

## Laws of Thermodynamics and Strategy of Health Protection

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### ABSTRACT

The article is the review of 40-years-old researches of author.

Life is supported by energy of a Sun. She is transformed through food in energy of macroergs of mitochondries. Due to this energy selforganisation of the living system comes true with the use of reactions of homeostasis, adaptation, reactivity, regeneration of and other. Than more energy is in the biosystem, the higher her viability. Basis of energypotential of the biosystem is made by aerobic formation of energy that at organism level can be described by the maximal consumption of oxygen (on 1 kg of mass in a min.). Simple methodology of indirect description of this index that testifies to the degree to viability of organism (physical health level) is worked out. The phenomenon of «safe physical health level» is first described in such index of maximal aerobic possibilities, neither endogenous risk of chronic uninfected diseases factors nor diseases (12 MET for men and 10 MET for women) are higher than that determined. It gives an opportunity to conduct the primary individual prophylaxis of chronic uninfected diseases. To that end it is recommended to form in addition to existent «industry of illness» (medical establishments) «industry of health».

**Keywords:** laws of thermodynamics, maximal consumption of oxygen, «safe» health level, strategy of health protection, «industry of health».

*Thermodynamics is an old imperious aunt that all dislike, but that is always right (Joke of physicists)*

### INTRODUCTION

The article is the review of 40-years-old researches of author.

In XXI eyelid there are many positive changes, but people continue to be ill and die. Thus nobody sees paradoxes in a fight against inevitability of illnesses and death. However, they exist. First from them consists in that, putting the task the achievement of health, medical science did a fight the basic strategy against illnesses. This paradox erroneous, but firmly deep-rooted ideas are the basis of that a health is this absence of illness. Meantime, different mechanisms and different technologies of influence have a health and illness in the basis on them.

The second paradox yet more striking: a fight against illnesses takes place despite good sense, id est of contrary well known for the Natural laws. We will make an effort deeper understand with this paradox.

### PROBLEMS OF THEORY

Nothing in the world takes place without the expenses of energy. Energy manages all, that takes place in the world. Her laws determine existence of Universe, our Planet, all living and lifeless. Well and, certainly, Man. Do we take into account in a due measure circumstance that a man is the open thermodynamics system functioning due to sunny energy, and his state is in a great deal determined by the laws of thermodynamics? Centuries-old experience of practical health protection gives a negative answer for this question.

We will recur: a source of life is sunny energy. Through the reaction of photosynthesis sunny energy is transformed in chemical energy of food. Passing a certain way in an organism, energy comes to the eventual link of transformation - energy of macroergs. Exactly the macroergs of mitochondries provide the mechanisms of selforganisation of the living system - homeostasis, adaptation, reactivity, resistens, regeneration, reparation, indemnification, ontogenesis and ets. These are the mechanisms of health. A damage or

insufficiency of any of them results in development of pathology. But medicine does not occupy practically by them. She engages in pathology.

Thus, methodically all deeper submerging checked, medical science while did not yet decide the problem of timely interference with the processes of normalization of vital functions. Already quite soon we will reach in the diagnostic researches to the molecular level, but the decision of problem of health is improbable. And why. We will imagine the algorithm of activity of abstract cage. On included in her is food oxidant (oxygen) and water prepared for oxidization. As a result of oxidization of food macroergs accumulate in mitochondries. On an exit are exhaust foods of metabolism. A triangle regulates the process of life as nervous, endocrine and immune systems. It would seem, at a safe receipt checked of necessary for formation of energy components and optimal adjusting, nothing threatens an organism. But this erroneous conclusion: there is one circumstance, radically influencing on all vital functions of organism. Law «atrophy from disuse» - one of basic laws of Nature. What does it mean for our situation? And it means that without the permanent substantial expenses of energy potential of vital functions of cage goes down. One energyspending on metabolism obviously not enough, physical activity, able to form the «effect of overcompensation», arising up after the substantial energyspending, is needed. From this point of view the positive for the health of man role of the organized motive activity it is difficult to over-estimate. Energypotential of the biosystem goes down at her insufficiency, entropy increases, chaos of functions and pathology develop.

Most clearly on applicability of the second beginning of thermodynamics to the living systems specified E. Bauer. He is set forth principle of «steady unequilibrium»: exactly continuous thermodynamics unequilibrium is a cardinal difference living from lifeless. On this basis, an author set forth the basic law of biology: «All and only the living systems never are in an equilibrium and carry out due to the free energy constantly work against the equilibrium required by the laws of physics and chemistry» (5, p. 32).

What does it mean in practice? And it means in practice, that estimating reserve of «free energy» of the living system (organism) in number, we will be able to do a reasonable conclusion about her stability in the concrete

terms of environment, id est physical health level.

### Methodical Bases of Estimation of Health Level on Direct Indexes

The problem of individual health medicine investigates more than two thousand years. The result of these researches represented R. Doll (7): «Were many attempts to build the scale of positive health, but until now measuring of health remains the same illusion, as measuring of happiness, beauty and love». And it is logical, because «wellness» (a keyword is in definition of health of WHO) the same abstractly-logical category, as happiness and beauty, and then it is impossible to describe quantitative criteria. For the decision of problem it is necessary to step back from the criterion offered to WHO, and offer new - real is a criterion of health. Thus for those, who investigated a problem deeply, obviously, that the great number of aspects of health dictates the necessity of narrowing of this category to the limits, giving an opportunity to give operation definition of health. Such determination must contain rules describing a method, what the state of object can be standard described. How to do it?

In the years of existence of the USSR an author took part in researches on subjects Departments of defense, that today can not be repeated on ethic considerations (terms of offensive of hypoxic coma for divers at breathing by hypoxic mixture, physical capacity to- and after massive loss of blood (500 mls), loud speaker of professional capacity of operators in the conditions of multimonthly influence of complex of unfavorable factors of environment of and other). The analysis of results of these researches showed that a general sign of stability of organism of man is to unfavorable influences is energypotential of the biosystem (that answers the second law of thermodynamics). And then more formation of energy on unit of mass of organism, the more effective the biological function of survival comes true.

Thus, a leading criterion of existence of the biosystem is energy potential, providing viability. He can be fixed in basis of quantitative estimation of physical health on direct indexes. At organism level energy potential of the biosystem can be described by maximal possibilities of aerobic formation of energy-maximal consumption of oxygen (MCO; ml/kg of mass\min.) that reflects the state of function of mitochondries. His increase is accompanied

by the system reactions of organism - expansion of functional reserve and economisation of functions at peace and at the dosed influences. Worked out by us on this basis the system of express-estimation of level of viability (aerobic potential) fully can come forward as a quantitative criterion of physical health level (1). The simplest indexes are used, characterizing reserve and degree of economisation of functions. A body-mass index is included in the diagnostic system. Indexes are ranged, the point is appropriated every grade, and the sum of points is characterize a health (to viability) level. It is set that the sum of points has a high coefficient of correlation with the maximal consumption of oxygen (about 0,8). 5 health levels are distinguished.

Quite obviously, that a physical health level must reflect simple conformity to law : more health - less illness, and vice versa. And it is shown in our numerous researches. So, from our data frequency of exposure of chronic somatopathy at ambulatory examination for the workers of plant goes down from 94% for the representatives of group with the low level of physical health to 1-2% at the persons included in groups with high and above average by a health level. The same conformity to law is educed at consideration of prevalence of endogenous risk of ischemic heartdesease -IHD (violation of lipid exchange, hypertension, etc.) trouble factors depending on a physical health level: than higher health level, the less expressed of IHD risk factors (2).

During realization of clinical veloergometry men are 30-59 that did not produce complaints on a health, ischemic reactions are educed on loading for the representatives of group with the low level of health in 36% cases, in a group with a level below the average in 28%, middle level in 6% and it is not discovered signs of untolerance to loading in the groups of c high and above average by health levels (2).

Our attention was attracted by one conformity to law, that showed up at all researches: a level of maximal aerobic possibilities is, neither endogenous risk of chronic uninfectious diseases factors nor diseases are higher than that determined. In number he is characterized 12 MET for men and 10 MET for women (42 and 35 ml /kg/ min MCO). We named this level a «safe» health level (SHL). Quite obviously, that he can be used as a criterion of primary individual prophylaxis of IHD and other chronic uninfectious diseases.

Now only about 1% of the Ukrainian population are in the zone of SHL, 25 back this index made 8%.

### DISCUSSION

Nobody of drivers will search direct reason of failures in-process car, if an accumulator is discharged. But medicine until now searches the hidden reasons illnesses for that accepts one or another links of pathogeny. Although here they - lie on a surface: mitochondries, i.e. intracellular accumulators, is discharged. But medical science does not examine energypotential of the biosystem as basis of healthy existence, and gives all forces to the fight against the consequences of deficit of energy, providing the process of vital functions.

The phenomenon of SHL, described by us yet in 1992 (1), is confirmed S. Aspenes a.o. (4) on the example of the Norwegian population. Inspecting more than 4600 healthy men and women, authors showed that every decline of MCO on 5 mls/min/kg below 44 for men and 35 mls/min/kg for women increases the risk of development of cardiovascular pathology on 56%.

Keteyian a.o. (8) showed that every increase of specific MCO on a 1 ml was accompanied by the decline of risk of death for men and women with IHD on 15%. Myers (9) of and other mark that increase of maximal aerobic ability on 1 MET accompanied by the increase of survivability of men with cardiovascular diseases on 12%.

Inspecting more than 5000 persons of different age with the different level of the aerobic training of Tucker L.A proved ability of the aerobic loading to detain the age-related changes of DNA(10).

Consequently, MCO mls/ kg of mass/ min really reflects a health level and can serve as the integral criterion of viability. The results of our researches demonstrate possibility of receipt of indirect information about this index with the use of simple methodical approaches, that approaches him to realization in the primary link of health protection.

In spite of great number of our publications (index of quoting of Hirsh=32), the presented conceptual model did not get wide distribution, although logic of exposition of facts, in our view, is blameless. The articles bewilderment is expressed in that appear as a result, why force of handshake is closely associate with the risk of development of cardiovascular pathology(6), why ability to do physical activity as a 40 quetching is the reliable sign of health of the

cardiovascular system etc. At the same time it is needed to do justice to the researchers: modern scientific literature is filled by proofs of positive influence of physical activity on the state of functions at the most different diseases - from psychical illnesses to somatic pathology (11). However, to change a look to physical activity only as an important factor of healthy way of life, scientific public is while unable.

Return to the title of the article, we can draw conclusion, that strategy of health protection is incorrect. At least, she needs displacement of accent of fight against pathology on monitoring and strengthening of health of man. Importance and necessity of similar radical change of strategy are conditioned by another very sad for humanity circumstance that while is not noticed by medical science : on Humanity an evolutionary catastrophe approaches as biological degradation of type of Homo Sapiens(3). Her signs: epidemic of chronic uninfected diseases, , speed-up rates of aging, violation of reproductive function, birth of weak posterity, worsening of psychophysical internalss and other. Reason of all described phenomena one is a decline of stability of the open thermodynamics system which a human organism is, because of lack of energy in mitochondries. Obviously, came it is time to be thoughtful above forming in addition to «industry of illness»(establishments of ministry of health) of the «industry of health», sent to renewal of power potential of organism.

### CONCLUSION

Thermodynamics conception of health proves convincingly, that people fall ill and prematurely die from the loss of health, and chronic uninfected diseases are investigation of exit of energypotential of the biosystem for the limits conditioned by an evolution(more health - less illness, and vice versa). The problem of formulation of new strategy of health protection becomes actual. Essence of her consists in a primary transition from expensive, but not justifying itself from the point of view of maintenance of health of population of «conception of permanent perfection of medicare to the population» to «conception of monitoring, reproduction, maintenance and

strengthening of health of population». Thus making healthy must come true constantly, and treatment if necessary. For making healthy necessity in addition to «industry of illness»(establishments of ministry of health) forming of «industry of health».

If for someone out of readers doubts arose in legitimacy of the expounded facts and conclusions, read once again epigraph to the article.

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