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Review Article

The Evolutionary Predecessors of Aging, Inflammation and Carcinogenesis: A Hypothesis

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Abstract

The mechanisms adjusting course of processes of ageing, inflammation and oncogenesis highly organized animals and the person are atavistic mechanisms of regulation normal ontogenesis the first on Earth Metazoa which were sedentary (sessile) and modular. In work mechanisms of processes normal ontogenesis at modern primitive invertebrates *(Spongia, Hydroidea, Anthozoa*, Bryozoa, *Kamptozoa, Pterobranchia* and colonial Ascidiacea) are considered and the hypothesis explaining as these mechanisms during evolution were transformed to ageing, an inflammation and oncogenesis is offered. It is discussed also, what role ageing, an inflammation and oncogenesis in the adaptation of highly organized animals and play the person to an inhabitancy.

Introduction

Human aging is an everyday reality. But it is a public concern. There is still no consensus on the nature of ageing and its role in the life of mankind and the biosphere. This gave rise to reckless intentions to free a person from the need to grow old. Gradually, it becomes a common reality and oncogenesis. There are more and more of us with cancer. Pathophysiological mechanisms that control aging, inflammation and oncogenesis have not yet been deciphered. The prevention of cancer and its treatment are conducted blind. Therefore, the efforts made to combat it have not produced the desired result. They can't lead until you have deciphered the mechanisms of malignant transformation of cells, tumor growth and its regression. There are still no answers to the following questions:

1) Can a person be made potentially immortal?

2) Do you need to do it?

3) What is cancer?

4) How did the mechanisms of aging, inflammation and oncogenesis appear in the course of evolution?

The work discusses these issues. It is written on the basis of previously published articles by the author [1-22].

Aging, inflammation and oncogenesis - the result of the physiological regulation of the body. This system is multistage. It is built on hierarchical principle. It was formed in the course of evolution through the development of more efficient and economical compensatory-adaptive mechanisms. Wasteful and ineffective morphogenetic mechanisms of ancient reactions lost their activity, but their program remained in the genome. When phylogenetically young mechanisms prove to be untenable, the program of ancient morphogenetic regulatory mechanisms is implemented. Aging, inflammation and oncogenesis are the consequence of this realization. Therefore, to understand how these pathological processes are regulated by the body, it is necessary to find out how their evolutionary predecessors were regulated by the body in normal ontogenesis in ancestors. And for this you need to first find out which ancestors they were part of normal ontogenesis. Discuss the pathological processes are widely distributed among Metazoa. They are also observed in very primitive species located near the base of the phylogenetic ladder Metazoa. This inclines to the opinion that the processes, which are now aging, inflammation and carcinogenesis, is an integral part of the normal ontogeny was the earliest, the first on Earth,

Metazoa: These Metazoa have become extinct, leaving no paleontological traces. Opinions about the way of life they led - the area of guesses and assumptions. According to Ivanov [23], alone the authors, in their including and he himself, believe, that they were freely mobile, other think, that they were sessile. When answering the question, which human ancestors and highly organized animals aging, inflammation and oncogenesis were an integral part of normal ontogenesis, it is necessary to be based on the assumption, and the conclusion to do on the basis of incomplete knowledge.

The attractiveness of the hypothesis about the origin of modern Metazoa from sessile ancestors, which prompted me to accept it and put it in the basis of the stated hypothesis about the origin of aging and oncogenesis, in that it allows you to see a common for all the evolutionary lines of Metazoa sequence of change of regulatory and adaptive mechanisms as you move up the branches of the phylogenetic tree Metazoa. By adopting this hypothesis, we can understand how the formation in the history of life on Earth mechanisms that control the destructive processes occurring in aging and oncogenesis. If we assume that the primary was a free-moving lifestyle, then explain it fails. To explain the nature of inflammation assumption of the origin of Metazoa from sessile ancestors is not necessary.

The body of most modern sessile primitive invertebrates, located close to the base of the phylogenetic tree Metazoa, consists of several, sometimes many, usually identical blocks, or modules. These animals - *Spongia, Hydroidea, Anthozoa,* Bryozoa, *Kamptozoa, Pterobranchia* and colonial Ascidiacea - modular. Probably the first on the earth Metazoa were not only sessile, but also modular. (Animals are divided into modular and unitary. Modular reproduce sexually and asexually. When sexless reproduction of the individual is formed from a complex of somatic cells. Unitary species reproduce only sexually). If the hypothesis, according to which the first on earth Metazoa were sessile and modular, is true, they adapted to the environment as well as modern sessile modular species, and part of their normal ontogenesis were normal ontogenesis of these animals. Recognizing this, we should further recognize that the physiological regulatory system of highly organized animals and humans is based on reactions similar to those of normal ontogenesis of modern sessile modular animals and these reactions can be considered as evolutionary precursors of aging, inflammation and oncogenesis. Below all the presentation is based on this assumption.

These modular sessile invertebrate's modules result of asexual reproduction. Evolved into a new species they retain physiological connection with the parent body. According to existing ideas, the fate of sexual and asexual reproduction during the evolution of Metazoa was different. Sexual reproduction was maintained throughout the evolution of Metazoa. The ability to reproduce asexually after the organism reached a certain level of integrity disappeared in different evolutionary lines [24]. But without a trace? Or did his traces remain, but in such a way that their nature is not yet understood? The basis for the assumption that the mechanism of asexual reproduction in a highly modified form continues to function and unitary, that is, only sexually reproducing species, is that the mechanism of sexual reproduction during evolution is very changed. Its differences in species at the top of the Metazoa evolutionary tree and at its base are so large that it took generations of researchers to understand that gametogenesis and gamete fusion are universal processes. In this work, it is assumed that the mechanism of asexual reproduction in unitary species has been preserved and is the basis of mechanisms aging and oncogenesis. Biologists studying asexual reproduction of primitive invertebrates, and physicians looking for answers to the questions of how the body regulates the processes of aging and cancer, are likely to deal with the same morphophysiological mechanisms, only differently manifested in representatives of Metazoa, located at the top of the evolutionary ladder and at its base. Therefore, knowledge of the mechanism of asexual reproduction of animals is necessary to decipher the mechanisms of aging and oncogenesis.

A sexual animals reproduce, the practical value of which is small. Therefore, it was studied in animals, little. But the achievements in its study, writes Ivanova-kazas [24], may be key in solving the problem of aging. The summary of the accumulated data on asexual reproduction of animals is written By Ivanova-kazas [24]. This book and the book of Tokin "Regeneration and somatic embryogenesis" [25], were fundamental for the formation of the following views on the formation of the processes of aging, inflammation and oncogenesis in the course of evolution.

Asexual reproduction is always associated with destruction in the body of the individual [24,25]. Among modern primitive animals, the largest amount of destruction in normal ontogenesis is observed in sessile modular animals. Probably the first Metazoa on Earth the situation was the same as them, and this destruction - evolutionary predecessors of the devastation taking place now in the unitary types in aging, inflammation and carcinogenesis. To understand why this, and not otherwise, the body is destroyed by aging, inflammation and oncogenesis, it is necessary to answer why this, and not otherwise, occur destructive processes of normal ontogenesis in sessile modular animals. Consider the destructive processes occurring in normal ontogenesis in sessile modular species.

Morphogenetic Adaptations of Sessile Modular Animals

The ability to age, undergo inflammatory processes and form a malignant tumor - the emergent properties of the individual. (An emergent property is a property of a system that is missing from its elements and is the result of its integrity.) To discuss the nature of aging, inflammation and oncogenesis, it is convenient to use the terms of the theory of functional systems [26]. According to it, the unit of activity of the body is a functional system. It is a set of coordinated interrelated processes aimed at achieving a useful result for the body. For the emergence of a functional system requires motivational excitation. It appears because of one or another need of the body. Deployed functional system by passing through the stages of synthesis of the signals from the endo - and activation, decision-making, formation of action and evaluation of achieved results.????? Functional system is deployed by passing phases of synthesis of signals from Endo-and jekzoreceptorov, the decision, formation of actions and evaluation of achieved results.

Along with the functional systems of normal ontogenesis there are pathological functional systems. They – the functional system of the normal ontogeny of ancestors. Motivational excitation, forming them, is aimed at meeting the needs, which the individual does not have, but which were at the passed stages of its evolution. To understand what needs of our ancestors were pathological functional systems and in this way to explain how they are regulated in the descendants, it is necessary to compare the descendants and ancestors are not separate processes, and their interrelated totality, that is, functional systems.

Individual sessile modular species-a colony. It consists of modules. There are *Spongia* modules are called flagellated chambers, *Hydroidea* and *Anthozoa* -hydrants, the representatives of other groups of sessile modular types - zooids. Patterns of functioning leading attached lifestyle modular individuals with similar patterns of operation of the plant. In plants, an individual, as in sessile modular animals, is also a set of physiologically related modules. Plant modules-shoots and leaves. The plant and sessile modular animal in the body there are areas of embryonic tissue, the cells of which are divided, and the ontogenesis program is carried out many times in the formation of each new module. In plants, embryonic tissue is called meristem. It is located on the tops of shoots. Its cells remain embryonic from the time of their origin from the germ meristem [27]. Unlike plants in sessile modular animal's embryonic tissue is formed each time before the act of asexual reproduction again by dedifferentiation of specialized cells. Dedifferentiated cells in sessile modular animals begin to multiply and then to differentiate in new directions in developing the child modules. This method of asexual reproduction is called somatic embryogenesis [25].

To Update the Unit Composition Modular Sessile Individuals

Plants and sessile modular animals adapt to changes in the environment during a favorable season with the help of a functional renewal system. Its work consists in continuous change of modular structure of an individual and in change of its form. The need to change the shape of a modular species is caused by the fact that some modules of sessile modular animals due to changes in the flow, the growth of a number of attached sessile modular animals or algae and because of other reasons are in a position that makes it difficult for them to collect feed, and the plant-in the shade, and photosynthesis The cost of resources for maintaining the structure and functioning of the individual cease to pay off. These modules are individual breaks. Their destruction in sessile modular animals is carried out by including in the modules of the mechanism of senile involution, after which the modules are resolved. In plants, shoots caught in the shade, dry up, the leaves turn yellow and fall off. Replacing the modules with others in other places facilitates the extraction of energy from the environment. Module modular sessile individual's death. While favorable for life season it eroparity modules (that is, before you die of old age, form the intervals of time several times by asexual reproduction child modules). The functional system of updating of modular structure of an individual in different evolutionary lines of animals and plants arose independently.

Formation of Reduction Bodies

Sessile modular invertebrate and some primitive freely motile invertebrates (Turbellaria, Nemertini*)* adapt to the action of damaging factors, which exceed their adaptive capabilities, using the functional system of reduction. Modular seats and some primitive freely mobile invertebrates (Turbellaria, Nemertini) adapt to the effects of damaging factors, the power of which exceeds their adaptive ability, with the help of functional system reduction. The reduction consists in the transformation of modules into reduction bodies. It occurs in response to factors of physical, chemical or biological nature, as well as hunger, and is to reduce the size of the modules, they have dedifferentiation of some cells and destruction of others. The reduction bodies are similar in structure to the early embryos, are able to tolerate an unfavorable period of life and restore the former structure of the modules when the conditions improve. Plants are also capable of reduction. It can be caused by placing pieces of tissue in a nutrient solution. Thus cells dedifferentiate and become totipotent callus. The accumulation of callus cells is a structure similar to the reduction body of sessile modular animals. The functional system of formation of reduction bodies in different phylogenetic lines of animals and plants arose independently.

Preparation for Seasonal Deterioration of the Environment

Sessile modular animals and plants have two programs of somatic embryogenesis. One takes place during the favorable for life season is in the formation of the active modules. Another is carried out in preparation for an unfavorable season for life and is the formation of resting modules. Resting modules of sessile modular animals and plants are early somatic embryos. They are very different in structure and physiological properties from the early embryos of actively functioning modules. *Spongia* have dormant embryos called gemmule, Cnidaria-podocysts, Bryozoa -statoblasts, *Kamptozoa, Pterobranchia,* and colonial Ascidiacea -resting buds. Gemmule *Spongia* similarstructure to morulae, resting the embryos of other modular sessile species, usually with the gastrula [24]. In plants, the resting germ -buds. In trees and shrubs, they are formed on the branches, in herbaceous plants -on tubers, roots and rhizomes. Resting embryos of plants and animals are similar structures. They are stocked with nutrients and serve for the experience of the unfavorable season, and in sessile modular animals -and for the settlement of the species. Among the free-moving, that is, more integrated forms, somatic dormant embryos are described, as far as I know, only in the *Phagocata velata turbellaria* [28]. Primitive freely movable modular and unitary animals -the Turbellaria, Oligochaeta, *Gastrotricha*, Rotatoria and Crustacea and *Hydra*, form for the experience of adverse live season and resettlement resting early embryos, but not of somatic and zygotic, occur from the zygote [1], They are called latent eggs.

The formation of dormant somatic embryos in sessile modular animals occurs in each species according to a hereditary program, and rest occurs at a strictly defined stage of embryonic development. These resting stages emerged in the course of evolution as an adaptation to the annually repeated changes in nature. Therefore, they should be called diapausing. (Diapause is the state of physiological inhibition of metabolism and stopping of formative processes). In preparation for the seasonal deterioration of the environment the modules of sessile modular animals and plants are semelparous (i.e. reproduce asexually only once after which they die).

The formation of resting modules in plants and animals is not accompanied by alternation, as before the preparation of the individual to seasonal environmental degradation, but by simultaneous and rapid destruction of all actively functioning modules. In plants, leaves fall off, above-ground grass shoots dry up, in sessile modular animals, the modules undergo senile involution. The functional system of diapausing somatic embryos in sessile modular animals and the functional system of formation of resting embryos in plants is included in response not to seasonal environmental degradation, but to signal factors warning of its imminent deterioration (for example, to change in the length of the day). The formation of these embryos in sessile modular animals and plants is, as well as the formation of reduction bodies, the reverse development of individual modules.

The ability of a sessile modular animal and plant to quickly complete the transition to the formation of resting embryos (and the speed is provided by the simultaneous death of actively functioning modules) was developed independently in representatives of different evolutionary lines. Individuals who did not have time to prepare for the adverse time of year or started to prepare for it too early, were eliminated.

Have sessile modular animals, in contrast to the primitive and freely movable from *Hydra*, diapausing somatic and not zygotic embryos, probably because individuals of the species forming resting eggs, more complete (with the exception of *Hydra*) than individuals of species of sessile modular. The plant species is also very low integrated and also forms somatic embryos to experience an unfavorable season. But in plants, along with somatic embryos, zygotic embryos - seeds-serve for experiencing an unfavorable season. The experience of adverse live season of early somatic embryos, probably phylogenetically from the primary Metazoa method of diapositive. The functional system of diapausing somatic embryos formation in different evolutionary lines of animals and plants appeared independently.

Thus, plants and sessile modular animals in connection with the attached lifestyle and low level of integrity of the individual on different genetic basis formed three similar functional systems in the work which play an important role in the destruction of the body. This similarity of representatives of different phylogenetic lines of sessile modular animals and plants is convergent. The considered three functional systems are universal. If the first on the earth Metazoa were sessile and modular, they used these three functional systems to adapt to the environment. These functional systems are probably the basis of the regulatory physiological system of all Metazoa. From modular sessile species, they allow normal ontogenesis, the unitary kinds − pathological. Understanding the mechanisms of regulation of these functional systems in sessile modular animals is necessary to decipher the mechanisms of regulation of aging, inflammation and oncogenesis in unitary types of work on the regulation of these three functional systems in sedentary modular animals, I do not know. In plants, these functional systems are studied. Information about their regulation is of interest.

Regulation of Destructive Processes of Normal Ontogenesis in Low-Integrated Modular Individuals

Plants have meristem synthesize auxin, a hormone that moves through the body and causing her power to attract of formed of modules of the nutrients and to absorb them [27]. Donor-acceptor bond occurs between the old and emerging modules (meristem). In the formation of dormant embryos preparing to experience an unfavorable season, the outflow of the plant from the formed modules increases, which explains the simultaneous and rapid aging and death at the end of the growing season. The property of multiplying meristem cells to attract nutrients from the formed modules is called apical domination [29].

In sessile modular animal's destructive processes occurring during the operation of functional systems of renewal and preparation for seasonal deterioration of the environment are probably also controlled by similar mechanisms. The centers that attract nutrients, they are probably breeding cells of emerging modules, as preparing for active life, and preparing for diapause. These centers, as well as the meristem of plants, emit, probably, some substances that have a remote effect on the whole body. In preparing for diapause embryos of sedentary modular animals, as well as in preparing for the rest of the embryos of plants, the property to attract nutrients from other modules is more pronounced than in the embryos of modules preparing for active life. Aging of modules in animals, as well as in plants, is a consequence of redistribution of resources in the body. They have, like plants, captures not the entire species, but has local character. Apical domination is probably a universal mechanism of interaction of old and new-forming modules in different phylogenetic lines of sessile modular animals and plants.

Sites of embryonic tissue in plants and sessile modular animals take part in the management of functional systems of renewal and preparation for seasonal environmental degradation only at the local level. At the level of the whole modular organism, the regulatory physiological system of the individual is responsible for redistribution of resources between the newly formed and formed modules. The existence of a modular sessile animal and plant of this regulatory system is evidenced by the fact that the individual responses to changes in the environment are appropriate.

If the individual on some signals coming from the external environment, "learns" that the unfavorable season for life will not be very severe, and it can be experienced in an active state, it interrupts the preparation for it. So, the behavior of some colonial Ascidiacea. They began to form preparing for diapause somatic embryos dissolve, and began to break up the vital organs of the actively functioning modules are restored [30,31]. Such transition of an individual from the formation of resting somatic embryos to the formation of actively functioning modules is also described in the plant of Jerusalem artichoke (*Heliánthus tuberósus*) [32]. Donors in this case, animals and plants become specialized tissues, such as in preparation for the unfavorable season, and the beginnings of preparing for the rest of the somatic embryos. Resorption of these embryos indicates that the destructive processes in a modular individual are controlled not by the areas of embryonic tissue, but by the regulatory physiological system of the whole organism.

Since the mechanisms of functional systems of renewal, preparation for seasonal deterioration of the environment and the formation of reduction bodies are present in *Spongia* and plants that do not have nervous and endocrine systems, it should be thought that the regulation of these functional systems does not involve the nervous and endocrine systems. These functional systems are controlled by intercellular and inter-tissue interactions.

Adaptive Value of Destructive Processes Occurring in Normal Ontogenesis in Plants and Sessile Modular Animals

Understanding the adaptive value of destructive processes occurring in normal ontogenesis of sessile modular animals and plants is necessary to understand the nature of aging, inflammation and oncogenesis of unitary species. Morphogenetic method of adaptation to environmental changes, used by sessile modular animals and plants, is associated with the destruction of tissues, the creation of which was spent resources of the body. The choice of sessile modular animals and plants of this wasteful adaptation strategy is due to thermodynamically. In the Protozoa, each cell independently adapts to changes in the environment. The systemic response to these changes, that is, a response based on the division of the body's functions between its cells, has emerged with the advent of Metazoa and Metaphyta on Earth. In sessile modular animals and plants, it is still at a very low level of development and its effectiveness is therefore small. Energy armament of sessile modular animals and plants is very weak.

Regulatory processes are associated with energy consumption [33]. The force opposing external forces seeking to destroy the organism is a set of integrative links between its cells differentiated in different directions. These relationships are the effects of one cell on another. Any interaction is a waste of energy. The more complex the system is, the more functionally different elements it consists of, the more in-system interactions it has and the more the system has to perform work to maintain its integrity. When the force of external influence exceeds the adaptive response capabilities based on internal system interactions, the energy required for these interactions is not paid off and the system reduces the number of functionally different elements it consists of. This reduces its energy requirements and allows it to maintain the energy balance in conditions when its metabolism is damaged by a damaging factor and the power of its metabolism is reduced. This adaptive simplification individual provides functional systems of formation of resting somatic embryos and formation of reduction bodies.

Functional systems, which are based on the adaptive simplification of the individual, are widespread in primitive invertebrates. The mechanism of their implementation (an adaptive mechanism of disintegration) is included with the deterioration of the environment, for example, when the deterioration of the water in the tank, a sudden change in salinity, temperature or the attack of the enemy. In these cases, colonies of *Hydroidea* relieve hydrants, *Phoronida* separate crown of tentacles, Nemertini, Polychaeta and Oligochaeta are divided into segments, *Holothuroidea* fall to pieces or through the gap of the wall of the cloaca throw away the intestines, water, light and part of the gonads of the starfish break off the rays of Ascidiacea through locally siphon throw the throat, intestines and gonads [24,34 -38].

Why Sessile Modular Invertebrates Diapaused at the Stage of Somatic Embryogenesis, the Structure Similar to Gastrula

At the stage of blastula or gastrula diapausing resting zygotic embryos, i.e. latent eggs. Their form, remember, *Hydra,* Turbellaria, Oligochaeta, Gastrotricha, Rotatoria and Crustacea. Species, which would diapause occurred before the formation of blastoderm, write Lees [39] and Breny [40], is unknown. This rule managed to find the exception: the Turbellaria of *Microstomum lineare* diapause flows into the eight cells of the zygotic embryo [41]. In sessile modular animal's somatic embryos diapaused in most cases, as mentioned above, at the stage of the structure similar to gastrula. Thus, embryonic diapause independently appeared in different evolutionary lines of sessile modular species and primitive unitary species at morphologically similar stages. Why?

The most resistant to damage have the least differentiated cells. The need to split the zygote before diapause of the early embryo is due to the fact that the oocyte, and therefore the zygote – highly differentiated cells and therefore they are not resistant to damaging effects. Low resistance and differentiated somatic cells, from which diapausing somatic embryos of sessile modular animals are formed. During the fragmentation of the zygotic embryo and divisions preparing for diapause of the somatic embryo lost features of specialization, inherited from the zygote and from specialized somatic cells. Diapause at the stage of blastula or gastrula and similar to them in the structure of the stages of development of the somatic embryo occurs because at this time the loss of specialization traits inherited from the somatic cells and from the zygote ends, but the specialization associated with the further development of the embryo does not yet begin. At this time, the embryo has the greatest resistance to adverse environmental factors. It has all the genes turned on at this stage and has not yet started to turn them off due to differentiation of the embryo cells. At this time, the interaction between the cells of the embryo is still weak and therefore its energy needs are minimal [42- 44]. Diapause of sessile modular animals and forming latent eggs of unitary animals is based on the maximum reduction during the unfavorable season of the role of systemic adaptive reactions and on the increase of the role of individual cell stability. The diapause of these low -integrated species is two different ways of solving the same vital task of energetically poor individual -preservation of viability in a state of physiological rest by simplifying the structure of the diapausing stages.

Stopping the development of the early embryo is known in birds. Their eggs before their incubation are at the stage of late blastula -early gastrula. Resistance of their embryo to cold has the form of a curve, the peak of which is at the time of the end of blastulation -the beginning of gastrulation, that is, at the stage to which the egg laying is timed [42,43]. This allows the eggs to cool down before they hatch. Increased stability of these stages of embryogenesis was found in mammalian embryos [45], frogs [46] and fish [47]. Stages of late blastula-early gastrula have the greatest extent and the ability to reverse the stop of development. It is installed on the eggs of frogs [48] and fish [47].

With the end of the unfavorable season for the individual, it is important to start using the resources of the environment as soon as possible until others have spent them. However, the primitive invertebrates, before you start using them, have to spend time on individual development. They cannot diapause at a later stage of ontogenesis, allowing to quickly move into the active state. Sessile modular animals and plants are forced to use these environmentally unprofitable functional systems of preparation for diapause because of the low power of their metabolism.

Adaptive Value of Reproduction of Dedifferentiated Cells, Preceding The Onset of Diapause of the Somatic Embryo and The Formation of Reduction Bodies in Sessile Modular Animals

While preparing for diapause and in the formation of reducing bodies sessile modular animals simultaneously with destructive processes goes dedifferentiation reproduction of cells. In oncogenesis have a unitary species also from the destructive processes is the multiplication of dedifferentiated (malignant) cells. Dedifferentiated cells reproduce simultaneously with destruction and inflammation. To answer the question, why in oncogenesis in the body and inflammation of the dedifferentiated cells proliferate, you need to answer the question of why they breed in the formation of diapausing embryos and the reduction body.

The increase in the number of components of a system of homogeneous elements is a response to damage in systems of different levels. Proliferation is a universal reaction to damage of Metazoa [49] and Metaphyta [50]. Have *Hydroidea* after exposure to harmful substances accelerated the formation of new hydrants [24]. In trees after the accident at the Chernobyl nuclear power plant in the area of acute radiation exposure, intensification of shoots was observed. Low concentrations of heavy metal ions accelerate the reproduction of bacteria [51], yeast [52] and algae [53]. Damaging effects stimulate asexual reproduction of primitive animals [24]. The demographic system is also subject to system-wide laws [54]. The peaks in fertility were recorded after the First and Second world wars in the countries that took part in them. The birth rate in China increased in 1962-1970 after the food crisis of 1959-1961 [55], as well as in Armenia in 1989-

1990 after the Spitak earthquake of 1988 [56]. The rise in birth rate in Prague in 1974-1978 [57] may have been associated with the invasion of the Warsaw Pact troops in 1968. The birth rate surge is a common phenomenon after social and natural disasters [56]. In the biocenosis, in response to damage, too, the number of homogeneous elements that make up it increases. With adverse effects on it, there is a return to the initial stages of succession. While slowly proliferating K-types are replaced by fast-breeding r-types. The adaptive value of the increase under the action of damaging factors of the number of homogeneous elements in polyps, trees, in supra-organizational and above-species systems is not clear to me. The cell division, which occurs in the formation of dormant somatic embryos and reduction bodies in sessile modular animals and plants, is due to the fact that during its formation there is a loss of specialization traits inherited from the original somatic cells [44]. As a result of this loss, the number of integrative links in the individual, subjected to reverse development, decreases and its energy needs are reduced. This allows the dormant somatic embryos and the reduction bodies of the sessile modular animals and plants to maintain the energy balance in deteriorated conditions. In oncogenesis and inflammation, reproduction of dedifferentiated cells occurs because this reproduction in distant ancestors of unitary species was an integral part of the preparation for experiencing adverse living conditions.

The Reversibility of the Ontogenesis of Sessile Modular Animals

In sessile modular species gametes are formed from somatic cells. Therefore, A. Weisman's views, according to which gametes are immortal, and soma is mortal, are valid only for unitary species. In modular species is immortal and soma. Individuals of these species are potentially immortal. She dies only external, but not from internal, causes [58-61]. The potential immortality of the sessile modular species is also provided by the reversibility of its ontogenesis. From modular sessile individuals and individuals some freely movable modular types of alternating processes of development and reverse development. During the reverse development of the individual returns to the embryonic state. The ability to reverse development is provided by functional systems of formation of reduction bodies and diapausing somatic embryos. The sessile modular individual allows to be potentially immortal also updating of its modular structure. Thanks to the upgrade, the old modular specimen consists of young modules. The renewal of its modular composition and the reversibility of its ontogenesis are possible due to the low specialization of its cells.

According to parametabolistic theories of senescence [62,63] in the aging play an important role harmful to the body parametabolistic reaction. They are the satellites of useful reactions for the body. Their products accumulate in non-renewable cells, which is why these cells eventually die. Non-renewable cells are highly specialized cells. They play an important role in the life of the individual. The decrease in their number due to the accumulation of products of parametabolic reactions (senile involution) leads to a decrease in homeostatic properties of the individual, that is, to its aging. Boyko expressed similar views on aging. According to it, the life expectancy of an individual is limited by the life of postmitotic, i.e. non-renewable cells [64-66]. Parameteabolic reactions cause senile involution only in the presence in the body of individuals non-updatable cells. In their absence, these reactions do not harm it and the individual does not age [62,63] in sessile modular invertebrates there are no non-renewable cells. The low differentiation of their body cells allows their cells to differentiate and renew all types of cells from which the body is built.

In relation to the sessile modular animal, the term "individual" (indivisible) is not applicable, since each module separated from the individual can become the founder of another modular individual Instead of the term "individual" uses the term "geneta". (Geneta is a set of modules that have emerged from the same Zygote. It can be represented by one or more modular individuals. All modules geneta genetically identical to each other). Can be considered ageless if its fertility does not decrease with age, and mortality does not increase. Watkinson and White [67] believe that sessile modular individuals meet this requirement. Martinez and Levinton [60] have been observing *Hydra* geneta for 4 years. During this time, her death rate has not increased. In favor of the potential of immortality of geneta says that 1) many species of plants and some species of Turbellaria and Oligochaeta reproduce only asexually; 2) a large number of plant species in the seed the embryo is formed from somatic cells, that is, the multiplication of seeds they have asexual; 3) culture of plant cells do not age.

The Emergence of Aging Accelerating the Evolution of Unitary species

If the first on the earth Metazoa really were sessile and modular, then the mechanisms of your morphophysiological adaptations of modern sessile modular animals lie at the base of the regulatory physiological system of all unitary species. The destructive processes observed in sessile modular species in normal ontogenesis are evolutionary precursors destructive processes observed in aging, inflammation and oncogenesis in unitary species. Let us consider how the functional system of updating the modular composition of the sessile modular species, that is, the functional system of its asexual reproduction, during the evolution was transformed into a functional system of aging unitary individuals.

The cells of the first on the earth Metazoa were still very little differentiated. In the struggle for existence won those individuals who used the energy resources of the environment more effectively than others. And the effectiveness of their use depended on the completeness of the separation of individual functions between its cells. Therefore, due to natural selection, the differentiation of individual cells increased and the flow of energy flowing through it increased. The complication of the structure of the individual is an endothermic process. It needs energy to flow. In further complication of the structure of the first individuals on Earth Metazoa arose the obstacle caused by the lack of ability to move. Being attached, they ate those organisms that happened to be nearby. The low efficiency of this method of extracting energy from the medium limited their energy capabilities. Therefore, the growth of the number of cell types in them, reaching a certain value, stopped. Modern sedentary modular animals are species that have stopped at this stage of evolution.

To continue the complexity of its structure modular Metazoa began when they acquired the ability to move. Modern freely movable modular animals -this, remember, jellyfish, *Ctenophora,* Turbellaria, Nemertini, and *Echinodermata*. They have lost physiological connection with their modules, but the ability to sexless reproduction of some of them still preserved. The ability to actively move made it possible to search and pursue production, which opened up new sources of energy for them, allowing them to continue the evolution of the complexity of the body structure. The freely mobile modular individual, having existed some time, died from old age. This her death atavistic death from senile involution module modular sessile ancestors. It has not accelerated evolution yet, as its descendants, which arose by asexual reproduction (and therefore genetically identical to it), continued to exist. In each of the groups of free-moving modular animals, some species are still modular, and some have lost the ability to reproduce asexually and have become unitary [24]. On the example of these invertebrates can be observed independent in different phylogenetic lines lost the capacity for asexual reproduction, that is, the conversion unit types in a unitary.

The free-moving modular individual became unitary when due to the growth of specialization of its cells it has even more decreased the ability of cells to re-differentiate and became impossible because of this asexual reproduction. A unitary organism is a module of a sedentary modular individual that has lost the ability to reproduce asexually due to the growth of integrity. The ontogeny program of a unitary individual is a life cycle program of a module of a sessile modular individual, the final part of which was the senile involution. Functional system of unitary aging individuals is translating functional upgrade system modular sessile ancestors, has changed the functional system of asexual reproduction. Thus, the functional renewal system, which provided the potential immortality of the sessile modular ancestors, during the evolution was transformed into a functional system that limits the life of the individual. Motivational excitation, leading to the implementation of the functional system of aging - the need of sessile modular ancestors to change the shape of the body in response to changes in the environment.

Thus, the emergence of the mechanism of aging is an inevitable side effect of the evolution of the growth of differentiation of individual cells, that is, increasing its integrity. It occurred due to the natural course of things - natural selection-growth path the integrity of individuals, allowing her to win the struggle for existence. Highly differentiated cells of the individuals are in the course of ontogenesis. Hence, aging is a consequence of previous ontogenesis, during which undifferentiated cells of the early embryo are converted into highly differentiated cells of the adult. Since the functional systems of renewal in different evolutionary lines of the first on the earth Metazoa appeared independently, the functional system of aging in different evolutionary lines of unitary species appeared independently. Mechnikov wrote about the independent origin of the mechanism of aging of representatives of different evolutionary lines of animals at the beginning of the last century [68].

Along with the mechanism of aging based on senile involution, other functional systems of aging were formed. This happened after the transition of Metazoa to a unitary state, and before him. For example, *Hydra* (sessile modular) in asexual reproduction potentially immortal. Having started sexual reproduction, it becomes semelparous, that is, death. In the aging of the Protozoa [69], fungi [70-72] and plants [67,73] senile involution is not involved. They had other functional aging systems.

Restructuring of The Body, Occurring During Its Aging

In the work of functional systems of unitary aging individuals arise absent in the body strensham atavistic intra integrative connections that arise from individual primitive Metazoa when updating its modular composition. These relationships include donor-acceptor relationships. The role of donors to the sessile module in the implementation of its functional renewal system is performed by specialized cells. Unitary individuals have specialized cells become donors during aging. And somatic embryos in a unitary individual, which could be acceptors of nutrients, did not. What kind of tissue it causes involution of highly specialized cells? It was probably connective tissue that replaces highly differentiated cells during senile involution. It is probably atavistic preparing for the active life of the embryo,

In the work of the functional aging system of the unitary individual, the nervous and endocrine systems do not participate, since in sessile modular species these systems did not participate in the work of the functional renewal system. In a unitary individual, the functional system of aging is controlled by intercellular and inter-tissue interactions. For the first time, as far as I know, that the mechanism of aging of unitary species appeared at the first stage of evolution, wrote Kogan [74].

Adaptive Radiation of Unitary Species On the Way of Life Expectancy Change

The first unitary Metazoa on the Earth were resistant to biotic and abiotic factors to different degrees. In this regard, there were two strategies to adapt to the environment - r- and K-strategy. Vulnerable species, which are subject to high mortality, have become r-strategies. They began to produce by natural selection ability to quickly reach sexual maturity, leave many descendants and die early from old age. Species less vulnerable mortality in populations which were low, were produced strategy. They began to grow slowly, live a long time, later, to grow old and produce relatively few descendants.

The reduction in life expectancy of r-strategists accelerated the evolution, and, therefore, facilitated the adaptation of the population to changes in living conditions. So, in adults of certain insect mouth parts have become rudimentary. They cannot eat and, having exhausted the stock of fat accumulated during larval life, die [75]. Probably, the old involution did not make their evolution fast enough, which made it difficult to adapt to an unstable environment. To speed up adaptation to a changing environment, a different functional system of aging was needed, interrupting life at an earlier stage. Females of some Cladocera (Crustacea) die for unknown reasons until they have exhausted the ability to reproduce [53]. In honeybee, ontogenesis is interrupted for unknown reason until it decreases motor activity and learning ability [76].

The Occurrence of Inflammation Mechanism

Sessile modular ancestors of unitary species could in response to insurmountable damaging factors return to the embryonic state and this way to save their lives. Growth differentiation cells, occurring in the course of evolution, made from a unitary species impossible alteration of cell differentiation. (Growth differentiation of cells occurring in the course of evolution, the cells of a unitary species are incapable of changing the direction of differentiation). This led to the fact that the return of the individual to the embryonic state as a result of the functional systems of formation of reduction bodies or the formation of diapausing somatic embryos became impossible. Butthese functional systems have been preserved in the unitary species. The functional system of formation of the reduction body was transformed into a functional system of inflammation. In inflammation, as in the reduction of primitive invertebrates, there is dedifferentiation of specialized cells and their death, dedifferentiated cells multiply, and the dead differentiated cells are replaced by less differentiated connective cells. Motivational excitation causing the realization of the functional system of inflammation in an individual – the need of sessile modular ancestors to preserve the viability under the action of a damaging one a factor whose force of action exceeds its adaptive capacity. Since the functional system of formation of reduction bodies in different evolutionary lines of primitive invertebrates arose independently, independently and in different evolutionary lines there was also a functional system of inflammation. The similarity of inflammation in representatives of different evolutionary lines of unitary species is convergent. Since the reduction is known in sponges that have no nervous and endocrine systems, inflammation is probably regulated by intercellular interactions.

The Emergence of the Mechanism of Carcinogenesis

I and Khudoley paid attention to the similarity of the functional system of formation of diapausing somatic embryos in sessile modular species and the functional system of oncogenesis of unitary species. Based on this similarity, we offer the following explanation of the nature of cancer. The formation of a malignant tumor is an atavistic transition of a unitary individual into diapause, an act of atavistic asexual reproduction, and the tumor is an atavistic somatic embryo preparing for diapause. The destruction occurring during oncogenesis is atavistic destruction that occurred in the first Metazoa on Earth during the formation of somatic embryos preparing for diapause [12,21,77]. According to Boyko et al. from the co-authors [65], the explanation of the nature of cancer offered by us does not contradict the known facts.

So the functional system of formation of diapausing somatic embryos, which provided the potential immortality of the sedentary modular species, in unitary species began to interrupt the flow of life. Motivational arousal that activates a functional system of carcinogenesis, caused by the need for modular sessile ancestors unitary species to maintain viability in the seasonal deterioration of the environment. Oncogenes, on the basis of this hypothesis, are the genes that drove the primitive sessile Metazoa funkcionalnoe modular system of preparation for diapause. Oncogenesis is a perversion of the preparation for diapause. The perversion occurred due to the fact that the functional system of oncogenesis in a unitary individual did not have an adaptive value for the individual and mutations distorting the implementation of its evolutionary predecessor were not eliminated by selection.

If the formation of reduction bodies in sessile modular species-the response to the damaging effects, the formation of diapausing somatic embryos -the response to signal factors warning individuals about the approaching seasonal deterioration of the environment. Carcinogenic factors are probably atavistic signaling factors that caused the formation of diapausing somatic embryos in the first Metazoa on Earth.

If the evolutionary predecessor of oncogenesis was an adaptation to the seasonal deterioration of the environment, then it would have to remain similarities with preparation for diapause. Some publications seem to confirm this. Preparation for the diapause of the somatic embryo includes the transition to the ancient more stable metabolic pathways, the emergence of the ability to tolerate freezing and dehydration [1]. In the tumor, too, there is a switch to the ancient stable pathways of metabolism -the suppression of aerobic metabolism and use instead of it on the ancient anaerobic pathway of carbohydrate oxidation, gaining the ability to tolerate anoxia and hypothermia [78 - 81]. Vertebrate tumor cells do not die when dried [82- 87], but normal vertebrate cells do not suffer dehydration. Consequently, the tumor cells with which the authors cited worked had the ability to remain viable in dehydrated state during tumor growth, as well as diapausing somatic embryos during preparation for diapause.

Reproduction of dedifferentiated cells in sessile modular species in the formation of diapausing somatic embryo stopped at a stage similar in structure to the stage of gastrula. With the onset of mitotic diapause in the somatic embryo of sessile modular ancestors of unitary species stopped. According to Gateff [88], based on her and other data, the increase in the number of tumor cells is only a stage of tumor growth, which also comes to an end of their reproduction, it is rarely Observed because of the death of the patient, who does not usually live up to this stage of tumor development.

Diapausing somatic embryos of sessile modular animals can be formed from derivatives of any of three embryonic leaves [24]. Tumors can also be formed from a variety of fabrics. The predisposition to the formation of malignant tumors in individuals population varies and is an inherited sign. The predisposition to diapause in individuals of the population also varies and is also an inherited sign. It follows from the proposed hypothesis that since the functional system of formation of diapausing somatic embryos in different evolutionary lines of sessile modular species arose independently, in different evolutionary lines of unitary species there was also a functional system of oncogenesis. The similarity of oncogenesis in representatives of different evolutionary lines of unitary species is convergent. It is explained by the similarity of the processes of formation of diapausing somatic embryos in representatives of different evolutionary lines of the first on the earth Metazoa. Somatic embryogenesis in the formation of diapausing embryos begins with the emergence of tissue in the individual zone, whose cells are differentiated. Oncogenesis starts is also not due to a mutation of a single cell, and may occur in specialized tissue areas, which cells malignities (i.e. dedifferentiate).

In species forming diapausing somatic embryos, it is impossible to cause the formation of tumors. They have a functional system of preparation for diapause is not yet a functional system of oncogenesis. In plants, cancer is also impossible for the same reason. Functional education system diapausing somatic embryos from sedentary modular types optional. If the sessile modular individual does not receive signals warning it of the approach of the unfavorable season, this functional diapause preparation system does not work. The program of the functional system of oncogenesis is also optional. Therefore, the principal opportunity to prevent cancer, as opposed to the ability to prevent aging, there. Since the functional systems of formation of resting somatic embryos in plants and sessile modular animals are similar to each other, the functional system of oncogenesis and the functional system of formation of resting somatic embryos of plants are similar. Therefore, researchers looking for ways to decipher the mechanism of oncogenesis, it is necessary to keep in mind the achievements in the study of the formation of resting embryos not only modular animals but also plants. Best of all, the process of formation of resting plant embryos is studied by the example of potato tuberization [89].

More Arguments in Favor of the Proposed Explanation Nature of Cancer

It is widely believed that the tumor-the result of the exit of cells from the regulatory influence of the body. It's against the oncogenic theory of cancer. If, as follows from it, the appearance of the tumor is a consequence of the activation of genes normally found in each cell, then oncogenesis is the implementation of a hereditary development program, an alternative program for the development of the normal. Cancer, based on the above ideas about its nature -initiated and regulated by the body process. All regulation includes inhibition and stimulation. Inhibition of tumor growth is carried out by the immune system. But the tumor may grow and there are reasons to think that growth is the consequence is not of breaching by tumor cells immunological surveillance, but stimulation of the body their breeding grounds. Connective tissue of experimental animals contributes to the proliferation of tumor cells [90]. It is also favored by the growth of vessels in it [90, 91]. Immune and humoral cell reactions can lead to increased tumor growth [92]. Among the lymphocytes infiltrating the tumor, T -, B - and plasma cells were found to stimulate tumor growth [93]. When metastasizing, lymphoid cells and macrophages destroy tissues, facilitating the spread of the tumor [94]. There is a system that controls tumor growth [95,96].

The comparison of morphogenetic capabilities of immunocytes in animals at different stages of evolution leads to the identification of parallels between oncogenesis and somatic embryogenesis, confirming our assumption about the nature of cancer. The jaws of immunocompetent cells archeoceti and colonocyte [97,98], flowing down -wandering cells mezoglei and interstitial cells [97,99]. Suggested [100] that has a broad morphogenetic potencies wandering amebocyte Turbellaria -the same evolutionary precursors of hive. The cells of the ascidians, the function of which aimed at the realization of immunological and morphogenic potentials, are lymphocytes, or hemocytoblasts, as well as macrophages and some other types of hive [101,102].

Insects morphogenetical potencies have lymphocytes [103].

The participation of the immune system in morphogenesis consists in the performance of its cells formative and regulatory functions. The ability of cells of the immune system to perform a formative function, that is, to be a source of tissue construction in the normal ontogenesis, most strongly expressed in modular species. Some *Spongia* by aggregation of archeocytes that are outside of the colony, formed by developing without diapause modules [104]. Diapausing somatic embryos (podocysts) are formed by aggregation of wandering amoebocytes outside the body in the polyp of the scyphoid medusa *Aurelia aurita* [105]. Diapausing somatic embryos of *Spongia* (gemmula) is the accumulation of archeocytes sponge inside. Some of the Ascidiacea in the formation of somatic embryos, as diapausing and developing without delay, formative role lifecity (hemocytoblasts) [24]. In contrast to sponges and the polyp of *A. aurrita* scyphomedusa, other cells play a formative role in the formation of somatic embryos, in addition to cells of the immune system [24]. Have Turbellaria from wandering amebocytes can be formed, probably all cell types of the body [34]. Immune cells take part in the formation of regenerative blastema [106] and in insects [103]. Insects of the hive is formed by the fat body [103], and the *Ascidiacta* - oocytes [107]. In vertebrates, the cells of the immune system perform a formative function in embryogenesis, forming new foci of hematopoiesis, and in postnatal life, creating a colony of stem cells in already functioning hematopoietic organs. Formative immunocompetent cells of vertebrates are also in the regeneration of hematopoietic tissue and hematologic malignancies [108,109].

The immune system is controlled by morphogenesis through the destruction of cells, stimulation of their reproduction and the effect on their differentiation. Histolysis of vital organs is an integral part of the preparation for diapause of sedentary modular species. *Spongia* have histolith cells is carried out using archeocytes [24], the Ascidiacea -with the help of macrophages and possibly other cells of the immune system [30,110,111]. In insects with complete transformation of tissue phagocytosis by lymphocytes is observed in metamorphosis [112 - 114].

Along with histolytic regulatory cells of the immune system of invertebrates perform a trophic function. Areacity of *Spongia* and Ascidiacea of macrophages, swallowed cells or fragments thereof, become nurse cells of. Trophocytes migrate to somatic embryos (preparing for diapause and developing without stopping) and provide them with nutrients [24]. In insects with metamorphosis, nutrients of lymphocytes formed as a result of phagocytosis of larval tissues serve for the growth of imaginal stages [112-114]. No information on the effect of the immune system on cell differentiation was found in invertebrates. In vertebrate immune cells direct the differentiation of cells [115], contribute to their reproduction [98,115] or phagocytose them. Unlike formative regulatory cells of the immune system, having played a role, they die and are not included in the composition of modules and regenerated tissues.

Thus, the formative capabilities of the immune system cells decrease as they move up the branches of the phylogenetic tree. In the most primitive Metazoa *Spongia* and cnidria they can be the only material in the construction of a new module. The Ascidiacea, together with lymphocytes in the formation by somatic embryogenesis of a new module involves cells that are not immunocompetent. In even more highly organized species – insects and vertebrates due to the loss of the ability to somatic embryogenesis cells of the immune system are no longer involved in the formation of a new organism, but in the processes of normal development and reparative regeneration formative role still perform. The destructive role of cells of the immune system as the organization of the individual also decreases. There are *Spongia* and Ascidiacea in preparation for the seasonal deterioration of the environment most types of cells phagocytized. cells of the immune system. In more advanced evolutionary species (except insects with complete transformation) the volume of destructive processes in normal ontogenesis is less.

In oncogenesis, the lost formative capabilities of the immune system cells are restored. When leukemia tumor cells of vertebrates, like the formative cells of the immune system of *Spongia*, polyp scyphoid jellyfish *A. aurita* and the Ascidiacea, forming malignant tumors, which are constructed also from the differentiation (malignant) cells. The occurrence of these tumors in leukemia also precedes migration (by the bloodstream) immature (malignant) cells of the immune system. Lifecity and macrophages of vertebrates in oncogenesis, as areacity of *Spongia* and Ascidiacea of macrophages before the onset of the inhospitable season, to stimulate the growth of tumors and destroy vital organs. This destruction, as in *Spongia* and Ascidiacea in preparation for diapause, leading to the disintegration of the body, destruction of vital organs. From invertebrates closest to vertebrate's Ascidiacea. Aside and vertebrates is homologous to the following processes: 1) the destruction by immune cells of individual modules during pre-diapause and destruction of lymphocytes and macrophages tissue of the tumor, facilitating the spread of the tumor; 2)the transfer of the nurse cells of the growing preparing for diapause somatic embryo nutrients, and immunostimulation of tumor growth; 3) formative of the function of lymphocytes (hemocytoblasts) the formation of somatic embryos of diapausing and hematological malignancies.

Restructuring of The Body, Occurring in Oncogenesis

From the unitary of cases of cancer individuals, there are missing in a healthy organism atavistic intra-module communication, which arose in primitive Metazoa with their preparation for the seasonal deterioration of the environment. These include the donor-acceptor inter module relationships. Donors in a unitary individual become specialized tissue, and their acceptor-tumor. The destruction that occurs in a unitary body in cancer, as well as in aging, is a consequence of the depletion of specialized donor tissues. The reason for the similarity of changes developing in the body with aging and cancer, which indicates V.N. Anisimov [116,117], that in both cases the destruction of specialized tissues is a consequence of donor - acceptor interactions in the body. Both aging and oncogenesis is a highly altered process of asexual reproduction, Destruction in the body, which occurs during the passage of these pathological processes, are always associated with asexual reproduction destructive processes, which were written by B. p. Tokin [34] and Ivanov-kazas [23].

In sessile modular ancestors, the death of differentiated cells and the formation of diapausing somatic embryos allowed individuals to reduce energy needs and thereby maintain energy balance and avoid death during the adverse season of the year, when its metabolism is disturbed and it is because of this in a state of energy deficiency. A unitary individual cannot solve its energy problems by returning to the embryonic state. It has a simplification of the structure of the individual, beginning with oncogenesis (with atavistic preparation for the return to the state of early somatic embryo), cannot be completed, as interrupted at the beginning of the death of the individual.

Destruction of specialized tissues of the individual in oncogenesis is faster than in aging, because in preparation for diapause sessile modular ancestors had to hurry to be prepared for the seasonal deterioration of the environment. Tardiness threatened them with death. But the premature transition to diapause was also harmful, because in this case the individual would underutilize the resources of the environment, which would reduce its chances to stay in the biocenosis in the environment of competing with it for the resources of other individuals of this and other species. Therefore, in the formation of diapausing somatic embryos of primitive Metazoa iteroparous went from asexual reproduction to semelparous. Seven-pair asexual reproduction allowed individuals in a short time, mobilizing all the resources of the body, to acquire the necessary resistance to the expected adverse changes in nature.

In the work of the functional system of oncogenesis, the nervous and endocrine systems do not participate, since they did not participate in the formation of diapausing somatic embryos in sponges and plants that have no nervous and endocrine systems. The functional system of oncogenesis is controlled by the mechanism of intercellular and interstitial interactions.

Tumor Regression

Cancer treatment is a painful process that does not always lead to the desired result. But the possibility of painless treatment of this disease is. This is evidenced by the existence of a tumor regression mechanism. Tumor regression is the recovery of an oncological patient without medical intervention [118, 119]. If we could understand how the mechanism of tumor regression works, and artificially start it in cancer patients, we could get rid of surgery, chemotherapy and radiotherapy. The way to decipher the mechanism of tumor regression is to decipher the mechanism of the evolutionary predecessor of this process. The evolutionary precursor of tumor regression is the resorption of a diapause-preparing somatic embryo of sedentary modular species, which is referred to in section 2.Changing the method of asexual reproduction (transition from the formation of modules preparing for diapause to the formation of modules developing without stopping) it indicates the functional plasticity of the reproductive system of the individual. Functional plasticity of the reproductive system occurs when the population lives in an environment in which the living conditions are unstable. In the ocean and in large seas due to the presence of large amounts of water, the conditions of existence cannot change dramatically and quickly. Unstable environment in small bodies of water - in bays, estuaries, separated from the sea waters. Since the tumor regression mechanism exists, vertebrates probably originated from sedentary modular invertebrates that lived in water bodies, the conditions of existence in which rapidly and sharply changed.

Oncogenesis - Accelerator of Evolution

There is a hypothesis that oncogenesis selectively weeds out of populations of insufficiently adapted to the habitat of individuals. In human populations, the natural selection is opposed by the health care system. The resulting slowdown leads to an increase in the number of carriers of harmful mutations, that is, to the accumulation in populations of genetic cargo. This load grows, reducing homeostatic properties of populations. Living systems have the ability to counteract harmful changes in them. Populations also have this property. Human cancer is probably a way to counter the growth of populations in their genetic cargo. To this opinion inclined the ideas contained in the articles Sommer [120] and Liechtenstein [121]. These authors suggest that using cancer eliminated individuals, genetic inferiority which is for populations in danger. Malignant neoplasms, they write, killing defective individuals and accelerating this evolution, act for the benefit of populations. Cancer counteracts the growth of harmful mutations in human populations. He's an evolution medic.

The mechanism of oncogenesis is likely to be activated in cases where environmental conditions change so quickly that natural selection does not keep up with them. As a result of this lag, the adaptation of populations to the environment is reduced and they are threatened with going into oblivion. Cancer of modern man is probably a compensatory reaction of supra-organizational systems of populations to the activities of doctors fighting for the extension of life carriers of harmful mutations. Improving the health care system will further inhibit the natural selection. If Sommer and Lichtenstein are right, the more successful doctors will be in treating non-oncological diseases, the greater will be the genetic burden in the populations and the more people will suffer from cancer. From the views of Sommer and Liechtenstein, it follows that cancer is the price that humanity is forced to pay for resisting natural selection. Currently, the health care system is improving in developed countries. It should be thought that it will continue to improve in these countries. The mechanism of oncogenesis is likely to be deciphered and cancer will cease to be a threat to man. When this happens, the imbalance of society will increase even more, and to maintain the sustainability of this imbalance, society will have to spend even more energy than now.

Metazoa's Transition from Modular to Unitary State Increased the Role of the Population's Supra-Organizational System in The Adaptation of the Species to The Environment

Individuals have a unitary functional system of aging a mandatory part of ontogenesis, as it was mandatory to have a functional system updates the modular structure of the ancestors of unitary types. The inevitability of the termination of the existence of a unitary individual is also guaranteed by the functional systems of aging and inflammation. The genetes of modular organisms in natural conditions in the mass due to various reasons cease to exist. But they have a chance to live forever. The unitary individuals do not have it.

Have sessile types of unit modules are an infinite number of times to duplicate their genotype. Therefore, they have populations in which the number of genets may be small or represented by only one. The low genetic diversity of populations of sessile modular species makes the selection of the most adapted genets and culling of unsuitable ones ineffective. And because of the slow change of genets in populations of modular species slowed adaptive genetic adjustment in response to changes in their environment adaptation at the population level is difficult.

In unitary species, duplication of genotypes is impossible. The number of genotypes in populations of unitary species is higher than in populations of modular species. As a result of this and the inevitability of the termination of the existence of a unitary individual is more effective than in the populations of sessile modular species, is being eliminated from the populations unsuitable genotypes and selection of the most adapted. Adaptive genetic rearrangements of unitary species populations are faster than those of modular species. Aging, inflammation and carcinogenesis is a unitary fee for individuals belonging to populations that can quickly in response to environmental changes genetically to adapt and thus to adapt to the changing environment.

Opportunities and Prospects of Immortalism

According to V. P. Skulachev and co-authors, it is necessary for animal populations to be genetically reconstructed by natural selection in response to changes in the environment. Humanity is adapting not by evolving, but by transforming the environment to suit its needs. Aging in humans-harmful atavism. It is necessary and can be eliminated [122]. Hope to escape from the need to age prevalent here and abroad. Articles on the Internet devoted to immortalism are evidence of this.

By adapting the environment to its needs, man has destroyed many species. If the decline in biodiversity continues, the evolution of the Earth will accelerate dramatically. Happens compensatory avalanche flash of speciation. Some of the newly emerged species will be pathogenic to humans [123,124]. Before will be found the means of combating them, they will cause non-immune screening of genotypes. This screening is happening in our time. Disease-causing organisms evolve, humanity in response to this by natural selection evolves towards the development of immunity to them. There is a conjugate evolution of human and disease-causing organisms. Unable to evolve populations of ageless people, which intend to create immortalists, will be due to the emergence of new pathogens and the evolution of existing doomed.

By transforming the environment, man has polluted it. We breathe air containing harmful substances, drink water purified from industrial and household waste, eat food containing heavy metals and pesticides. We’re exposed to radiation and electromagnetic fields. This has resulted in the widespread spread of environmentally-related diseases. In populations of ageless people, which the immortalists intend to create, there will be no change of generations. Natural selection in these populations will stop. Non-aging people will face death not from old age, but from environmentally-related diseases. Therefore, it is unlikely that these populations will last long.

By adapting the environment to its needs, humanity has come close to social, economic and global environmental crises. Intensively using the resources of the environment, it exceeded the capabilities of the biosphere. The rampant growth of the world economy has led to the exhaustion of the planet’s resources. The continuation of the economy is still a disaster. The economic collapse of modern civilization is approaching. [125,126]. In the context of the global environmental and socio-economic crisis, the possibility of human adaptation to the environment by changing it will be narrowed and the role of natural selection will increase.

Man, as all life on Earth is evolving. It is subject to mutations, horizontal gene transfer, genetic recombination, gene drift, and gene allele transfer from one population to another [127]. The mutagenic process in humans accelerated because of the action of the mutagens of anthropogenic origin [128]. Resistance to adverse environmental factors caused by civilization, whether abiotic, biotic or social factors, is a genetically determined characteristic [129, 130]. Individuals are ill, whose mechanisms of adaptation to life in the conditions of scientific and technological progress contain defects. Diseases eliminate genotypes that are unable to resist the adverse factors of urban life, and populations, although very slowly, increase their resistance to these factors.

The approximate size of genotype dropout in human populations can be judged from the following data: 15% of embryos die in the early stages of ontogenesis, 3% are born dead, 2% of newborns die immediately after birth, 3% of those born die before the reproductive period, 20% of adults do not marry. As a result of this, approximately half of the population gene pool is not reproduced in each next generation [128].

Only the change of generations will allow a person, despite the expected cataclysms in nature and in society, to remain an integral part of the biosphere. Populations of ageless people in the global environmental and socio-economic crisis will die out. But even if the ominous predictions of the global environmental crisis and the collapse of world civilization will not come true, the populations of ageless people will not be able to survive for a long time. The experience of recent history teaches that periods the relative well-being of mankind is alternated with wars, during which there is a mass death not only of military personnel, but also of civilians. Populations ageless people wars not to worry. Thus, if the designs of the immortalists could be realized, it would not bring good.

The habitat of a species, a member of a community, has changed in the past, is changing now and will change in the future as other species of the community on which its existence depends evolve. The abiotic environment of the view has been, is, and will continue to be. Because of this, the efficiency of previously developed types of devices is reduced. To survive, the species needs to evolve in response to these changes. If the development of new devices will keep up with the reconstruction of the community, the species will remain a member. Otherwise, he will die. Aging, inflammation, and cancer appeared on Earth when unitary Metazoa emerged. This happened shortly before the Cambrian. So, since that time, these pathological reactions, accelerating evolution, influenced the formation of the biosphere, including the emergence of man. The presence of accelerating the evolution of aging, inflammation and oncogenesis facilitates the adaptation of the population to the changing environment and makes its position in the community stronger.

Man is adapted to life in the biosphere, which due to his activities ceases to exist. A new biosphere is emerging with a new species composition of plants, animals, fungi and microorganisms and a new chemical composition of water, soil and air. To life in it man not well adjusted. To remain an integral part of the biosphere, it needs to evolve. It can evolve only if there is a change of generations. Aging, inflammation and oncogenesis provided the ancestors of the man a strong position in the changing biosphere, provides it now and will continue to provide.

Summary

If the proposed hypothesis about the nature of aging, inflammation and carcinogenesis is correct, then to decipher the mechanisms of these pathological processes, efforts should be directed at the study of adaptive mechanisms of the destruction invertebrate's homeostasis close to the base of the tree filogenetiseskogo Metazoa. Can help in deciphering the mechanisms of these pathological processes in the study of the adaptive processes regulating the destruction of homeostasis in plants. To decrypt the mechanism should be tumor regression to decipher the mechanism of resorption preparing to diapause somatic embryos from kolonaalnyh Ascidiacea.

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