

THEORETICAL BASES OF PROCAINE THERAPY (GEROVITAL H₃ AND ASLAVITAL) IN THE PROPHYLAXIS OF AGING

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Summary. The reduced number and functional capacities of the cells during the aging process induce numerous characteristics of aging. As regards the neurons, the main object is to extend the cellular resources, with the help of psycho-pharmacology. The author proved, 25 years ago, the influence of procaine on the nervous system, by psychological and functional, clinical and experimental investigations. Recently the procaine pharmacology has developed by means of some American authors' researches, among which double-blind studies, concerning the favourable effect of Gerovital H₃ on the depressive moods of the elderly. The connection was proved between the aging process and the intensification of mono-aminoxidase activity in the brain as well as procaine and especially Gerovital H₃ capacity to inhibit MAO and to reduce the aging marks at the level of the central nervous system. The anabolic action of procaine was proved in researches on cell cultures as well as on the animals finding, among others, an improved general trophicity and a prolonged life span. Other results obtained in the field of procaine action mechanisms refer to: the improved nitrogenous balance, favoured ATP synthesis, antioxidating action, intervention in the oxidative phosphorylation, the fat metabolism disturbances of atherosclerosis, the increased speed of nerve condition, the excretion of urinary steroids and metabolites, etc. The ultra-structural studies revealed the contribution of Gerovital H₃ to the stabilization of membranes and of the main cellular organelles, the intensification of cell metabolic activity in the treated cultures. All these lie at the basis of the prophylactic action and therapy of the aging phenomenon. In order to intensify the lipotropic action as well as that on the cerebral aging, the author elaborated a new product, Aslavit. The results of this treatment obtained in the first 9 years of application prove its efficacy in the involutive processes, predominantly cerebral, and in atherosclerosis (especially in the disorders of blood coagulability and lipid metabolism) as well as in the prevention or treatment of complications.

The decrease in the functional capacity, rendered more evident by the action of a stress factor, is one of the characteristics of the aging body. The decrease is closely correlated with the lowering number and functional ability of the active cells. With the progress of life, the rhythm in which mitotic cells regenerate slows down, thus the number of active cells decreases, as against the total body mass. This decrease induces the numerous characteristics of aging, such as: asthenia, physical disabilities, diminished muscular strength, impaired heart and kidney function, etc. The unbalanced adaptative mechanisms are also common.

Up to the present, there has been no proof of neuronal regeneration. Nevertheless, in our opinion, the possible prolongation of the brain cellular resources is a main objective of current gerontological research, that is of the psycho-pharmacology of aging.

Thirty-four years ago we published the first article on procaine action at the level of the respiratory centres in humans [1]; since 1949 our researches have

pointed out procaine action in the process of aging [2]. The stimulation of hair growth and repigmentation in humans [3], improved fur trophicity in rats [4], positive action on memory and depression have also been pointed out. The clinical and physiological investigations carried out in collaboration with C. I. Parhon and Al. Vrabiescu [5] pointed out procaine influence on the brain (studies based on conditioned reflexes).

Luth [6] emphasized that Parhon and Aslan had been the first scientists who mentioned the psychic effect of procaine ("procaine influence on the patient's psychic condition was signaled for the first time in the medical literature by the Romanian authors").

During the last 23 years our investigations of the biotrophic action of this substance, as well as studies carried out by foreign researchers have contributed to the improvement of procaine pharmacology. In the present paper I shall present the investigations of procaine action on the central nervous system and metabolic processes, with emphasis on the study of the regeneration phenomenon: in other words, I shall speak about the theoretical bases of this therapy in the process of aging and the prophylaxis of premature aging.

Our study on conditioned reflexes in human subjects were confirmed by Tsobkallo and Kuteherenko's experimental investigations [7]; they noticed the stimulating effect of 1–2 mg/kg body weight (amounts we used in human subjects) on the higher nervous activity as against the inhibitory effect of 20 mg/kg body weight. The above-mentioned authors pointed out that the upper area of the brain is mostly influenced by procaine. (The experiments were carried out on dogs and rabbits, and procaine was administered subcutaneously). Certain authors noticed that the products resulting from procaine hydrolysis were less active than procaine itself. This is a proof that the effect on the central nervous system is due to the intact procaine molecule.

Injecting procaine intravenously in dogs, Genovese and Garrattini [8] noticed the fixation of the substance in the central nervous system rather than in other organs.

S. Mora's electroencephalographic study [9] revealed significant differences between the 139 subjects investigated, the average age being 66, and younger subjects, the average age being 27. The combination of alpha and beta waves was pointed out in 67.7% of the aged subjects. The corresponding percentage with the younger subjects was 32%. Better EEG tracings were pointed out in 1/3 of the treated cases; no modification was noticed in the subjects with beta waves prevalence. The author establishes a possible correlation between the EEG tracings and the psychic reactivity.

The investigations conducted in collaboration with Broșteanu and C. Enăchescu [10] pointed out normal, unimpaired electric tracings under intermittent luminous stimuli in 75% of the Gerovital H₃ chronically treated subjects (the average age 85); in aged untreated subjects, normal tracings were evidenced only in 20% of the cases.

Subsequent to our investigations on the psychic effect of procaine (the results of which were published in 1956) pharmacological studies were carried out in 1957 on dimethylaminoethanol (DMAE) action by Pfeiffer and coll. [11], who noticed a higher improvement in muscular tonus and sleep, as well as a stronger mental stimulation with DMAE rather than with amphetamine. This study placed emphasis on the relations existing between DMAE and acetylcholine. Subsequently, Groth, Bain and Pfeiffer's comparative researches [12] based on ¹⁴C. DMAE and choline action proved that DMAE breaks through the blood-brain barrier, takes part

in the metabolic process of the nervous cells fixing their proteic and lipid fractions and is instantaneously changed into choline and acetylcholine. Unlike DMAE, labelled choline is removed through urine and respiration. DMAE may be looked upon as an acetylcholine precursor.

Numerous biochemical studies on the animal metabolism were carried out with an emphasis on DMAE transformation into choline. The cycle is the following: serine, aminoethanol, monoaminoethanol, DMAE [13]. Eicholtz's investigations [14] *in situ* of striated muscle also revealed DMAE transformation into choline. Beside the above-mentioned pharmacological, biochemical and biophysical data, procaine stimulating action on the central nervous system was pointed out by experimental investigations in white rats. In collaboration with Al. Vrăbiescu and coll. [15] we studied the learning and memorizing capacity with 24-month-old rats, according to Verzar and McDougall's maze method [16]; the results obtained in Gerovital H_3 treated animals were significant.

Studies based on our method were conducted on psychic disturbances and brain syndromes in old age. Bucci and Saunders [17] emphasised the favourable effect of the treatment in elderly schizophrenic subjects: the disappearance of hallucinations and the new contact with the environment up to the recovery of the intellectual activities. These authors consider procaine an energizing substance and correlate its action with monoaminoxidase (MAO) inhibition. Besides us, Tsobkallo, Bucci and Saunders found procaine more active than DMAE.

Significant data were communicated in 1972 on the existing relationship between MAO brain level and the aging phenomenon. Robinson and coll. [18] pointed out the marked increase in MAO brain level after 45, as well as the possible connection between this increase and the aging phenomenon.

MacFarlane [19] has appreciated Robinson's important contribution to the understanding of a biochemical modification connected with the aging process. Based on his data he emphasised that Gerovital H_3 induces a stronger MAO inhibition than the normal procaine hydrochlorate; its action is reversible and competitive.

The results of such studies pointed out Gerovital H_3 favourable effect on the aged subjects, due to the inhibition of the MAO increased levels; biogenous amines levels are also brought to normal values. The results of the clinical researches on the effect of Gerovital H_3 on the elderly suggest that the normalization of MAO levels has a positive influence on aging associated symptoms.

Long [20] investigated procaine effect on orientation, memory, attention and body weight in the aged. Double-blind studies according to our method were conducted for 1 year, on 60 subjects with orientation troubles. A special procedure for measuring orientation, attention and memory was used; it pointed out better scores in the treated group. Memorizing ability improved in the treated subjects, whereas a decrease was noticed in controls; body weight increased in the treated subjects and decreased in controls.

Beside positive results, certain negative facts were noticed in Great Britain [21, 22, 23]. Three experiments were conducted on a small number of subjects with severely impaired general condition. The treatment was applied neither with our product nor according to our method.

In our first investigations we used a procaine solution with pH = 4.2. Since 1957, the solution had been buffered at pH = 3–4, in order to obtain a higher stability. Our solution (Gerovital H_3) contains: procaine 2%, benzoic acid 0.12%, potassium metabisulphite 0.10%, dinatrium phosphate 0.01%. Potassium salt was added in order to intensify the effect on the nervous system and the heart.

Mention should be made of Holland's investigations (quoted by Giotti [24]) which pointed out the slowing down of potassium loss in a potassium-lacking environment subsequently to procaine administration.

Alfonskaia [25] noticed that potassium prolongs and intensifies procaine action.

The fact is also known that potassium ion potentiates acetylcholine activity; it is also known that procaine acts at the cellular level. The hypothesis may thus be advanced that the potassium ion facilitates procaine penetration into the cell.

The studies carried out by Benetato and coll. [26] pointed out the contribution of the researches on potassium mechanism of action to the cellular biophysics, particularly in the aged.



The long-term treatment with Gerovital H₃ administered to aged subjects resulted in skin revitalization, hair growth stimulation, development of muscles, increased resistance to stress, quicker consolidation of fractures.

Mortality was 5% in the chronically treated subjects, as against 16% in controls. The anatomo-pathological evaluation of the deceased subjects [27] focussed on the analysis of cell division; the multiplication of certain myocardial fibres and nuclei against the atrophy of others was thus noticed. The authors suggest that this fact represents the reactivation of myocardial nuclei correlated with the metabolic process. Another morphological finding was the absence of sclerosis consecutive to parenchymatous atrophy in the liver, heart, brain and endocrine glands.

The experimental researches, conducted in collaboration with Al. Vrăbîescu, C. Domilescu and I. Nicea, consisting in the clipping of the sciatic muscle, pointed out both physiologically and morphologically the stimulation produced by Gerovital H₃ in the regeneration of the striated muscle. This effect is significantly stronger with Gerovital H₃ than with the common procaine solution. A study on the regeneration of the peripheral nerves pointed out the positive effect of Gerovital H₃ on the continuity of the sciatic nerve; it delays the occurrence and the progress of neurodystrophic processes and results in the regression of sural triceps muscle atrophy. The regression of the atrophy was pointed out in 71% of the Gerovital H₃ treated cases, in 26.6% of the controls and in 36% of the animals subjected to the procaine treatment.

Statistically speaking, the studies on nervous dystrophy (Speransky's method) and experimental fractures pointed out more significant effects of the drug when applied before the dystrophy or fracture, thus supporting its prophylactic utilisation.

The experimental studies pointed out procaine anabolic action noticed previously. In studies on Infusoria (*Colpidium colpoda* and *Vorticella*) we noticed the stimulated cell proliferation as a result of a weak procaine solution, this pointing to the anabolic action of the drug [28]. The investigations on rats drew the attention on procaine anabolic influence noticed in the animals' weight increase and improved quality of the hair [4]. In a study on 3-month-old rats, Berger [29, 30] obtained similar results with 6 mg/kg body weight procaine. A 5-month-prolongation of the life span was noticed.

On the other hand, Verzar [31] used 25 mg/kg body weight procaine (amount which inhibits the oxidoreduction) and did not notice any modification.

In order to solve the problem of these contradictory results we initiated [15] a study on 1800 white rats treated with Gerovital H₃ since the age of 3 months,

that is before the onset of aging. The results pointed out a 21% increase of the life-span in Gerovital H_3 treated animals; an improved general trophicity was also noticed, as well as an increased resistance to bronchial-pulmonary diseases. Less myocardial lesions were recorded on ECG (coronary irrigation disorders in 30% of the treated animals, as compared to 80% of the controls). Fewer spontaneous tumors occurred in the treated group as against the controls.

Histological examination of the treated animals revealed a less important connective invasion in the myocardium, the striated muscle, and less degenerative lesions in the renal tubule.

Konieczny [32] noticed the weight increase and the diminution of the nitrogen catabolism in the procaine treated rats. Nicolae and Dumitrescu investigated the influence of procaine therapy on the nitrogen metabolism in aged. The treatment resulted in the decreased nitrogen excretion, the improvement of the nitrogenous balance even in quite aged patients. These authors emphasized the importance of the above mentioned therapy in dystrophic states associated with proteic metabolic troubles.

In a previous study [34] we noticed the improvement of the restricted diffusion as a result of procaine administration; the intensified albumin supply was thus ensured. Procaine intervention in the carbohydrates metabolism was experimentally evidenced in our researches. The study on aloxanic diabetes in rats [35] pointed out procaine intervention in balancing metabolic disturbances as well as its action in preventing aloxanic aggression (insulin-like effect).

The investigations of isolated homeothermal and poikilothermal organs evidenced the stimulation of the vital processes produced by procaine. The studies were conducted by Teitel and coll. [36]. The authors noticed that low procaine amounts have a trophic and stimulating effect on the dorsal muscle of the leech prolonging its spontaneous activity and increasing the amplitude of the contractions. The researchers noticed procaine to be more sensitive to potassium action.

In other studies the emphasis was placed on procaine intervention in the intermediate metabolism, favouring ATP synthesis [37, 38]. This hypothesis was based on the discrepancy between the favourable trophic effect on one hand, and on the reduced O_2 consumption on the other. This finding seems to point out procaine similarity with the antioxidative substances. Fichez and Klotz also insist on the procaine antioxidative effect [39].

Other studies carried out on yeast [40] pointed out procaine action on the enzymes involved in oxidoreduction. Researches on liver homogenate pointed out procaine intervention on oxidative phosphorylation of glucidic metabolism [41, 42].

Analysing the relationship existing between aging and atheromatosis we realised that procaine effect on lipid metabolism required further investigation.

The studies on experimentally induced atheromatosis revealed the slowing down of the process in the animals simultaneously treated with Gerovital H_3 [43]. From a humoral standpoint the breaking down of lipoproteins shift to beta macromolecules was noticed. These results were confirmed by Tchernov [44]. Sidorovitch [45] noticed a similar action and suggested a possible synergism between procaine and female hormones.

The effect on atherosclerosis was investigated by Litovchenko and coll. [46] in 145 patients; the oscillometric evaluation subsequent to 2-4 series of procaine injections revealed a normal reaction to cold stimuli. The capillaroscopic investigation pointed out the acceleration of the blood flow subsequent to 3-5 series of injections. A similar effect on the capillaries was communicated also by Schulze.

Litovchenko emphasized that procaine influenced the neurotic and circulatory disturbances in atherosclerotic subjects [46].

Kurth's studies [47] on procaine action on the lipid metabolism recorded favourable results in atherosclerotic subjects in whom the function of the cell membrane was corrected. Also 3/5 of the arteriosclerotic dysproteinemias became normal as a result of procaine administration. The author also noticed the quicker serum clearing as well as the decrease of cholesterol levels.

In order to point out the antiatherogenous action of Gerovital H₃ we carried out a study on 25 subjects aged 72–90, subjected to procaine treatment for 4–11 years; an equal number of patients were used as controls. The author studied lipoproteinlipase activity *in vitro* as well as different fractions after both heparin injections and the activation of the endogenous lipoproteinlipase. Lipoproteinlipase activity reached the average values 13.01 ± 2.01 in the treated subjects, as against 8.75 ± 1.77 in the controls (the normal value is 15 ± 1.6).

An obvious dislocation of the lipoproteic fractions was noticed after the heparin injection, with the modification of the beta / alpha-lipoprotein gradient (80% in the treated subjects, as against 15% in the controls). The modifications of the coefficient beta / alpha specific to the post-heparin lipoproteins tallied with the lipoproteinlipase enzymatic activity *in vitro*.

The inference may be thus drawn that one of the important links in the atherosclerotic dyslipoidosis chain is also subjected to the biotrophic influence. These data may be correlated with the reduced number of thrombotic accidents in aged subjects treated with Gerovital H₃. These observations confirm the results of our previous studies [48] on Gerovital H₃ based prophylaxis of atherosclerosis.

Comparative studies on Gerovital H₃ and procaine action, carried out by Greppi and Seardigli [49] pointed out the higher efficiency of Gerovital H₃.

Gordon and coll. conducted comparative studies on American procaine and Gerovital H₃. The experiments on rats revealed higher procaine levels subsequent to intramuscular Gerovital H₃ injections as against American procaine.

The "rejuvenating" effect of Gerovital H₃ on the excretion of the urinary steroids and metabolites, as well as on the conduction speed of the stimuli to the peripheral nerves were pointed out in the double-blind comparative researches [50].

The above-mentioned authors carried out psychic and social studies on 60 patients aged 68–90, subjected to the treatment based on Gerovital H₃ and American procaine. The general and psychic conditions improved more with the Gerovital H₃ treated group [51].

Friedman [52] communicated the results obtained with the Gerovital H₃ treatment in mental disturbances (confusion of organic origin). The clinical alleviation of the senile symptoms present in 1/3 of the treated subjects was noticed. In the author's opinion, senile confusion may be correlated with the metabolic disturbances, which can be alleviated through a biochemical reaction.

The favourable influence upon the depressive psychical states of the aged was also noticed [37]. The antidepressive effect of procaine has also been pointed out by Bucci and Saunders [17], Siggelkow [53], Cambel [54] and other researchers.

Together with Parhon [3] we found an improvement of memory, attention and sleep in patients chronically treated with procaine.

Recently, a double-blind research, Zung and coll. [55] using placebo and imipramine, tried to evaluate the efficiency of Gerovital H₃ therapy in depressive troubles, on 30 elderly patients. The clinical observations and psychometrical tests performed

before and after the four week treatment pointed out the superiority of Gerovital H₃ over imipramine.

Recently published data [18, 19, 56] draw attention to the modification induced by aging and depressive states in the enzymatic activity of the nervous cell as well as to the intervention of procaine at this level. The increased MAO activity could play an important part in the biochemical modifications induced by aging and depressive states. As a matter of fact, depressive states have been correlated with the reduction of central amines [57], which is due, as recently shown, to the increase of monoaminoxidase.

All these data point to procaine action on the cell metabolism beside that on the cell membrane. They also show the stronger effect of Gerovital H₃ (potentiated procaine solution) at cellular level particularly on the central nervous system as against common procaine.

We should also emphasize Officer's research [58] which, based on Hayflick's observation on the limited life-span of culture cells, pointed out that Gerovital H₃ introduced during the second passage accelerates cell doubling rate and, after the division has ceased, provides a longer life-span in the treated as against the control cells; it also prevents the transformation of the cell into a permanent cell line.

Our studies carried out on secondary cellular cultures from monkey kidneys showed that the average cell postmitotic life span was 72.4 days in cultures treated with Gerovital H₃ having undergone 14 passages and 62.3 days in nontreated cultures having undergone 12 passages.

The ultrastructural study revealed the contribution of Gerovital H₃ to the stability of main cellular organelles during the cultivation of cercopithecus kidney cells. A significant increase in the number and size of autophagic vacuoles was detected in untreated, control cells. The cytoplasmic reticulum was constricted and empty with few polyribosomes and prominent vacuoles. Large cytoplasmic damage was seen.

The ultrastructural findings correlate with stimulation and increase of the metabolic activity in Gerovital H₃ treated cells.

Based on the clinical and experimental results of the research work in our Institute, we have started since 1954 the prophylaxis of aging based on eutrophic medication (Gerovital H₃).

During the last years, 144 gerontological centres have been organised in industrial and agricultural enterprises.

Under the supervision of the Institute of Geriatrics in Bucharest, the workers aged 45 to 60 were subjected to medical examination; the physicians and the local social workers also drew up the social anamnesis of the patients. The complex evaluation of the health and social condition of the population is associated with a series of functional tests based on which the subjects' biological state is assessed. Gerovital H₃ therapy was thus administered to a group of subjects, as against a control group. The evolution was recorded every 6 months. (Prophylactic therapy: 5 series each including 12 Gerovital H₃ injections — 5 ml — annually, with one-month break between the series). The improvement of the psychic condition and work capacity was noticed in 70% of the cases; the appetite as well as the body weight increased; morbidity figures dropped and the resistance to stress increased.

Beside the anaesthetic effect, procaine also acts as an eutrophic agent in the process of aging. The clinical and experimental investigations pointed out this prophylactic efficacy. According to Soehring [59] the anaesthetic effect is but a small part of the procaine general effect. Both as an intact molecule and through

DEAE, PABA and the folic acid it intervenes in the metabolic regulation. It favours acetylcholine action and prevents epinephrine oxidation. According to Laborit and coll. [60] the substances having this type of action play an important part in the cellular reactivation.



In order to intensify Gerovital H_3 lipotropic action, as well as that on the nervous system, a lipotropic factor and another one with stimulating effect on the neurons were added to the basic formula. The new product, called Aslavital, was studied 10 years both experimentally and clinically.

Since 1961, the Aslavital ampoules and dragées have been administered to 182 patients hospitalized at the Institute of Geriatrics and 1230 outpatients. The effects of the treatment were studied comparatively with a group of patients that were not subjected to treatment. The patients were examined clinically, physiologically and by X-rays; functional, biochemical and hematological investigations were also carried out.

The clinical and laboratory data pointed out improvements in the general biological condition, tissue revitalization, the slowing down of the involutive process, the alleviation of the chronic degenerative diseases and the prevention of the complications they might induce. 50%–80% of the cases with predominantly cerebral aging, particularly in initial stages, improved. Physical and psychic asthenia was alleviated in 82% of the cases, the intellectual over-exertion (disturbed memory, concentration and attention) in 67% of the cases, depressive state in 86% of the cases and anxiety in 56% of the cases.

The EEG tracings pointed out the increased amplitude of the waves, a better modulation and frequency of the alpha rhythm in 72% of the cases; the frequency of the slow elements decreased in 22% of the cases and remained unchanged in 30.5%.

Favourable results were obtained in cases of atherosclerosis, either generalized or cerebral, coronary or peripheral as well as in the prevention and control of thromboembolic accidents and posthemorrhagic sequelae.

The results of the clinical and functional investigations pointed out the normalization and the stabilization of the blood pressure, the improvement of hemodynamics in 63% of the cases and a better vascular reaction in all the subjects that presented deviations from the normal values.

The EKG pointed out the improvement in the S-T sequence and T wave in subjects with coronary pathology.

The improvement or the correction of global plasma hypercoagulability, hypofibrinolysis, thrombocytic hyperfunctionality, endogenous hypoheparinemia and hyperlipoproteinemia in the treated atherosclerotic aged patients, also pointed out the antiatherogenic therapeutical properties of Aslavital.

Positive results have also been obtained on sugar, lipid, cholesterol and beta-lipoprotein levels.

Important improvements have been noticed in the psychosomatically deficient children, as well as in those with postencephalomyelitic sequelae.

We could not include in this paper all the studies recently conducted on Gerovital H_3 therapy in old age and the prevention of premature aging. Those data were mentioned which are the theoretical basis of procaine therapy and emphasize its action on the central nervous system and the regulation of the metabolic processes.

Résumé. La baisse du nombre et de la capacité fonctionnelle des cellules au cours du vieillissement induit de nombreuses caractéristiques du vieillissement. En ce qui concerne les neurones, le principal objectif est le prolongement des ressources cellulaires, fait rendu possible grâce à la psychopharmacologie. L'auteur a démontré, il y a 25 ans déjà, l'influence de la procaine sur le système nerveux par des investigations psychologiques et fonctionnelles, cliniques et expérimentales. Récemment la pharmacologie de la procaine s'est développée grâce aux recherches de certains auteurs américains, parmi lesquelles des études double-blind aussi, sur l'effet favorable du Gérovital H₃ dans les états dépressifs des vieillards. On a démontré la relation entre le phénomène de vieillissement et l'intensification de l'activité de la monoamineoxydase dans le cerveau, ainsi que la capacité de la procaine et spécialement du Gérovital H₃ d'inhiber la MAO et de réduire les signes de vieillissement au niveau du système nerveux central. L'action anabolique de la procaine a été démontrée par des recherches sur des cultures de cellules, mais sur des animaux aussi, en constatant parmi autres, l'amélioration de leur état trophique général et la prolongation de leur durée de vie. Autres résultats obtenus dans le domaine des mécanismes d'action de la procaine se réfèrent à: l'amélioration du bilan azoté, la favorisation de la synthèse de l'ATP, l'action anti-oxydante, l'intervention dans la phosphorylation oxydative, dans les troubles du métabolisme lipidique de l'athérosclérose, dans la croissance de la vitesse de conduction nerveuse, l'excrétion de stéroïdes et métabolites urinaires, etc. Les études ultrastructurelles ont relevé la contribution du Gérovital H₃ à la stabilisation des membranes et des principaux organites cellulaires, l'intensification de l'activité métabolique des cellules des cultures traitées. Tous ces faits constituent la base d'action de la prophylaxie et de la thérapie du phénomène de vieillissement. Afin d'intensifier l'action lipotrope, ainsi que celle agissant sur le vieillissement cérébral, l'auteur a élaboré un nouveau produit, l'Aslavital. Les résultats obtenus les 9 premières années d'application de ce traitement attestent son efficacité dans les processus involutifs, à prédominance cérébrale et dans l'athérosclérose (surtout dans les troubles de coagulabilité sanguine et du métabolisme lipidique), ainsi que dans la prévention ou le traitement des complications.

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