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## **A Mathematical Model of the Background Functioning of a Living Organism**

A human organism as well as any living organism should be considered as a complex dynamic system created by nature.

According to the systems' modeling we consider the following essential components needed for functioning of the system:

1. structural elements (in the living system: organs and subsystems (cardiovascular, nervous, musculoskeletal, digestive, secretion, endocrine etc.)
2. conductors inside a subsystem
3. intersystem conductors
4. parameters indication system
5. data processing system
6. feedback system
7. checking, control systems and various types of regulation

The mechanical and cybernetic models of the complex systems could be the more similar to prototypes for the living system in mathematical modeling.

Very these models are combined by principle of dynamic nature - the system reacts fast both inside and outside.

Peculiar features of the mechanical model lie in the fact that the system functioning is controlled by principle of susceptibility to mechanical changes, it means that identification sensors react to changing of pressure, temperature, amplitude of movement etc, and the system is sensitive to changes of a certain gradient (differences of a background and an actual index) of that or another parameter (a gradient becomes a parameter of sensitivity for the system). Water-supply system functions very on this principle namely water spontaneously flows from high pressure to low pressure. In the living system cardiovascular, partially digestive and secretion subsystems correspond to this type of functioning.

When we consider the model of the cybernetic system, it is more sensitive structure with numerous indicators and powerful control system. It is so kind of electronic system with large superstructures of consecutive and parallel conductors' connection. Therefore in comparison with the mechanical system chances of emergency breakage of the system are quite high, as in case of breakage of one segment the whole system could be blocked. In the living system nervous, digestive, secretion, endocrine, partially cardiovascular subsystems correspond to the electronic-cybernetic type.

Very this distribution of various algorithms in a subsystem's functions inside the human organism enables to consider its functioning on the whole as a mixed mechanic-electronic (hybrid) model.

At the present level of the science development the living organism is simulated in particular as the cybernetic system with numerous constant and variable parameters, which characterize its dynamics, participate actively in the processes of regulation and control.

Naturally, that the question arises: «What type of the system control prevails in functioning of the hybrid system?» It is possible that the muscular system in the human organism is as a mediator between the electronic and mechanical systems.

According to the hierarchy of functioning of the living system we consider the organism as an integral system with numerous indicators that function by principle of feed-back and submit to single center. Only such hierarchy enables to make a principle of subordination and precise submission of different control levels.

Therefore we should multisided consider complex hierarchy of the living system and virtually imagine it in many dimensions:

1. Macro- and microlevel of processes' organization in the living organism.
2. Level of providing vital activity in the organism:
  - minimum for life preservation,
  - average (background) - for providing background vital activity of the organism,
  - high (reserve) - for supporting the organism at overloads.
3. Levels of subsystems' functioning:
  - structural (reverse and irreversible damages)
  - hydrodynamic level
  - hemodynamic level
  - energy level.
4. A level of the intrasystem balance in every subsystem of living organism:
  - structural balance
  - functional balance
  - conduction balance
  - energy balance
  - mechanical balance
  - electronic balance (cellular, humoral etc)
5. Hierarchical level of the balance control:
  - autonomous subsystemic
  - central intersystemic

Thus, the human organism is a complex many-sided living system with numerous changeable parameters of its functioning on different levels of its organization with many indication systems and feedback connection. The present level of mathematical modeling development enables to investigate profoundly the hierarchy of the models' functioning of the hybrid systems and study new unexplored algorithms of autoregulation in the living organism.

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