



## Laws of Thermodynamics and Strategy of Healthcare

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Received Date: December 21, 2019; Published Date: January 03, 2020

### Abstract

The necessity of changing of strategy of healthcare in connection with the sharp increase of cost of curatively-diagnostic process is proved by his insufficient efficiency. Existent strategy conduces to bankruptcy of the world system of healthcare at the permanent height of morbidity. As an alternative it is suggested to develop thermodynamics conception of health. A living organism is examined as an open thermodynamics system stability of that depends on her energy potential. And only on leaving of individual for the limits of aerobic energy potential of the bio system (12 MET for men and 10 MET for women) conditioned by an evolution entropy increases with subsequent development of pathology. By the alternative of existent strategy of healthcare as a fight against pathology there is counteraction of entropy. An organizational form of counteraction of entropy is measures aim of that maintenance of aerobic energy potential of the bio system within bounds of «safe» zone of health.

**Keywords:** Strategy of Healthcare; Entropy; Safe Health Level; Industry of Health

**Abbreviations:** CUD: Chronic Un-infectious Diseases; IHD: Ischemic Heart Diseases; WHO: World Health Organization

### Introduction

The world system of healthcare moves to inevitable bankruptcy. Complication of curatively-diagnostic procedures increases, their cost increases excessively. Already now many curative measures are inaccessible to the patients from their high cost (for example, transplantation organs). To it is necessary to add the height of population of earth. Thus the height of expenses on a healthcare protection substantially exceeds growth of population rates, not reducing morbidity. A problem became such serious, that she is discussed by the experts of economic forum in Davos. From their data already in the nearest decades global expenses on the sector of healthcare will grow almost three times: 3 921 trillions of

dollars in 2014 to 2 424 trillion in 2040 at the increase of population from 7 to 9 milliards of persons. About the same talked the Secretary general of BO3 Miss M. Chen on anniversary Assembly of WHO (2012): the «Chronic un-infectious diseases can reduce to all conquests of modernization and development the zero. If we will not change strategy of fight against these diseases, then the world system of healthcare is waited by a financial crisis».

Chronic un-infectious diseases (CUD: cardiovascular, malignant, endocrine, breathing systems) are a leading problem of modern health protection. Their height and rejuvenation are objective reality. Exactly this group of diseases is principal reason of death in the developed countries (87%), and limitations in social realization of personality. A fight against them while does not suggest optimism. Is there an alternative of traditional strategy of healthcare, basis of that is made by treatment of patients?

Yes, such alternative exists and constrained her with the laws of thermodynamics.

## Theoretical Bases

A living organism is the open thermodynamics system that exists due to sunny energy. Without energy there is no life. Surprisingly, as until now medicine did not take advantage of this absolute conformity to law for the decision of problems of health protection. Sunny energy passes the row of the stages of transformation and saved in mitochondria's as macroergs. Exactly macroergs are basis of mechanisms of self-organization of the living system and provide her viability (homoeostasis, adaptation, reactivity, regeneration, indemnification and other). In fact to it processes of self-organization of the living system are the mechanisms of health that support the low level of entropy. In existent strategy of healthcare affecting them practically is not envisaged, because a primary objective of this strategy is influence on the processes of pathogens. At the same time, as well as in any other mechanism, potential of energy determines the degree of his perfection - than more energy (taking into account mass), the system works more perfect.

Position about sources and character of energy, providing functioning living systems, about applicability to them the second beginning of thermodynamics is outspoken by Bauer as early as 1935. He is set forth principle of "steady non-equilibrium "; exactly continuous non-equilibrium is a cardinal difference living from lifeless. Coming from this parcel, Bauer 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." [1]. About applicability of the second beginning of thermodynamics to the living systems a prominent physicist E. Shredinger talked in the lectures read in 1943 in the Dublin university [2]. Defining energy potential of the living system is possible, if to take into account that her basic part is made by the aerobic mechanisms of formation of energy. Determining maximal possibilities of consumption of oxygen (MPC of ml/of kg/of mines), we get information about power potential of the bio system. From the physiological point of view this index integrally characterizes the state respiratory, sanguineous and metabolic functions; with biological is a degree of stability (to viability) of the non-equilibrium system - living organism. Direct determination of MPC with a loading test difficult enough and dangerous for a modern population procedure. On this account for greater availability and safety we created the simple and cheap system of express estimation of MPC [3]. Our methodical approaches are based on system reactions, reflecting the

height of aerobic energy potential is expansion of reserve of functions and their economization at peace. The simplest indexes of functions, characterizing functional reserve (power and respiratory indexes) and economization of functions («double work» and time of renewal of heart rate after 20 squat after 30 s), are used. A mass body index is included in the diagnostic system. Indexes are ranged, the point is appropriated every grade, and the sum of points is characterize the level of aerobic possibilities, in other words - health and viability. 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. Exactly at the use of this methodology of estimation of power potential of organism the conformities to law, presented below, were got.

## Results of Researches

Small labour intensiveness and cheapness of the use of the indicated diagnostic system, availability of her for qualification of middle medical staff allowed undertaking studies of many thousands practically of healthy and sick people 80 from 6 to that gave an opportunity to educe and describe the new phenomena of individual health [3]:

- What higher health level, the less probability of development of endogenous risk and demonstrated forms of ischemic heart diseases (IHD) and other diseases trouble factors; - There is a «safe» health level, neither endogenous risk factors nor demonstrated forms of diseases are higher than that determined; him quantitative description (12 MET for men and 10 MET for women) is given to;
- On leaving of individual from the «safe zone» of health the phenomenon of «self-development » of pathological process is marked;
- There is reverse development of endogenous risk of IHD factors at the increase of possibilities of aerobic energy;
- Having quantitative indexes, it is possible to manage (to form, save, restore) a health;
- Return in the «safe zone» of health practically healthy people is the most effective way of primary prophylaxis of chronic un-infectious diseases («preventive rehabilitation»).

Thus, a health protection can work out the most actual problems, not using «management technology» illness.

## Discussion

In the process of life of function of the living system for diverse reasons can be violated, i.e. there is illness. Where illness - there treatment. Modern strategy of health protection allopathic medicine is the basis of. Why did she

score an advantage by comparison to other technologies of influence on a health? To the middle of the XIX century in medicine the expressed dividing appeared into «empiricists» and «allopathes». Empiricists - it all those, who followed conception in obedience to that a sick organism needs only to help to recover natural self-organization, and he will manage with illness. To allopathes took those, who used strong chemical facilities, surgery and bloodletting and followed conception in obedience to that the symptoms of illness must be removed, a patient will get better and then. A powerful lot of money of bank magnates and proprietors of chemical industry stood after allopathic medicine. Allopathies also strongly helped the last achievements of science are an invention of anesthesia and introduction of asepsis and antiseptics allowing much wider to apply surgery as curative method.

At that time there was not a strict standard, on that it was possible to characterize medical specialists there was not organization that this would engage in. Fund of Rockefeller's, that began to engage in forming of standard of medical schools in behalf on the absolute prevailing of allopathic medicine in an on-line tutorial and complete removal in her all natural directions, was organized in 1913. Medical schools of America began to get enormous under backs in an exchange on setting of 1-2 persons from Fund of in the board of directors. And those, in turn, insisted on the change of on-line medical tutorial that was now oriented exceptionally on the business - pharmaceutical medicine. Students-physicians began to study on the new program, in that treatment of patients consisted only in applications of the synthesized chemical preparations, expensive procedures and operations.

Allopathes began to name natural medicine unscientific, because at that time many successful natural methods could not be explained scientifically, while operating of chemical preparations it was already possible to explain on an organism. Those schools that disagreed so radically to reprogram did not get an under back, and could not compete with allopathic medical schools. In future part of chemical industry grew into pharmaceutical, and, inculcated in the American medical association, got complete control above her.

This organization became by that time accreditation medical educational establishments. As a result only schools, getting under backs from Fund of Rockefeller's and accepting allopathic, could get accreditation.

During a few ten of years all America and Europe accepted allopathy as only form of official medicine. In our time became obvious, that to expect the substantial strengthening of health at financing mainly of sphere of

curatively-diagnostic help senselessly. Thus in practice of health protection the pattern of consumption of preparations poorly correlates with the structure of morbidity. But even the correctly appointed preparations do not render the expected therapeutic effect often. So, from data of researches, most medicinal facilities appear effective only for 25-60% patients. For example, according to data of WHO modern preparations do not provide a curative effect at 75% of patients by a hyperpiesia [4].

In too time our researches show, that high aerobic potential of organism are the reliable obstacle of development of endogenous risk factors, assist the decline of morbidity of HUD and death rate from them.

Researches of many authors confirm our using of aerobic possibilities given about possibility as an index of stability organism to pathogenic influences. Keteyian a. o. [5] showed that every increase of specific MPC on a 1 ml was accompanied by the decline of risk of death and women with IHD on 15%. Myers of and other [6] mark that increase of maximal aerobic ability on 1 MET accompanied by the increase of survivability of men with cardiovascular diseases on 12%. Group of the Norwegian researchers [7], inspecting more than 4600 practically healthy men and women, marked that for women of MPC/of kg of mass/of mines below 35 mls in 5 times, and for men below 44 mls/of kg/of mines in 8 times more often meet risk of development of cardiovascular diseases factors. Thus every decline of specific MPC on 5 mls is accompanied by the increase of expressed and prevalence of risk of cardiovascular morbidity factors on 56%.

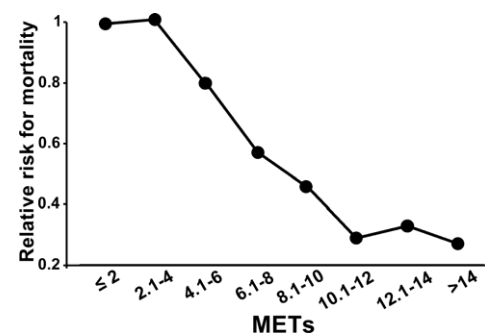


Figure 1: Risk of death for the veterans of war of the USA depending on MPC.

1 MET=3,5 mls/of mines/kg of mass of body (Booth a.o., 2012).

It is shown in other researches, that length of telomeres, life-span follows with that, is straight proportional ( $r=0,78$ ) to maximal aerobic possibilities of individual [9].

Yet more convincing are results of research of the American scientists, showing dependence of risk of death rate on maximal aerobic possibilities of individual (fig.). On leaving of individual outside MPC 10-12 MET sharply increases death rate [8].

## Conclusion

Thermodynamics conception of health proves convincingly, that people fall ill and prematurely die from the loss of health, and HUD are investigation of exit of energy potential of the bio system for the limits conditioned by an evolution (more health — less illness, and vice versa). The problem of formulation of new paradigm of healthcare 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 (support of energy potential within the limits of safe zone of health) healthy must come true constantly, and treatment if necessary. For making healthy it is necessary in addition to «industry of illness» (curative establishments) forming of «industry of health». «Industry of health» supposes development of whole series of measures assisting optimization of motive activity of population (satiation of informative space, preparation of medical personnel in area of «management» a health, creation of athletic-health infrastructure, corresponding materials, tourist-recreational clusters, etc.). As a criterion of necessity of involving of individual in the sphere of «industry of health», and also efficiency of the indicated measures is the health level determined on our methodology.

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