

PATHOGENIC MINERALS INSIDE OF US

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One of actual directions of modern researches in the field of mineralogy is studying minerals which formation is connected with ability to live of organisms. Thus during genesis of a biomineral the unit directly joins in a biological cycle or is its product. Last years borders of actually mineralogical researches of a biomineralization have essentially extended. The main feature of a new scientific Biomineralogy representation about OMA as about mineral units which history of formation is indissolubly connected with a human body is, and occurrence is caused by its abnormal condition. The structure of these units is distinguished. Difficulties of studying of pathogenic minerals are connected, first of all, with complex material and element structure of the stones which are being containing as mineral (often it is very bad crystallize), and organic components which are very difficult for dividing. To promote in a direction of understanding of laws of genesis of uric, bilious and other stones in an organism of the person, it is necessary to study in more details their substance, involving the broad audience of modern tool methods. The given work is devoted to biomineralogy of uric, bilious, dental and salivary stones - the basic pathogenic OMA the units formed in an organism of the person.

In the present work research of the basic moments pathogenic mineral cave in an organism of the person is lead on the basis of the complex approach including detailed studying basic pathogenic OMA of the units (uric, bilious, dental and salivary stones) and corresponding stones formation environments with use of the broad audience of modern tool methods. The collection of the stones removed under medical indications during treatment of inhabitants of Omsk and St.-Petersburg, consisted from uric (241), bilious (185), dental (69) and salivary (10).

Quantitative definition of the basic organic components of operational bile of inhabitants of Omsk region is lead. It is established, that concentration of the main component of bile - bilious acids (stabilizers of cholesterol) for 25 tests below norm, for 12,5 - in norm, for 62,5 - above norm; concentration of cholesterol, lipids and threegylerin for all tests above norm (for cholesterol on the average in 11 times); the maintenance of bilirubin for 18,7 tests below norm, and for 81,3 - is raised concerning norm. Thus the structure of pathogenic bile mismatches norm; in most cases the maintenance of the basic organic components exceeds it. For acknowledgement lithogenicity of bile properties of the analysed bile for all tests on the received data about its structure indexes lithogenicity (LT), stability of bile being by criteria to coagulation have been calculated. It has appeared, that all values LT mismatch norm that confirms pathogenic properties of analyzed bile. At an estimation of the maintenance albuminous components in investigated tests of operational bile the quantity of the general nitrogen has been certain. It has appeared, that its maintenance is in a range from 1,50 up to 1,80 mass., that ~ in 3 times exceeds the maintenance of nitrogen in bile of the healthy person (0,48 weights.) . The increase in a share of the general nitrogen possibly, is connected with increase of the maintenance in pathogenic bile not only amino acids, but also such organic connections, as bilirubin and lipids. The maintenance of the majority inorganic a component in pathogenic bile also is raised, namely the mass fraction of sodium in 1.2 times exceeds its maintenance in norm, phosphorus and potassium - in 1,5 time, calcium - in 2,5 time, magnesium - in 4,5 times; the maintenance of iron in 3,5 times is less than norm. In a kind of that the mineral structure bilious is presented mainly by cholesterol, for detection of other composing bilious stones, is necessary was to lead preliminary extraction of cholesterol from the sample. Use of the developed technique stage-by-stage divisions of components of bilious stones has allowed to find out except for waterless cholesterol $C_{27}H_{46}O_6$ in investigated samples following additional phases: carbonates of calcium $CaCO_3$ (faterit, aragonite and tiff), phosphate of calcium $Ca_3(PO_4)_2$ and a number bilirubin ($C_{33}H_{36}O_6N_4$) and other.

In structure of bilious stones it is identified more than 36 elements, which share колеблется in a range from 10^{-5} up to 2 weights. Percentage of elements from their general weight decreases in the following order: Ca, K, Mn, Fe, Cu, Pb, Ti, Zn, V, Ni, Bi, Cr, Hg. Contain calcium makes 95mass., then follows potassium (more than 3 weights.), close a number chrome and mercury on which share it is necessary about 0,02 weights. The increase the maintenance of calcium in pathogenic bile promotes formation bilious, containing carbonates of calcium and bilirubin calcium which is the basic phase of pigmentary stones. Urine as stones formation environment. In urine of the healthy person it is identified more than two tens inorganic and organic connections. It is possible to carry glucose, fiber to pathological components of urine, blood. In urine of the healthy person the traces of fiber which are

not defined by usual qualitative reactions contain. At illnesses of kidneys and a number of other diseases allocation of fibers with urine increases. Now in structure of uric stones 29 minerals from which the majority are salts of calcium are identified. In stones of an investigated collection 11 connections are identified. Most often meet $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$; phosphates: $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$, $\text{Ca}_5(\text{PO}_4)_3(\text{OH})$, $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ and $\text{Ca}_3(\text{PO}_4)_2$ and other. In samples quartz SiO_2 is found out rare for uric stones, in one stone (together with quartz) silicate of calcium Ca_3SiO_5 for the first time is met. Frequency of occurrence of minerals in uric stones of various regions varies. The majority investigated uric stones have layered, it is frequent thinly zonal, structure with alternation both mineral and organic layers, and layers of various mineral structure. Lamination manages to be observed at different levels of research, as at visual studying cuts of large stones, and on electronmicroscopical pictures of separate sites of samples.

For the first time the basic types of localization of organic substances of the albuminous nature are found out: nuclear (in the center of the unit), interlay (concentric and beam layers), diffuse (in the form of impregnations in crystals of minerals). As a rule, in uric stones types of localization of organic substance with appreciable prevalence of one them them are fixed simultaneously all. Practically in all investigated uric stones the method of scanning electronic microscopy establishes display of microheterogeneity. On the basis of variations of parameters of a crystal lattice and data of the local microanalysis it is established, that oxalates and phosphates uric stones are characterized variable nonstoichiometry by structure that reflects nonuniformity conditions of their formation.

Results cluster the analysis have shown, what uric stones of various mineral structure differ under the maintenance of such elements as Ca, P, Mg, Na, K, S, F (more than 0,1 weights.), and also Sr, Zn, Ba, Cu, Br, Pb, Sb, Zr, Rb (less than 0,1 weights.) . The maximal number of microcells (F, K, Sr, Zn, Ba, Zr, Sb, Rb) gravitates to phosphatic group. To group that it is possible to explain their isomorphic occurrence in crystal structures of phosphates, first of all, apatite. An oral liquid as stones formation environment. Quantitative definition of the main components of an oral liquid (the mixed saliva) 250 inhabitants of Omsk concerning four groups: in a mouth of members of three examinees of groups is lead (except for, control) there were dental stones. Authentic change of parameters of a saliva (in comparison with control group) are fixed at the persons accepting medical products and subject to caries. In an oral liquid of members of these groups the increase in concentration of ions potassium, sodium, downturn of the maintenance of fiber, inorganic phosphorus, and also both downturn, and increase pH concerning norm is revealed.

In structure of the investigated dental and salivary stones various phosphates of calcium are found out: apatite, $\text{Ca}_5\text{H}_2(\text{PO}_4)_6 \cdot 5\text{H}_2\text{O}$. The most widespread mineral is apatite. As is known, mineral a component of firm fabrics of a tooth (enamel, dentine) is presented only by apatite. Thus, the mineral structure of pathogenic formations formed in an oral cavity (dental and salivary stones) is more various, than genic. Variations of parameters of a crystal lattice of apatites of salivary and dental stones also are connected with wide display of isomorphism in all crystal positions. The range of changes of parameters of a lattice of apatites of salivary and dental stones is wider in comparison with apatites of firm fabrics of a tooth, but it is essential less, than at apatites of uric stones.

Ontogenetic laws. Studying of structurally-textural features of investigated pathogenic units has shown, that their formation proceeds staging. Development spherulites occurs owing to intensive splitting crystals; spherulites are often combined by one mineral. Spherulite the structure of units testifies to direct crystallization of components of a stone with origin on the initiating centers. Thus crystallization of a metastable phase, with its subsequent replacement on is possible. The granular structure of phosphatic stones specifies that formation of these of the OMA is caused basically седиментацией and agglomeration of a fine-grained or amorphous material. Actually crystallization in this case has the subordinated value, participating in formation of minor minerals with higher solubility. Formed allocation of phosphates could be aggregated and enveloped by viscous fiber. Thus, the layer behind a layer was formed, thus structure of phosphatic stones often granular or latentcrystal.