs which are fixed to the front part of the upper jaw.

The family Viperidae is a characteristic of Azerbaijan fauna. Fangs are situated in the temporal region behind the eye. Their fangs can rotate about a transverse axis approximately to 90 degrees. The large poison fang is capable of being rotated through a considerable angle, and moved nearly horizontal position to a nearly vertical position, when snake opens its mouth. The venom gland consists of main part which occupies 2/3 of a gland, the primary duct, bipartite  accessory gland and secondary duct. The gland has a complex alveolar structure. The secretory material thus produced is accumulated in the central cavity of the gland. A snake bite or artificial extraction of venom stimulates the gland, which reaches its maximal level in 7-8 days after venom extraction. Common European viper and Caucasus viper are found in Azerbaijan.

Red-bellied racer of Colubrid snakes is found on the territory of Azerbaijan.

The Crotalinae and Viperidae are distinguished by the presence of a facial fossa located between the eye and the nostril . This fossa is heat-sensing pit organ, which in effect give the snakes a sense to find immobile or sleeping prey in the dark.

They contain enzymes (mainly hydrolases), toxic polypeptides, some proteins with specific biological properties (nerve growth factor- NGF, anticomplementary factor), and inorganic components. The most common snake venom enzymes include phospholipase A2, hyaluronidase, oxidase L-aminoacid, phosphodiesterase, 5-nucleotidase and oth. Snake venoms are complex mixtures of biologically active compounds. However, their venoms can contain various enzymes.

The family Colubridae are the largest and most widespread snake family. Elapid snakes are widespread in subtropical regions except in Europe. Colubrids are found in south and east Asia, North and South America. Sea snakes (family Hydrophiidae) is a specialized group of typical sea inhabitants.

Snake venom consists of proteins with several disulfide bonds. Its major activity is an influence on the biological membranes (membrane-active polypeptides). The protein in various venoms is close by physicochemical properties. However, they are distinguished by pharmacological activity. Protein from Viper venom (viperotoxin) causes primarily hemodynamic disorders.

Protein complex – crotoxin is isolated from the venom of the rattlesnake.

**Cobra venom contains protein complex – cobrotoxin with neurotoxic action.**

**In addition to membrane-active polypeptides, snake venom contains a lot of high-activity enzymes, which damage the cells and intercellular substances: hyaluronidase, phospholipase A2, phosphodiesterase, DNase, ATPase,**  nucleotidphosphotase, L-aminoacid oxidase and oth. Cobra venom, in addition, contains acetylcholinesterase, alkaline phosphatase; viper venom – proteases; mineral substances, pigments and oth.

In the village of Zira (Azerbaija,Baku) the serpentarium was found and lebetina viper was contained there. Each year 3 kg of venom is isolated from viper snake.

Snake venom thus obtained is used for the production of “Viprosal” and other medical preparations. Unfortunately, during 90s of 20th century the activity of serpentarium was closed.

Snake venom preparations are used as an analgesic and anti-inflammatory for the treatment of neuralgia, myalgia, polyarthritis, myositis, radiculitis, lumbago, sciatica and oth.

Snake venom preparation is contraindicated in patients with allergy, feverishness, pulmonary tuberculosis, heart defect, cerebrovascular and cardiac insufficiency, liver failure, kidney injury. These preparations are contraindicated to a breastfeeding mother.

Snake venom is used as an injection, tablet, ointment or liniment. They include:

The aqueous solution of Vipera Berus venom for injections (“Vipraxin”, “Viperalgine”) Water solution containing central asian cobra venom (“Nayaxin”, “Cobratoxin”).

Sterile venom, stabilized solution of snake venom- viperine. Standardised preparation from crotaline venom – “Epilarctin”.

 “Viprosal” Ointment. 100 g of ointment contains 16 IU (1 IU corresponding the activity of 0,11 mg of lebetina viper), in contrast to “Viprosal”, the ointment “Viprosal B” contains the viper venom ordinary instead of lebetina viper (5 UI). In addition, “Vipractun”, “Vipraside”, “Vipletox” are produced.

Characteristic of honey bee and products of its vital activity.

*Honey bees – Apis mellifera L, family: Apidae*. These insects protect the human health. Beekeeping has an ancient history. In 1919 honey seeker depicted on [cave painting](https://www.revolvy.com/main/index.php?s=Cave+painting) near [Valencia, Spain](https://www.revolvy.com/main/index.php?s=Valencia,+Spain). The painting is 15000 year old.  3200 year old dried honey was found in Egyptian pharaoh tombs. Sumerians living in Mesopotamy in 3000 B.C. used the honey as a preparation.

Honey bess is stinging hymenoptera ancient insect, it remains unchanged for 56 millions of years.

Every hive contains a honey bee colony, consisting of one queen bee, several hundred drones and several thounsand worker bee.

A worker bee is a female with undeveloped reproduction organs.   The life expectancy of workers varies seasonally from only 30 to 60 days in the summer from 6 to 8 months in the winter. . Worker bees are a natural biological laboratory and produce honey, bee venom, royal jelly, propolis, pollen and wax, which are used in allopathic and homeopathic medicine.

Bee venom

Bee venom (apitoxin) - Venenum Apium. Bee venom is a product of the secretion activity of a special gland in a worker bee's body. Bee venom is derived from the Greek *apis* – bee, *toxicos* – poisonous. The quantity and quality of the poison depends on the age of the bee, the time of the year and the characteristics of the diet. Bee venom causes burning pain, redness and edema.

The sting apparatus is situated at the end of the abdomen, it consists of an chitinous spicule with notches at the end. After stinging, the whole stinging apparatus breaks off and the bee without sting dies after several hours.

Bee venom is secreted from the 2 venom glands of a honey bee. Worker and queen-bee have a protective organ – sting at the end of the abdomen. The stinging apparatus consists of a sting, 2 venom glands and venom reservoir. Honey bees can easily pull their stings out after stinging other insects. However after stinging a mammal when the bee pulls away the sting remains in the skin along with the rest of stinging apparatus, the bee dies.

The observations showed that 15-20 years-old bees contain 0,3-0,8 mg of liquid venom.

Bees get excited by the electrical current, and they react by “stinging” the filter paper or thin membrane of animal origin and releasing the venom. Bee venom is also collected by the removing of venom reservoir. Bee is affected by ether vapors to obtain bee venom, it produces about 0,085 mg. The quantity of venom is the greatest in young bees in spring. The quantity of venom in bees depends on the food which the bee consumes. Food with a high proteins content yield more venom.

Bee venom is a clear and dense liquid with a light-yellow color, has a specific smell that resembles honey,  specific gravity is 1,131. It has a bitter or burning taste. Bee venom is easily soluble in water, it is acidic (pH- 4,5-5,5), it is heat resistant (till 100 C) and low temperature or high temperature does not destroy its properties. Bee venom is broken down under the influence of digestive enzymes. It quickly hardens (dry residue is 40%). However, it can be stored for a long time without losing its toxic properties.

Numeric values. Loss on drying not more than 12%, total ash content – not more 2%, insoluble impurities – not more 10%, phospholipase A2 activity - not less 100 ME, activity of glycosaminoglycan complex – not less 70 ME.

Biologically active substances in the bee venom, are divided into several groups. The first of them - are proteins with enzymatic properties, among which the most important are phospholipase A2, hyaluronidase and acid phosphatase. The next group consists of toxic polypeptides: mellitin (main component of bee venom about 50%), apamin, tertiapine, secapine, minimine. Minor components of bee venom are histamine-containing penta- and tetrapeptides (procamine). The third group includes biogenic amines (histamine, in small quantities dopamine and noradrenalin).   More recently α-glucosidase, phosphomonoesterase, p-galactosidase and some other enzymes are described in bee venom. Lipids, various acids (formic, hydrochloric, phosphoric), aminoacids (alanine, valine, leucine, threonine, arginine, prolintirozine, methionine and oth.) and oth. are detected. Apitoxin varies in its composition based on the age of the bee. The largest number of melittin is secreted on the 10th day of life bees and histamine - at 35-40-day.

Melittin is a major cytolytic polypeptide component of bee venom, it is composed of 26 amino acid residues that constitute 50% of a dry honeybee.

3 lysine residues, 2 arginine and glutamic residues participate in melittin.

Melittin stimulate the pituitary-adrenal system.

Phospholipase A2 has a molecular weight of 14629 and consists of 129 amino acid residues of which 12 are cysteine, which enter the disulfide bridges. Phospholipase A2 makes up 12% of bee venom. Hyaluronidase of bee venom is a glycoprotein, the molecular weight of enzyme is 35000-53000. It is composed of mannose, galactose and fucose, which are linked to biogenic amines. The amount of enzyme in the venom is 2-3%.

Acidic phosphatae is a glycoprotein, the molecular weight of enzyme is 4900, it contains aminoacids (methionine, cystine, leucine, isoleucine).

In past bee venom was obtained by time-consuming and ineffective methods – removing the sting apparatus from dead bees and extraction the venom, a glass is filled with solution and covered with a membrane of animal origin, then a live bee is put on the membrane and made to sting it, collection of venom from the walls of a rotating drum, filled by live bees

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At present bee venom is obtained by special equipment. All the bees entering the bee hive are irritated by the electric discharges (9 Volts) and sting on the glass plate. The equipment operates during 1-1,5 hour, then glass plates are removed from the collector frame and drained about 1-2 hours.

Low-molecular compounds (peptides) play a significant role in human organism. They stimulate biochemical processes, protein, lipid, hormonal, mineral, water and other metabolism. Peptides increases the activity of central and peripheral nervous system. Melittin is a basic peptide of bee venom, consisting of 26 amino acids (50-55% of the dry weight). It stimulates the adrenal glands, increases plasma cortisol, enahnces specific antibody formation, binds and excretes the product of inflammatory reactions. Low doses of melittin increase the formation of cATP in liver and stimulate of endocrine glands. Melittin possesses antibacterial (mainly against gram-positive microbes) and radioprotective properties. The stimulating action of peptide on the functions of bone marrow was found. Melittin is able to induce the smooth muscle contraction. Small doses of mellittin reduces the blood viscosity.

Apamin (polypeptide) is composed of 18 amino acids and has alkaline properties.

Low doses of apamin are able to strongly stimulate the central and peripheral nervous system, adrenal cortex – pituitary, increases the adrenalin, cortisol, blood pressure. Apamin acts as a poison to the central nervous system.

Bee venom is biologically active substance with a broad spectrum of action on human organism. Its effect is usually expressed in units of activity. Bee venom primarily affect the two most important systems of the bod: the nervous and vascular, immune and pain system, exerting both local and systemic effect.

Bee venom  has a strong disinfecting properties, even if dilute it 1: 50,000, it would still be sterile, and there will be no microorganisms.

Around 0,5 to 2 percent of people are allergic to bee venom. It may cause anaphylaxis in susceptible people.

The chemical composition of bee venom is complex. The main components of venom are proteins, which are divided into high-molecular (enzymes), low-molecular (peptides) weights and oth. High-molecular substances consist of phospholipase A and B, hyaluronidase, acid phosphatase and oth. Hyaluronidase is a polysaccharide (in connective tissue and cell membranes) degrading enzyme, it has allergic properties. This enzyme cleaves the blood and tissue structures. Phospholipase A (the most active antigen and allergen) converts phospholipids into toxic compounds. That’s why it disrupts the tissue respiration. This enzyme (2% of total composition) is composed of 183 amino acid residues, to which the sugars are attached. Phospholipase B (lipophospholipase) converts toxic lysolecithin into non-toxic compounds, decreasing the phospholipase activity. Acid phosphotase is a complex protein, non-toxic, provides the hipersensitivity to bee venom.

**Bee venom includes 18 of the 20 essential amino acids – alanine, valine, glycol, leucine, isoleucine, serine, triionine, lysine, arginine, glutamic and aspartic acid, tryptophan, proline, tyrosine, cystine, methionine, phenylalanine, histidine. Methionine activates hormones, vitamins, enzymes, reduce the cholesterol level.** Histidine normalizes lipid metabolism, improves the conditions of patients with atherosclerosis.

Biologically active substances included in the bee venom, are divided into several groups. The first of them - are proteins with enzymatic properties, among which the most important are phospholipase A2, hyaluronidase and acid phosphatase. The next group consists of toxic polypeptides: mellitin (main component of bee venom about 50%), apamin, tertiapine, secapine, minimine. The third group includes biogenic amines (histamine, in small quantities dopamine and noradrenalin).   More recently α-glucosidase, phosphomonoesterase, p-galactosidase and some other enzymes are described in bee venom. Lipids, various acids (formic, hydrochloric, phosphoric), aminoacids (alanine, valine, leucine, threonine, arginine, prolintirozine, methionine and oth.) and oth. are detected.

. Apitoxin varies in its composition based on the age of the bee.

Melittin is a major cytolytic polypeptide component of bee venom, it is composed of 26 aminoacid residues that constitutes 50% of dry honeybee.

The largest number of melittin is secreted on the 10th day of life bees and histamine - at 35-40-day.

3 lysine residues, 2 arginine and glutaminic residues participate in melittin.

Tertiapine is a21 amino acid residue pptide.

Hyaluronidase of bee venom is a glycoprotein, the molecular weight of enzyme is 35000-53000. It is composed of mannose, galactose and fucose, which are linked to biogenic amines. The amount of enzyme in the venom is 2-3%.

The major carriers of therapeutic properties of bee venom are melittin, phospholipase A and apamin.

Adolapin is a main polypeptide isolated from bee venom. The molecular masst of adolapin is 11500. Adolapin possesses anti-inflammatory and analgesic activities and inhibits the cycloxygenase acitivity. In addition, adolapin inhibits the activity of bee venom phosholipase A and lipoxygenase from human platelets. Similar to other nonsteroid analgetics, adolapin displayed antipyretic effect (40 micrograms/kg caused an inhibition of the mean temperature about 62%).

Around 0,5 to 2 percent of people are allergic to bee venom. It may cause anaphylaxis in susceptible people.

Application methods for bee venom include natural form, natural bee stings and various preparations.

Bee venom is widely used in medicine of Azerbaijan and foreign countries. Recently bee venom gives a good result in the treatment of rheumatism and nervous diseases, sciatica, radiculitis and trigeminal neuralgia.

The bee venom apitoxin has a beneficial effect on the hematopoietic system: increases the amount of hemoglobin, reduces blood clotting and its viscosity, reduces ESR, incresases both local and general leukocytosis. Bee venom regulates cardiac muscle, reduces the high blood pressure, promotes metabolism. Bee venom is used for the treatment of non-healing wounds.

Bee venom can be applied in the form of topical ointments (Apisartron and Forasin), by [electrophoresis](http://medicalency.com/electrophoresis.htm) (Apiphor), parenteral solutions (Venatolin, Virapin), and apitherapy, i.e. natural bee stings.

Modern medicine has developed the method by bee venom (apitherapy) for the treatment of various diseases.

Rheumatic diseases (rheumatoid polyarthritis, rheumatic diseases of muscles, rheumatic carditis

İnfectious nonspecific polyarthritis

Diseases of the peripheral nervous system ( lumbosacral radiculitis, sciatica, , intercostal neuralgia, polyneuritis)

Trophic ulcers and  sluggishly granulating wounds.

Vascular and surgical diseases (trombophlebitis without purulent inflammatory processes, endarteritis, atherosclerotic lesion of the vessels of the extremities);

 bronchial asthma

migraine

Hypertension (I-II degree);

İritis and iridocyclitis and oth.

The preparations of bee venom are the following:

*Apizartron.* Combined preparation on the basis of bee venom for outdoor use. It exerts a local irritant, vasodilating and analgesic effect. It induces flushing (redness) and increase in skin temperature.

Indications. Myalgias (muscle aches) and arthralgias (joint pain) in rheumatism and degenerative-dystrophic diseases of joints ; it is also administered in neuritis, distractions of joints and [muscles](http://context.reverso.net/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/muscles), for a warm-up massage of muscles before and after sport.

Mode of administration. The strip of ointment 3-5 cm partitioned into the lesion to the layer about 1 mm thick and allowed to stand 2-5 minutes until the response to drug application (redness, warmth). Then slowly and intensely rubbed ointment into the skin. To enhance the therapeutic effect is recommended to keep the treated area of the body warm.

*Apitoxin.* The aquesous solution of bee venom. It is used in rheumatic diseases (arthritis, polyarthritis and arthtosis), diseases of muscle and peripheral nervous system.

*Apiphor.* It is produced in the form of tablets. Apiphor is used for electrophoresis in polyartritis, miosites, lumbosacral radiculitis and oth.

*Apizartron.* The ointment is applied to the painful areas affected by rheumatism, myalgia, neuralgia, some allergic diseases.

*Venapiolin.* The preparation of bee venom is made in peach or apricot oil. It possesses analgesic and anti-inflammatory activities.

*Virapin.* It is used for rheumatism, miositis, neuralgia, radiculitis, allergic diseases. *Mellivenon.* It is used for arthritis, arthrosis of various origin, gout, neuritis and oth.

*Melissin.* The solution of bee venom in oil and produced in ampoules.

All preparations are used for the treatment of polyarthritis, myositis, radiculitis, the diseases of peripheral vessels, neuralgias, migraine and oth.

Bee venom can be applied in the form of topical ointments (Apizartron and Foracin), by [electrophoresis](http://medicalency.com/electrophoresis.htm) (Apiphor), parenteral solutions (Venatoline, Virapin), and apitherapy, i.e. natural bee stings.

All preparations are used for the treatment of polyarthritis, myositis, radiculitis, the diseases of peripheral vessels, neuralgias, migraine and oth.

Apitherapy has a number of contraindications:  liver disease, kidney and pancreas, diabetes, cancer, tuberculosis, intolerance to bee venom.

Royal jelly– Apilacum

Royal jelly or apilacum is a secretion of  pharyngeal and mandibular glands of worker bees, actively functioning in nurse bees aged between 7 and 12 days, it is used to feed the larvae in the colony.

0,3-0,4 g of royal jelly can be obtaind from each queen bee.   Alınan südü enli boğazlı butulkalara 9/10 hissəsi dolana qədər yerləşdirir, kip bağlayır və parafinlə örtürlər. It is stabilized by 40% alcohol. It is stored at temperatue of 0 C.

Royal jelly is a creamy white or pale yellowish substance with specific odour and bitter taste.  The royal jelly subjected to light and air, at room temperature for is turned into yellow and dried.

Royal jelly has a complex composition. It contains proteins, lipids, carbohydrates, vitamins and mineral substances. In addition, it contains gonadotropic hormone, which activates the function of reproductive glands.

Royal jelly contains albumins and globulins, which produce glycoproteins and lipoproteins with carbohydrates and lipids. The proteins contain about 23 amino acids. The carbohydrates of royal jelly primarily are the following: glucose, fructose, ribose, maltose, turanose and oth.

Royal jelly contains organic acids, vitamins (thiamin, riboflavin, folic acid, biotin, pantothenic acid), about 20 mineral substances and enzymes.

All the larvae are fed during their first three days of life with royal jelly. Larvae destined to develop into queens are fed on royal jelly during their whole larval life, for queen – in egg-laying period. .

Royal jelly practically doesn’t exert toxic effect.

Royal jelly exhibits a wide spectrum of pharmacological action. It is administered in chronic polyarthritis, neurosis, bronchial asthma, sclerosis, liver cirrhosis, chronic gastritis, colitis, diabetes, skin diseases, etc. Royal jelly enhances the formation and development of living cells during these diseases, recovers the sturctural damage. Royal jelly gives an effective result in the treatment of vessel atherosclerosis, miocarditis, stenocardia, the period of myocardial infarction, chronic infringement of a children's feed, [poliomyelitis](https://www.linguee.ru/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/poliomyelitis.html) and oth.

Royal jelly stimulates the activity of digestive system, normalizes the blood pressure, increases the iron, erythrocytes and hemoglobin in blood.

Royal jelly promotes the production of adrenal hormone – adrenaline and increases blood glucose level.

Royal jelly reduce blood cholesterol level, promotes the healing process of the wounds and ulcers.

Systematic use of royal jelly causes expansion of coronary vessels and smooth muscles of bronchial tubes therefore it is recommended for treatment and prevention of hypotonia, atherosclerosis, stenocardia, a hypotrophy and other diseases. Royal Jelly is a highly nutritious substance and easily digested by human organism. It contains all important amino acids which are needed by the human body. It also contains vitamins B1, B2, pantothenic acid, folic acid, promoting metabolism and exhibit the hematopoietic action.

Royal jelly is a creamy white or pale yellowish substance with specific odour. The acidity pH is 3.6-4,5.

Royal jelly contains 60-70% of water, 30-40% of the dry matter, which includes more proteins, fixed oils and oth.

Proteins of royal jelly are similar to human blood proteins. The amino acid composition is identical to meat, milk, eggs. It contains amino acids such as arginine, glycocol, cysteine, isoleucine, threonine, serine, methionine, glutamic acid, tryptophan, proline and oth.

The composition of macro- and microlements is variable and depends on the living conditions of bees. It always contains iron, phosphorus, calcium, potassium, sodium, magnesium, copper, nickel, argentum, mercury, gold, aluminium and oth.

The carbohydrates of royal jelly primarily contains glucose and fructose. The small amounts of sacharose, ribose and oth. are present.

The enzymes of royal jelly are amylase, invertase, glucoxidase, ascorbic acid oxidase and oth.

Royal jelly is highly resistant to stress, infections and other harmful external factors. It promotes faster healing after surgery and diseases. Royal jelly has a great therapeutic properties. The pronounced antibacterial activity with a bacteriostatic and bactericidal effect (at 1:10 dilution has stronger effect on microorganisms than carbolic acid).

Royal jelly improves appetite, metabolism in tissues, activates metabolic processes, improves the eyesight, normalizes the blood pressure, eliminates vasospasm, stimukates  [hemopoietic](http://context.reverso.net/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/hemopoietic)  function, reduces blood sugar level, it has anti-radiation properties, accelerates the elimination of various toxins from the body inclduing heavy metals, it has anti-inflammatory and antitumour actions.

Royal jelly stimulates and controls the activity of the endocrine glands (including reproductive glands) and immune system. It improves hematopoiesis, reduces the blood and tissue cholesterol, normalizes lipid metabolism and dilate blood vesssels.

Royal jelly is an useful substance for the treatment of stomach and duodenal ulcers, diseases of intestines, kidneys, liver. Royal jelly is effective for the treatment of atherosclerosis, stenocardia, low or high blood pressure, myocardial infarction, arthritis, various skin diseases, bronchial asthma, neurosis, vegetovascular dystonia and oth.

The medicinal preparation “Apilac” is made from royal jelly.

Propolis

Propolis is a dark grey substance greenish or brownish in colour with a pleasant balsamic smell and bitter taste.  It is initially very mild, but with prolonged storage it thickens and hardens, transforming into a fragile substance.  Propolis  melts at a temperature of 80-104 degrees,  and with cooling less than 15 degrees it is easy to crumble. It is soluble in hot alcohols – methanol and ethanol (more than 70%), petrol. It is partly soluble in ammonia and concentrated acetic acid. It is insoluble in water. When propolis is burnt, it exhibits a smell of aromatic resins. Propolis is collected from the buds of birch, poplar, chestnut, oak, elm-tree and willow.

Propolis has bactericidal action in honey-comb, that’s why the bees produce it, when the brood is grown.

Propolis is produced by honey-bees and used to seal their hive by filling gaps, polish the honeycomb, seal pests, glue the frames.

 The main sources of propolis are birch and poplar. Its colour, chemical composition can vary depending on the plants from which it is collected. For example, if bees collect it from a birch tree, then it is greenish, if from a poplar – reddish, aspen – gray. Propolis can also be come across brown, reddish black and even almost black.

Bees under natural conditions use propolis for isolation of nests from the decaying hollow wood, for protection against pathogenic microorganisms and enemies.   Its main constituents are resins, volatile oils, wax, flavonoids, phenolcarboxylic acids and microelements. It contains more flavonoids, the content of total flavonoids is 25% in propolis.

Propolis possesses antibacterial, antiviral, antifungal, anti-inflammatory and anesthetic properties.

Propolis is used in dentistry and dermatology. It is used for the treatment of Inflammatory oral cavity diseases, gastric mucosal damage, inflammation of the middle ear, wounds and different degrees burns.

Standartisation of propolis is carried out by the total amount of phenolic compounds and carotenoides. It is stored in a cool place, protected from light. The shelf-life is 1,5 years.

Determination of authenticity. The solution of lead acetate basic is added to alcoholic solution of propolis and yellow precipitate is produces (polyphenols).

2. Magnesium powder is added to alcoholic solution of propolis in the presence of concentrated hydrochloric acid and red colour is produced (flavonoids).

Numerical values. The content of total phenolic compounds determined by spectrophotometric method should be not less than 15%, mechanical impurities – not less 20%, antibacterial activity: preparation should inhibit the growth of test-microorganisms (*Bacillus cereus*) at concentration not more 0,08%.

Storage. Store below 20 C. The shelf-life is 3 years.

Propolis can be created in briquettes, balls or in the form of a crumb. Taste is bitter, slightly burning. Density - 1,112-1,350 g/cm3.

 Than it is more in propolis-wax-subjects less its specific weight. Propolis melting point is 65-80 C. Solubility in water low, depending on temperature and duration of influence makes 6-11%.

Propolis is dissolved in alcohol (depending on temperature - from 40 to 75%), turpentine, volatile oils, and also in fat oils and vaseline.

Propolis should not contain foreign impurities. The contamination of propolis is determined by its repeated boiling (4-5 times) with two volumes of ethanol. Then it is filtered. After washing with hot alcohol, solid particles incoluble in alcohol remain in the filter.

Resins consist mainly of organic acids. Balsam contians tannins and other substances. Essential oils provide the smell and taste of propolis. Essential oils are paleyellow semi-solid substances with strong distinctive smell and bitter taste. Wax provides the consistency of propolis. The amount of wax is different in various places of the same beehive.

Propolis contains benzoic, caffeic, ferulic and some other – biologyvally active substances, exerting antibacterial, anti-inflammatory, antioxidant and oth. activities.

Ferulic, caffeic, benzoic and other acids in propolis belong to biologycally active substances. Ferulic acid for example inhibits the growth of gram-positive anf gram-negative bacteria. Additionally, phenolic acids have an astringent character.  It promotes healing of wounds and ulcers. These compounds also have  capillary strengthening and antiinflammatory properties.

Propolis contains a small amount of vitamins. Propolis includes the amino acids such as such as aspartic acid, glutamic acid, tryptophan, phenylalanine, histidine, arginine, proline, tyrosine, threonine, alanine and lysine**.**

Propolis has uunique therapeutic properties and it is widely used in medicine. Propolis and its preparations are used for the treatment of skin diseases, long-term non-healing wounds, stomach and duodenal ulcers, gynecological inflammatory diseases, [hemorrhoids](https://www.linguee.ru/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/hemorrhoids.html), cold, neuritis, radiculitis and oth.

The following preparations of propolis are produces: “Proposol” (aerosolum), “Propoceum” (ointment) and oth.

Beeswax – Cera alba, Cera flava

Wax is produced by bees at the age of 12-18 days, which is used for comb construction. Wax has white or pale-yellow colour with pleasant honey aroma. To get 1 kg of wax, bees should use 3,6 kg of honey and 4,7 kg of sugar and some pollen.

Wax for medical purposes is obtained by solar wax melter or wax melting followed by pressing.

The Wax is bleached by 20% alkaline solution. Its melting point is 60-68 C, soluble in chloroform and toluene. It is insoluble in water and glycerol. It is mixed with fats and paraffine. Just a small portion of substances in beeswax is soluble in alcohol.

Beeswax contains free carbohydrates, ethers (monoethers, diethers and oxyethers), alcohols, acids, high fatty acids (cerotic, montanine and oleic acids), about 0,4% of water, carbohydrates (heptacosane and pentacosane), vitamins and oth. Beeswax has bactericidal, soothing and anti-inflammatory effect. It is used for the production of ointments, suppositories, patches in pharmacy, in dermatology and cosmetology for the manufacturing emulsions for the treatment of burns, sunscreens, lipsticks, nourishing creams.

Pollen.

Pollen is male germ cell of flowering plants, product of anthers, Пыльца цветочная **– это мужские половые клетки цветковых растений, продукт пыльников**, окружающих пестик в центре цветка. Pollen is a tiny powder-like substance . When pollen grains land on the stigma, they stick to it and begin to germinate.  When bees fly from one flower to another, pollen is spread from plant to plant. Pollen consists of individual, the smallest pollen grains. Pollens from different plants have different colour, shade, size, shape and surface texture.

**Pollen has specific spicy,** **honey smell and a sweet taste. Pollen** comes in a wide variety of colours and different shades of these colours: from white to black. The flowers of white acacia have white pollen, yellow acacia-greenish-yellow, raspberry-gray, willow and buckwheat-light yellow, sunflower-golden-yellow, etc.

The colour of pollen grains is due to the presence of plant pigments: carotenoids and flavonoids.

Pollen grain consists of single cell covering by two layers – intine and exine. They are very stable with high molecular weight. These substances are oxidative polymer of carotenoids and their ethers.

**Pollen is a complex product, consisting of food and biologically active substances. It contains proteins, carbohydrates, lipids, nucleic acids, amrko- and microelements, various vitamins and other biologycally active substances.**

**Proteins contain most of essential amino acids: alanine, glutamic acid, phenylalanine, tryptophan, cystine, proline, aspartic acid and oth. The composition of essential amino acids of pollen protein exceeds the protein of milk. Pollen lipids are fats and fat-like substances (phospholipids, phytosterols and oth.). Fats include** include lauric, myristic, palmitic, stearic, arachidonic, oleic, linoleic, linolenic and other fatty acids. The main pollen carbohydrates are glucose and fructose. **Other carbohydrates are disaccaharides – maltose and sacharose, starch, cellulose and pectin substances.**

**Pollen contains a large amount of vitamins and vitamin-like substances: thiamine, riboflavin, carotene, nicotinic acid, pantothenic acid, pyridoxine, biotin, folic acid, inositol, ascorbic acid, etc.**

It contain the following macro- and microelements such as potassium, phosphorus, calcium, magnesium, copper, iron, silicon, sulfur, chlorine, titanium, manganese, barium, argentum, gold, palladium, vanadium, wolfram, cobalt, zinc, arsenic, tin, platinum, molybdenum, chromium, cadmium, strontium, uranium, aluminium, thallium, lead, beryllium and oth.

Pollen contains phenolic compounds such as flavonoids and phenolic acids.

Honey – Mel

Honey is a product made from nectar or juice. The complex transformationso occur in bee and as a result honey is produced. Honey is composed almost entirely of plant nectars, just some components are obtained from bee organism. Honey contains about 300 various substances: fructose, glucose, macro- and microelements, enzymes, organic acids, nitrogencontaining substances, vitamins and biologycally active substances.

Honey is a substance produced by honeybees from the nectar
Honey is a product of vital activity of bees and flowering plants. At each time the insect bears 30-40 mg of nectar. It takes 10 million flowers to produce one kilo of honey. Nectar is different from honey by its composition- it contains more water (about 50% of water) and less sugar. During the processing nectar into honey most of the water is evaporated, the sugar content is increased to 80%. At the same time enzymes (inverstae, amylase, glucogenase, lipase, tripsin, protease and catalase) are added to the nectar via the bees salivary glands, under the influence of these enzymes the substances of the nectar are changed.

Sucrose in nectar is converted into fruit (fructose) and grape (glucose). These sugars are easily digested by the human body. The colour of honey depends on many factos and can easily change from light to dark brown (the placement of hives, vegetative phase, type of vegetation cover and oth.)

Honey is classified by its origin, appearance, density, transparency, taste and odour. According to its colour honey is divided into light and dark. The colour depends on the plants from which the nectar is gathered. Light honey is obtained from [inflorescences](https://www.linguee.ru/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/inflorescences.html)  of acacia, sunflower, linden and oth., dark – from buckwheat, milkweed.

Honey contains about 20 amino acids. The aminoacids play an important role in the darkening of honey, they form darkened compounds called [melanoidins](https://en.wikipedia.org/wiki/Melanoidin) during the reaction with monosaccharides during heat processing.

Organic acids give the particular taste to honey. Citric, malic, gluconic and lactic acis are the most distributed among them. Floral honey has pH 3,78, whereas honeydew honey has pH 4,57. Blossom honeys have a mineral content about 0,14%, honeydew honey– 1,6%.

Honey contains the following enzymes: invertase, diastase, catalse, lipase and oth. The following vitamins predominate in honey : B1, b2, B3, panthothenic, nicotinic 9PP), ascorbic (C) acids and oth.

 Caloric content of honey –328 kcal per hundred grams

Honey produced from the nectar of only one plant is called monofloral. Accordingly, honey is called white acacia, buckwheat, sweet clover, linden, sunflower, etc.

Polyfloral honey: obtained from different plant species.

Honey contains 13-20% of water, 75-80% of carbohydrates (glucose, fructose, sacharose), essential oil, phenolic compounds, enzymes, vitamins В1, В2, В6, Е, К, С, β-carotene, folic acid, microelements and oth.

When the honey is heated above 60 C, the following changes occur: becoming darker in colour, caramelisation of sugar, disappearance of volatile oils, loss of enzymatic and other properties, it becomes an ordinary carbohydrate food.

The analysis of honey is carried out according to GOST 19792-2001. Each type of honey has its own diastase number. Several methods are carried out to verify the quality of honey. Chemical analysis, physic-chemical methods, microscopic study and organoleptic method are used. Honey has nutritional value. In contrast to other valuable food products honey has a high caloric value, 1 kg of sugar contains 3900 calories, 1 kg of honey – 3150, wheat bread- 2170, hen eggs (20) – 1590, beef – 1330, cow milk – 665.

It has been used  as medicine since ancient times.

Clinical trials conducting in most countries showed that honey has antibacterial, regenerative, stimulating and oth. activities. Honey is recommended for the treatment of diseases of the blood-forming organs and cardiovascular system, liver diseases, gastritis, stomach and duodenal ulcers. Honey has beneficial effect on patients with severe diseases.

After being extracted from the honeycomb, honey tends to crystallize (sugar becomes crystalla). **The balance between glucose and fructose** in the [composition of honey](http://honeypedia.info/honey-ingredients-a-comprehensive-list) is the main reason for honey crystallization and determines whether a certain type of honey would crystallize faster or slower, the more glucose honey, the faster crystallization. Temperature can accelerate or slow down the process of crystallization. Honey crystallization is most rapid around 13-14 C. As the temperature becomes lower the crystallization process decreases, because the viscosity of honey increases. At a temperature above 14 C the crystallization process is slowed down, at a temperature of 40 C the crystalls are dissolved. Crystallization (sugaring) does not impair the quality of honey, crystals only give it a certain appearance and attractiveness.

Honey has an antibacterial activity, speeds up methabolism, promotes the tissue regeneration, exhibits anti-inflammatory, tonic properties.

Honey normalizes the acitivity of gastrointestinal tract, stimulates the function of internal organs, prevents sclerosis, normalizes sleep, stimulates the body's defense system.

 Bees in the manufacture of honey from nectar flowering plants, trees, add to it a special substance inhibin, as a result of which, honey acquires absolute sterility.  Honey used externally kills staphylococcuse and other bacteria. Honeycomb extracts can treat eye cataract. Since honey strengthens the blood circulation it leads to purification of tissue. Honey used internally is a powerful source of energy. Honey is assimilated 100%. **Sportsmen are recommended to eat 200 g of honey before competition.** Bees are fed with aqueous extracts of medicinal plants in winter.

Up to the present time, a technique for collecting nectar replacing the activity of bees, has not been developed however it is impossible to create an artificial honey corresponding to natural honey in any laboratory.

The world's exporters of honey are China, Russia, France, Kazakhstan, Greece, Australia, etc.

 Fresh water sponge – Spongilla fluviatilis

Freshwater sponges belong to the Class Demospongiae, which is characterized by silica skeletal structures - Spongilla fluviatilis Lieberkuhn, Spongilla lacustris Carter. Freshwater sponge live in standing and running fresh water.

Freshly collected sponges removed from their aquatic habitat are mucoid amorphous masses and emit a characteristic odor that most observers describe as unpleasant. Next the sponge mass is washed and sun- dried

The sponges are very light, highly porous, hydrophobic in pristine form, and can be elastically and reversibly deformed into any shape. The surface is covered with small holes. It is gray-green or gray-yellowish, without smell. Sponges can cause the inflammation of mucous membranes of nose and eyes. After the sponge is boiled in solid alkali, flexuous tracery Silica is visible in microscopy.

Powder and ointment are used in radiculitis, bruise, haemorrhage. The ability to exfoliate dead or damaged cells is widely used in cosmetology for the treatment of aging skin, polishing and removing wrinkles, scars, acne, pigment spots.

Antlers

**Antlers**  are young horns of deer, shed in spring, in may-june, in a certain stage of its rapid growth and development. Antlers of all kinds of deer – maral- Cervus elaphus sibiricus, stag - С. el. Xanthopygus, sika deer - — С. hippon horfulorum are collected. They are found inManchuria and Siberia. In spring old horns are shed and new ones start to grow. The process is repeated during its all life. The shedding of old and growth of new horns is a complex physiological process that is closely related to hormonal activity, subject to the cycle of reproduction. The horns are grown in stags. They are absent or less developed in doe. Growing horns (antlers) are soft, painful. The greatest medical value is antlers when it have not reached the complete development. It should be without ossification, porous.

**Chemical composition. T**he chemical composition of deer antler is highly complex. They contain phosphatic limestone, spermine, leucithine and oth. They contain organic substances 52-57%, ash- 30-35%, nitrogen – 9-10% and fats.

The mineral composition of antlers are various. Their ash contains calcium, magnesium, iron, phosphorus, sodium, potassium, a small amount of nickel, copper, titanium, manganese, tin, lead, barium.

Antlers contain 25 various amino acids, 38% of them are glycine, proline and glutamic acid. Antlers contain a large amount of lipids. Lipids include phosphatides, cholesterol and esters of cholesterol.

Medicinal raw material. Antlers (young horns) are not ossified and are covered with skin and velvet (hair-covered skin). There are usually not more than three tines per antler. Antler is not less than 8-10 cm long. Antlers are divided into cut i.e. by cutting off the deer’s antler and intact i.e. taken from dead deer with the skull.

“Pantocrine” and “pantarine” are produced from antlers. These preparations are used as toning agent to relieve fatigue, neurosis, neurasthenia, after acute infectious diseases, weakened heart muscle, hypotony.

Leech - Hirudo

Medicinal leech – Hirudo medicinalis L.

Family of leech – Hirudinidae

Medicinal leeches are annelids of class Clitellata. Respiration in leeches takes place through the body wall, it has no gills. Musculature in the bhody wall of leech is well developed and forms 65% of the body wall. The outer-covering is called epidermis, which consists of a single layer of cells. The outer surface of the epidermis is covered with the cuticle.  The cuticle is transparent, has a protective function and grows continuously, periodically renewed during the moulting process. The shedding of mucus by medicinal leeches occurs every 2–3. days.  The leech is elongated, consists of 102 rings. . Leeches varies in size from 3 to 13 cm length, about 1 cm width. The life span of leech is about 20 years.

Leech with yellow-orange stripes along its back is used in medical practice. Leeches have a sucker at both the anterior and posterior ends, The mounth connects to the stomach by a long tube with 10 pockets. The medicinal leech can consume over 2-3 times it body weight. They feed mostly on mammal blood (human and animal) and on amphibian blood (including frogs). Leeches inhabit ponds, swamps, rivers. Hermaphrodite. Breeding is june to august.

Hungry medicinal and health leeches with weight of 1-3 g should be taken into drug-store The secretion of the salivary glands of the medical leech contains polypeptides – hirudin- inhibitor of enzyme thrombin, trypsin – plasmine inhibitors – bdellin, chymotrypsin and eglins- inhibitor of cathepsin and prostaglandins.

Medicinal leeches are used for the treatment of diseases of the cardiovascular system, hemorrhoids, skin diseases, furunculosis, psoriasis, lupus erythematosus, chronic eczema, paralysis resulting from nervous diseases, migraine, sciatica, atherosclerosis, glaucoma, and gynecological diseases.

The preparations “Piyavit” and “Hi-rudo” form medicinal leech exert anti-inflammatory and thrombolytic activities.

Animal fats

Lipids are one of the main constituents of cell membrane. Lipids serve as an energy reserve in the body, in some cases they are the most importatn nutrients for some protista and animals. Lipids usually serve a protective function in plants. Animals accumulate lipids in liver, under skin and in muscles. Lipids of different localization are distinguished by chemical composition. The chemical composition of lipids is different depending on localization. The primary lipid depots in plants are fruits (in pericarpium) and seeds (in endosperm, rarely germs sometimes in perisperm). The role of lipids in fruits and seeds is adaptive, they increase the ability to endure reduced temperatures during the overwintering.

The degree of acid saturation has a strong impact on the physico-chemical properties of fats. Saturated higher acids tend to be solid, unsaturated – liquids at room temperature.

Liquid (fish oil, cod oil) and solid (beef, pork, sheep, bone fat) animal fats are used in pharmaceutical and medical practice.

 Some fats of sea fish, particularly cod liver ol, shark oil and oth. are used in pahrmaceutical practice.

Codfish inhabits the North Atlantic ocean. The following species of codfish are distinguehed: atlantic, arctic, white sea, baltic and oth. Atlantic cod can grow to lenths of 1,8 m Fish 40-8- cm long ad at the age of 3-10 years are used in fishery.

Fat derived from the various tissues of some shark species along with cod liver oil is used in northern countries (particularly in Norway).   The greenland shark (Somniosus microcephalus) and spiny dogfish (Squalus acanthias) are most often used for these purposes.

Medical fish oil is derived only from the fresh cod liver.

Cod-liver oil is specific by chemical composition of triglycerides. Acids containing an odd and even number of carbon atoms give rise to their formation: physetolic, heptadecylic, oleic, erucic acids, and highmolecular unsaturated acids, for example terapin with 4 double bonds and odd number of carbon atoms. That’s why cod oil has a high iodine value (about 180).

Chemicak composition. Cod oil is characterized by high amount of vitamin A (not less 350 IU) and D2; it also contains lecithin and cholesterol (unsaponified matter about 2%) and polyenoic fatty acids with 4,5 and 6 double bonds, and iron, manganese, iodine, calcium and oth. Medicinal raw material. The gall-bladder is separated from the liver and the oil is rendered from in the cauldrons. Rendered oil is filtered, the cooling precipitates solid glycerides. A clear and mild taste oil is obtained after separation by filtration.

Application. The cod liver is rich in fats (about 74%). Fish oil is used to treat hypovitaminosis and avitaminosis of A and D. Gelatine capsules and fat emulsion are used internally. Cod-liver vitaminised oil is produced. Cod-liver oil vitaminised by A and D vitamins contains retinol acetate 1000 UI and ergocalciferol (vitamin D) in oil 100 UI in 1 g of fish oil. Recent years Omega-3 -   unique source of polyunsaturated fatty acids is extracted from cod oil.

Polyenoic acids with 5,6 double bonds has an hypocholesterinimic property.

Fish oil is a biologically active additive, it is extracted from the whole fish of the Gadidae family. Codfish inhabits the North Atlantic ocean. The following species of codfish are distinguehed: atlantic, arctic, white sea, baltic and oth. Atlantic cod can grow to lenths of 1,8 m Fish 40-8- cm long ad at the age of 3-10 years are used in fishery.

Fish oil is rich in fatty acids omega-3 (eicosapentaenoic and docosahexaenoic), vitamins A, E and D.

Fish oil is widely used for the treatment and prevention of various diseases, including arthritis.

Fish oil is traditionally given to children as a source of vitamin D both to prevent rickets, eliminate the deficiency of D and A.

Fish oil is a clear, light-yellow coloured oily liquid with a specific odour. Fish oil come in capsule, solution and other dosage forms.

It is known that omega-3 unsaturated fatty acids are very useful. It is known that they prevent the cardiovascular diseases, provide the proper functioning organs of vision, nervous and endocrine system.

Table. The products containng various oils

|  |  |  |  |
| --- | --- | --- | --- |
| Saturated fats | Monounsaturated fatfats – Omega- 9 | Polyunsaturated fatfats– Omega-3 | Unsaturated fats – Omega-6 |
| Butter | Olive oil | Fish oil | Sunflower oil |
| Meat, pork fat, animal fat | Peanut butter | Flaxseed oil | Corn oil |
| Palm oil | Avocado oil | Colza oil | Nut butter |
| Cocоnut oil | Poultry meat | Wheat germ oil | Soybean oil |

The benefit of fish exists because it contains most essential vitamins and other nutrients. Vitamin A is essential to support vision, especially in dim lighting, maintain the health of skin, hair and mucous membranes of nose, throat, respiratory and digestive systems. It has anti-oxidant properties, helps to keep the immune system strong, fight bacterial and viral infections.

Vitamin D is important for maintaining healthy bones and teeth,  promotes the absorption ofcalcium and phosphorus into cells, prevents a tendency to muscle spasm.

Omega-3, omega-6 and omega-9 are all types of natural unsaturated fats, which play an important roles in a healthy diet. The beginning of the carbon chain is called the "alpha" end and the opposite one iscalled the "omega" end.Omega-3s have "3" in their name because the first double bond of the molecule is located three carbon atoms away from the omega end (same for omega-6 and omega-9 fatty acids).

The experts warn our body is unable to produce omega-3 fatty acids, so they need to come from the products rich in omega-3. The three main omega-3 fatty acids are: alpha-linoleic acid, eicosapentaenoic and docosahexaenoic acids. Eicosapentaenoic and docosahexaenoic acids are found in fish, that are especially rich in fat such as salmon, mackerel and herring. Eicosapentaenoic acid has a powerful anti-inflammatory effect and according to the studies it is able to reduce the risk of heart diseases, rheumatism and cancer. Docosahexaenoic acid plays an important role in brain health.

Omega-6 fatty acids aren’t produced by the body. These acids are mainly found in plant oils such as corn, safflower, sesame, soybean oils and peanut butter. However, omega-6 play an important role in the body,  since consuming too many omega-6 fatty acids can increase the risk of inflammation.

In contrast of omega-3 and omega-6, omega-9 aren’t important, i.e. less consuming of omega-9 doesn;t cause the defficiency, it can be obtained from colza, sunflower, olive, almond and avocado oil.

Docosahexaenoic acid (cervonic acid) is an omega-3 essential acid. Docosahexaenoic acid is called “irreplaceable” by some authors, by others – “semi-irreplaceable”. In humans, docosahexaenoic acid is synthesized (insufficient amounts) by desaturase  Δ5, elongase and other enzymes. Docosahexaenoic and arachidonic acids comprise 20% of total fatty acids in the brain phospholipids.  These polyunsaturated fatty acids influence the signal transduction between nerve cells through synapse. In the membrane phospholipids 60% of polyunsaturated fatty acids are represented by docosahexaenoic acid, which influnce the photoreceptor function by activating the visual pigment – rhodopsin.

Eicosapentaenoic acid (timnodonic acid) is an omega-3 polyunsaturated fatty acid. Eicosapentaenoic acid is produced by human organism (insufficient amounts) from alpha-linolenic acid catalyzed by desaturases Δ5 and Δ6.It was found that eicosapentaenoic acid reduce the risk for coronary heart disease. This acid is found in various specis of fish: herring, sardine, capelin, flatfish, pink salmon, horse-mackerel, eel and oth.

Omega-3 has an anti-inflammatory properties, so it reduces symptoms linked with arthritis, increases brain function, reduces stress, prevents allergy, facilitates an asthma attack.

Eicosapentaenoic acid is beneficial for cardiovascular health, helps to stop inflammation in all body. It has antidepressant activity.

Docosahexaenoic acid improves eyesight, keeps the nervous system healthy, save beautiful and healthy skin.

Studies have shown that consuming 1-2 teaspoons of fish oil per day, a person prevents serious diseases such as diabetes, arthritis, musculoskeletal pain, kidney disease, cancer. Fish oil also prevents high levels of cholesterol

*Wax – Cera*

Wax – is a product of vital activity of honey bees (*Apis mellifica*). The wax is is secreted in thin sheets and used to form honeycomb. Hexagonal-shaped cells are used to store the honey and hold the queen bee’s eggs.

Chemical composition. Wax esters are composed of mono alcohols and fatty acids; the ester of myricyl alcohol and palmitic acid predominant. In addition, it contains free acids (pentacosanoic, cerinic, montanic and myricil) and free alcohols (neocerylic, cerylic, myricyl). Yellow wax contains carotenoids, in white wax it is destroyed during bleaching process.

Medicinal material. Wax is prepared after removal of honey from honey-comb,expressing from it the honey, by melting the comb in boiling water, separating from the mechanical impurities (honey residue is dissolved by the water). Then the wax itself rises to the surface is melted again and solidify in suitable molds. Yellow wax thus obtained (Cera flava) is exposed to the sun or UV-light. The pigments are destroyed (carotenoids) and white wax- Cera alba is obtained.

Application. It is used for the preparation of ointments and plasters. Due to the presence of vitamin A and carotenoids in wax ointments the healing process of burns is rapid.

*Chachalot oil– Oleum Physeter*

*Mumabənzər kütlə – Spermacetum (Cetaceum)*

Spermaset 15-25 m uzunluğa malik dişli balinaların nümayəndələri olan kaşalotdan – Physeter macrocephalus L., həmçinin Atlantik, Sakit və Hind okeanlarının tropik və digər regionlarında həyat sürən bəzi balinayabənzər dəniz heyvanlarından alınır.

Chemical composition. The major component of spermaceti is the ester of cetyl alcohol (C16H33OH) with palmitic acid. In addition, spermaceti contains some free alcohols - octadecyl, cetyl, and eicosyl. The melting point is 43-45 C.

Spermaceti (*Cetaceum*) consists of 98% cetin (cetilpalmitin). It is used in pharmacy and perfumery as ointments, suppositories, creams bases etc.

Medicinal material. The head of the sperm whale has a large cavity containing sufficient crude sperm oil. The same cavities are both sides of the spine till tail. The sperm whale is firstly cut and these cavities are separated from fat. Spermaceti is formed as a result of cooling of fat. It is wrapped in a cloth and pressed for the removal of fat residue from spermaceti. Pressed spermaceti is again melted, spermaceti is crystallized and pressed from fat. The further purification of spermaceti is carried out by the heating with alkaline; the soap thus obtained is easily washed by water.

The large sperm whale contains 70-90 tons of fat and about 5 tons of spermaceti. . The whale fat from the cavities of head is rich in spermaceti than fat from other part of the body.

Application. Spermaceti is a component of ointment bases, it is valuable for the production of medical creams - cooling and emollient, it is widely used in the perfume and cosmetics industry. Spermaceri cream has regenerating and anti-inflammatory effect.

Spermaceti is a dense waxy substance, it easily  becomes liquefied at temperature 43-45 C. A spermaceti accumulates in special «spermacetovom sack» in skull cavity. Spermaceti is extracted from *Physeter catodon* (family — *Physeteridae*). The volume of this sack sometimes reaches 1900 l. In addition to sperm whale spermaceti is extracted from *Hyperoodon ampyllatus* ( family *Ziphiidae).* One whale yileds sbout 200 kg of spermaceti. The content of “sack” is boiled with fat and then pure spermaceti is isolated by cooling.  Spermaceti thus obtained is pressed. The major component of spermaceti is the ester of cetyl alcohol with palmitic acid. In addition, spermaceti contains some free alcohols - octadecyl, cetyl, and eicosyl.

Previously, spermaceti was widely used as a base for the production of ointments. However in recent years it has been widely used in the perfume industry.

*Lanolin– Lanolinum*

Lanolin (from the latin word “lana”-wool, “oleum”- oil) is fat-like, substance secreted from sheep's sebaceous glands**.** It is a viscous, brownish-yellow mass. It differs from other waxes by high concentration of sterols (particularly cholesterol). Lanolin is similar to human skin according to the properties. It is chemically inert, neutral and stable during storage. Purified lanolin is  a viscous, brownish-yellow mass. The melting point is 36-42 C. Lanolin is insoluble in water, weakly soluble in ethanol. “
It is easily soluble in aceton, ether, benzene, chloroform and oth. solvents. In contrast to anhydrous lanolin- Lanolinum, - Lanolinum hydricum is fat-like mass with white-yellowish colour..

Chemical composition. The composition of wool grease (lanolin) is very complex and till now has not been studied thoroughly. Mostly it is a mixture of esters of high alcohols (cholesterol isocholesterol etc.) with higher fatty acids (myristic, palmitic, cerotic et al.) and free high molecular alcohols. A significant amount of cholesterol and isocholesterol is in the free state. It also contains carnaubic acid and its corresponding alcohol.

Medicinal material. The initial source of lanolin is wool fat, isolated from rinse waters during the first treatment of sheep wool in washer factories. During the washing of wool by hot water with alkaline the emulsion liquid containing lanolin, fat, proteins and other ballast substances are obtained. When the centrifugation is carried out the layer floats, which then is separated – crude lanolin. Crude lanolin is melted, oxidized, neutralised, dried, filtered and packed. Qışda lanolini ağac çəlləklərdə, yayda isə metal bankalarda saxlayırlar.

Application. The most valuable feature is its ability lanolin emulsified to 180-200% of its own weight of water up to 140% glycerol and 40% ethanol (70% concentration) to form an emulsion of «oil-water». Addition of a small amount of lanolin to fats sharply increase their miscibility with water and aqueous solutions, which resulted in its widespread use in the composition of the hydrophilic-lipophilic bases. Lanolin is widely used as a base for ointments, particularly emulsion type. It is included in patches and adhesive bandages. It is widely used in perfumery and cosmetic industry.

Medicinal material of mineral origin

# Shilajit – Mymijo

Natural shilajit is tar-like with a dark brown colour. It is expected that shilajit is a product of vital acitivity of Ochotona pika and Rodenta gray-tailed vole. These products are produced as a result of enzymatic degradation of fungi in high-mountainous area. Natual shilajit is found predominantly in Central Asia, Transbaikal (Russia) and Altai region. Shilajit is known by various other name: dorobi (Tajikistan), shilajit (Central Asia, Nepal, India), mumio-acyl (Central Asia), baragshun (Transbaikal, Mongoloia, Tibet) and oth.

The melting poins is 80C; pH of 0,5% solution is 6,7-7.  When storing gradually hardens due to loss of moisture. 45-80 % of shilajit is dissolved in water. It is weakly soluble in 95% ethanol, ether and other organic solvents. It contains 2,5-7,5 % of total nitrogen, 3,4-7,5% of proteins. Aqueous solutions are transparent, of a brown colour. It contains amino acids, glycine, organic acids such as adipic, succinic, malic, citric, oxalic and myristic. It contains a large amount of steroidal compounds and paraffin. It also contains melanin pigments that give shilajit various colours.

Shilajit complex composition determines its medicinal properties, as part of the Shilajit there are biologically active substances that are well dilates blood vessels, and this is extremely important in the treatment of hypertension, multiple sclerosis, headaches, heart attack, as well as some diseases that are directly related to metabolic disorders .

Thanks to modern research, it became known that in the present Shilajit fungi that are very similar in their properties with penicillin, thanks to these fungi mummy can act as a safe antibacterial agent in the treatment of a large number of infectious diseases, for example, such as dysentery, tuberculosis, and any diseases that are associated with inflammatory processes.

Shilajit is one such remedy, which has been in use as a folk medicine for over 3000 years.

Shilajit has an anabolic and immunomodulatory activity, it has an impact on the hematopoietic process in the body, accelerates of bone formation during fracture.

Sometimes other compounds can be offered under the name shilajit. Particularly in some regions of Siberia (Russia**), Transbaikal** and Caucasus people offer pale-grey or pale-yellow powder substance instead of shilajit, which is called “white oil” or “stone oil”. These substances are collected from rocks and in contrast of shilajit they have mineral origin.

In Central Asia, there are black, fairly thin, highly soluble in water , called "zogh". “Zogx” is a product of vital activity of cyanobacteria. Neither “white oil”nor “zoqx” has relation to shilajit, they are different in composition and effect.

 Naftalan oil – Naphthalan oil

In 1890 mining engineer E.I. Egger bought land on Naftalan oilfields. The studies show that the oil had no petrol fraction. However after witnessing the wide-spread use of naftalan oil as medical substance and learning from the local people how to use it as a medicine in 1890 he constructed a small plant to produce ointments from naftalan oil.

The source of naftalan oil is situated on east edge of the Caucasus Mountains.

Physico-chemical properties are changed depending on the source.

Naftalan oil is thirstly, less active, black-brown color and specific smell liquid substance. Naftalan oil has acidic reaction, the specific gravity is 0,953-0,963. It is soluble in chloroform, benzene, ether and partly in various alcohols. It is practically insoluble in water.

The chemical composition of naftalan has not been completely studied yet. It contains olefins, aromatic compounds, asphaltenes and sulfur linked with organic radicals. It contains more than 3,14% naphthenic acids. Naphthenic acids are decomposed into components at boiling point.

It was found that the main ingredients of naftalan are polycyclic naphthenic hydrocarbons.

Ointments and baths of Naftalan oil are used for the treatment of skin diseaase and diseases of musculoskeletal system. Preparations of nafalan oil are used in veterinary medicine.

Recently the method of more qualitative purification of naftalan oil is developed. As a result, a more qualitative product known as colorless, fat-like Naftalan oil is obtained. “Naftalan oil” and “Naftalan ointment” slow the development of psoriasis, increase occurence of remission and prolong it.

The therapeutic and cosmetic set Nano Naftalan is offered together with medicinal forms for external use. Cream-balsam and shampoo for all hair types, shower gel, scrub and mask are widely used in Azerbaijan, CIS countries and Europe.

 “Parodonaftlaan” is used in stomatology for the treatment of periodental diseases.

Hydrobionts.

Hydrobionts – *Hydrobiontes* (from the latin. *hydro* –water and *biont* – organism) are organisms which in the course of evolution, have adapted to living in water. They inhabit in ocean, sea and water pond. Hydrobionts also include organisms, living in water part of the life cycle, i.e. amphibians.

Hydrobionts are classified by the following way:

Pelagic organisms are animals or plants that live in the water column or on the surface of water

Neuston is group of organisms found on top of or attached to the underside of the surface film of water

Pleuston are the plant or animal organisms, that live in the thin surface layer existing at the air-water interface of a body of water

Rheophiles are organisms that live in flowing water

Necton refers to the aggregate of actively swimming [aquatic organisms](https://wikivividly.com/wiki/Aquatic_life) in a body of water.

Plancton are mostly small organisms that are suspended in the water and drift with it as it moves

Benthos comprises organisms on the bed of the water body