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ROLE OF ALKALOIDS IN MEDICINE

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Abstract: *In this article describes alkaloids, their classification, naming history, their importance in medicine and agriculture.*

Key words: *alkaloids, nitrogen, amino acids, properties, peptide.*

Аннотация: *В данной статье описаны алкалоиды, их классификация, история наименования, их значение в медицине и сельском хозяйстве.*

Ключевые слова*: алкалоиды, азот, аминокислоты, свойства, пептид.*

Alkaloids (from late Latin alkali - "alkali" or Arabic al-qali - "vegetable ash" and other Greek εἶδος - "appearance") - a group of nitrogen-containing organic compounds of natural origin (most often vegetable), predominantly heterocyclic, most of which have the properties of a weak base; they also include some neutral and even weakly acidic compounds biogenetically related to the main alkaloids. Amino acids, nucleotides, amino sugars and their polymers do not belong to alkaloids. Sometimes synthetic compounds of a similar structure are also called alkaloids.

In addition to carbon, hydrogen and nitrogen, alkaloid molecules can contain sulfur atoms, less often chlorine, bromine or phosphorus. Many alkaloids have a pronounced physiological activity. Alkaloids include, for example, substances such as morphine, caffeine, cocaine, strychnine, quinine and nicotine. Many alkaloids in small doses have a therapeutic effect, and in large doses they are poisonous. Alkaloids are different in their physiological action: some of them depress or excite the nervous system, others paralyze nerve endings, dilate or constrict blood vessels, others have an analgesic effect, etc.

The boundary between alkaloids and other nitrogen-containing natural compounds is drawn differently by various authors. It is sometimes believed that natural compounds containing nitrogen in the exocyclic position (mescaline,

serotonin, dopamine, etc.) are biogenic amines, but not alkaloids. Other authors, on the contrary, consider alkaloids to be a special case of amines or classify biogenic amines as alkaloids.

The name "alkaloids" (German: Alkaloide) was introduced in 1819 by the German pharmacist Karl Meissner and is derived from Late Lat. alkali - “alkali” (which, in turn, comes from the Arabic al qualja - “ashes of plants”) and other Greek. εἶδος - "similar", "view". The term came into wide use only after the publication of a review article by O. Jacobsen in the chemical dictionary of Albert Ladenburg. There is no single method for assigning trivial names to alkaloids. In many cases, alkaloids are assigned names, forming individual names of alkaloids by adding the suffix "-in" to the species or generic names of alkaloids. For example, atropine is isolated from the plant Belladonna (Atropa belladonna L.), strychnine is obtained from emetic nuts - the seeds of the Chilibukha tree (Strychnos nux-vomica L.). When isolating several alkaloids from one plant, instead of the suffix "-in", the suffixes "-idin", "-anine", "-alin", "-inin", etc. are often used. This practice has led to the existence, for example, at least 86 alkaloids containing the root "vin" in the name (isolated from periwinkle, lat. Vinca).

Compared with most other classes of natural compounds, the class of alkaloids is distinguished by a large structural diversity. There is no single classification of alkaloids.

Alkaloids are often divided into the following large groups:

1. Alkaloids with a nitrogen atom in the heterocycle, the biogenetic precursors of which are amino acids. They are also called true alkaloids. Examples of true alkaloids are atropine, nicotine, morphine. This group also includes some alkaloids containing, in addition to nitrogenous heterocycles, terpenoid fragments (like evonine) or having a peptide structure (like ergotamine). The piperidine alkaloids coniine and conicein are often included in this group, but their precursors are not amino acids.

2. Alkaloids with a nitrogen atom in the side chain, the biogenetic precursors of which are amino acids. Also called protoalkaloids. Examples are mescaline, adrenaline and ephedrine.

3. Polyamine alkaloids (derivatives of putrescine, spermidine and spermine).

4. Peptide (cyclopeptide) alkaloids.

5. Pseudoalkaloids - compounds similar to alkaloids, the biogenetic precursors of which are not amino acids.

The significance of alkaloids for living organisms that synthesize them has not yet been studied enough. Initially, alkaloids were thought to be the end products of nitrogen metabolism in plants, as urea is in mammals. Later it was shown that in many plants the content of alkaloids can either increase or decrease over time; thus, this hypothesis was refuted.

Most of the known functions of alkaloids relate to the protection of plants from external influences. For example, the aporphine alkaloid liriodenine, produced by tulip liriodendron, protects the plant from parasitic fungi. In addition, the alkaloid content of the plant prevents insects and herbivorous chordates from eating them, although animals, in turn, have developed ways to counteract the toxic effects of alkaloids; some of them even use alkaloids in their own metabolism.

Alkaloids also have endogenous significance. Substances such as serotonin, dopamine, and histamine, sometimes also referred to as alkaloids, are important neurotransmitters in animals. The role of alkaloids in regulating plant growth is also known.

Many alkaloids are psychoactive substances. Preparations of plants containing alkaloids, their extracts, and later pure preparations of alkaloids were used as a stimulant or narcotic. Cocaine and cathinone are central nervous system stimulants. Mescaline and many indole alkaloids (such as psilocybin, dimethyltryptamine, ibogaine) have a hallucinogenic effect. Morphine and codeine are strong narcotic painkillers.

In addition, there are alkaloids that do not have a strong psychoactive effect, but are precursors for semi-synthetic psychoactive substances. For example,

methcathinone (ephedron) and methamphetamine are synthesized from ephedrine and pseudoephedrine.

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