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Biophysical and Biochemical Mechanisms of Forming and Development A Human Eukaryotic Organism from Single Pluripotent Cell into Multicellular Embryo and A Living Organism in Norm

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Abstract

The mechanism forming and development a human eukaryotic organism from single pluripotent cell was described from the point of view of thermodynamics, biophysics and biochemistry. The genesis and development of an organism was explained using famous Prigogine theorem and Glansdorff and Prigogine theory sharing into such stages of human life development: born of an organism, babyhood, childhood, young age, juvenile age, middle age, full age, elderly age, old age. There was estimated levels metabolic activity of each stage of human life. Also all stages of human life development were considered via energy flow which generates cells developments through stem cells into cells types. The mechanisms of these transformations cells were described from point of views of thermodynamics, biophysics and biochemistry. There were described mechanisms Gametogenesis, impregnation ovum by sperms and foetus growth from single cell considering flows energy from stem cells to cells types which cause transition diploid cellular division through mitosis into haploid cellular division through meiosis and back into diploid cellular division through mitosis.

Keywords: Diploid cellular cycle; Haploid cellular cycle; Basic stem cells; Totipotent stem cells; Pluripotent stem cells; Multipotent stem cells; Oligopotent stem; Cells types; Prigogine theorem; Glansdorff; Prigogine theorem

Introduction

The metabolic mechanisms of an organism during its life are subjected as to outer influences from surroundings as well as to inner influences. An organism expends some energy from Basic Internal Energy which is stored energy in stem cells sequentially in Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem and then distributing between cells various types and leading to cells' proliferations. However this expenditure Basic Internal Energy results in senescence of an organism. Just mechanisms of genomic processes activity are the links of mechanisms stem cells operations which cause advance an organism during its life. In a developing embryo, stem cells generate differentiation into all the specialized cells forming corresponding tissues (ectoderm, endoderm, mesoderm etc.). These transformations of stem cells maintain stability each tissue of an organism, such as blood, skin, intestinal tissues etc. These transformations of stem cells are the potency of obtained energy which specifies differentiation into different cell types of the stem cell. In a development babyhood and childhood, stem cells exert expression metabolic processes operations stimulating hormonal processes and immune defensive processes. In a development young age years and juvenile age years, stem cells continue exertion metabolic processes operations stimulating hormonal processes and immune defensive processes as well as forming sex organs, sex characters and Gametogenesis with possible generating foetus cells which receive energy from mother's stem cells. In a development middle age years and full age years, stem cells continue maintenance stability Internal Energy an organism, its hormonal and immune functions. In elderly age years, stem cells have less energy than in middle age and full age for continue maintenance stability Internal Energy an organism, its hormonal and immune functions. In aging organisms stem cells have insufficient energy for continue maintenance stability Internal Energy an organism, its hormonal and immune functions.

Genomic processes during an organism's life and proliferative processes in impregnated ovum

The born organisms

The born organisms, both feminine gender and masculine gender, accept fresh air through their lungs and form own respiratory catabolic aerobic exergonic oxidative processes. These born organisms have normal mechanisms maintenance stability Internal Energy: stable temperature 36.3°C-36.8°C by which all enzymes operate; stable index pH=7.35 in blood and in neurolymph; stable index of osmotic pressure-285 ± 5 mil-osm/kg H_2O, corresponding to 0.14-0.15 molar sodium chloride or the other univalent ions; stable index of colloidal-oncotic pressure-18-25 mmHg, corresponding to human serum albumin solution up to 300 grams per liter etc. Besides these born organisms have stable Internal Medium displaying normal concentrations substances in blood and neurolymph [1-3]. Mechanism maintenance stability Internal Energy of an organism creates common balance catabolic aerobic exergonic processes & catabolic anaerobic exergonic processes & anabolic endergonic processes [1-5]. Besides the all cells of born organisms have normal mechanisms maintenance stability their cytoplasms basophilic chemical potentials via staining cells [6-8]. Also the born organisms are the open non equilibrium thermodynamic systems [9,10]. The common Energy (E_{common}) born

open non equilibrium thermodynamic systems of organisms, both feminine gender and masculine gender, contain Basic stable Internal Energy (U_{basic}), which is included into fluctuating stable Internal Energy of an organism (ΔU). Stability Internal Energy of an organism (ΔU) is supported by organism's Internal Works ($W_{org\ int.}$) and organism's external Works ($W_{org.\ ext.}$) forming Stationary State of an organism according first law of thermodynamics [9,10]. Just it is the formula of stability Internal Energy according first law of thermodynamics: $E_{common}=\Delta U+W_{int}+W_{ext}$ [E_{common}-common energy, W_{int}-internal work of an organism, W_{ext}-external work of an organism] [9,10]. Basic Internal Energy (U_{basic}) of a born organism is the store energy keeping expending its energy. Therefore Basic Internal Energy (U_{basic}) stores 100% energy after birth of an organism. Basic Internal Energy is found in cells of Central nervous System (neurons) which are Basic stem cells. Just Basic stem cells (neurons) distribute Basic Internal Energy (U_{basic}) among the other stem cells which distribute obtained energy among cells types of different tissues. All stem cells and cells types divide via Mitosis in eukaryotic organisms. There are two broad types of stem cells: embryonic stem cells, which are isolated from the inner cell mass of blastocysts, and an organism's stem cells, which are found in various tissues. All cells of born organisms have in their nuclei 22 chromosome pairs and two sex chromosomes for a total of 46 chromosomes, i.e. diploid cells having homologous pair chromosomes. Females have two X sex chromosomes; males have X sex chromosome and Y sex chromosome. All cells of an organism proliferate through G_0, G1/S, G2, M (Mitosis) phases of cellular cycle showing diploid proliferative processes. Just M phase cellular cycle consists of two processes: karyokinesis and cytokinesis. Karyokinesis processes exert division cell's chromosome. Cytokinesis processes exert division cell's cytoplasm with all its organelles forming two daughter cells. Cell's division is vital process by which hair, skin, blood cells, and some internal organs are renewed. After cell division, each of the daughter cells begin the interphase, i.e. in (Table 1) G_0, G1, S, G2 phases cellular cycle, and M phase cellular cycle, of a new cycle.

Phase	Description development cellular cycle via cellular phases
G_0	A phase where the cell has left the cycle and has stopped dividing.
G1	Cells increase in size in G1 [Gap1]. The G1 checkpoint control mechanism ensures that everything is ready for DNA synthesis. In G1 phase, there occurs production as enzymes as well as the proteins for development further phases.
S	DNA replication occurs during this phase.
G2	During the G2 [Gap 2] between DNA synthesis and mitosis, the cell will continue to grow. The G2 checkpoint control mechanism ensures that everything is ready to enter the M (mitosis) phase and divide.
M	Cell growth stops at this stage and cellular energy is focused on the orderly division into two daughter cells. A checkpoint in the middle of mitosis (Metaphase Checkpoint) ensures that the cell is ready to complete cell division

Table 1: Phases of cellular cycle.

The G_0 phase cellular cycle is characterized via cell's state on the quiet in which it occurs RNA translation and transcription for biosynthesis of proteins.

The G1 phase cellular cycle is characterized via preparing of DNA synthesis. It is also called the growth phase. During this phase, it is continued the biosynthetic activities of the cell. In this phase, the cell increases its supply of proteins, enzymes, increases the number of organelles (such as mitochondria, ribosome, lysosome and the others), and grows in size.

The S phase cellular cycle starts when DNA synthesis begins; when it is completed, all of the chromosomes have been replicated, i.e., each chromosome has two sister chromatids. Thus, during this phase, the amount of DNA in the cell has effectively doubled; the diploid of the cell remains the same. Rates of RNA transcription and protein synthesis are very low during this phase. An exception to this is histone production, most of which occurs during the S phase.

The G2 phase cellular cycle occurs after DNA replication and is a period of protein synthesis and rapid cell growth to prepare the cell for mitosis. During this phase microtubules begin to reorganize to form a spindle.

The M phase cellular cycle (Mitosis) is the process by which a eukaryotic cell separates the chromosomes in its cell nucleus into two identical sets in two nuclei via prophase, metaphase, anaphase and telophase. During the process of mitosis the pairs of chromosomes condense and attach to fibers that pull the sister chromatids to opposite sides of the cell. After mitotic karyokinesis there is immediately followed cytokinesis, which divides the nuclei, mitochondria, cytoplasm, organelles and cell membrane into two cells containing roughly equal shares of these cellular components. Mitosis and cytokinesis together define the division of the mother cell into two daughter cells, genetically identical to each other and to their parent cell [11].

Considering dynamic development mechanisms cellular cycle in developing human organism it should exhibit development interactions between aerobic processes and anaerobic processes supporting by Hypoxia-induced Factors (HIF). Just regulatory mechanism cellular cycle exhibits anabolic endergonic processes to a large degree which operate in anaerobic hypoxic condition, i.e. anaerobic hypoxic processes. Also catabolic anaerobic exergonic processes are anaerobic hypoxic processes. Just anaerobic processes use energy which is stored as Basic Internal Energy (U_{basic}) in Basic stem cells (neurons) of an organism. As comparison with anaerobic hypoxic processes, catabolic aerobic exergonic processes use outer energy from Environment operating in aerobic condition, i.e. aerobic processes. Thus common balance catabolic aerobic exergonic processes & catabolic anaerobic exergonic processes & anabolic endergonic processes consist of anaerobic hypoxic pathway and aerobic environmental respiratory pathway. The anaerobic hypoxic processes of regulatory mechanisms cellular cycles of different tissues' cells types are based on the obtained energy from the stored energy in Basic Internal Energy in the genes' molecular bonds of Basic stem cells

(neurons). This energy was obtained via sequence from unipotent stem cells, oligopotent stem cells, multipotent stem cells, pluripotent stem cells, totipotent stem cells, basic potent stem cells (neurons). Just the genes encode protein synthesis, named cyclins, and cyclin-dependent kinases (CDKs) which advance cellular cycles of different tissues' cells types determining different cells' division cycles, e.g. cdc 20 or cdc 25 [11]. These different cellular division cycles are finished with Mitosis (M phases) of kariokinesis and cytokinesis. Energy of the gene's molecular bonds determine different cells' lifetimes via creating different their cycle times. Thus taking into account the quantity 50 times of each cell division, the obtained energy in the gene's molecular bonds determines the lifetime of a cell. Really results from the study of E2F transcriptional dynamics at the single-cell level prove that the role of cyclin-CDK (Cyclin-dependent kinases complex) activities in G1 phase cellular cycle, in particular cyclin D-CDK4/6, is to create the timing rather than the inducing cell cycle entry in S phase cellular cycle [12,13] although cyclin-CDK complex promotes expression of transcription factors which stimulated by Hypoxia-induced aFactor (HIFa) and cFactor (HIFc) [12]. Just active cyclin S -CDK complex phosphorilates proteins that prepares pre-replication complexes in G1 phase cellular cycle for DNA replication in S phase cellular cycle. Just single chromatid is decondensed in chromosome. Therefore after DNA is copied, chromosome consists of two sister chromatids connected by proteins [cohesins]. Two sister chromatids are tightly connected at the centromere region condensing chromosome. Chromatids are pulled apart. Now each of these two chromatid s can be considered it's as own chromosome. The driving mechanisms of these transformations in nucleus are that the obtained cellular energy is expeneded in G1 phase cellular cycle for anabolic endergonic biosynthetic processes in anaerobic condition. The expression anabolic endergonic processes leads to moderate shift balance anabolic endergonic processes & catabolic anaerobic exergonic processes into anabolic endergonic processes with partial suppression Krebs Tricarcoxilic Acids Cycle (TCA). This expression anabolic processes with partial suppression Krebs Tricarcoxilic Acids Cycle (TCA) is extended to cytoplasm and cellular mitochondria maintaining stable basophilic chemical potential of cytoplasm ($\mu_{cytoplasm}$). Suppression Krebs Tricarcoxylic Acids Cycle (TCA) in mitochondria leads to lack Hydrogen ions which are produced in Krebs Tricarboxylic Acid Cycle. The lack Hydrogen ions don't neutralize whole oxygen (O_2) which come from lungs and is carried by systems of Hemoglobins and Cytochroms. Therefore there are formed considerably quantity of surplus Superoxide ($O_2^{\bullet}$) due to surplus oxygen (O_2) via adding electron which is produced by transformings NAD+↔NADH and FAD ↔ $FADH_2$: $n[O_2]+n[e-] \rightarrow n[O_2^{\bullet}]$. Superoxide ($O_2^{\bullet}$) induces forming ROS/$H_2O_2$/Free radicals [14,15]. Free radicals ($^{\bullet}OH$) react on nDNA and induce process replication via realizing of 2nDNA [14,15].

- $^{\bullet}OH+H_2$-nDNA-DNA → $H_2O+H^{\bullet}$-nDNA-DNA
- $O^{\bullet}+2H_2O \rightarrow 2H^{\bullet} + 2OH^{-}$
- $2H^{\bullet}$-nDNA-DNA + $2H^{\bullet} \rightarrow$ 2nDNA-$H^{\bullet}$+2nDNA-$H^{\bullet}$
- 2nDNA-$H^{\bullet}$ + $2^{\bullet}OH \rightarrow 2nDNA+H_2O$

Just process replication occurs in S phase cellular cycle. The process replication advances in such mode. The each portion of the cell's genome replicates once and only once via expending of obtained stored portion energy. Thus daughter cells touch on all parts of crucial genes of cell's genome only once promoting replication in S phase cellular cycle only once. Also S phase cellular cycle is shown expression catabolic aerobic exergonic respiratory processes of link [from lungs O_2 → oxyhemoglobin → Mitochondrial system cytochromes] which interrupts anabolic processes via suppression expressed anabolic endergonic biosynthetic processes in G1 phase cellular cycle. Catabolic aerobic exergonic respiratory proceses consume much energy as through an organism's cellular system of stem cells and tissues cells types exerting catabolic anaerobic exergonic processes as well as through Environment accepting oxygen (O_2) which exerts metabolic oxidative processes causing oxidative excretion waste substances via CO_2 and H_2O. Such oxidative excretion waste substances via expression aerobic processes eliminates metabolic blocking anaerobic hypoxic processes of anabolic endergonic processes that results in expression proliferative processes. The replication in S phase cellular cycle is finished when replicative energy is exhausted in the gene's molecular bonds, and catabolic aerobic exergonic processes are suppressed by expressed anabolic endergonic processes causing transition into G2 phase cellular cycle which receive supplementary energy via link [Basic stem cells (neurons) → sequence of stem cells → tissue's cells types]. The expressed anabolic endergonic processes of G2 phase cellular cycle induce biosynthesis of proteins and other substances preparing to Mitosis (M phase cellular cycle) of karyokinesis and cytokinesis. Transition G2 phase cellular cycle into M phase cellular cycle occurs due to exhaustion supplementary energy received via link [Basic stem cells (neurons) → sequence of stem cells → tissue's cells types]. M phase cellular cycle (Mitosis) receive supplementary energy also via link [Basic stem cells (neurons) → sequence of stem cells → tissue's cells types] and use this energy in anaerobic hypoxic processes of both catabolic anaerobic exergonic processes and anabolic endergonic processes. Mitosis (M phase cellular cycle) is asexual reproduction. During the Mitotic phase the chromosomes are separated in two new nuclei. Mitosis is often accompanied or followed by cytokinesis, which divides the cytoplasm, organelles and cell membrane into two new cells containing roughly equal shares of these cellular components [16]. During mitosis, the chromosomes, which have already duplicated, condense and attach to spindle fibers that pull one copy of each chromosome to opposite sides of the cell [16]. As the result, there are formed two genetically identical daughter nuclei. The rest of the cell may then continue to divide by cytokinesis to produce two daughter cells [16]. Mitosis and cytokinesis together define the mitotic (M) phase of cell cycle, i.e. the division of the mother cell into two daughter cells genetically identical to each other. The process of mitosis is divided into stages corresponding to the completion of one set of activities and the start of the next. These stages are prophase, prometaphase, metaphase, anaphase, and telophase.

Prophase: Before prophase, each chromosome contains one DNA or one chromatid. During prophase the cell prepares to divide by tightly condensing two chromosomes and initiating mitotic spindle formation, this process is called chromosome condensation. After prophase, each chromosome has two chromatids. The two chromatids are joined at a place called centromere [17,18].

Prometaphase: At the beginning of prometaphase in cells, phosphorylation of nuclear laminas causes the nuclear envelope to disintegrate into small membrane vesicles. As this happens, microtubules invade the nuclear space. In late prometaphase, kinetochore microtubules begin to search in order to attach to chromosomal kinetochores [19]. A kinetochore is a proteinaceous microtubule-binding structure that forms the chromosomal centromere during late prophase [19,20]. A number of polar microtubules find and interact with corresponding polar microtubules from the opposite centrosome to form the mitotic spindle [21]. The polymerisation and depolymerisation of microtubules, provides the

pulling force necessary to later separate the chromosome's two chromatids [22].

Metaphase: After the microtubules have located and attached to the kinetochores in prometaphase, the two centrosomes begin pulling the chromosomes towards opposite ends of the cell. The resulting tension causes the chromosomes to align along the metaphase plate or equatorial plane, an imaginary line that is centrally located between the two centrosomes (at approximately the midline of the cell) [21]. To ensure equitable distribution of chromosomes at the end of mitosis, the metaphase checkpoint guarantees that kinetochores are properly attached to the mitotic spindle and that the chromosomes are aligned along the metaphase plate [23]. If the cell successfully passes through the metaphase checkpoint, it proceeds to anaphase.

Anaphase: During anaphase A, the cohesions that bind sister chromatids together are cleaved, forming two identical daughter chromosomes [24]. Shortening of the kinetochore microtubules pulls the newly formed daughter chromosomes to opposite ends of the cell. During anaphase B, polar microtubules push against each other, causing the cell to elongate [25]. In late anaphase, chromosomes also reach their overall maximal condensation level, to help chromosome segregation and the re-formation of the nucleus [26].

Telophase: Telophase is a reversal of prophase and prometaphase events. At telophase, the polar microtubules continue to lengthen, elongating the cell even more. If the nuclear envelope has broken down, a new nuclear envelope forms using the membrane vesicles of the parent cell's old nuclear envelope. The new envelope forms around each set of separated daughter chromosomes (though the membrane does not enclose the centrosomes) and the nucleolus reappears. Both sets of chromosomes, now surrounded by new nuclear membrane, begin to "relax" or decondense. Mitosis is complete. Each daughter nucleus has an identical set of chromosomes. Cell division may or may not occur at this time depending on the organism. Maybe cytokinesis is either a telophase of mitosis or rather a separate process, necessary for completing cell division. In animal cells, a cleavage furrow (pinch) containing a contractile ring develops where the metaphase plate used to be, pinching off the separated nuclei [27,28]. In both animal and plant cells, cell division is also driven by vesicles derived from the Golgi apparatus, which move along microtubules to the middle of the cell. In plants, this structure coalesces into a cell plate at the center of the phragmoplast and develops into a cell wall, separating the two nuclei. The phragmoplast is a microtubule structure typical for higher plants, whereas some green algae use a phycoplast microtubule array during cytokinesis [17,18]. Each daughter cell has a complete copy of the genome of its parent cell. The end of cytokinesis marks the end of the M-phase.

Thermodynamic genesis and development of organisms

T Basic Internal Energy (U_{basic}) is the store retention energy during life of an organism reflecting mechanism minimization of gain entropy for maintenance stability Internal Energy of an organism (temperature 36.4°C-36.8°C by all enzymes operate and the others) according Prigogine theorem [6]. The genesis of an organism ends due to born organism, then there appear babyhood from 0 to 1 year, childhood from 1 to 3 years, young age from 3 to 14 years, juvenile age from 14 to 18-20 years, middle age from 18-20 years to 30 years, full age from 30 years to 55 years, elderly age from 55 years to 70 years, old years after 70 years (Figure 1).

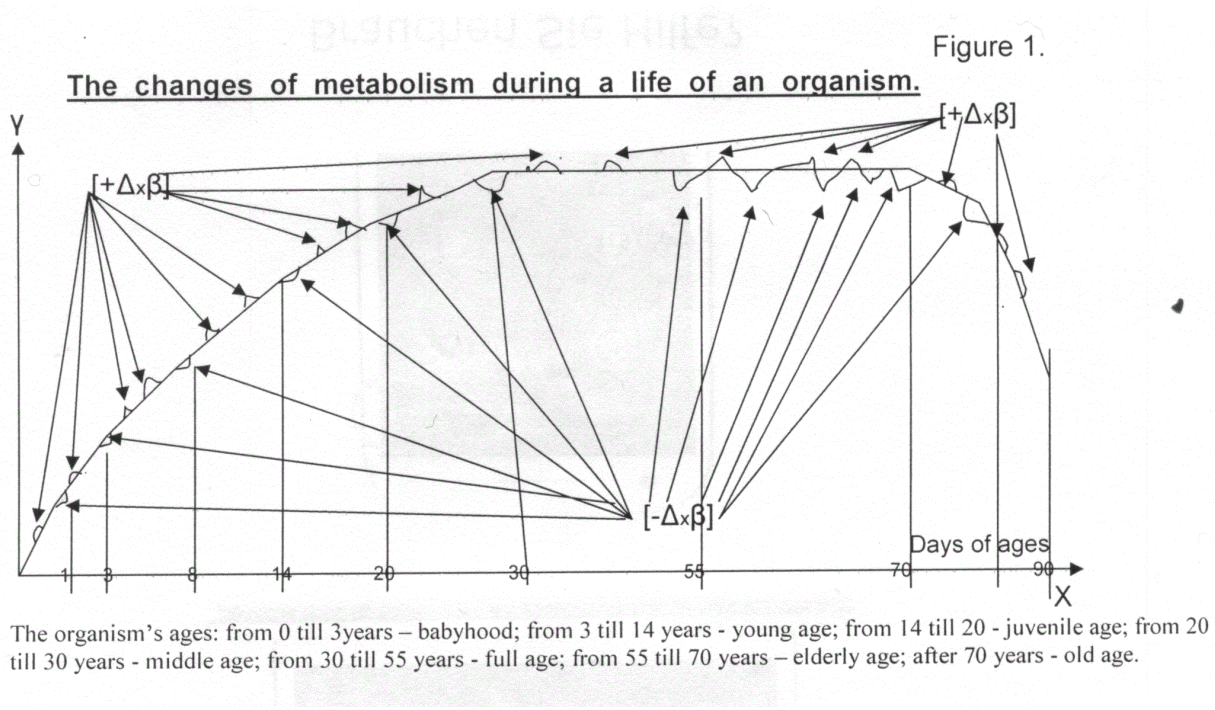

Figure 1: Metabolism during a life an organism.

The changes of an organism's genomics from born organism to old years are stored with energy by Basic Internal Energy both in male organism and female organism via expending some genomic energy. 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.

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 [29]. They divided local production Enropy into two data corresponding such for mile:

$d\beta/dt = d/dt\ (\Sigma J_k X_k) = \Sigma J_k dX_k/dt + \Sigma X_k dJ_k/dt$ [β-Entropy, t-time, X-Force, J-Stream]

The stability system gives following formula: $dJ_k/dt = 0$; Hence $d\beta/dt = d_x\beta/dt$, i.e. stability thermodynamic system defines Force (X).

However the minimization gain entropy shows: $d_x\beta/dt \leq 0$, i.e. negative fluctuation entropy. It is meant that it is far away from equilibrium of open thermodynamic system although the sign of equality defines Stationary State thermodynamic system.

Just state stability Stationary State is described so: $d_x\beta=\Sigma dJ_k dX_k>0$. It corresponds to positive fluctuations entropy. However the positive fluctuations entropy ($d_x\beta>0$) are fast disappeared in such 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 possible negative fluctuations entropy which transits thermodynamic system into new Stationary State with decreased entropy ($\Delta S_x<0$) (Figure 1). Thus Glansdorff and Prigogine theory explains mechanism development of a human organism as open non equilibrium nonlinear thermodynamic system from its birth to death. Just Force of energy (X) defines as stability Stationary State of open thermodynamic system via positive fluctuation entropy ($+\Delta_x\beta$) of anabolic processes in G1/S phases cellular cycle as well as negatve 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. Thus $\Sigma J_k dX_k/dt$ is the manifestation Force which is meant manifestation anabolic endergonic processes; $\Sigma X_k dJ_k/dt$ is the manifestation Stream which is meant manifestation catabolic exergonic processes.

Foetus at the end of 9 months pregnancy and baby at first moment after birth have similar equations: $\Sigma J_k dX_k/dt=0$ and $\Sigma X_k dJ_k/dt=0$. Just foetus at the end of 9 months pregnancy and baby at first moment after birth obtained 100% basic energy from their parents. Then the organism of born baby after opening lungs' respiration begins to maintain stability Internal Energy of its open thermodynamic system due to appearance catabolic aerobic exergonic processes [$aer\Sigma X_k dJ_k/dt$].

Catabolic aerobic exergonic processes [$aer\Sigma X_k dJ_k/dt$] induce expression catabolic anaerobic exergonic processes [$anaer\Sigma X_k dJ_k/dt$] causing balance catabolic aerobic exergonic processes & catabolic anaerobc exergonic processes [5], i.e. balance $aer\Sigma X_k dJ_k/dt$ & $anaer\Sigma X_k dJ_k/dt$. Balance catabolic aerobic exergonic processes & catabolic anaerobc exergonic processes exert balance catabolic exergonic processes & anabolic endergonic processes (2,3), i.e. balance $\Sigma X_k dJ_k/dt$ and $\Sigma J_k dX_k/dt$. Thus it is formed three levels of mechanism regulation stability Internal Energy and Internal Medium of Stationary State an organism as open non equilibrium thermodynamic system [2-5,9,10].

Just thermodynamic mechanism maintenance stability open non equilibrium thermodynamic system via minimization gain Entropy was proved by famous Prigogine theorem [6]. But open non equilibrium thermodynamic system of an organism is characterized also as nonlinear pathway of its development according to Glansdorff and Prigogine theory. Hence we study the mechanisms of open non equilibrium nonlinear thermodynamic system of an organism.

The development an open non equilibrium nonlinear thermodynamic system of an organism depends on the store of Basic Internal Energy which is situated in Basic stem cells (neurons). On the one hand, the Basic stem cells, as the store of energy, provide with energy as specific differentiations of the next generations stem cells as well as the proliferation of cells types which operate in different tissues of an organism being derived from stem cells (Figure 2).

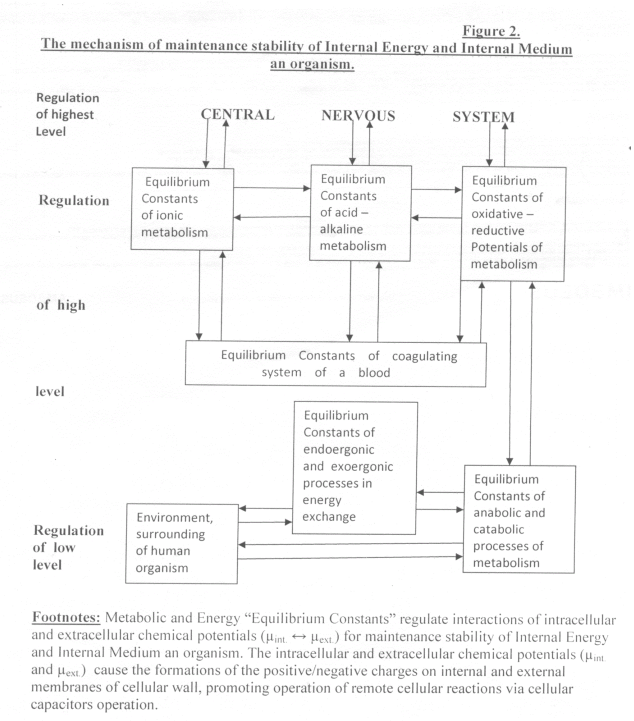

Figure 2: Maintenance stability Internal Energy an organism.

There are the specific differentiations of the stem cells:

- Basic stem cells are cells which store Basic Internal Energy (U_{basic}) which is expended during life of an organism causing aging of an organism and maintaining stability Internal Energy of an organism as highest level regulation (Figure 2).
- Totipotent (or omnipotent) stem cells can differentiate into embryonic and extraembryonic cell types. Such cells can construct a complete, viable organism. These cells are produced from the

fusion of an egg and sperm cell. Cells produced by the first few divisions of the fertilized egg are also totipotent [30].

- Pluripotent stem cells are the descendants of totipotent cells and can differentiate into nearly all cells, i.e. cells derived from any of the three germ layers [31].
- Multipotent stem cells can differentiate into a number of cell types, but only those of a closely related family of cells [32].
- Oligopotent stem cells can differentiate into only a few cell types, such as lymphoid or myeloid stem cells [32].
- Unipotent cells can produce only one cell type, their own, but have the property of self-renewal, which distinguishes them from non-stem cells (e.g. progenitor cells, which cannot self-renew).

Basic Internal Energy in Basic stem cells is divided into two parts: The intact part of Basic Internal Energy ($U_{basic\ intact}$) takes part in mechanism maintenance stability Internal Energy of both thermodynamic system Atmosphere and earth organisms via exchanges with energy and substances after death of organisms, exhibiting possible immortality human soul after man's death which is proved by using Prigogine theorem [33].

Secondary parental inherited part of Basic Internal Energy (U_{basic}) store energy for development an organism during its life. Both parts of Basic stem cells are situated in Central nervous system as nervous cells (neurons) (Figure 2).

Basic Internal Energy (U_{basic}) realizes Central nervous system's Highest level regulation mechanism maintenance stability Internal Energy of an organism via expending stored electric energy and stimulating both high level regulation and low level regulation mechanism maintenance stability Internal Energy of an organism [2,3] (Figure 2).

Depending on metabolic biochemical processes in tissue, each tissue has special extracellular chemical potential ($\mu_{extra\ cell}$) which induce charges on external cellular membranes of tissue's cells walls. Internal cellular membranes of tissue's cells walls are charged due to inducing by cytoplasmic basophilic chemical potentials ($\mu_{cytoplsm}$).

Thus there are formed cellular capacitors of tissues' cells which relative resonance waves with tissue chemical potentials determine tissues' mechanisms maintenance stability Internal Energy of tissue. Just cytoplasmic basophilic chemical potentials of Central nervous System's cells (neurons) and also named Basic stem cells form electric charges on cellular inner membranes. Central nervous system neurons build nerve fibers with neurotransmitter receptors in each tissue.

Thus neurotransmitter receptors present cytoplasmic chemical potentials of neurons ($\mu_{neurotrans\ receptor}$), and tissue cells' membrane receptors proteins are charged due to being induced by neurotransmitter receptors' chemical potentials. Just there are such membrane receptor proteins of neurotransmitter receptors: heat-sensitive membrane, photo-sensitive membrane, osmo-sensitive membrane, mechano-sesitive membrane, chemo-sensitive membrane, pain-sensitive membrane.

Mutual influences between three activities as relative resonance waves of cellular capacitors tissue's cells, neurotransmitter receptors' charges with various sensitive membranes and tissue's chemical potential determine mechanism maintenance stability Internal Energy of tissues (e.g. skin, connective tissue, muscular tissue, neuroglia etc.).

Besides the charged nervotransmitter receptors of Basic stem cells (neurons) transmit energy of electric charge sharing it through the sequence of the other pluripotent stem cells and then to various cells types. Basic stem cells supply next generations of stem cells with energy from Basic Internal Energy (U_{basic}) which expends this energy during life of an organism (Figure 1). Moreover Basic stem cells retain Basic Internal Energy (U_{basic}) in genes of its chromosomes displaying specific human capabilities, i.e. memory, musical talents, artistic talents, mathematical talents, scientific talents, constructor talents and the other gifts.

These parts of Basic internal Energy (U_{basic}) are inherited capabilities from mother's and father's chromosomes. Also Basic stem cells (neurons) are divided very rarely as compared with the other stem cells due to defining aging of an organism. Basic stem cells expend the stored energy as for development of an aging organism as well as for development of all cells considering terms of each cell's life, i.e. cellular cycle, apoptosis, autophagy etc., as compared to the other stem cells which expend their substances and energy for only advance cells types of various tissues [34-39]. Just the ageing processes during life of an organism expend some Basic Internal Energy (U_{basic}) from Basic stem cells exerting cellular internal Works ($W_{int\ cell}$) via expression some cellular metabolic processes with inflow and excretion substances in order to maintenance stability cellular Internal Energy as stable basophilic cytoplasm's chemical potentials via cells staining as well as stable Internal Energy of an organism (Figure 1) [1]. Just this expending Basic Internal Energy (U_{basic}) induces the change of an organism's state from babyhood and childhood to old age in processes of an organism's ageing. On the other hand, the Basic stem cells, as the store of energy, are some replenished with the energy by inflow energy with food products through gastrointestinal tract of the "Initial Level of metabolism" (Figure 3).

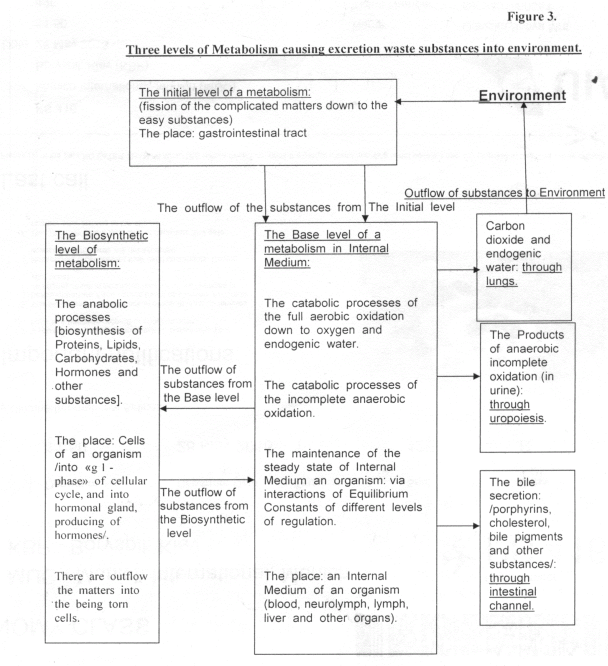

Figure 3: Levels metabolism for excretion waste substances.

Moreover the Basic stem cells are some replenished with the energy due to accepting some solar ray's quanta energy. Just long-lived persons live considerably more among mountain dwellers than among dwellers of flat ground because solar rays are considerably more in mountain than in flat ground. Therefore the Basic stem cells retain more Basic Internal Energy in mountain than in flat ground. However the replenishing energy of the Basic stem cells occurs in different ages of an organism differently reflecting aging of an organism. The Totipotent or omnipotent stem cells are the next step differentiation of stem cells after Basic stem cells. Totipotent or omnipotent stem cells induce initial development all cells of an organism. However Totipotent or omnipotent stem cells operate differently in male organism and in female organism, e.g. in female organism Totipotent or omnipotent stem cells differentiate initial cells into embryonic and extra embryonic cell types as well as initial cells of female secondary sexual characters; in male organism Totipotent or omnipotent stem cells differentiate initial cells of male secondary sexual characters. Also Totipotent or omnipotent stem cells are divided considerably rarer than next stem cells. Next sequence differentiated generations of stem cells are Pluripotent stem cells, Multipotent stem cells, Oligopotent stem cells and Unipotent stem cells which bring differentiations of stem cells nearer to differentiations of specific cells types certain tissues of an organism.

Babyhood and childhood from 0 to 3 years

Organisms in babyhood and childhood begin their life's from full 100% Basic Internal Energy (U_{basic}) [d/dt ($\Sigma J_k X_k$)]. Basic Internal Energy (Ubasic) is distributed into Basic stem cells (neurons) and all Pluripotent stem cells. Basic stem cells expend very gradually Basic Internal Energy (U_{basic}) sharing expended energy into Totipotent stem cells, Pluripotent stem cells, Multipotent stem cells, Oligopotent stem cells and Unipotent stem cells which share obtained energy into specialized cells types in various tissues, e.g. osseous tissues, connective tissues, muscular tissues, glandular tissues, blood cells types etc.. The Basic Internal Energy (U_{basic}) [d/dt ($\Sigma J_k X_k$)] expends some energy for G_0, G1/S, G2, M phases of cellular cycles displaying proliferative processes which occur mainly through anabolic processes of Force expression [$\Sigma J_k dX_k/dt$]. This expenditure some Basic Internal Energy (U_{basic}) is recompensed by energy of gone into substances via food energy [$\Sigma X_k dJ_k/dt$]. The inflow substances and outflow waste substances into environment maintain stability Internal Energy of an organism according first law of thermodynamics [2,3,6,9,10] (Figure 3). Besides the inflow energy of substances via food energy recompenses also expended Basic Internal Energy (U_{basic}) for various cells types that exerts various types of cells' external works ($W_{cell\ ext\ work}$) inducing an organism's internal works ($W_{org\ int\ work}$), i.e. heart work, lung work and other organs works. Also useful expenditure some energy of various cells types causes expression cellular cycles via G_0, G1/S, G2, M phases cellular cycle resulting in intensive growths as tissues of an organism as well as an organism in babyhood and childhood (Figure 1). Just expressions proliferative processes in all cells types and intensive growth an organism and its tissues are characterized positive fluctuation entropy ($+\Delta_x\beta$) and ascending line of babyhood and childhood graph (Figure 1). The inflow energy of food substances is enough for growth of both small infantile and childish organisms as well as for these organisms internal Works ($W_{org\ int\ work}$) which exert heart work, lung work and other organs works of a small infantile and childish organism. Also the inflow energy of food substances is enough for these organisms' external Works ($W_{org\ ext\ work}$) displaying expressions of mental recognizing and getting to know activity (native language, parents' views. relatives' views, surrounding conditions etc.), great motion muscular activity and the other activities. The some interactions between neurons (Basic stem cells) occur via their relative resonance waves due to operations of their cellular capacitors. The local connections of relative resonance waves form local maintenance stability Internal Energy of Central Neural System cerebral tissue. The mental recognizing and getting to know activity accept information from surroundings into neurons of Central Nervous System through external oscillations of quanta different waves [sound waves, reflected solar ray's waves, mechanical waves, airwaves etc.]. These quanta different waves intrude into links of joined cellular relative resonance waves causing certain rearrangements of local Internal Energy leading to the new higher level maintenance stability local Internal Energy of Central Nervous System cerebral tissue. So it occurs the biophysical mechanism of mental recognizing and getting to know activity of infantile and childish persons. Almost 100% Basic Internal Energy (U_{basic}) into Basic stem cells (neurons) remains via activity of infantile small organisms in first month of babyhood (Figure 1). But some Basic Internal Energy (U_{basic}) from Basic stem cells (neurons) are expended by metabolic processes with cellular proliferative processes and activity of infantile small organism in first year of babyhood. Also few energy of Basic Internal Energy (U_{basic}) from Basic stem cells (neurons) are expended by metabolic processes with cellular proliferative processes and activity of childish small organism in second year and in third year of childhood (Figure 1). Expression metabolic processes with cellular proliferative processes lead as to growth all tissue of an organism and an organism as well as growth and progressing immune and hormonal tissues. The inherited from parents' genomics produce hormonal tissues which progress under subjecting as to solar rays of fusion quanta waves, inducing synthetic processes, as well as to oxidative influences of Environment. The mechanisms operation of hormones are the links as Ligands of interactions with corresponding receptors of corresponding cells causing productions different Factors as links of some cellular biophysical and biochemical processes, e.g. m-CSF, G-CSF, EGF, FgFs,BNPs, GDF9, HGF, IGF-1, IGF-2, NGF, TCGF, TPO and so on. The inherited from parents' genomics produce insufficient immune system which is improved and modernized under persistently changed influences of Surroundings (viruses, bacteria etc.). Just each some few expenditure of Basic Internal Energy (U_{basic}) from Basic stem cells (neurons) causes the negative fluctuations entropy ($-d_x\beta$) resulting in small shifts Stationary State of infantile and childish organisms into new Stationary State of infantile and childish organisms according Glansdorff and Prigogine theory (Figure 1) [1]. Besides Basic stem cells expend some Basic Internal Energy (U_{basic}) sharing into Totipotent stem cells, Pluripotent stem cells, Multipotent stem cells, Oligopotent stem cells, Unipotent stem cells and then into specialized cells types in various tissues. Nuclear genome of infantile organism's cells has obtained genes from mother's chromosomes and father's chromosomes which produce enzymes for synthesis ergosterol or Provitamin D3 [7-dehydrocholesterol]. Also the direct influences on eukaryotic organisms of solar rays' fusion quanta energy induce photosynthesis of producing active Vitamin D_2. Just solar UV radiation transforms Provitamin D_3 [7-dehydrocholesterol] into Vitamin D_3 or cholecalciferol. Then cholecalciferol (Vitamin D_3) is transformed into Vitamin D_2 in liver. Thus direct positive influences of solar radial energy save the infantile organism from serious illness-rachitis. Also using cod-liver oil save infantile organism from rickets because positive influences solar UV radiation on eukaryotic cods' organisms induce forming Vitamin D_2. However solar radial fusion quanta energy generates some harmful prokaryotic organisms as some bacteria and

viruses. But infantile and childish organisms did not receive from the parents' inherited defensive mechanisms against these bacteria and viruses which induce childish infections [rubeola, scarlatina, pertussis, child's poliomyelitis etc.]. Affecting infantile and childish organisms by these childish infections don't react with activity of free blood cells-phagocytes on intruding the childish infectious agents. Therefore the inoculation of child with vaccine of killed or broken causative agent of the childish infection exert local connective tissue's cellular mechanism maintenance local stability Internal Energy via reaction cellular capacitors' resonance waves on causative agents as strange objects. The reaction of local cellular mechanism maintenance stability Internal Energy spreads to whole organism's cellular mechanism maintenance stability Internal Energy of an organism, i.e. operation of phagocytes. The reactions of cellular capacitors in cell's wall stimulate reactions nuclear capacitors in nuclear envelope which stimulates nuclear DNA for biosynthesis of proteins as immune antibodies against causative agents of childish infection diseases. So it is formed immunity against childish infection diseases by infantile and childish organisms.

A young age from 3 to 14 years and juvenile age from 14 to 18 - 20 years

Organisms in young age and juvenile age continue their lives from some expended Basic Internal Energy (U_{basic}) [d/dt ($\Sigma J_k X_k$)]. The expenditure some Basic Internal Energy (U_{basic}) in young age and juvenile age occur more intensively than in childhood showing increased gain positive fluctuating entropy ($+\Delta_x\beta$) versus negative fluctuating entropy ($-\Delta_x\beta$) that leads to further intense growth of an organism and its tissues (Figure 1). Also the growth of an organism requires supplementary energy for internal Works ($W_{int\ org}$) and external Works ($W_{ext\ org}$) which are required for maintenance stability Internal Energy of an organism (temperature 36.4°C-36.8°C by all enzymes operate and the other indices). The internal Work of an organism ($W_{int\ org}$) exerts heart works, lung works and works of the other organs and tissues. The internal Works of all organs and tissue of an organism ($W_{int\ org}$) promote mechanism maintenance stability Internal Energy of an organism via normal metabolism of an organism forming as balance catabolic anaerobic exergonic processes & catabolic aerobic exergonic processes as well as balance catabolic exergonic processes & anabolic endergonic processes. The external Work of an organism ($W_{ext\ org}$) resists harmful influences of Environment and accepts useful energy from Environment. However the growth of an organism was limited by genetic inheritance and depend on male or female. The genetical inherited energy into the genes bonds of the stem cells [Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells] sharing between cells types were limited for each cell causing increased energy and decreased energy and leading as to expression growth via ($+\Delta_x\beta$) as well as depression growth via ($-\Delta_x\beta$) that determine advance lifetime of each cell (Figure 4) [7,8].

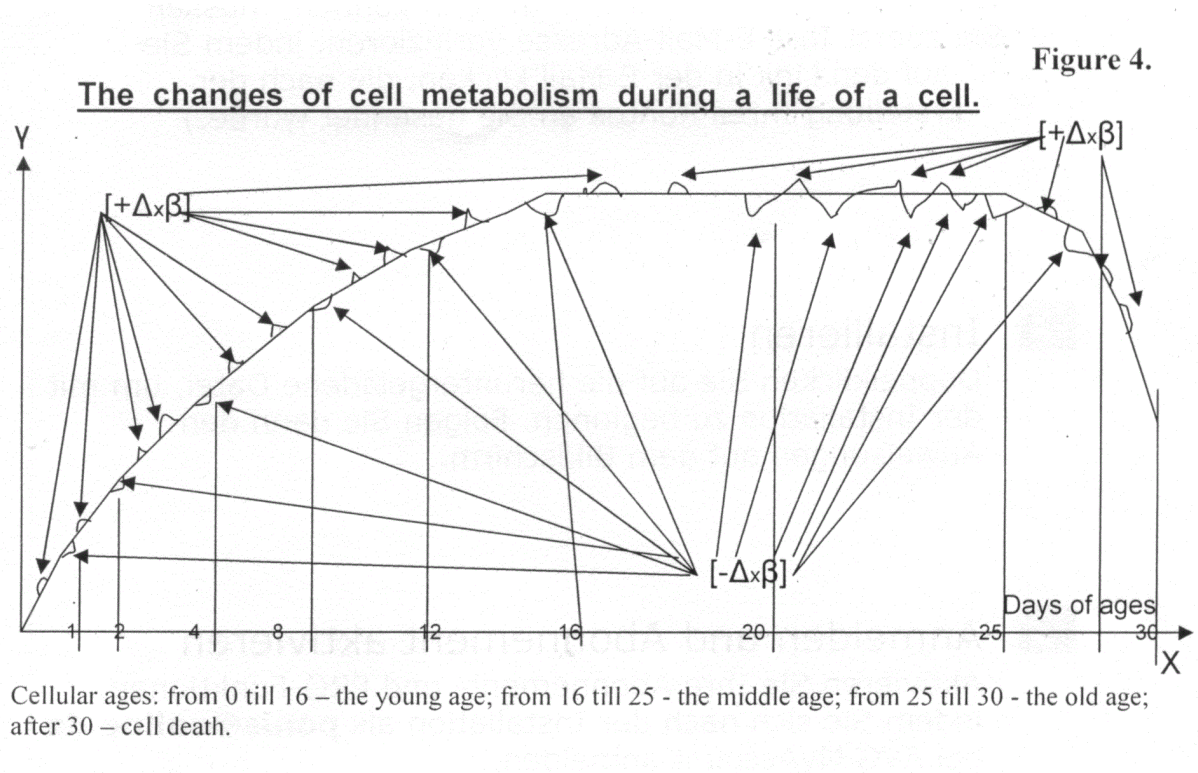

Figure 4: Cell metabolism during cells life.

Such mechanisms are determined an organism's life too. All cells female organism have in their nuclei 22 pair chromosomes and two sex chromosomes X and X for a total of 46 chromosomes. All cells of male organism have in their nuclei 22 pair chromosomes and two sex chromosomes X and Y for a total of 46 chromosomes. Taking into account that X chromosome in 10 times longer than Y chromosome having in 10 times more genes than Y chromosome, all cells types of female organism use considerably more energy in mitotic processes of

M phase cellular cycles for division their cells with two sex chromosomes X and X than use all cells types of male organism in mitotic processes of M phases cellular cycles with two sex chromosomes X and Y.

Therefore the limited energy from stem cells [Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells] for an organism's Growth in female organism remains less energy than remained energy from the limited energy of stem cells for an organism's Growth in male organism. Hence the duration growth of a male's organism is considerably longer than duration growth of a female organism. Therefore men are longer than women because increasing length of female organism comes to a stop or a deceleration at 12-16 years old versus increasing length of male organism comes to a stop or a deceleration at 18-20 years old. Also two sex chromosomes X of female sex glands contain genes generating mechanism production female sex hormones which are the links of the mechanisms forming female secondary sex characters. The sex chromosomes Y (one from the two sex chromosomes X and Y) of male sex glands contain genes generating mechanism production male sex hormones which are the links of the mechanisms forming male secondary sexual characters. Furthermore the stop or deceleration growth of both female organism and male organism due to partial exhausted the limited energy from stem cells leads to a stop or a deceleration growth of an organism's organs including sex organs. Besides stop or deceleration growth both female organism's sex organs and male female organism's sex organs due to partial exhausted the limited energy from stem cells switch over the remained rest limited energy from stem cells for exertion sex glands operation generating mechanism production supplementary sex hormones which stimulate as links of mechanisms diploid cellular cycles of male testicles cells as well as links of mechanisms diploid cellular cycles of female ovary cells.

Gametogenesis

There are sequence processes in Gametogenesis:

- Gametocytogenesis occurs via Mitosis in such mode: Sex cell having diploid nucleus (22 pair chromosomes and two sex chromosomes for total 46 chromosomes) is divided via mitosis forming two sister cells having diploid nuclei (23×2 chromosomes for total 46 chromosomes) which are named gametogonia.
- Gametogenesis occurs via Meiosis I in such mode: Each gametogonium having diploid nucleus (23×2 chromosomes for total 46 chromosomes) is divided via meiosis I forming two cells having diploid nuclei (23×2 chromosomes for total 46 chromosomes) which are named primary gametocytes.
- Further Gametogenesis occurs via Meiosis II in such mode: Each primary gametocyte having diploid nucleus (23×2 chromosomes for total 46 chromosomes) is split up and divided via meiosis II forming four cells each of them having haploid nuclei (only 23 chromosomes) which are named secondary gametocytes.
- Further Gametogenesis occurs via continuation of Meiosis II in such mode: Each secondary gametocyte having haploid nucleus (only 23 chromosomes) continues development karuogenesis and citogenesis and transforms in the beginning into gametid having haploid nucleus (only 23 chromosomes) and then into gamete having haploid nucleus (only 23 chromosomes). In meiosis, the chromosomes duplicate during interphase (G1, S, G2 phases), and homologous chromosomes exchange genetic information during the first division, called meiosis I. Then the daughter cells divide again in meiosis II, splitting up sister chromatids to form haploid gametes. Thus development sex cells with diploid cellular cycles in condition insufficiency of energy inflow lead to degradation of the mitotic processes of M phase cellular cycle which require great quantity energy. Degradation of the mitotic processes of M phase diploid cellular cycle having 22 pair chromosomes with two sex chromosomes [either X and Y in male cells, or two X in female cells] for a total of 46 chromosomes results in switching over diploid cellular cycles with mitotic processes of M phase cellular cycle into haploid cellular cycles having 23 chromosomes including either X chromosome or Y chromosome and requiring considering less energy. Thus degradation of the mitotic processes [M phase cellular cycle] generate sex gametes showing haploid cellular cycle with meiosis processes. Just each one chromosome has fewer genes in chromatid than two chromosomes. The gene bonds are the carriers of the energy, obtained from an organism. Hence using only 23 chromosomes, haploid cellular cycle consume less obtained from an organism energy than diploid cellular cycle which use 46 chromosomes. Such haploid cellular cycle generates as male gametes, named sperms or spermatozoa, as well as female gametes, named ova. Therefore Gametogenesis begins simultaneously with the stop or deceleration growth of both a male organism at 18-20 year old and a female organism at 12-16 year old, i.e. male puberty come at 18-20 year old, and female puberty come at 12-16 year old.

Middle age from 20 to 30 years and full age from 30 to 55 years

Organisms in middle age and full age continue to use Basic Internal Energy (U_{basic}) [$d/dt\ (\Sigma J_k X_k)$]. However the expenditure Basic Internal Energy (U_{basic}) occurs in middle age and in full age of an organisms' life differently. The Basic Internal Energy (U_{basic}) in middle age of an organism's life expends considerably more energy for metabolic processes and sex life than in full age of an organism's life showing more intensive increased gain positive fluctuating entropy ($+\Delta_x\beta$) in middle age of an organism's life than in full age of an organsm's life (Figure 1). Such expenditure Basic Internal Energy (U_{basic}) in middle age of an organism's life leads to intensive activity of metabolism inducing expression of immune and hormonal systems in an organism and its tissues that shows increased gain positive fluctuating entropy ($+\Delta_x\beta$) (Figure 1). The expenditure Basic Internal Energy ($U_{basic)}$ in full age of an organism's life is decreased and is equilibrated with inflow energy from Environment resulting in some decreased activity immune and hormonal systems that shows transiting ascending graph of an organism's metabolism into linear graph of an urganism's metabolism (Figure 1 and Figure 2).

The expenditure Basic Internal Energy (U_{basic}) in middle age of an organism's life stimulates intensive sex life which causes some suppression proliferative processes in tissues' cells of an organism due to stop growth of an organism's tissues and an organism. Just stop growth of an organism's tissues via some suppression diploid cellular cycles of all cells of an organism preserve great quantity energy obtained from an organism's stem cells [Basic stem cells → stem cells → stem cells → stem cells → stem]. These preserved energy is used for the generation of younger generation. Thus diploid cellular cycle generates cells via consumption great quantity energy which build new compound organized perfective organisms.

The mechanisms ovum impregnation, foetus growth and born organism

Preserving limited enegy obtained from stem cells [Basic stem cells → stem cells → stem cells → stem cells → stem], gametogenesis generates sex gametes via switch over diploid cellular cycles of sex cells into haploid cellular cycles of sex gametes. Male gametes (sperms) and female gametes (ova) have different chemical potentials in their cytoplasms due to chromosome Y in sperm's nucleus and chromosoma X in ovum's nucleus, i.e. chemical potential of sperm's nucleus is marked as μy and chemical potentional of ovum's nucleus is marked as μ_x.

Chemical potential of sperm's nucleus [μ_y] and chemical potentional of ovum's nucleus [μ_x] induce different charges on inner membrane of sperm's wall and inner membrane of ovum's wall. However outer medium of both sperm's wall and ovum wall is general medium having general chemical potential [μ_{medium}] which induce identical charges on outer membrane of sperm's wall and outer membrane of ovum's wall. Just the charges on inner cellular membrane and outer cellular membrane determine capacitance of cellular capacitor [6].

Male gametes (sperms) and female gametes (ova) have sperm's cellular capacitors and ovum's cellular capacitors. According to the equation of the method calculation molecular orbitals - a linear combination of atomic orbitals (MO LCAO), the wave functions molecules of both chromosomes X and Y are determined as the total wave functions of the nuclear DNA molecular orbitals, via multiplied by the appropriating weight coefficients: Ψ=c1φ1+c2φ2+… cnφn. (Ψ-Wave function of DNA molecule, φ-wave functions of the nuclear DNA molecular orbitals, c-the appropriating weight coefficients) [6]. Thus sperm's cellular capacitors and ovum's cellular capacitors have related resonance waves in spite of forming by different chemical potentials of their cytoplasm [μ_y and μ_x]. Therefore just different waves' functions of substances chromosome Y and chromosome X cause mutual attraction sperms to DNA of ova' chromosome X and ova to DNA of sperms' chromosome Y (Figure 5) [6-8]. Thus it happen impregnation ovum by sperm forming in one nucleus two different genetic materials, i.e. two sex chromosomes [X and Y] with different genomes as well as 22 pair chromosomes with different genomes. Thus two haploid sex nuclei are fused in one cell which contains coupled two halves of limited energy obtained from stem cells [Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem]. The further development occurs via Meiosis which is operated into Meiosis I and Meiosis II. Both Meiosis I and Meiosis II are shown further divided cell through Kariokinesis I and Cytokinesis I as well as through Kariokinesis II and Cytokinesis II respectively. In the beginning Meiosis I is shared into Prophase I, Metaphase I, Anaphase I, Telophase I then Meiosis II is shared into Prophase II, Metaphase II, Anaphase II, Telophase II, versus Mitosis which is shared into Prophase, Prometaphase, Metaphase, Anaphase, Telophase.

During prophase I of Meiosis I, homologous chromosomes are paired and exchange with genes of DNA (homologous recombination). It results in chromosomal crossover. This process is critical for pairing between homologous chromosomes and hence for accurate segregation of the chromosomes at the first meiosis division. The new combinations of DNA created during crossover are a significant source of genetic variation, and result in new combinations of alleles, which may be beneficial.

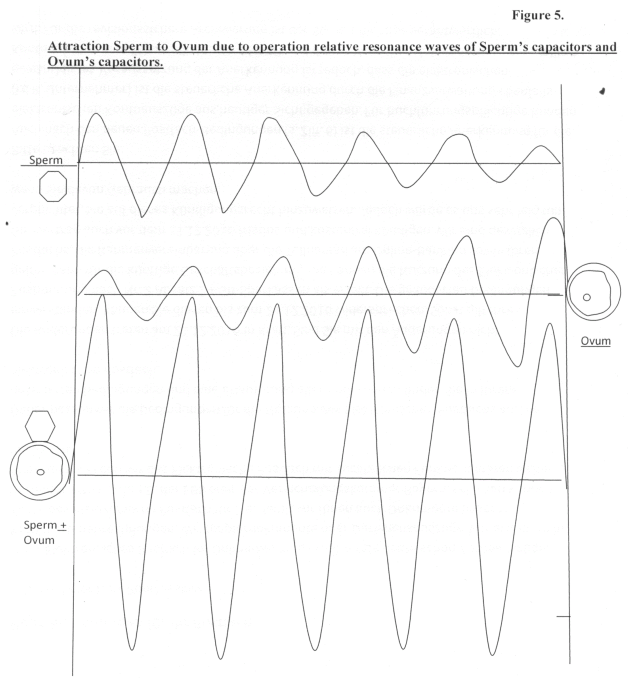

Figure 5: Attraction sperm to ovum due to resonance waves.

Then Meiosis I segregates homologous chromosomes, which are joined as tetrads (2n, 4c), producing two haploid cells from one haploid cell in which each cell contain chromatid, i.e. results in two haploid cells having half the number of chromosomes as well as the parent sex cell (gamete). But non-homologous chromosome Y and chromosome X remain as un-joined chromosomes although in prophase of Meiosis I, it happen primary rearrangement genomic organization in chromatids of chromosome X and chromosome Y. However this primary rearrangement genomic organization is insufficient in Meiosis I, and formed two haploid cells has half the number of chromosomes including nonhomologous either chromosome Y or chromosome X. Therefore Meiosis I is referred as reducted division. During prophase II of Meiosis II, also homologous chromosomes are paired and exchange DNA (homologous recombination). It results in chromosomal crossover. Also during Meiosis II, the cohesion between sister chromatids is released and they segregate from one another, as well as during mitosis. Just Meiosis II is an equational division analogous to mitosis, in which the sister chromatids are segregated, creating four haploid daughter cells (1n, 1c) [34-39]. However in prophase of Meiosis II, it happen repeated rearrangement genomic organization of chromosome X and chromosome Y which transform nonhomologous chromosome Y and chromosome X into two homologous chromosomes. Therefore twofold rearrangement genomic organization in chromatids of chromosome X and chromosome Y in Meiosis I and Meiosis II forms two haploid cells having half the number of homologous chromosomes, as well as during mitosis. The next steps after Meiosis II of development of these haploid cells are further advance of Cytokinesis via receiving supplementary energy from mother stem cells that exerts kariokinesis mechanisms causing transition haploid cells into diploid cells named Zygotes. Maybe Zygotes are the initial cells of Basic stem cells which

preserve stores Basic Internal Energy of expectant organism. Just Zygotes has diploid cellular cycle which leads to forming multicellular human organism via sequence stem cells: Basic stem cells, Totipotent stem cells, Pluripotent stem cells, Multipotent stem cells, Oligopotent stem cells, Unipotent stem cells. Thus Meiosis I and Meiosis II preserve some energy obtained from stem cells [Basic stem cells → Totipotent stem cells → Pluripotent stem cells → Multipotent stem cells → Oligopotent stem cells → Unipotent stem cells]. Then Meiosis II transits into Mitosis receiving supplementary energy from stem cells of mother organism.

Elderly age from 55 years to 70 years and old age more than 70 years

During elderly years, also a little energy is expended from remained stored energy of Basic Internal Energy of an organism. The quantity expenditure energy from Basic Internal Energy (U_{basic}) in elderly age of an organism's life is decreased and is equilibrated with inflow energy from Environment resulting in considerably decreased activity immune and hormonal systems showing alternations increased gain positive fluctuation entropy ($+\Delta_x\beta$) with increased gain negative fluctuation entropy ($-\Delta_x\beta$) into linear graph of an organism's metabolism (Figure 1 and Figure 2). The violation metabolic processes due to insufficiency energy display decreased both catabolic processes and anabolic processes resulting in violation of essential organs works as heart, lungs, liver, kidneys etc. The violation of essential organs works lead to violation excretion waste products of metabolic processes via oxidative decompositions that result in cholesterol sediments in aorta as atherosclerosis plaques. Also the violation of essential organs works leads to violation cellular capacitors operation that result in violation phagocytosis, autophagy and the other immune and defensive mechanisms of an organism. Thus the organism in elderly age is subjected to various diseases. The some energy is expended for sexual activity of an organism in elderly age. Taking into account that X chromosome in 10 times longer than Y chromosome having in 10 times more genes than Y chromosome, during life of a female organism and especially during puberty years from 14 years to 60 years, all cells types of a female organism use considerably more energy in mitotic processes of M phase cellular cycles for division their cells with two sex chromosomes X and X than during similar period use all cells types of male organism having in mitotic processes of M phases cellular cycles two sex chromosomes X and Y. Thus the limited energy from stem cells [Basic stem cells → stem cells → stem cells → stem cells → stem → Unipotent stem cells] for sex organs operation in a female organism remains less energy than remained energy from the limited energy of stem cells for sex organs operation in male organism. Therefore sexual activity of female organisms finishes approximately from 55 years to 60 years as compared to male organism which sexual activity finishes approximately from 60 years to 70 years. Such cessation sexual activity of a female organism is named menopause or climacteric female. Simultaneously with cessation sexual activity, there occur decrease production sex hormones in female organism because production sex hormones require a lot of energy too.

At old age of an organism, very little energy of the limited energy from stem cells [Basic stem cells → stem cells → stem cells → stem cells → stem → Unipotent stem cells] remains that leads as to critical violation metabolic processes as well as to critical decreased activity immune and hormonal systems showing great increased gain negative fluctuation entropy ($-\Delta_x\beta$) which turns over line into descending direction of life's graph [1,9,10].

Discussion

Investigating role stem cells in productions different cells types, the driving mechanisms sharing functions between Basic stem cells, stem cells, stem cells, stem cells, stem cells and Unipotent stem cells in production different cells types in an organism are remained unclear. Just all stem cells and all cells types have identical structure. However it should consider that only the stored energy from one source can distribute energy between these stem cells exerting driving mechanisms of sequence distribution energy from Basic stem cells into other stem cells stem cells → stem cells → stem cells → stem cells → Unipotent stem cells and then to corresponding cells types. Just Zygote is the diploid cell which obtains energy from mother's organism in order to transforming via Mitotic phase of cellular cycle into two cells called Blastomeres. Then Blastomeres are divided via Mitotic phase of cellular cycle transforming into 16 Blastomeres called Morula. Zygote, Blastomeres and Morula are Proembryo. But Zygote, Blastomeres and Morula are not store of energy which exerts driving mechanism development an organism during its life. Therefore these cells are not Basic stem cells because Basic stem cells store energy for development all cells of an organism and as well as an organism during their lives. Hence only the neurons of Central Nervous System are Basic stem cells which preserve Basic Internal Energy for mechanisms maintenance stability Internal Energy of an organism as well as stability Internal Energy of an organism's cells during their lives according first law of thermodynamics. Just the storing cells with energy, Basic stem cells (neurons) induce sequence division stem cells → stem cells → stem cells → stem cells → Unipotent stem cells and cells types correspondingly.

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

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