Research article

Three layer functional model and energy exchange concept of aging process

Valery Chuprin^{1,*} & William Mihajlovic²

¹2 West End Ave #2W, Brooklyn, NY 11235, USA; ²New York Institute of Technology, 1855 Broadway, New York, NY 10023-7692, USA; *Author for correspondence (e-mail: Vchuprin@yahoo.com; fax: 718-331-0276)

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Abstract

Relying on a certain degree of abstraction, we can propose that no particular distinction exists between animate or living matter and inanimate matter. While focusing attention on some specifics, the dividing line between the two can be drawn. The most apparent distinction is in the level of structural and functional organization with the dissimilar streams of 'energy flow' between the observed entity and the surrounding environment. In essence, living matter is created from inanimate matter which is organized to contain internal intense energy processes and maintain lower intensity energy exchange processes with the environment. Taking internal and external energy processes into account, we contend in this paper that living matter can be referred to as matter of dissipative structure, with this structure assumed to be a common quality of all living creatures and living matter in general. Interruption of internal energy conversion processes and terminating the controlled energy exchange with the environment leads to degeneration of dissipative structure and reduction of the same to inanimate matter, (gas, liquid and/or solid inanimate substances), and ultimately what can be called 'death.' This concept of what we call dissipative nature can be extended from living organisms to social groups of animals, to mankind. An analogy based on the organization of matter provides a basis for a functional model of living entities. The model relies on the parallels among the three central structures of any cell (nucleus, cytoplasm and outer membrane) and the human body (central organs, body fluids along with the connective tissues, and external skin integument). This three-part structural organization may be observed almost universally in nature. It can be observed from the atomic structure to the planetary and intergalactic organizations. This similarity is corroborated by the membrane theory applied to living organisms. According to the energy nature of living matter and the proposed functional model, the decreased integrity of a human body's external envelope membrane is a first cause of the structural degradation and aging of the entire organism. The aging process then progresses externally to internally, as in single cell organisms, suggesting that much of the efforts towards the restoration and maintenance of the mechanisms responsible for structural development should be focused accordingly, on the membrane, i.e., the skin. Numerous reports indicate that all parts of the human body, like: bones, blood with blood vessels, muscles, skin, and so on, have some ability for restoration. Therefore, actual revival of not only aging tissue of the human body's membrane, but the entire human body enclosed within, with all internal organs, might be expected. We assess several aging theories within the context of our model and provide suggestions on how to activate the body's own anti-aging mechanisms and increase longevity. This paper presents some analogies and some distinctions that exist between the living dissipative structure matter and inanimate matter, discusses the aging process and proposes certain aging reversal solutions.

From a fairly common point of view, a typical cell, as fundamental unit of life, contains three main regions:

- plasma membrane,
- cytoplasm, and
- nucleus.

It can be assumed that these three basic cellular structures can be extended to the higher structural living systems whose organization develops from elementary cells, (see Figure 1).

As an example of this extension of structure, a bird's egg and the organism of a bird, it can be seen that despite having over a trillion of cells (over 10^{14}), the structural organization of a living bird can be simplified and shown to be cell-like. Botanist Rene Soheges, in his work "Life of Plants, Kinematics of Life," (Zalmanov 1993) writes: "The egg represents a model cell," (see Figure 2). It is highly improbable that the organism developed from a egg should have a new and very different structural organization. That is, it can be assumed that a developed organism, in a sense, inherits cellular structural organization, extends it to a higher structural level, and exhibits three distinct functional zones:

- external,
- intermediate and
- central.

Empirical observations of the matter of general organization in nature points to the induction based

Figure 2. Bird's egg cross-section.

analogy that may be used as a foundation for a functional model of living and inanimate entities. Starting with the structure and behavior of single-celled organisms as a prototype for dissipative processes, and extending such a prototype to more complex organisms developed from individual cells, we can arrive at a model of the human body as one of the most complex organisms known. Such an extension based model maintains significant correspondence between the observed simplest and the very complex levels representing the organization of living matter. The common quality lies in the parallel structure between the cell's basic three-part structure (with the cell nucleus, cytoplasm, and outer membrane) and the human body (the inner organs, bodily fluids with connective tissue, and external skin integument). One could attempt to extend this three-part structure

Figure 1. The three main regions of a cell.

Figure 3. Human organ internal layered structure.

organization (see Figure 3) to various inanimate entities in nature. In a similar fashion, layered structure can be observed in atoms with subatomic particles, in planets as well as in stellar and intergalactic systems. For example, see the layered structure of the planet Earth shown in Figure 4.

The matter organization appears as a multilevel hierarchy of similar three layered structures in a fractal like manner. As Figures 1–4 illustrate, this structural similarity manifests itself best visually. In addition to visual similarities, living and inanimate matter exhibit additional dynamic similarity at all points of the interface with the surrounding environment. Namely, living and inanimate entities are both exposed to the variety of influence forces from the outside, and both are balancing such forces with the forces from within.

Figure 4. Earth divided into three main regions: a central core, a mantle, and lithosphere.

Assuming that the environmental interface layer in living matter regulates the balance between external and internal forces, and based on the internal and external energy processing nature of living matter, this paper proposes that the decreased integrity of a human body's external membrane is the first cause and could be the dominant cause of internal structural degradation and aging. The aging process progresses from the outside to the inside, as in a single-cell organisms, suggesting that much of the efforts towards the restoration and maintenance of mechanisms responsible for structural development should be focused accordingly, on the body 'wrapper', namely the skin.

Numerous medical research reports indicate that all parts of the human body, e.g., bones, blood with blood vessels, muscles, skin, etc, have abilities of restoration. Therefore, the actual revival of the aging tissues of the human body's 'wrapper', and the body itself may be expected.

Aging theories

Although vast data have been collected on the physiology, biochemistry, morphology and biophysics of aging, and a great number of theories of aging have been put forward, there is not a single one that would be unchallenged. None of these theories unquestionably proves the validity of its model of the aging of a human, nor it extends itself as universal in clarifying the nature of aging mechanisms (Frolkis 1982; Ikeno et al. 1977; Doubal and Klemra 1999; Balin 1994). The relative incompleteness of such theories may be well justified by the following rationalization. As some investigations point out (Smith Sonneborn 1985; Hart and Turturro 1983; Rosen 1978), there is no convincing evidence for the necessity of aging in one-cell organisms at all, and that may be the case even with the multi-cell organisms.

Many aging theories are based on assumption that in the human organism exists a central mechanism for aging, such as:

- free radicals
- oxidative stress
- immunorefectory hypothesis
- a theory of brain regulation
- a theory of errors
- an endocrine theory (Shukitt-Hale 1999; Harman 1992; Academic American Encyclopedia 1998a).

However, all these theories do not explain the most important aspect of the nature of aging, i.e., why different biological species and even different systems within the same organism exhibit various rates of aging (Voitenko and Polyukhov 1986; Hadshiew et al. 1999).

A concept of a 'life clock' has been introduced by some authors (Robinson 1979; Ewbank et al. 1979; Lakowski and Hekimi 1996), to explain the termination of existence of the single-cell organism. In such a theory, the cause of degeneration or aging of a single-cell organism is the 'biological clock' inherent in the cell nucleus, and such a mechanism determines in advance the life span of a cell. According to this general idea, aging is intrinsic to all cells, to their nucleus and their genes. Only a secondary role was attributed to the cell integument (Zg-Nahy 1979).

While the nucleus and cytoplasm are seen as playing a primary role in the mechanism of the life-supporting infrastructure of a cell, the environment-cell interface and energy exchange processes occurring within the cell membrane are mostly neglected (Pier 1997). The work of L. Hayflick, supports the 'clock' theory (Hayflick and Moorhead 1961). L. Hayflick has shown that a cell has a limited number of divisions, equal to the so-called 'Hayflick's Limit.' However, L. Franks and others (Loo et al. 1987; Nooden and Tompson 1995; Frolkis 1988a), have shown that the number of cell divisions can be considerably greater than that stipulated by the 'Hayflick Limit,' having practically no limit at all.

Not very widely known experiments carried out by L. Woodruff and S. I. Metalnikov in 1917, showed that thousands of consequent generations of a single-cell organism were obtained by transferring every new generation of the initial cell into a fresh nutrient solution (Frolkis 1988a). During the experiments performed, none of the cells observed showed any degeneration whatsoever. The cells were divided normally in compliance with their intrinsic program. Numerous experiments were carried out for decades, until final artificial interruption. No appearance of dead cell 'corpses' were ever detected. Based on these observations, L. Woodruff concluded that aging is not a major property of living matter, i.e., that there are no mechanisms of aging in the cell organism itself, but aging could be caused by hostile 'poisoned' cell surrounding medium. According to Woodruff, this poisoning results in the blocking of physiological functions of the membrane, which in

turn leads to disfunction of the cell's inner system. In the end, the successive generations would fail, and at some moment cell division would cease (Frolkis 1988a). A few years before 1912, A. Carrel drew similar conclusion about possibility of the permanent life of the cell tissue (Carrel 1912).

Of principal importance here is the fact that prolonged existence of a cell is not necessarily accompanied by accumulation of errors that result in considerable deviation from the original genetic structure and material. Due to a genome's possessing the capability of self-repair, under appropriate conditions, with minor cell damage, the cell may maintain itself indefinitely (Hadshiew et al. 1999; Wei et al. 1993).

V. Frolkis (1988a) states that deprivation of oxygen, due to pollution of the surrounding medium of the cell by its metabolic by-products, leads to energy deprivation of a cell, leading to blocking of its protein-related, fat and hydrocarbon metabolic processes, negatively influencing cell functions and cell structure. In such situations, degeneration in consecutive cell generations then takes place, and the harmonious interaction of the 'organism-nutrient' system is disrupted.

Thus, the work of L. Woodruff, S. I. Metalnikov, L. Franks and V. V. Frolkis counter the aforementioned 'clock' theory as questionable. According to these authors, special inner programs and mechanisms of self-destruction are simply unnecessary. The environment (surrounding medium) is rather aggressive toward all material formations, and toward living creatures as well, constantly exerting destructive influence upon them. Therefore, it may be reasonable to assume that the causes of destruction of an organism is not driven by some inner mechanisms, but are the result of a destructive interaction between the 'living organism' and the 'nutrient medium,' as manifested at the boundary (interface) of such an interaction.

Both the free radical hypotheses of human aging (Miquel and Fleming 1986), and oxidative stress hypotheses (Yu and Yang 1996) stress that deprivation of oxygen in cells is caused by the natural-oxidative or energy processes (Shigenaga et al. 1994; Reiter 1997) as an aging mechanism. In light of this, the deprivation of oxygen in each cell of any complex organism may be seen as a major aging factor.

Such aging theories maintain that "Oxidation is one of the most important modifications relevant to

aging because of its ubiquitous effect,” (Shigenaga et al. 1994; Goto and Nakamura 1997).

Our work presents a general functional model of living organism and its aging based on entropy law applied to the human organism. According to the presented model, human organisms age and deteriorate due to destructive processes in outer membranes, mainly caused by the oxidative processes. To describe the functional model of the human body and related aging processes, the model of a single-cell organism has been chosen as a parallel prototype. Degradation of vital functions and structure of the skin in living organism point to the dominant cause of aging of the organism. The proposed age reversal method in this context is directed at the skin lining and via skin of the entire organism.

Energy nature of aging

As mentioned earlier (Yu and Kharlamov 1968), the levels of structural organization and flow of energy divide living and inanimate matter (see Figure 5).

The laws of thermodynamics define energy flow on a very high level of generality. As the most pertinent to the basic tenets of this article, we focus here in particular at the Bioenergetics and Thermodynamic laws (de Duve 1984).

The main practical function of energetics (originally named thermodynamics because it was developed to explain the relationship between the thermal heat, and dynamic energies), is to put different forms of energy and related energy transducers into certain quantitative terms and allow measurement of free-energy gains and losses for various kinds of work and various kind of conversion. Bioenergetics provides this explanation for living organisms, which obey exactly the same laws as do inanimate objects (de Duve 1984).

In the first law of thermodynamics, energy transfers across system boundaries are classified as either

work or heat transfers, and the energy of the system itself may change in a process that progresses from one state to another. There is nothing in this analysis about reversibility of such a process, i.e., changing the energy flows in the opposite direction. The first law concerns the conservation of energy, not the direction in which energy processes may proceed (David 2000).

The direction of processes is the subject of the Second Law of thermodynamics, which ultimately states that every process that thermodynamic system may undergo can go in one direction only and that the opposite processes, in which both the system and its surroundings will be returned to their original states, is impossible. The second law applies to every type of natural process; physical, chemical, biological, etc. (Prigogin 2003).

The Second Law of thermodynamics, sometimes referred to as “the Law of degradation of energy and degradation of matter” (de Duve 1984), is often discussed in abstract terms, but it has very specific consequences. The proposed energy concept of aging, in this context, is based on the fundamental law of nature – the Second Law of Thermodynamics, which could be summarized in a following manner: “Energy strives to dissipate, and matter strives to disorganize” (Atkins 1994).

As a result of energy dissipation, degradation, disintegration, decomposition and aging are in the realm of the Second Law of Thermodynamics. The Second Law applies to all natural processes (Thermodynamics). The application of thermodynamics in biology has a long history, rich in confusion (Horowitz 1992). For instance, some researchers state that life violates the Second Law of Thermodynamics (Klyce). This is not the case; we know of nothing in universe that violates that law.

Due to the characteristic energy exchange organization by which living organic nature is distinguished from inorganic matter, it has been observed that living matter has dissipative structure, i.e., the living matter exhibits the higher level of organization of its component elements (Atkins 1994). The dissipative structure is formed and maintained at the necessary functional level through continuous energy flow. As soon as such energy flows are hindered, blocked, or cease, the overall structure begins to fall apart. The concept and the phenomenon of a dissipative structure has become an extremely useful concept when trying to explain how the living world functions. It

Figure 5. Degrees of matter organization in nature.

appears that global entities such as mankind, life or biosphere (David 2000), follow principles similar to those seen in a single cell or living being.

Living organisms are open systems, traversed by fluxes of matter and energy. An open system is one that exchanges both matter and energy with its outside environment (de Duve 1984).

As the open system structure sustains constant resistance, negative interaction from the surrounding medium, the structure-forming mechanisms, upon reaching their functional peak, begin to weaken and fade. Weakening of functional properties leads to acceleration of disorganization and degradation. This process may be called aging of living formation, with the terminal consequent stoppage of all living processes and complete disintegration of the dissipative structure into its constituent elements. This process can be explained by the second law of thermodynamics, 'Second Law of Degradation' or 'The Law of Aging'.

Contrary to the 'internal clock' model and its inadequate conclusions, negative external influences can be affected significantly (Mitchel and Karentz 1993; Gilchrest and Bohr 1997). The energy concept eliminates the question of predestination of aging as a programmed process of quantitative and qualitative changes occurring regularly within the generic apparatus and controlled by genes (Woodbury and Manton 1983; Human Body 1994).

Given the assumption that the cause of aging in living organisms is the natural fading of energy processes (which initially have created a dissipative (live) structure out of the environmental matter), and knowing that outer regions in living creatures start deteriorating or aging first, may allow for application of certain counter influences. Aging impeding and opposing influence may trigger internal regenerating mechanisms. References (Frolkis and Muradyan 1992; Gilchrest and Bohr 1997) refer to such mechanisms as the Vitauktas mechanisms.

Assuming that nature is simple and universal in its essence, we can attempt to find an answer to the challenge of aging opposing influences by studying simple organizations, both liquid and solid. Only a few laws generally govern the behavior of all complex natural systems – gas, liquid, solid, as well as dissipative systems (see Figure 5). The most vital one is the Second Law of Thermodynamics. It states that energy strives towards dissipation, from hot to cold, leading an order towards a chaos. This implies that all natural processes are accompanied by an

Figure 6. Eroded metal surface.

increase in entropy. In other words, once created, the material entities are subject to constant destructive actions of the environment. The first area exposed to the destructive environmental forces would be the outer layer of the material formation, which is usually in direct contact with the environment. Dissipative creatures (living organisms) as natural formations cannot be exceptions. It is not surprising that mixing entropy and biology still fosters confusion. The confusion may be eradicated if we recognize that earth's biological system is open to organizing input from outside (Klyce). Thus, with age degradation, the outer structure will be degraded first (see Figures 6 and 7).

One may turn for confirmation of the above to the nature of dissipative formations. We will use a single-cell organism as a model since a single-cell organism represents a basic organizational unit of

Figure 7. A layer of dead human skin cells.

living nature. During the lifetime of a single-cell organism, the number of its divisions also depends on the surrounding medium (Zg-Nahy 1979). Under natural conditions, the cell is subjected to destructive forces with time. But, under artificial conditions, with renovation of nutrient medium, one may bring about a stimulating effect on the integument, and so extend the organism functions for an indefinite period of time without any signs of degradation (Frolkis 1988a; Carrel 1912).

Accordingly, with age, degenerative changes appear in the skin integument. Flaccidness and flabbiness of the skin structures develop, the supply of blood to the skin decreases, the color of the skin grows dull, and the metabolic and protective functions of the skin diminish. Natural destruction of outer structures of the living formation occurs.

The fact that age degradation of the structures and functions of the human skin integument occurs at a greater rate than that of the internal structures has been confirmed experimentally. Numerous autopsies of the deceased have shown that structure of internal organisms was degraded by aging to a lesser degree. Following this observation, one may state that, it is easier to estimate the age of a person by his/her degradation of skin, rather than by degradation of internal organs, which apparently age more slowly (Frolkis 1988a; Chuprin and Mihajlovic 2003). By preventing skin neglect, an aging person can physically enhance its vital functions and become stronger, even more vital than in the past younger age. However, if left unattended, the epidermis and the layers below will most definitely slowly degrade in its functionality and structure.

According to the given energy concept, processes of degradation first appear and develop in the human skin integument, then lead to natural aging of the whole body. Thus, the Second Law of Thermodynamics explains general structural senile changes occurring on the molecular level.

Functional model for the human body

Modelling aging processes is a frequent practice in gerontological investigations. A wide range of biological models can be found in related literature—from the protozoa to the complex organisms like primates, or even humans.

Robinson's model (Robinson 1979) proposes as the possible cause of cell aging, a mechanism which he calls a 'catastrophe of errors'. Such 'catastrophic errors' as local cell processes in the main regulatory portion of a cell, (in the cell nucleus), simply affect entire cell, causing the cell to deteriorate and perish. Models as this are local in their focus. Rosen (1978a; Voitenko and Polyukhov 1996) in his publications in 1978 flatly denounces local models and insists on universality of aging mechanisms.

Some models are mathematical in the approach. Mathematical aging models claim to be conceptual, phenomenological, global, factual, and so on (Glushkov et al. 1986; Woodbury and Manton 1983). Most of such models describe death rate dynamics satisfactorily only in a narrow observation range, and even an accidental use of data from adjacent ranges may cause a substantial distortion of the modeling final results. Practical use of mathematical models is complicated and has a small impact, not only because of the necessity of pre-setting the margins of the model capabilities, but also because of the loss of a considerable portion of useful information (Frolkis and Muradyan 1992).

By characterizing aging model viability and its changes in ontogenesis as "death activation entropy model," Atlan (1968) establishes biological aging model using the Second Law of Thermodynamics.

The concept of aging of living organisms described in the previous section could be used to represent an energy aging model. Stressing energy dimension of the aging process, may lead to the model that fits well with all living formations, (both very simple and very developed ones). The energy model explains the onset of senile degradation of matter as natural decrease of the quality of the energy forming in a living (dissipative) structure. The Second Law of Thermodynamics supports well this mechanism of energy decrease and entropy increase (Klyce).

The nature of human aging is typically described by means of biological and mathematical models. However, the human organism as a whole is not modeled functionally. For instance, a single-cell organism, presenting a complex structure and consisting of great many internal components-organelles, is commonly divided by researchers into three clearly distinguished functional zones:

- external (membrane)
- intermediate (cytoplasm and organelles) and
- central (nucleus)

Bogomolets, Frolkis (1982) and few other authors, try to place aging processes within these zones, in the vicinity of the membrane, nucleus or cytoplasm.

The human organism is often defined as a sum or a system of cells and organs without delineating the functional zones described above (Human Body 1994; Encyclopedia Americana 2001). The organizational similarities between the fertilized cell (one-day old organism) and itself only nine months of development later (human organism) are not found in the definitions. For instance, the *Encyclopedia Britannica*, defines the human organism in the following manner: "Human body is the physical substance of the human organism, composed of living cells and extra-cellular materials, organized into tissues, organs and systems" (Human Body 1994). "The human body is marvelously complex array of cells and fluids combined into tissue and systems that function together as a single organism," (Academic American Encyclopedia 1998b). "The primary division of the body are the head the neck, and extremities," (Encyclopedia Americana 2001).

Life is an organization. From prokaryotic cell, eukaryotic cell, tissue, and organs, to plants and animals. Life is an organization, at every scale (Atkins 1994; Klyce),

For example, the formation of crystal is the straightforward result of chemical and physical laws that do not evolve. The crystal lattice is prescribed by the structure of the molecules that compose it (Klyce). By induction, we can extend that similarly, in human organisms, equivalent 'lattice of cells' is prescribed by the structure of individual cell structure, and that natural laws do not evolve either.

Starting at the very beginning the integument of the fertilized human egg through the development process becomes transformed into the human skin integument which eventually occupies more than 20% of the total body weight. Concurrently, the cytoplasm and nucleus of the initial cells develop into the blood, the lymph and other body liquids with connective tissues, bone architecture, nervous system and internal organs. The experimental confirmation of this theoretical assumption may be the following.

Excitation is a known response of every cell to irritation. The response reaction of the cell when its membrane is irritated, i.e. excitation, is accompanied by a complex array of electrical, thermal, chemical and functional changes inside the cell (Selye 1976;

Mamontov and Zakarov 1996). Model concepts of the nature of this phenomenon are based on the membrane theory. Similar reactions toward external irritation are also inherent in humans. Reaction of the organism to any sufficiently strong exogenous or endogenous influence of the medium with disturbance of homeostasis happens first, by a non-specific response, through endocrine and other routes. H. Selye defined this stress of the organism as a general adaptive syndrome (Selye 1976).

In both living objects, cell and human organism, stimulation of their integument (biologically or physiologically) results in similar reaction-activation of the functions of the internal systems. This may confirm the existence of a common structural organization based on the membrane principle stating that the cell is built mainly of a membrane and is surrounded by a membrane, that the cells are grouped in colonies and united in an organism with its new membrane (Mamontov and Zakarov 1996). This, in turn, is explained by the common character of the fundamental laws pointing out to the organizational, materialistic, energetic unity of nature (Yu and Kharlamov 1968).

In effect, the human body is a marvelously complex array of cells and fluids combined into tissues and systems that function together as an organism (Academic American Encyclopedia 1998b). The cell is the fundamental structural and organizational unit of life. This relationship manifest itself on the higher structural level.

Application of the model

If, as stated above, the human body skin integument is the first to begin aging, then treating it should be the first step in an anti-aging therapy. The question may be posed: "How skin can be induced to regenerate itself the most efficiently?", or "What are the necessary external stimuli for regeneration of the skin?" (Vogel 2000).

The skin integument is itself capable of restoring and improving the lost vital structural organization and functional potential. Experiments show that in the series of transplantations to a new recipients, the vital capacity of the skin of mice was retained for seven years, and that of prostate cells for six years. In other words, a change of a habitat enables tissue life

maintenance for a period of time longer than the life span of the donor from whom that tissue was taken (Loo et al. 1987).

Everything in the body develops from stem cells. "Skin stem cells have enormous proliferative potential," says cell biologist Elaine Fuchs of the University of Chicago (Vogel 2000). A complete regeneration of skin might become routine. Research shows that the regenerative capacity of just a small patch of adult skin is immense (Davidson 1998). By bringing itself into a more healthy state, the integument, as in experiments of Woodruff with single-cell organisms, will revive the organism as a whole, i.e., inner structure will be regenerated too.

All of the remarkable advances in restoring and regenerating various cells, tissues and organs, imply many radical changes in the technologies of tomorrow's health care (Davidson 1998). The experiments with single-cell organisms prove that aging changes in the cell nucleus are not irreversible in all cases. In certain situations the cell rejuvenates (Frolkis and Myradyan 1992).

For example, quite often, when hormones and other physiologically active products are added to the culture, the ability of cell division grows indefinitely without any indications of degeneration.

If some mechanisms of rejuvenation exist in the life program of a cell, then, according to the given functional model, these mechanisms also exist in the developed organism and must be explored further. A vivid example of that may be popular bodybuilding.

Muscle tissues stimulated by the physical exercises are being improved structurally and functionally. Muscles that are trained develop while those that are not become atrophic. Skin tissue has similar features. It can restore itself with artificial stimulation. Skin has enormous proliferate potential (Vogel 2000) and its regenerative capacity is immense (Davidson 1998). As entropy cannot decrease spontaneously, and as order cannot arise out of chaos without external influence (de Duve 1984), skin tissue needs external stimulation to activate regeneration mechanism to restore itself and influence the regeneration of the degrading inner body, (see Figure 4). A complete regeneration of the entire aging human body might become a routine technique of skin specialists and physical therapists.

Although the skin integument comprises 20% of the total weight of the human organism, and it is the

largest organ of the body, it is approached (if at all) only with matters concerning skin diseases or some internal ailments, but not as a self-sustained developmental object. For example, "The skin is the largest organ of the body and often the most neglected and forgotten," (Baranoski et al. 2000), and "The skin serves as a protective barrier against the outside world," (Martin 1997). We should remember that a one-cell organism gets nourishment through the membrane only. It is a stomach and protective shield. When it is nourished properly and for sufficient periods of time, as shown in the experiment of L. Woodruff and other researchers, it maintains its functionality for longer than usual time. In this paper, we can propose that human body skin should get appropriate nourishment and care to prolong perfect skin functioning (Voitenko and Polyukhov 1986; Martin 1997). The rather limited view and approach of (Martin 1997), is extended here.

If, as shown by experiments, the internal tissue can live longer than the organism from which the given tissue has been sampled, the internal overall structure of the organism may improve if the skin and the surrounding habitat is changed. Rejuvenation of the skin integument is closely correlated to the positive change of the habitat (environment). All this serves as a basis for hope that sometime soon humans will be able to truly increase their life span.

Conclusion

Living matter is created in accordance with natural energy exchanges, which are applicable to the lower structures of matter. For instance, to identify the causes of weakening of structural mechanisms, we can refer to the Second Law of Thermodynamics. It states that all sorts of energy processes operating in a closed system last for a finite time, eventually ceasing by themselves when the total energy becomes completely expanded or falls below levels necessary for the processes to continue. There is no perpetual motion machine in nature (Thermodynamics). The primary evidence of energy dissipation, and the resulting structure degradation in a living organism appears in its external layer, the border between living and non-organic matter. There is a zone where living matter loses its organizational structure, and

returns to the environment medium of its previous structure and becomes 'dead.'

Analogous to a single cell organism, we consider here a simplified model of a human body as a system consisting of three functional zones:

- external,
- intermediate and
- central

In light of this approach, both single cells and the human body, have similar functional schemes. Confirmation of such a statement can be found in membrane theory, fundamental law of the organizational, materialistic, energetic unity of nature, visual observation of many analogous systems, and proportional response to external stimuli.

The proposed theory of organismic aging is based on a hypothesis of its energy nature. The process of organism aging is explained as a continuous energetic interaction with its surrounding environment, accompanied by the destructive effects appearing on the interface surface of the interaction, and propagating inwards to inner organs (Chuprin and Mihajlovic 2000).

Medical experience shows that all organs of the human body have great potential to restore themselves. There is also a possibility of both preserving and activating their ability to do so. This gives great expectation that the whole old body can be rejuvenated from long period degradation with special treatment, unless there are fatal diseases. Contained herein is a review of currently known aging theories, rationalization of the proposed aging model, and suggestions on how to activate the body's inherent anti-aging mechanisms to insure longevity. We have presented the hypothesis that actual rejuvenation is possible and successful intervention over the aging process is achievable.

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