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Genetic Mechanisms an Open Thermodynamic System of an Organism in Norm and Pathology

Ponizovskiy MR[1,2]*

[1]Laboratory Biochemistry and Toxicology, Kiev Regional P/N Hospital, Vasilkov District, Street 8 Voksalna, Kiev, Ukraine
[2]Herschelstrasse 33, 90443 Nuernberg, Germany

Abstract

There were studied open thermodynamic systems both an organism and cells of an organism in conditions of environmental influences, as atmosphere as well as solar system. It was considered biochemical mechanism maintenance stability internal energy and internal medium which determine mechanism stability Stationary State of an organism. Besides it was described genetic mechanism maintenance stability internal energy during life both cells and an organism in norm. Also, there were described influences environment on an organism, and operations of defensive mechanisms both an organism and cells of an organism causing as immune mechanisms cellular capacitors resonance waves reaction on intrusion strange substances in an organism as well as reparative processes of healing great wound of tissue which are also the mechanisms maintenance stability Internal Energy of an organism. Moreover, these were studied mechanisms of Quasi-stationary pathologic States of an organism, as expression excessive catabolic processes of Inflammatory and Infectious processes as well as genetic mechanisms in excessive anabolic processes causing cancer oncogenesis. All these mechanisms maintenance stability normal Stationary States and pathologic Quasi-stationary States of an organism were considered from points of views of exertion genetic mechanisms cellular activity, apoptosis and autophagy.

Keywords: Internal energy of an organism; Basic internal energy; Stem cells; Type cells; Resonance waives; Cellular capacitors; Warburg effect; Pasteur effect; Glansdorff and Prigogine theory

Introduction

An open thermodynamic system of a human organism consists of thermodynamic systems of the organs which consist of thermodynamic systems of cells. These three thermodynamic systems are subjected to thermodynamic laws which determine stability Stationary States of an organism via stability internal energy (ΔU) each of these three thermodynamic systems. The forming these three thermodynamic systems occur via genetic germinations and development of genetic cellular mechanisms each of these thermodynamic pathways. Therefore, the Internal Energy (ΔU) of an open thermodynamic system of an organism must be shared into basic internal energy (E_{bas}) and Exchanged Energy (E_{exch}). Basic internal energy (E_{bas}) is inherited from parents energy and is preserved into Basic stem cells [neurons] for supply with energy through sequences Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells and then distributing between various type cells causing cells' stable Internal Energy via basophilic chemical potentials (μ) of their cytoplasm due to staining cells. Exchanged Energy (E_{exch}) maintains stability Internal Energy (ΔU) an open thermodynamic system of an organism via inflow energy from environment and outflow energy into environment causing maintenance stable Internal Energy (ΔU) of an organism [temperature 36°C – 36.9°C by which all enzymes operate] as well as maintenance stable Internal Works (W_{int}) of internal organs' works and External Works (W_{ext}) of an organism as defensive mechanisms against environmental influences. Besides genetic germinations and development of genetic cellular mechanisms in thermodynamic system of an organism share Basic Internal Energy (E_{bas}) into Progressive pathway of Basic Internal Energy (Progr.E_{bas}) leading to cells' development and Regress pathway of Basic Internal Energy (Regr.E_{bas}) leading to calls' Apoptosis. Thus, the formula of the first law of thermodynamics can been written as:

$$Q = \Delta U + W_{int} + W_{ext} \text{ as well as } Q = E_{bas} + E_{exch} + W_{int} + W_{ext}$$

This reflects as inflow energy and substances from environment into an organism as well as outflows energy and substances from an organism into environment, i.e., excretion waste products of metabolism into environment (Figure 1).

Literature Review

Genetic mechanisms of maintenance stability internal energy an open thermodynamic system of tissues and cells during a life of an organism

It is the formula of first law of thermodynamics:

$$Q = \Delta U + W_{int} + W_{ext}$$

[where Q – General Energy of a thermodynamic system, ΔU – Internal Energy of a system, W_{int} – Internal work of a system, W_{ext} – External work of a system].

Just thermodynamic systems of an organism is characterized by stability of Internal Energy (ΔU) which is determined by following indices: Stable temperature 36°C to 36.9°C by which all enzymes operate.; Stable index pH=7.35 in blood and in neurolymph; stable index of blood osmotic pressure - 285 ± 5 mil-osm/kg H_2O, corresponding to 0.14 – 0.15 molar sodium chloride and the other univalent ions; stable index of blood colloidal-oncotic pressure - 18 -25 mmHg, corresponding to human serum albumin solution up to 300 grams per liter etc.). Just stability Internal Energy and Internal Medium of an organism

***Corresponding author:** Michael R. Ponizovskiy, Herschelstrasse 33, 90443 Nuernberg, Germany, Tel: 49911-653-78-11/0038-04471-3-12-03; E-mail: ponis@online.de

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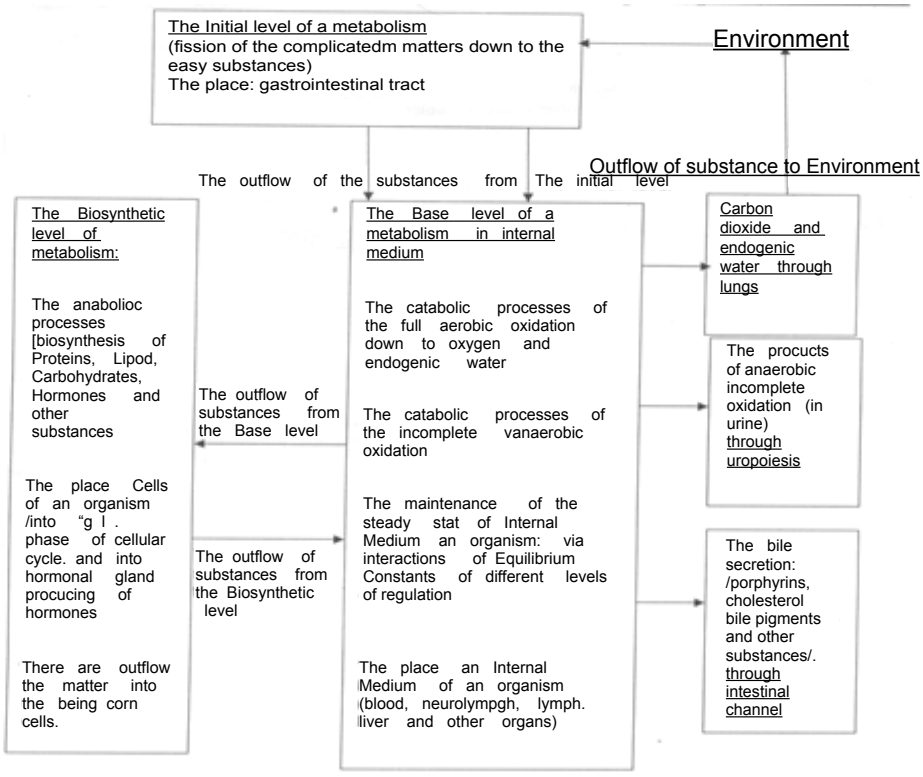


Figure 1: Metabolism leading to dissipation energy and substances (CO2 and H2O) into environment.

Notes:

1. The mutual influences between all sections of three levels of metabolism contribute to stability Internal Energy and Internal Medium an organism.

2. The inflow of Energy and Substances into an organism from Environment is exhibited by sections "The initial level of a metabolism" /gastrointestinal tract/ and "Environment".

3. Catabolic metabolic processes of substances oxidation with production calories for maintenance stable Internal Energy (U) of Stationary State an organism [stable temperature 36.5°C to 37.6°C by which all enzymes operate] and also for maintenance stability Internal Medium an organism [stable substances concentrations in blood and neurolymph] are exhibited by section "The Base level of a metabolism".

4. Anabolic biosynthetic processes of Metabolism for tissue growth, biosyntheses of all substances, [hormones, enzymes, immune antibodies and so on] are exhibited by section "The Biosynthetic level of a metabolism" [in liver, in the cells of the reticuloendothelial system (RES) and so on].

5. Both the section of inflow the substances and energy into an organism from Environment and the section of outflow the substances and energy into Environment demonstrate the interactions between an organism and Environment.

6. The excretions via outflow Energy and Products of metabolized substances from an organism is exhibited by section Environment: a/ Excretion carbon dioxide (CO2) and endogenic water (H2Oend.) as products of full aerobic oxidation occur through lung, b/ Excretion Products of the anaerobic incomplete oxidation occur through uropoiesis or through open bowels, c/ The bile secretion of porphyrins, cholesterol, bile pigments and the other substances occur through intestinal channel.

is maintained by three levels of Regulations: Highest level regulation – Central Nervous System; High level regulation - Equilibrium Constants of ionic metabolism, Equilibrium Constants of acid – alkaline metabolism, Equilibrium Constants of oxidative – reductive Potentials of metabolism, Equilibrium Constants of coagulating system of a blood; Low level regulation- Equilibrium Constants of anabolic endergonic biosynthetic processes and catabolic exergonic oxidative processes, Equilibrium Constants of anabolic and catabolic processes [1,2] (Figure 2). The mechanisms stability of Internal Energy (ΔU) are maintained by internal works (W_{int}) and External Works (W_{ext}), which generate the general energy of total heat Energy (Q). The internal works (W_{int}) and external works (W_{ext}) an open thermodynamic system of an organism realizes inflow energy and substances as well as outflow energy and substances between environment and an organism causing "minimization gain Entropy" according famous Prigogine Theorem that leads to stability Stationary State of an open thermodynamic system of an organism [3]. Besides stability Stationary State of an open thermodynamic system of an organism displays common balance catabolic aerobic exergonic oxidative processes and catabolic anaerobic exergonic processes of oxidative phosphorylation and anabolic endergonic biosynthetic processes [4,5]. Considering the role of Basic Internal Energy in aging of an organism, it should appreciate the role of Glansdorff and Prigogine theory in explanation of nonlinear development of an open non-equilibrium thermodynamic system of human organism [6-8]. Taking into account minimization of gain entropy according Prigogine theorem as mechanism maintenance stability open thermodynamic system of an organism, Glansdorff and Prigogine expand minimum production entropy into nonlinear field considering minimization of gain entropy for stability Stationary State of an organism [6-8]. Thus, the positive fluctuations entropy ($d_x\beta > 0$) are fast disappeared in situation of Stationary States thermodynamic system due to principle the minimization gain entropy in Stationary State. Therefore, thermodynamic system must return to initial state. But there arise negative fluctuations entropy ($d_x\beta < 0$) which transits thermodynamic system into new Stationary State with decreased entropy ($\Delta S_x < 0$). Thus, Glansdorff and Prigogine theory

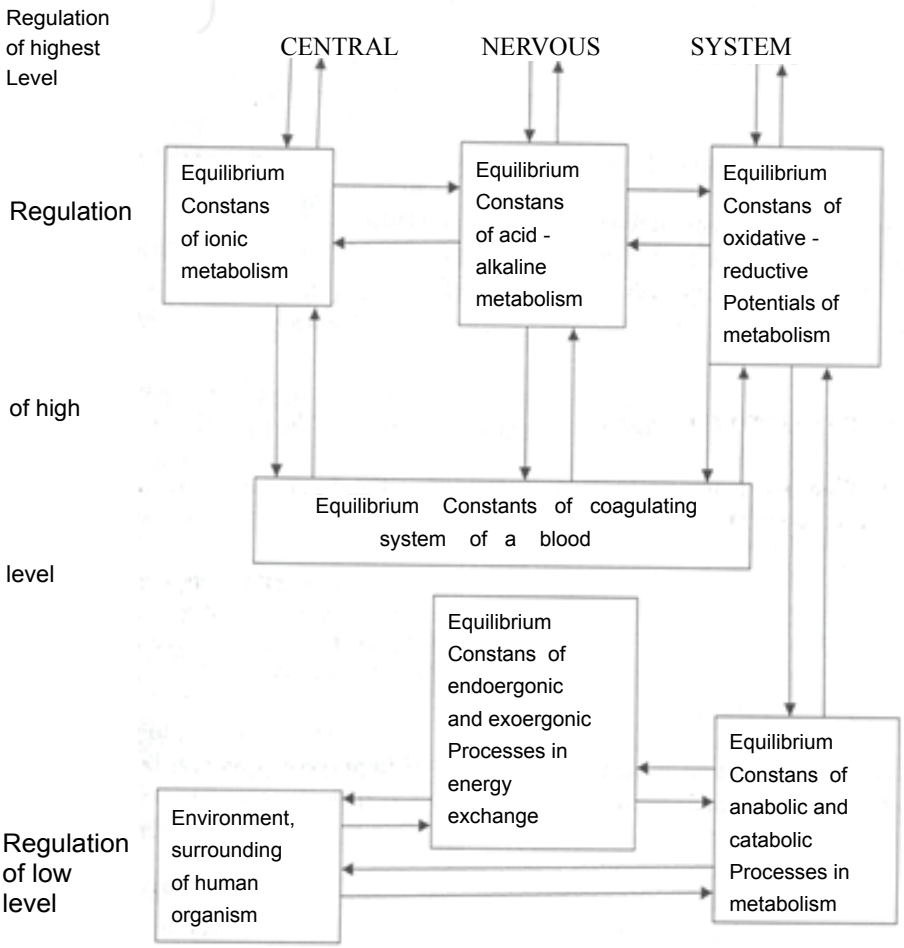


Figure 2: The mechanism of maintenance stability of Internal Energy and Internal Medium an organism.

Notes:

1. The regulative mechanism maintenance stability Internal Energy and Internal Medium of an organism exhibits Low level Regulation, High level Regulation and Highest-level Regulation.

2. Low level Regulation consists of "Equilibrium Constants of balance endoergonic and exoergonic processes of energy exchange" and "Equilibrium Constants of balance anabolic and catabolic processes of metabolism" which cause mutual influences one another.

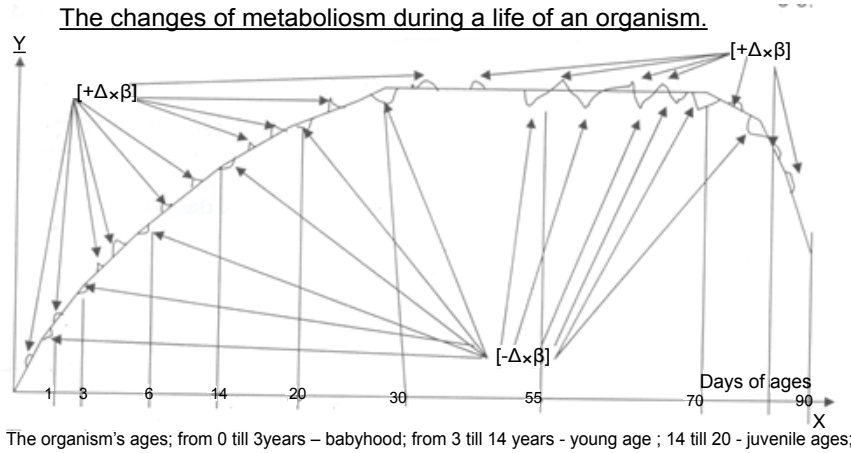
3. Low level Regulation is subjected to Environment influences and effects against Environment influences for maintenance stability Internal Energy and Internal Medium as an organism as well as cells of an organism.

4. High level Regulation consists of interacting "Equilibrium Constants of ionic metabolism", "Equilibrium Constants of acid – alkaline metabolism", "Equilibrium Constants of oxidative – reductive Potentials of metabolism" and "Equilibrium system of coagulating system", which cause mutual influences between them.

5. The Regulation both Low level Regulation and High-level Regulation is occurred via mutual influences between "Equilibrium Constants of oxidative – reductive Potentials of metabolism" of High level Regulation and "Equilibrium Constants of anabolic and catabolic processes of metabolism" of Low level Regulation.

6. Highest level Regulation is presented by Central Nervous System causing regulation both High level regulation and Low-level regulation.

explains mechanism development of a human organism as open non-equilibrium nonlinear thermodynamic system from its birth to death (Figure 3). Just Force of energy defines as stability Stationary State of open thermodynamic system via positive fluctuation entropy ($+\Delta_x\beta$) of anabolic endergonic processes in G1/S phases cellular cycle which transits into negative fluctuation entropy ($-\Delta_x\beta$) causing obstacle further development thermodynamic system that result in transition thermodynamic system into new Stationary State with decreased entropy ($\Delta S_x < 0$), i.e., minimization gain entropy according Prigogine theorem. Such transitions into new Stationary States are the thermodynamic mechanism of aging an organism in norm. As concern to genetic mechanisms, the open thermodynamic system of each tissue of the organ is separated from thermodynamic systems of the other thermodynamic systems tissues as genetically as well as pathways of development. Therefore it is impossible transplantation cardiac tissue, liver tissue, kidney tissue, cerebral tissue into the other organs although all open thermodynamic systems of tissues of organs have identical with an organism mechanism regulation stability internal Energy and Internal Medium of two levels: High level regulation - Equilibrium Constants of ionic metabolism, Equilibrium Constants of acid – alkaline metabolism, Equilibrium Constants of oxidative – reductive Potentials of metabolism, Equilibrium Constants of coagulating system of a blood; and Low level regulation - Equilibrium Constants of anabolic endergonic biosynthetic processes and catabolic exergonic oxidative processes (Figure 2) [1,2]. The open thermodynamic systems of each tissue have individual property separating itself from thermodynamic



The organism's ages; from 0 till 3years – babyhood; from 3 till 14 years - young age ; 14 till 20 - juvenile ages; from 20 till 30 years - middle age ; from 30 till 55 years - full age ; from 55 till 70 years – elderly age; after 70 years - old age.

Figure 3: The changes of metabolism during a life of an organism.

Notes:

1. The considerable advantage positive fluctuation gain entropy (+Δxβ) over rare negative fluctuation gain entropy (-Δxβ) from babyhood and childhood till young years and juvenile years of an organism's ages reflects ascending line of an organism's metabolic graph.

2. The small advantage positive fluctuation gain entropy (+Δxβ) over negative fluctuation gain entropy (-Δxβ) from juvenile years till middle years of an organism's ages reflects small ascending line of an organism's metabolic graph which define decreased metabolic processes.

3. The considerable decreased positive fluctuation gain entropy (+Δxβ) in middle years of an organism's age shows weak horizontal line of an organism's metabolic graph.

4. The equilibrium between positive fluctuation gain entropy (+Δxβ) and negative fluctuation gain entropy (-Δxβ) from middle years till full years of an organism's ages reflects strained horizontal line of an organism's metabolic graph which defines lack forces of energy for metabolic processes.

5. The considerable advantage negative fluctuation gain entropy (-Δxβ) over positive fluctuation gain entropy (+Δxβ) from full years till elderly years of an organism's ages reflects descending line of an organism's metabolic graph.

6. The very small positive fluctuation gain entropy (+Δxβ) on the descending line of an organism's metabolic graph from elderly years and during old years of an organism's ages define fading metabolic activity of an organism.

systems of the other tissues as some genetic mechanisms as well as pathways of development. Besides the open thermodynamic systems of cells maintain cellular stability Internal Energy of basophilic cytoplasm coloration via staining cells and also create supplementary mechanism maintenance stability internal energy of the thermodynamic system tissue of the organ due to cellular capacitors operations via related resonance waves [8-10]. Thus, mechanism stability Stationary State of each tissue depends as on stability Stationary State of an organism as well as on genetic mechanisms of cells' stability stationary states.

Genetic mechanism of cells' stability stationary states are determined by stable basophilic chemical potentials of cytoplasms ($\mu_{cytopl.}$) which are maintained due to permanent cells' division via cellular cycle causing by flow from Basic Internal Energy (E_{bas}) through sequence Basic stem cells (neurons) (BasStCells) → Totipotent stem cells (TotpStCells) → Pluripotent stem cells (PlupStCells) → Multipotent stem cells (MulpStCells) → Oligopotent stem cells (OlipStCells) and then distributing between various type cells (TypCells) (6). These Basic Internal Energy (E_{bas}) expends received from parents inherited energy sharing energy in such proportions corresponding to quantities forming molecules: $2n^{500}$ BasStCells → $4n^{8}$ TotpStCells → $6n^{6}$ PlupStCells → $8n^{4}$ MulpStCells → $10n^{2}$ OlipStCells → 12n TypCells. Thus, $2n^{500}$ BasStCells [Basic Stem Cells] have supplies of Basic Internal Energy (E_{bas}) for supply forming new young various type cells of various tissues during organism's life. This pathway of forming new young type cells is Progress pathway of Basic Internal Energy (Progr. E_{bas}). Also, Basic Internal Energy (E_{bas}) of Basic stem cells or neurons (BasStCells) is shared into three pathways: Basic Energy of Molecular Bonds (E_{bas}MolBonds), Basic Energy of Trophic Processes (E_{bas}TroPr) and Basic Energy of Mental-Soul Processes (E_{bas}MenPr).

Basic internal energy of molecular bonds (E_{bas}MolBonds) is the summary molecular energy of all cellular substances of neurons according to the famous Schreodinger equation of the method of the molecular orbitals – a linear combination of atomic orbitals (MO LCAO) which chemical potentials (μ_s) induce corresponding charges on cellular membranes neurons causing corresponding resonance waves of neurons' cellular capacitors. Thus, these connections between neurons maintain molecular structures of neurons' substances via corresponding resonance waves. Also chemical potentials' energy of different cellular substances of neurons, according to the famous Schrodinger equation of the method of the molecular orbitals – a linear combination of atomic orbitals (MO LCAO), induce charges on nerve fibers transmitting into nerve receptors which special energy exerts sequences forming basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells and then distributing between various type cells [6].

Basic internal energy of trophic processes (E_{bas}TroPr) is the summary energy of all cellular substances in neurons which chemical potentials (μ_s) induce cellular biochemical processes exerting genetical processes in cellular cycles via sequences Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells and then distributing between various type cells which cause stable balance catabolic exergonic processes and anabolic endergonic processes in various tissues due to stimulation three levels regulative systems operations.

Basic internal energy of mental-soul processes (E_{bas}MenPr) is the result of the reverse reaction. Energy of Surroundings influence on basic internal energy (E_{bas}) of neurons via nerve receptors in tissues and

organs of a human organism which cause some changes of chemical potentials (μ) in nerve receptors' cells. The changed chemical potentials (μ) in nerve receptors' cells cause change charges on membranes and inner fiber of nerve receptors' cells transmitting changed charges through nerve fibers on neurons' membranes. The changed charges on neurons' membranes induce changes neurons' cellular internal energy of basophilic chemical potentials cytoplasms leading to rearrangement chromosomes corresponding to quality of electric signal from receptors' cells. The states of rearranged chromosomes and the states of changed chemical potentials in neurons' cells are saved exhibiting mental properties neurons of certain area of brain depending to specialization of nerve fiber receptors. Thus, such fixed states in nerve tissue of certain area in brain define certain fixed sensation of shape. Combination of sensations from various arias of brain creates fixed image of form. The saved fixed image of form creates memory of fixed image of form. Just the best memory appears in young age of man which growth of an organism is exerted. Thus, human memory and growth of an organism are increased in young age versus decreased both human memory and growth an organism due to aging an organism down to elderly age. Thus, mechanism of human memory depends on changes in chromosomes activity. There are occurred mutual dependence as proliferative processes of an organism's growth as well as human memory. Just it occurs best memory in young age of an organism because of a lot of basic internal energy (E_{bas}) in neurons which is reacted on energy Surroundings influences causing fixed state of best changed chemical potential leading to best rearranged chromosomes for progress pathway of basic internal energy (Progr.E_{bas}) leading to cells' development via expression cellular cycle causing advance of an organism growth, gametogenesis, ovogenesis, embryogenesis, foetus, birth new organism. Versus young age, it occurs worst memory in elderly age of an organism because of remaining lack basic internal energy (E_{bas}) in neurons which is not adequate reacted on energy Surroundings influences via fixed state of worst changed chemical potential (μ) leading to worst rearranged chromosomes into Regress pathway of Basic Internal Energy (Regr.E_{bas}) leading to stopping of an organism growth, female menopause, violation trophism of all tissues of organs of an organism. Energy of creative faculty and talent, how new ideas, original thoughts, invention, discovery, construction, design etc., are partially inherited, i.e., receiving from parents via energy of chromosomes, which are supported and developed via learning by surroundings influences, how communication between human persons influencing on Basic Internal Energy (E_{bas}) of neurons' genes. However, the transmitting obtained change of Basic Internal Energy (E_{bas}) to chromatids of gene is more efficient considerably in young age than in elderly age. Therefore, forgetfulness is characterized elderly age of a person, but not young age person. However, these supplies of Basic Internal Energy (E_{bas}) expend received from parents inherited energy determining as length each type cells life as well as aging of an organism from birth to death. This pathway of expending received from parents basic internal energy (E_{bas}) during lives of various type cells determines length of an organism's life showing regress pathway of basic internal energy (Regr.E_{bas}) via growing down even to death of an organism.

Cellular defensive mechanisms as supplementary mechanism maintenance stability internal energy of an organism

The cellular defensive mechanisms are divided into such categories:

1) Defensive immune mechanisms against strange substances which intrude into an organism. Interactions between all cells of an organism occur due to remote reactions across distance as the results of cellular capacitors operations via production of resonance waves. Penetration of strange high-molecular substance into an organism creates local change of chemical potential and promotes remote reactions across distance of cellular capacitors via cellular resonance waves on common molecular wave of strange high-molecular substance, due to the wave function of any molecule which is determined as the total wave functions of the electrons orbits, according to Schreodinger equation of linear combination of atomic orbitals (MO LCAO). Interactions between cellular capacitors of cells maintain common stability of Internal Energy both in cells and in an organism. These intrusions strange substances stimulate reactions cellular capacitors of phagocytes which cause resonance waves on the wave function of the substances' molecular orbits – a linear combination of atomic orbits (MO LCAO), causing remote immune reactions across distance via attraction phagocytes to strange substances and decomposing molecules of strange substances via lysis by cellular lysosomes and exerting humoral immune reactions of immune antibodies operations (Figure 4) [8].

2) Defensive mechanisms of an organism's metabolism ruin dead cells via expression anabolic endergonic biosynthetic processes causing by cellular cycles which exert proliferative processes and metabolic processes of biosynthesis proteins (enzymes, immune antibodies etc.) and other substances as well as catabolic exergonic oxidative processes of excretion into environment waste products of metabolic processes via oxidative decomposing high-molecular substances into H_2O and CO_2 of Autophagy cleaning operation [9–16].

3) Defensive mechanisms of an organism's tissues reparation causing maintenance stability stationary state of an organism.

The process healing wound of surgical sterile matched incision occurs via following mechanism:

a) It is necessary to explain the mechanism tissue regeneration from the point of view of physical chemistry using Theorell formula. Here is Theorell formula:

$$dn/dt = -UcA\, d\mu/dx$$

[where dn/dt – quantity of diffusing substance molecules in the unit time; U – substance mobility; c – substance concentration; A – membrane area; μ – chemical potential; x – molecule distance from membrane]. Chemical potential (μ) is the driving mechanism for both active and passive transports substances across cellular membranes.

Taking into account, that cells of the same layer of any tissue comprise approximately identical substance concentration (c), having identical mobility (U), identical area of cellular membranes (A), identical molecule distance from the cell membrane (x). In the tissue the absence of substance diffusion $\left(dn/dt\right)$ through the cellular membranes of tissue due to the circumferential cell contact to the other cells is explained by the availability in all those cells the identical chemical potentials ($\mu_1=\mu_2=\mu_3$ etc.) that influences the decrease of cellular membranes permeability and the decrease of substance diffusion $\left(dn/dt\right)$ through the cellular membranes. Therefore, cells are not filled with substances due to identical chemical potentials of intracellular Medium and extracellular Medium each cell, and it takes place "contact cellular inhibition of propagating cells" in the quiescent G_0 phase of cellular cycle. The part of cellular membrane free from the cellular contact separates the cellular chemical potential from another environment chemical potential ($\mu_{cell} \neq \mu_{environment}$), i.e., the different chemical potentials of intracellular Medium and extracellular Medium each cell. Therefore "contact inhibition of cell propagation" is absent here promoting the increase of cellular membranes permeability and the

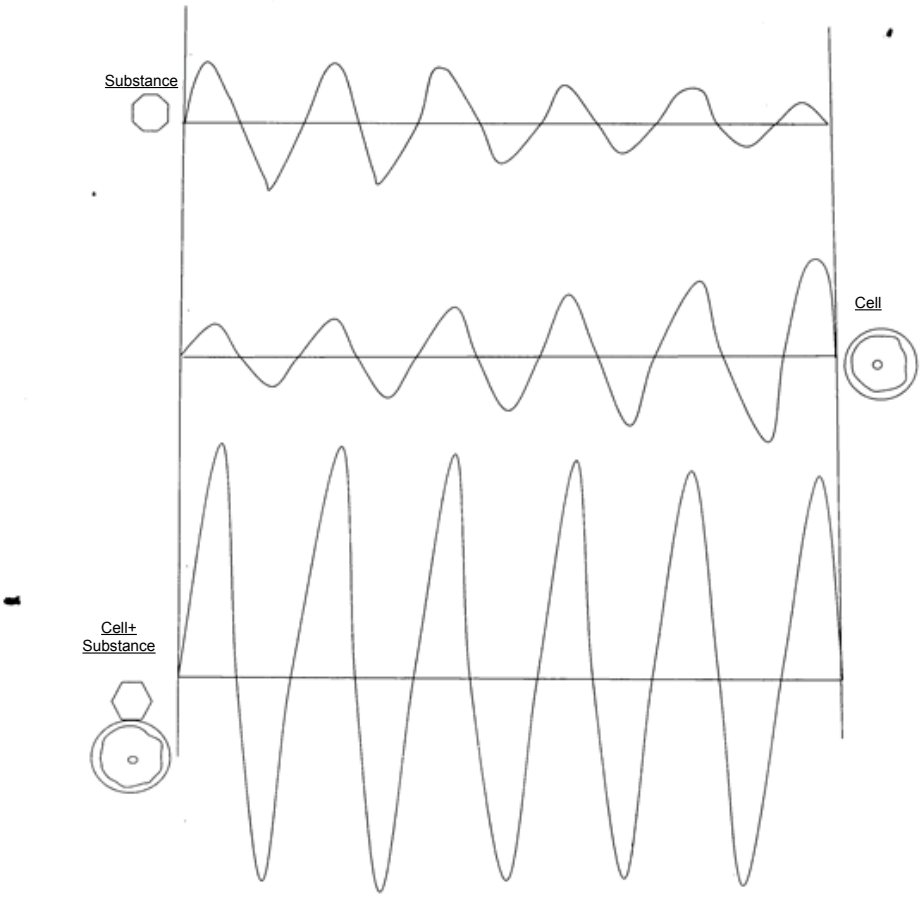


Figure 4: Cellular distance resonance on the strange agent by immune response.

Notes:

1. The resonance wave function of cellular capacitors is viewed across distance as the decaying wave.

2. The waives function of strange agents' substances due to the equation of the method of the molecular orbitals – a linear combination of atomic orbitals (MO LCAO), according outstanding Schreodinger equaton are viewed across distance as the decaying wave.

3. Attraction immune cells (phagocytes) to substances of strange agents due to resonance waves of immune cells (phagocytes) integrate with the wave functions nuclear orbitals of strange agents' substances.

increase of substance diffusion (dn/dt) through cellular membranes filling Gl phase of cellular cycle. Further it occurs the mechanism of tissue regeneration promoting wound of sterile matched incision healing via development cellular cycle causing proliferative processes which progress endocytosis via shift cellular balance catabolic and anabolic processes of quiescent G_0 phase cellular cycle into anabolic processes in G1/S/G2 phases cellular cycle with cumulation substances and energy in G1/S/G2 phases. Then the piled-up products of anabolic processes are subjected to exocytosis in S /G2 and M phases exhibiting alternative outflow energy and substances which distributed within new forming propagating cells via S /G2/M (Mitosis) phases cellular cycle, i.e., proliferative processes expression. Thus, these cellular processes maintain stability Internal Energy of an organism (stable temperature 36.6°C by which all enzymes operate and the other indices).

The process healing great wound should be considered via interactions between cells in wound and an organism. Such interactions between cells and organism should been supported by mechanism maintenance stability intercellular balance proliferative processes and apoptotic processes, i.e., processes balance cells' fusion and fission of generation cells and cells' death. Just balance apoptotic processes are determined by balance pro-apoptotic factors [BCL-2 family proteins] and anti-apoptotic factors [BH3, BAX, BAK, BOK] [16-19]. Stability intercellular balance proliferative processes and apoptotic processes are maintained by autophagy and via related resonance waves of their cellular capacitors [8]. The stability of balance proliferative processes and apoptotic processes depends on generated cells via cellular cycles of sequence [Basic stem cells → Totipotent stem cells → Pluripotent stem cells ste→ Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells → type cells] and apoptosis with autophagy due to aging cells. The dead cells don't form resonance waves due to cell's apoptosis and are subjected to autophagy as strange object. The cells of reticuloendothelial system (macrophages and monocytes) react to dead cells in great wound via their capacitors' resonance waves on the wave function of dead cells [the molecular orbitals – a linear combination of atomic orbitals (MO LCAO) according Screodinger equation], causing attraction cells of autophagy to dead cells via Receptors-Ligands (Figure 4) [8,16]. Then it occurs internalization Receptors-Ligands into cells due to different chemical potentials into cytoplasm and Receptors-Ligants forming vacuoles with two membranes which

Vitamins	Chemical names	Coenzymes names or Consist	Additional component or Enzymes	Chemical group(s) transferred	Distribution
Vitamin C	Ascorbic acid	An electron donor for eight enzymes	None	Electrons	Bacteria, plants and eukaryotes
Vitamin B_1	Tiamin	Coenzyme: thiamin pyrophosphate	Pyruvate and α-ketoglutarate dehydrogenase	2-carbon groups, α-cleavage	Bacteria, plants and eukaryotes
Vitamin B_2	Riboflavin	Coenzymes: FMN, FAD, Coenz. F420	Enzymes: Flavoenzymes and ADP	Electrons	Bacteria, plants and eukaryotes
Vitamin B_6	Pyridoxine	Coenzyme: Pyridoxal phosphate	Enzynes: Transaminase, Decarboxilase	Amino and Carboxyl groups	Bacteria, plants and eukaryotes
Vitamin H or B_7	Biotin	Biotin	Acetyl-CoA carboxylase and Pyruvate carboxylase	CO_2	Bacteria into intestine.
Vitamin B_3	Niacin	Coenzymes: NAD^+ and $NADP^+$	lactate and malate dehydrogenases as well as ADP	Electrons	Bacteria, plants and eukaryotes
Vitamin B_5	Pantothenic acid	Coenzyme A (CoA)	70 enzymes require coenzyme A (CoA)	Acetyl group and some acyl groups	Bacteria, plants and eukaryotes
Vitamin B_{12}	Cobalamine	5-deoxyadenosyl cobalamine and Methylcobalamine	Methionine synthetase transfers Methyl group	Acyl groups, hydrogen, alkyl groups	Bacteria in intestine.
Vitamin B_9	Folic acid	NADPH coenzyme and Tetrahydrofolic acid	Dehydrofolate reductase (DHFR)	Methyl, formyl, methylene, formimino groups	Bacteria, plants and eukaryotes
Vitamin K	Phylloquinone	Menaquinone, Vitamine K_1, K_2, MK_7, MK_{11}	Proteine Synthetases	Carbonyl group and electrons	Bacteria, plants and eukaryotes
Vitamin E	Tocopherol	α-, β-, γ-, and δ-tocopherols	Proteine Synthesis for coagulative processes	α-tocopherol us carrier proteins	Bacteria, plants and eukaryotes
Vitamin A	Coenzyme A Carotenoids	retinol, retinal, retinoic acid	α-carotene, β-carotene, γ-carotene, xanthophil β-criptoxanthin	Retinol, retinal, retinoic acid	Bacteria, plants and eukaryotes

Table 1: The characteristic vitamins of indirect production by solar radiation energy.

consist are related to chemical structures of cells, but chemical potentials of content vacuoles are differed from chemical potentials of cellular cytoplasms as well as cellular nucleus and mitochondria, including lysosomes and other organelles. There are violated normal cytoplasms' basophilic chemical potentials of cells leading to exertion nuclear processes of biosynthesis proteins forming E1 enzyme and E2 enzyme. Simultaneously, Lysosomes capacitors' resonance waves cause attraction Lysosomes to strange substances of vacuoles, and lysosomal enzymes, especial lipases, lyse shall of vacuoles releasing substances of dead cells into cytoplasms. Thus, Autophagy process is occurred which causes the bulk degradation of proteins, in which cytoplasmic components of the cell are enclosed by double-membrane structures known as autophagosomes for delivery to lysosomes enzymes for degradation. So Lisosomes lyse decomposing dead cells releasing a lot of proteins named autophagy-defective mutants (apg) [20-22]. Decomposed substances were subjected metabolic processes forming Products of metabolism H_2O, CO_2 and the other waste products which should be excreted in the beginning into blood of an organism and then excreted into environment (Figure 1) [20]. Thus, some proteins named autophagy-defective mutants (apg) remain in cells-macrophages and in blood as the Products of Autophagy. These proteins are conjugated one anothers in processes degradations due to Lysosome enzyme operation causing Apg5/Apg12 conjugations (20). Then Apg16 protein is added forming Apg12p–Apg5p–Apg16p conjugations similar to coagulation of proteins [21-23]. Also, cytoplasmic components are enclosed in autophagosomes and delivered to lysosomes/vacuoles [22]. Just these cytoplasmic components react with waste products of Autophagy including into Apg12p–Apg5p–Apg16p conjugations of 350-KDa Complex [24]. Also, Apg7 is a ubiquitin-E1-like enzyme which takes part in Autophagy [21,24]. Besides Apg12p-Apg5p conjugation reaction is mediated by Apg7p, a ubiquitin activating enzyme (E1)-like enzyme, and Apg10p, suggesting that it is a ubiquitination-like system [24,25].

Ubiquitination is the well-known modification system, which is involved in selective protein degradation, endocytosis, etc. [24]. Furthermore, Conjugation of SUMO-1[1] to Ran-GAP1 targets the otherwise cytosolic protein to RanBP2, a component of the nuclear pore complex [24]. Also, Apg8 is a ubiquitin-like protein that is activated by an E1 protein, Apg7, and is transferred into the E2 enzymes [Apg3/Aut1] [26]. Apg7 activates two different ubiquitin-like proteins, Apg12 and Apg8, and assigns them to specific E2 enzymes, Apg10 and Apg3, respectively [26]. These reactions are necessary for the formation of Apg8-phosphatidylethanolamine [26]. This lipidation has an essential role in membrane dynamics during autophagy [26]. The microtubule-associated protein 1 light chain 3 (LC3) of cellular cytoplasm causes specific labelling of autophagosome membranes [27-28]. Considering certain termination each cells life via Apoptosis, significance clearance from degradation components via Autophagy is important processes for maintenance stability internal energy and internal medium of an organism. Just insufficient processes of Autophagy lead to heavy diseases due to violation local mechanism or whole mechanism maintenance stability Internal Energy and Internal Medium tissue or an organism [29-31]. Even there are suggested to exert Autophagy in treatment some diseases [32]. However, Autophagy is not indifferent toward an organism. Just the lives of able-bodied cells and pathologic cells lead as to Apoptosis of normal dead cells as well as pathologic cells death. However dead cells should be destroyed and eliminated from a tissue by cells of autophagy operation with immune phagocytes (Figure 1). Therefore, there were appeared some microRNAs as fragments of dead cells' nuclear genomes which can contain as nuclear fragments of normal dead cells as well as dead cells' nuclear fragments affected with pathologic genome, e.g. microRNA with v-oncogene strands [33-36]. All of these microRNAs regulate the function of target genes at the post-transcriptional phase due to reaction resonance waves of autophagy cells' cellular capacitors on waves function of these microRNAs molecules corresponding to the Schroedinger equation of the method of the molecular orbitals – A linear combination of atomic orbitals (MO LCAO) [8,13]. Also, the short strand of microRNA polypeptide is conjugated into nuclear DNA strand of autophagy cells creating

DNA-MicroRNA Complex. The DNA-MicroRNA Complex causes cell reprogramming of the generation induced pluripotent stem cell (iPSC) [36]. Thus, there are occurred reverse reactions: DNA-MicroRNA Complices → induced pluripotent stem cells (iPSCs). These reverse reactions transit into normal right regulative developments where indued pluripotent stem cells [iPSC] substitute Unipotent stem cells: Basic stem cells (neurons) → Totipotent stem cells → Pluripotent stem cells ste→ Multipotent stem cells → Oligopotent stem cells → induced pluripotent stem cells (iPSCs)[DNA-MicroRNA Complex] → type cells. Then the conjugations DNA-MicroRNA Complices are broken up into DNA and MicroRNAs. Both DNA and MicroRNAs are subjected metabolic disintegrations. Further type cells in wound are developed by delivering energy through sequence of stem cells via Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells → type cells exerting proliferative processes via cellular cycle. Just the further mechanism of tissue regeneration depends on development cellular cycle promoting proliferative processes. Advance cellular cycles via G1/S and G2/M phases are exerted by remote reactions across distance between injured tissue and free cells with cells of reticulo-endothelial system, i.e., fixed and circulating phagocytic cells and autophagia (macrocytes and monocytes), due to resonance waves of cellular capacitors [8]. Remote cellular reactions contribute to attraction circulating phagocytic cells to injured tissue, and remote cellular reactions transit into the contact cellular reactions in which phagocytosis and autophagia clean wound from supplementary superficial wound infection and fragments of dead cells [8]. Then it is occurred the mechanism tissue regeneration which should be elucidated from the point of view of physical chemistry using Theorell formula. Here is Theorell formula:

$$dn/dt = -UcA\, d\mu/dx$$

[where dn/dt – quantity of diffusing substance molecules in the unit time; U – substance mobility; c – substance concentration; A – membrane area; μ – chemical potential; x – molecule distance from membrane]. Chemical potential (μ) is the driving mechanism for both active and passive transports substances across cellular membranes. Taking into account, that cells of the same layer of any tissue comprise approximately identical substance concentration (c), having identical mobility (U), identical area of cellular membranes (A), and identical molecule distance from the cell membrane (x). In the tissue the absence of substance diffusion (dn/dt) through the cellular membranes of tissue due to the circumferential cell contact to the other cells is explained by the availability in all those cells the identical chemical potentials ($\mu_1=\mu_2=\mu_3$ etc.) that influences the decrease of cellular membranes permeability and the decrease of substance diffusion $\left(dn/dt\right)$ through the cellular membranes. Therefore, cells are not filled with substances due to identical chemical potentials of intracellular Medium and extracellular Medium each cell, and it takes place "contact cellular inhibition of propagating cells" in the quiescent G_0 phase of cellular cycle. The part of cellular membrane free from the cellular contact separates the cellular chemical potential from another environment chemical potential $\mu_{cell} \neq \mu_{environment}$, i.e., the different chemical potentials of intracellular Medium and extracellular Medium each cell. Therefore "contact inhibition of cell propagation" is absent here promoting the increase of cellular membranes permeability and the increase of substance diffusion (dn/dt) through cellular membranes filling "Gl phase" of cellular cycle. Thus, it occurs as the mechanism of tissue regeneration promoting wound healing of proliferative processes via development cellular cycles. These processes are induced by exertion microRNAs into reverse reaction of induced pluripotent sten cells (iPSC) which stimulate cellular cycle of cells corresponding Theorell formula creating contacts between cells via chemical potentials of them that leads to healing wound by primary intention. However, if the cleaning wound by phagocytosis and autophagia is insufficient from supplementary superficial wound infection and fragments of dead cells, there express productions of Proteins as autophagy-defective mutants (Apgs) which are subjected as to conjugations as well as to lysis by enzymes of lysosomes leading to forming connective tissue. Connective tissue destroys contacts between chemical potentials of cells (μ_{cell}) forming scar. It is formed healing wound by secondary intention. Thus, the process healing wound is induced by progress endocytosis via shift cellular balance catabolic processes and anabolic processes in quiescent G_0 phase cellular cycle into anabolic processes in G1/S/G2 phases cellular cycle with cumulation substances and energy in G1/S/G2 phases. Then the piled-up products of anabolic processes are subjected to exocytosis in G2 and M phases exhibiting alternative outflow energy and substances which distributed within new forming propagating cells via G2/M (Mitosis) phases cellular cycle [9]. Proliferative processes display phenomenon "absent contact inhibition propagating cells" unlike the phenomenon "contact inhibition propagating cells" in quiescent G_0 phase of cellular cycle [9,10]. These cellular processes close up wound causing stable Internal Energy and Internal Medium of tissue. The healing tissue restores stability by the internal energy of stationary state of an organism.

c) The mechanism healing great wound via implantation of healthy tissues and regeneration of injured tissue causing stability internal energy of an organism. Long since, the cleaned unhealed wound after third-degree burn was treated via implantation healthy tissue of the patient which grows fast to injury of unhealed wound. The mechanism of such healing of unhealed wound can be explained via considering genetic mechanisms from the point of view of role mechanism maintenance tissue integrity in maintenance stability Internal Energy and Internal Medium of an organism. The interactions between cells of an organism and an organism occur via related resonance waves due to cellular capacitors operations and substances of an organism's tissues corresponding to the Schrodinger equation of the method of the molecular orbitals – a linear combination of atomic orbitals (MO LCAO) [8,13]. The cells' substances of related implanting tissue are accepted due to injured tissue's cells' cellular capacitors operations on the related substances of implanting tissue's cells. Thus, the substances of both dead celss implanting tissue and dead cells of injured tissue are subjected Autophagy via some proteins as autophagy-defective mutants (apg) in cells-macrophages and in blood as the Products of Autophagy for cleaning the wound from waste products of Autophagy. Also it occurs processes of closing up wound via forming DNA-MicroRNA Complex and then DNA-MicroRNA Complices → induced pluripotent stem cells (iPSCs) → Totipotent stem cells → Pluripotent stem cells Ste→ Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells → type cells and further healing wound by secondary intention corresponding to Theorell formula.

The shifts into quasi-stationary pathologic states of an organism as reactions of an organism and its cells on influences of environment

The mechanisms influence Solar Radiation on organisms and forming viruses: Being carriers of solar energy via reflecting solar balance fusion and fission, the solar radiation of positive and negative energy cause as complicated matters as well as elementary matters corresponding to increase Entropy and decrease Entropy according second law of thermodynamics and Boltzmann theory. Surely balance fusion and fission of radial energy induces forming balance positive

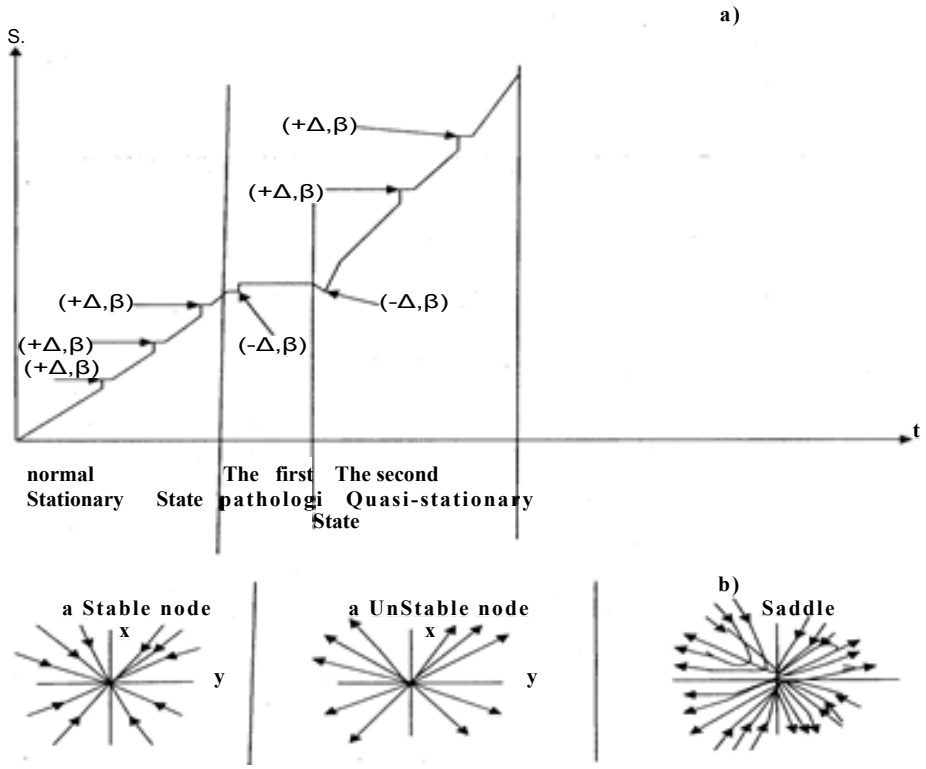


Figure 5: Change fluctuations of an entropy at transition from normal Stationary State into pathologic Quasi-stationary State.

Notes:

1. The linear up-going graphic of positive gain fluctuation entropy (+Δxβ) showing Stationary State of an organism in norm.
2. The negative gain fluctuation entropy (-Δxβ) pulls down linear graphic into the other position.
3. The positive gain fluctuation entropy (+Δxβ) pulls up linear graphic in the other position showing Quasi-stationary pathologic State of an organism.

particles and negative particles and balance positive ions and negative ions and so on. However also surely balance fusion and fission of radial energy induces balance decreased entropy and increased entropy. Distribution balance decreased entropy and increased entropy exert compound biochemical and biophysical processes which stimulate production compound inorganic molecules and organic molecules corresponding to quanta of radial energy according Einstein formula: $E = mc^2$ [E – energy, m – mass, c – speed of light]. Just Some waves of radial energy carry the mechanism of inducing synthesis positive particles in nuclei of atoms. Some waves of radial energy carry the energy of inducing synthesis negative particles in electron layers [K, L, M, N, O] and electron orbits [s, p, d, f] as main quantum numbers and orbital quantum numbers, filling orbital quantum number of synthesized atoms causing by corresponding to waves of radial negative energy. Thus, these influences of solar radial energy generate forming solid Planet-Earth and gaseous medium of Atmosphere with produced maters. The maintenance stability Internal Energy and Internal Medium of Atmosphere and Planet-Earth promotes germination living organisms in order to make them the open thermodynamic systems. Just exchanges by energy and substances between thermodynamic systems of living organisms and thermodynamic system Atmosphere promote maintenance stability Internal Energy both open thermodynamic system Atmosphere and Open thermodynamic systems of living organisms on Planet-Earth according famous Prigogine theorem [7,8]. Thus, it's meant that balance fusion and fission of quanta radial energy induces processes germination living matters and influence also on processes reproduction as prokaryote as well as eukaryotic organisms.

The processes of germination simple prokaryotic organisms as viruses and bacteria occur due to permanent influences of solar radiation's energy. These influences solar radial energy cause oscillations balance decreased Entropy and increased Entropy, promote as anti-apoptotic processes in living organisms as well as apoptotic processes in living organisms. Just viruses are smallest infectious agents which replicate and use alive organisms' genetic mechanisms for its lives [37]. Virus self-assembly locates within host cells [37]. Thus, viruses can be defined as pathologic promotor of all living organisms which are produced by solar fusion radial energy permanently versus solar radial energy of balance fusion and fission carrying energy for development living organisms. Therefore viruses can infect all types of life forms, from human organisms, animals and plants to microorganisms, including bacteria - bacteriophage. Taking into account developing viruses only within alive cells, it should consider that initial viruses generations occur due to broken cellular metabolic mechanism causing in weak point of cellular metabolism either by harmful factors of outer environment (human factors, technological factors, smoking, carcinogens etc.) or harmful influences some solar rays quanta (for example, wavelength lower than 200 nm). The harmful factors carry dangerous energy causing infection disease in cells. Then after initial viruses' infection disease it occurs infection of other persons. Hence there are occurred often influenzal epidemics as well as the other epidemics. Also, there appear in the same mode HIV viruses and the other viral diseases, including v-oncogenes of oncologic diseases. Following simple organisms producing by corresponding quanta of solar radial energy are prokaryotes. The prokaryotes have single circular chromosome and

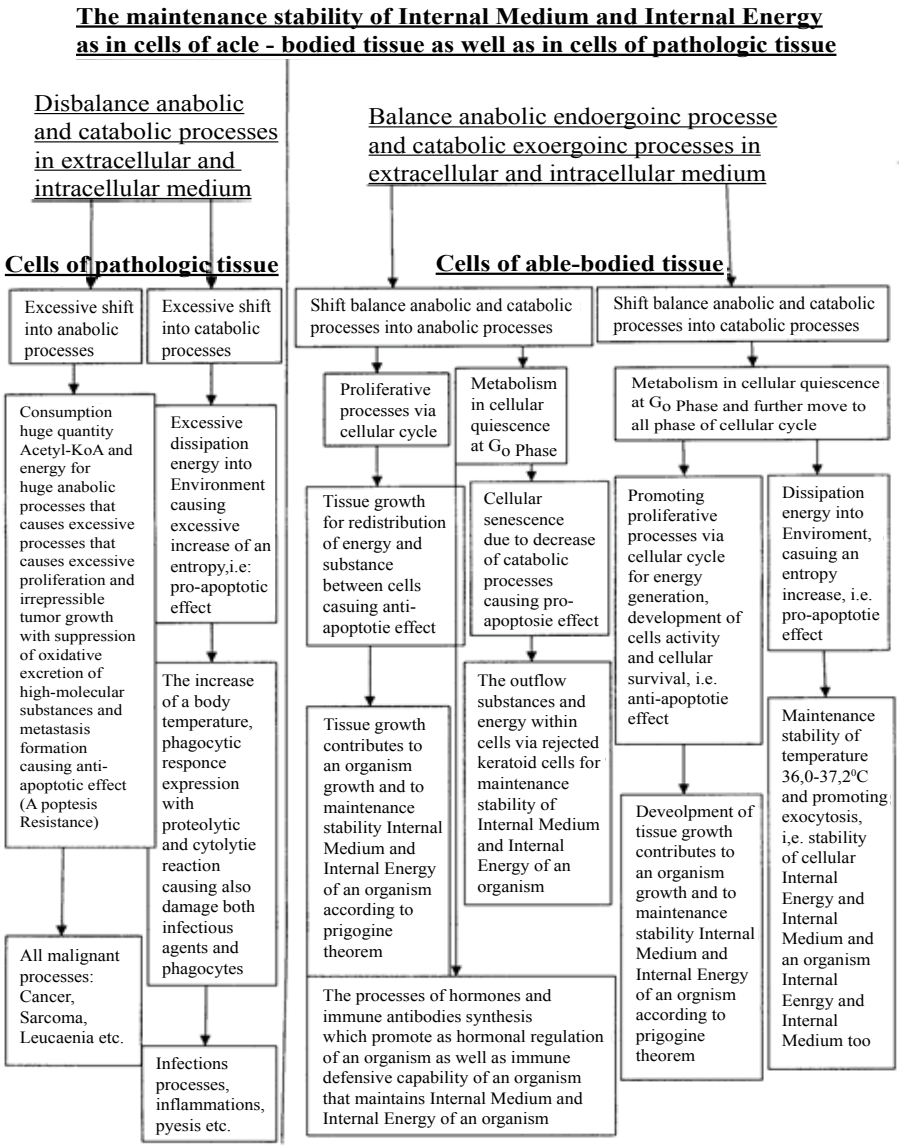


Figure 6: The maintenance stability of Internal Medium and Internal Energy as in cells of able-bodied tissue as well as in cells of pathologic tissue.

Notes:

1. Balance anabolic processes & catabolic processes of extracellular medium and Intracellular medium in norm.
   a) The moderate shifts into anabolic processes exerts cellular cycle causing proliferative processes.
   b) The moderate shifts into catabolic processes causing metabolic processes in quiescence G0 phase cellular cycle.
2. Disbalance anabolic processes & catabolic processes of extracellular medium and intracellular medium in pathology.
   a) The excessive shift into anabolic processes leads to malignant processes: Cancer, Sarcoma, Leucaemia etc.
   b) The excessive shift into catabolic processes leads to inflammations and infectious processes.

their DNA is organized into structure called nucleoid which occupies whole region of bacterial cell, i.e., haploid structure. The genes in prokaryotes are often organized in operon. However, this structure is dynamic and is maintained by the actions of a range of histone-like proteins, which associate with the bacterial chromosome. Therefore, bacteria have haploid organisms which can live independently for the other organisms.

Solar radiations influence on both prokaryotic organisms and eukaryotic organisms: Different prokaryotes have either important useful function for an organism, e.g. producing Vitamin B_{12} in an organism, or harmful function causing pathologic processes. However, development of eukaryotic organisms from its germination up to growth and down to death displays arising processes via decreasing Entropy and withering away processes via increasing Entropy. For example, at each spring there are appeared May beetles, flies, locusts and the other insects which live only one year. At winter all these insects are disappeared via going to dead. Such annual cycle of insects' lives is produced by quanta of solar rays which are formed due to solar thermonuclear synthesis via fusion. High organized eukaryotic organisms, including a human organism, subjected to the influences on neurons of an organisms' central nervous system by quanta ray's

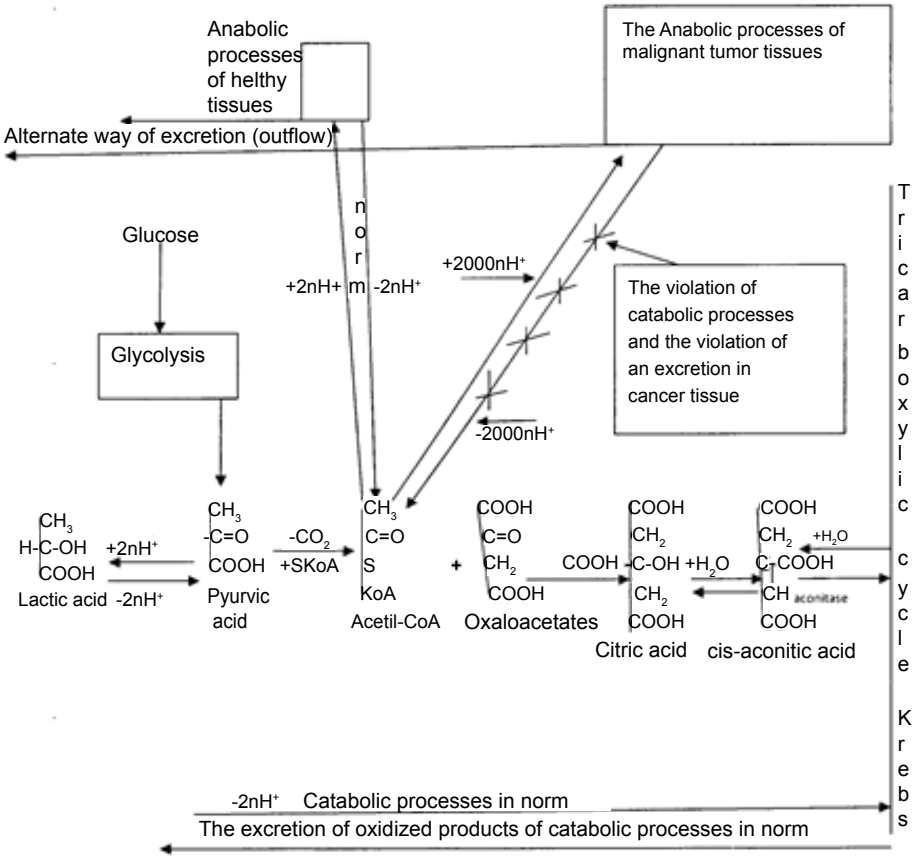


Figure 7: The metabolism of a malignant tumor tissue and of a normal tissue.

Notes:

1. Nodal point of bifurcation anabolic and catabolic processes.
2. Huge anabolic processes with huge consumption of energy and Acetyl-CoA for anabolic processes leading to overloading "Nodal point of bifurcation anabolic and catabolic processes" [NPBac] in cancer tissue.
3. Moderate metabolic processes displaying balance anabolic and catabolic processes in able-bodied tissue.
4. Alternative excretion of high-molecular substances within the structure rejected cells and the violation of excretion substances via oxidative processes due to suppression of catabolic oxidative processes in cancer tissue.
5. Accumulation of energy into lactic acid for anabolic processes.
6. Normal excretion substances via catabolic oxidative processes in able-bodied tissue.

solar thermonuclear synthesis. The influences solar radial energy due to oscillating balance fusion and fission causes oscillations balance decreased Entropy and increased Entropy inducing oscillations cellular balance anti-apoptotic processes and pro-apoptotic processes in living organisms which regulate expending Basic Internal Energy (E_{bas}) through sequence of stem cells via Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells → type cells exerting proliferative processes via cellular cycle. Just the loss energy of Basic Internal Energy (E_{bas}) in Basic stem cells (neurons of central nervous system) defines the length of a human life. The shifts of oscillating balance fusion and fission into fusion of solar thermonuclear synthesis produce quanta rays which induce shift oscillating balance anabolic endergonic processes and catabolic exergonic processes into anabolic endergonic processes in an organism. The shifts of oscillating balance fusion and fission into fission of Solar System produce quanta rays which induce shift oscillating balance anabolic endergonic processes and catabolic exergonic processes into catabolic exergonic processes in an organism. Thus, influences of Solar System on an organism's cells activity induce the mechanism regulation maintenance stability Internal Energy in high organized eukaryotic organisms. The mechanism regulation maintenance stability Internal Energy (stable temperature 36.0°C to 36.9°C etc.) and Internal Medium (stable concentration substances in blood and neurolymph) in high organized eukaryotic organisms consist of three level regulation: highest level regulation [Central Nervous System], high level regulation ["Basic Equilibrium Constants of all kinds of metabolisms] and low-level regulation ["Equilibrium Constant of energy exchanges" and "Equilibrium Constant of metabolism"] (Figure 2) [1,2]. Also, the common mechanism regulation maintenance stability internal energy and internal medium is supported by Hormonal system operations which influence as on metabolic processes via influencing through cellular receptors on some cellular functions. Besides an organism's cells create supplemental mechanism maintenance stability Internal Energy and Internal Medium as in an organism's cells as well as in an organism inducing autophagy and immune processes via remote reaction across distance on strange objects due to operation resonance waves of cellular capacitors [8]. However, the common mechanism regulation maintenance stability

Internal Energy and Internal Medium in eukaryotic organisms are subjected both positive influences and negative influences of Solar radiations displaying balance increased entropy and decreased entropy in environment. Just minimization gain increases Entropy in an open non-equilibrium non-lineal thermodynamic system of an organism, according famous Prigogine theorem [8], results in minimal shift balance increased Entropy and decreased Entropy into minimal decreased Entropy maintaining stable Internal Energy of an organism. Besides such oscillations of balance increased Entropy and decreased Entropy occur during the life of an organism reflecting states of an organism's metabolism from its birth to death (Figure 3). Moreover, these oscillations of balance increased Entropy and decreased Entropy correspond to thermodynamic probability of distribution Entropy according to outstanding Boltzmann formula. Just these solar radiation influences cause by direct actions and indirect actions on metabolic processes of the different organisms, e.g. plants, bacteria, animals, men and so on. The positive influence of solar radiation promotes life of the organisms via exerting as common mechanisms regulation maintenance stability internal energy and internal medium of an organism as well as the operation cellular mechanisms maintenance stability Internal Energy and Internal Medium of an organism. Besides the mechanisms influences of solar rays on eukaryotic organisms occur through photosynthetic processes in plants via cells' energy carrier exerting extracellular medium oxidative processes.

Vitamins as cofactors are exerted by solar radiation energy in an operation: The producing by solar radiations photosynthesis direct acting Vitamin D_2 is formed from natured ergosterol which is Provitamin D_3 [7-dehydrocholesterol]. Just provitamin D_3 or 7-dehydrocholesterol is located in a skin and in other tissues. Solar UV radiation transforms 7-dehydrocholesterol into Vitamin D_3 or cholecalciferol. Then cholecalciferol (Vitamin D_3) is transformed into Vitamin D_2 in liver. Vitamin D_2 takes part in metabolism calcium [Ca^{2+}] and phosphorus (HPO_4^{2-}) increasing permeability across cellular membranes of calcium [Ca^{2+}] and phosphorus (HPO_4^{2-}) that influence on mineralization of osseous tissue making rearrangement between bivalent ions {calcium [Ca^{2+}]/magnesium [Mg^{2+}]} and univalent ions {natrium [Na^{+}]/potassium [K^{+}]}. The rearrangement bivalent ions and univalent ions induces interactions between mineralization of osseous tissue and demineralization connective tissue influencing on vessels' muscular tissue and connective tissue due to ion pumps operations which exert cardiovascular function, intestinal function and function other organs. Just balance mineralization and demineralization is regulated by interactions between cortical hormones and mineralocorticoids which were produced from cholesterol. Hence these are links between mechanisms of operation Vitamin D_2 and mechanisms maintenance stability balance cortical hormones and mineral corticoids, i.e., balance anti-inflammation hormones and pro-inflammation hormones. The direct acting of solar radiation induce photosynthesis melanin in skin of an organism which defends against harmful actions solar energy ultraviolet rays of wavelength lower 200 nm. Just UV solar radiations affect skin exerting tyrosinase that results in transforming tyrosine into DOPA (L-3,4-dihydroxyphenylalanine), then DOPA both into Eumelanin through processes polymerization and into Pheomelanine through cysteine – cysteinildopa processes oxidation and polymerization. The photosynthesis of solar radiation affecting eukaryotic organisms occurs in following mode: The living prokaryotic and some eukaryotic organisms subjecting by solar radiations photosynthesis cause indirect acting both positive influences and negative influences on eukaryotic high organized organisms. Thus solar radiation photosynthesis is a process which is used by plants and other organisms in order to convert solar radiation quants energy into chemical energy that can later be released to fuel the organisms' activities via energy transformation into substances. This chemical initial energy is stored in carbohydrate molecules, such as sugars, which are synthesized from carbon dioxide and water. Here is this simple scheme of photosynthesis in plants:

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2,$$

i.e., Carbon dioxide + Water → Sugar + Oxygen.

The photosynthetic process always begins when solar rays' quants energy are absorbed by proteins of reaction centers which contain green chlorophyll pigments. In plants, these proteins are inside organelles called chloroplasts, which are most of ones in leaf cells. In bacteria, these organelles called chloroplasts are embedded in the plasma membrane. In these light-dependent reactions, some energy is used to tear away electrons from relevant substances, for example such as water for producing oxygen gas. The splitting water, caused by freed hydrogen, is used in the creation of two further compound structures as reduced nicotinamide adenine dinucleotide phosphate (NADPH) and adenosine triphosphate (ATP) which operate in cells as energy storage means. Just this stored energy is used for biosynthesis of more compound substances in plants and bacteria as proteins, hydrocarbons, fats as well as microelement and vitamins some of which operate as coenzymes. Vitamins can serve as precursors to many organic cofactors (e.g., vitamins B_1, B_2, B_6, B_{12}, niacin, folic acid) or as coenzymes themselves (e.g., vitamin C). However, vitamins D have other functions in an organism [38,39]. Symptoms of bone pain and muscle weakness can mean you have a vitamin D deficiency. However, for many people, the symptoms are subtle. Yet, even without symptoms, too little vitamin D can pose health risks. Low blood levels of the vitamin have been associated with the Vitamin D deficiency [40-44). Many organic cofactors also contain a nucleotide, such as the electron carriers NAD and FAD, and coenzyme A, which carries acyl groups. All vitamins exerted by appropriating quants of Solar radiations energy are significant links in mechanism maintenance stability Internal energy of the open non-equilibrium nonlinear thermodynamic system of eukaryotic organisms. Besides the operations of these vitamins reflect interactions between different mechanisms in metabolisms of different organisms causing common mechanism maintenance stability in Nature (Table 1).

Discussion

The maintenance stability internal energy of an organism in quasi-stationary states of infectious and chronic inflammatory processes in an organism

The shift balance catabolic exergonic processes and anabolic endergonic processes into excessive catabolic exergonic processes leads to Quasi-stationary state of Infectious and inflammatory processes. The maintenance stability Internal Energy of an organism occurs corresponding to famous Glansdorff and Prigogine theory via transition of steady Stationary State Graphics into unsteady fluctuating Quasi-stationary State Graphics due to positive fluctuating Entropy ($+\Delta_x\beta$) shifts into negative fluctuation Entropy ($-\Delta_x\beta$) and then into fluctuating of positive fluctuation Entrapy ($+\Delta_x\beta$) in condition of Infectious and chronic inflammatory processes in an organism (Figure 5) [15]. Also, the maintenance stability Internal Energy of an organism occurs via dissipation energy into environment due to fluctuating of positive fluctuation Entropy ($+\Delta_x\beta$) in condition of Infectious and chronic inflammatory processes in an organism (Figure 5) [15]. The

dissipation energy into environment in condition of Infectious and chronic inflammatory processes increase body temperature of an organism (Figure 6) [15]. Infectious and inflammatory processes are subjected to Immune reactions of an organism due to resonance waives of cellular capacitors operation in phagocytes' walls which attract phagocytes to causative agents creating links Receptor-Ligant (Figure 4) [8]. Then the links Receptor-Ligand were internalized into cytoplasm creating vesicles which were subjected to lyse by lysosomes' enzymes due to lysosomes' shells capacitors operations [16]. The lysed destructed contents of vesicles were excreted from cells and an organism into environment.

The maintenance stability internal energy of an organism in Quasi-stationary oncologic state of an organism

Affecting by viral oncogenes the nuclear DNAs of some an organism's cells are subjected to viral accelerating cellular cycles which consume abundance energy for great anabolic processes in G1/S phases cellular cycle for excessive proliferative processes of tumor growth. Thus it occurs shift balance anabolic endergonic processes and catabolic exergonic processes into excessive anabolic endergonic processes which absorb huge quantity energy and Acetyl-CoA causing overload "nodal point of bifurcation anabolic and catabolic processes [NPBac]" with partial suppression catabolic exergonic anaerobic processes of oxidative phosphorylation [TCA Krebs cycle] due to lack energy and Acetyl-CoA for catabolic processes and remaining some energy for cancer cells' survival (Figure 7) [45]. The partial suppression catabolic exergonic anaerobic processes of TCA Krebs cycle lead to forming great quantity superoxide [O*] causing forming great quantity ROS/H_2O_2/ free radicals. Free radical intrudes into nuclei of cancer cells exerting excessive proliferative processes due to realizing of 2nDNA [46-48]. The forming great quantity high-molecular substances due to excessive anabolic biosynthetic processes cannot been excreted via oxidative decompositions because of suppressed "nodal point bifurcation anabolic and cataboilic processes [NPBac]" (Figure 7) [45]. Therefore, cancer cells transit to other tissues without suppression "nodal point bifurcation anabolic and catabolic processes [NPBac]" that form metastases. Thus, cancer disease expands in organism absorbing great quantity energy and substances especially fat substances leading to cachexia (Figures 6 and 7). Also, metastases damage some organs of an organism, even essential organ sometimes. All of these cancer changes lead to transition normal balance anabolic processes and catabolic processes of normal Stationary State an organism into pathologic disbalance anabolic processes and catabolic processes of Quasi-stationary State an organism causing transition steady Stationary State Graphics due to fluctuating of positive fluctuation Entrapy ($+\Delta_x\beta$) into unsteady fluctuating Quasi-stationary State Graphics due to fluctuating of negative fluctuation Entrapy ($-\Delta_x\beta$) according Glansdorff and Prigogina theory (Figure 5) [15].

Transition stationary state of an organism into quasi-stationary pathologic state of an organism

The mechanism maintenance stability Stationary State of a developing organism depends on mechanisms maintenance stability Stationary States of propagating cells which both mechanisms maintenance stability Stationary States operate via as inflows energy and substances as well as outflows energy and substances according famous Prigogine theorem and Glansdorff – Prigogine theory [7,8]. Just Basic Energy is received by born organism from parents [mother and father] and is found in Basic stem cells [neurons] [6]. The Basic Energy is expended during life of an organism via sequences of stem cells: Basic stem cells [neuron] → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells → type cells exerting proliferative processes via cellular cycle [6]. Current inflows and outflows of both Energy and Substances maintain stability Stationary State during life of an organism. Just Current Energy and Substances are received from environment by an organism and are excreted into environment by an organism in norm (Figure 1). Thus, it should be considered cellular proliferative processes via cellular cycles and also cells death via Apoptosis with Autophagy taking into account different lives times of various type cells. The consequences of these processes result in microRNAs which appear as results of ruining nuclear DNAs of dead cells due to Apoptosis as in norm as well as in pathology. However, any excessive quantity of microRNAs stimulates repairing DNAs by DNA mismatch repair proteins (MMR) in S and M (Mitosis) phases of cellular cycles causing supplementary replications, corresponding to the Henderson-Hasselbalch Equilibrium Constant of reverse reaction, and increasing proliferative processes [49,50].

Conclusion

As concern to studies of oncogenesis, some authors note that microRNAs have been shown to play crucial roles in the tumorigenicity via inducing different processes even opposite processes. On the one hand, microRNAs induce suppression cancer proliferative processes and metastasis, inhibition cancer cells invasions, cancer tumor growth, cancer cells apoptotic processes [51-59]. On the second hand, microRNAs control CDKN1C/p57 and CDKN1B/p27 expression in human hepatocellular carcinoma and associate with intristic subtype [60-61]. On the other hand, microRNAs promote cell survival and proliferation by targeting tp53 and caspase-9 in lung cancer as well as metastasis [62-64]. There are following explanations of these manifestations of microRNAs. Really, MicroRNAs are products of disintegrations nuclear DNAs of dead cells due to autophagy. But the authors of these works used chemotherapeutic drugs such as 5-fluorouracil and the others which lead to increase dead cells, i.e., apoptosis, some suppression cancer metastasis and cancer cells proliferative processes. Besides the increased microRNAs can stimulate repairing DNAs by DNA mismatch repair proteins (MMR) in S and M (Mitosis) phases of cancer cellular cycles causing cancer cells survival, increase cancer proliferations and metastasis, corresponding to the Henderson-Hasselbalch Equilibrium Constant of reverse reactions.

Acknowledgment

This article is dedicated to the memory of my daughter T.M. Ponizovska.

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