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CONFERENCE ON THE PROBLEM OF LONGEVITY

ABSTRACTS OF REPORTS

- USSR -

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FOREWORD

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CONFERENCE ON THE PROBLEM OF LONGEVITY

ABSTRACTS OF REPORTS

- USSR -

Following is a translation of the Russian-language monograph Konferentsiya po Probleme Dolgoletiya (Conference on the Problem of Longevity), Moscow, 1959, 40 pages. The conference was in session from 31 January to 2 February 1959, and was held under the aegis of the Commission of Longevity, Moscow Society of Natural Science.

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FROM THE CONFERENCE ORGANIZING BUREAU

The theses of the reports of Prof. A. N. Rubakin "The Problem of Aging - a National Problem for the Soviet Union," Prof. V. V. Alpatov "The Present State of the Problem of Aging," Ye. I. Lebedinskiy "The Present State of Old Age Therapy and Related Sicknesses," and Prof. S. G. Zhislin "Clinical Patterns in Psychic Disorders of Old Age," which are a part of the conference's program were not delivered by the lecturers.

The Organizing Bureau

I. General Questions

THE PROBLEM OF RADICALLY INCREASING THE LIFE SPAN

L. V. Komarov

[page 3 of original missing]

3. The problem of radically increasing the life span can be solved only by using biological agents (pharmacological or biophysical). This is the method of controlled intervention in the intracellular processes and of altering their natural course, which would lead to a significant increase in the life span and a corresponding retardation of the onset of old age and accompanying disorders.

4. There is nothing in the human or any other organism, either in the biological or biochemical or physiological sense, that is insurmountable or capable of preventing the life span of man from being extended 2-3 times. There is nothing to prevent the restoration of the ability to work again and of other abilities of a more youthful age through the use of biological agents to old people already disabled.

5. Such a manifold extension of the life span through biological means has already been achieved in experiments with animals both here in the Soviet Union and abroad (Academician P. P. Lazarev, 1929; MacKay and his assistants, 1952; Getch, 1955, et al.).

6. The studies have shown that together with increasing the life span (through the use of biological agents), the time of the onset of disorders associated with old age was correspondingly delayed, their complex was altered, and in certain cases an almost complete absence of some of these disorders was observed (MacKay, Clive, Frank, and Lansford, 1956; Lee, Fisher, and King, 1956, and so on).

7. The limits to which the life span of man can be successfully extended will be determined only by the level of our knowledge and the amount of research devoted directly to discovering biological means of increasing the life span. The experimental work (M. I. V. Nikitin, A.V. Anuchin, L. V. Komarov, etc.)

The author has carried out a series of experiments with plants and microorganisms. These experiments showed that peptide products of fermentative decomposition of protein, separated from the organism, can be used actively to build up the proteins of the same organism. Recently at various laboratories experiments have been conducted which have shown that products of incomplete decomposition of proteins of organs can, by being introduced into an organism, be used selectively for the synthesis of proteins of homologous organs (Ebert, 1954; Meler, Walter, Belbenko, and Ellmann, 1958 et al.). These facts point to a selective reconstruction of individual changed organs and tissues by products of incomplete decomposition of homologous young organs and tissues. There is a period during the partial proteolysis in which the antigen quality of protein is lost and the obtained lysate becomes easily assimilable. However the obtained peptide fragments preserve many specific properties (eg., weak fermentative activity) tissular and species specificity, conditioned by a definite sequence of amino acid residues. The same thing, apparently, is characteristic for nucleic acids. Mixtures and different combinations of these products doubtlessly control the inexhaustible possibilities of biological stimulation and inhibition; it is not accidental that in nature itself a large part of the antibiotics and a large assortment of hormones are specific peptides. The study of the mechanisms of synthesis and protein changes with age and nucleic acids of different organs and tissues and the control of these processes by substituting products of an intermediate character is, though difficult, nonetheless a very real approach to controlling the syntheses of an organism.

II. THE BIOLOGY OF AGING

SOME BIOLOGICAL CONSIDERATIONS IN THE LONGEVITY
OF MAMMALS AND MAN

A. A. Malinovskiy

(The Ukranian Scientific Research Experimental
Institute of Eye Diseases and Tissular Therapy
imeni Academician V. P. Filatov, Odessa)

1. In studying the problem of longevity and the development of ways of increasing it the use of general biological principles can play a large role.

2. The duration of life in the animal world is an indisputable object of natural selection, directly and through its relation to other manifestations (maturation rate, intensity of reproduction, size of the animal, and the like). Experiments in artificial selection for high or low duration of life confirm this. An analysis of the connection between longevity and the intensity of reproduction also points to this. (S. A. Severtsov).

3. Despite their high development, mammals are not distinguished by a great longevity. Examination of the question from the comparative physiological point of view compels the belief that evolutionary tendencies lead to a shortening of the period of life. This is explained by the fact that the more rapid the succession of generations the more rapid is the evolutionary adaption to the environment.

4. simultaneously, however, a reverse tendency contradicts this course. Preliminary study of correlations between the longevity of a species and the speed of development, body size, and cephalization factor compels the belief that an evolved increased body size and a higher level of higher nervous activity leads to an increase in longevity. Development of higher nervous activity increases the value of long life thanks to the accretion of adaptive habits and partial replacement of morphophysiological evolution by changes in acquired forms of behavior. Actual longevity of a species is the result of the interaction of these different tendencies.

5. The high longevity of man's life in comparison with almost all mammals results from the

fact that in the course of anthropogenesis an ever increasing liberation from from direct morpho-physiological adaptation to the environment and from the pressure of natural selection took place.

6. What has been presented compels one to suppose that man's longevity (thanks to his heredity from his animal forebearers who experienced selection towards a shortening of life) is still far distant from the possible physiological limits and, therefore, can be considerably increased through artificial means.

7. One should remember that selection for a shortened period of life can proceed along different paths for different animal species. It is therefore possible that the basic reasons for aging in the different species do not coincide. This must be taken into account in experimental work on the problem and, in particular, it is necessary to control experimental studies on animals by a comparative physiological study of cases of longevity in man.

8. Studying the physiological conditions of longevity is made difficult because long life is explained, only after its determining conditions have already been exhausted and can not be investigated owing to profound changes brought on with age. Therefore a broad study of the correlations of longevity with a consideration of environmental conditions and morphophysiological dependencies is necessary as well as a study of the physiological changes in immediate members of the family insofar as any family correlation of longevity is available. It is also necessary to study longevity from the point of view of medical geography.

9. Inasmuch as the reasons for aging can be numerous and complex, the struggle to increase longevity must also assume a complex character. The limited number of successes thus far in the struggle to lengthen the limits of life are partially explained by the isolated application of separate methods, at a time when successes can only be expected from the proper combination of stimulation, substitution, and conservation methods. At the same time it is necessary to study the individual causes limiting the life span since the broad possibilities of artificial compensation for congenital physiological abnormalities have already been shown.

GERONTOGENESIS

Ye. A. Usov

(Polyclinic No. 3 Mosgorzdravotdel (Moscow Health Department). Gerontological office)

The development of changes in an organism in the aging stage is conditioned by:

1. internal biological mechanisms
2. the character of activity in preceding stages of life

3. direct interaction with the environment

I. Phylogenic Determinancy in Gerontogenesis.

1. In gerontogenesis a reserve recapitulation of characteristics of adult forms of immediate ancestor occurs.

2. In gerontogenesis the structures and functions of resistants are phylogenically older and constants are phylogenically more recent.

3. In gerontogenesis the structures and functions which rose earlier in the youthful stage (postembryogenesis), are preserved longer in the old age stage.

4. In gerontogenesis separate structures and functions change at different rates.

5. In gerontogenesis autonomizing of separate structures and functions takes place.

II. Ontogenic Determinancy in Gerontogenesis

(Characteristics of the passage of previous stages)

1. Acceleration - speeding the passage of a stage.

2. Abbreviation - breaking the terminal period of a stage.

3. Falling out of certain periods or stages from the whole

4. Shortening the passage of a stage

5. Prolongation - lengthening the passage of a stage

6. Retardation - delaying the transition to the next stage.

III. Ecologic Determinancy in Gerontogenesis

1. Changing the range of loads

2. Increasing the level of idioadaptation

3. Occurrence of intervals (pauses).

LONGEVITY IN DAGESTAN

R. Sh. Alikishiyev

(Dagestan Anti-Goiter Institute. Office for the Study of Longevity in Dagestan)

In a number of old people who have reached 100 years and more, Dagestan ASSR is first in the world. Thus far no one has studied their life, manner of living, or state of health. With the intention of explaining the conditions which facilitate long life, we have studied people who have lived 100 or more years, in a manner especially developed for this purpose.

Two hundred old people in 42 rayons and 7 cities of the republic were studied: 123 women (61.5%) and 77 men (38.5%). The average age of the old people was 114.5 years; for the men - 110.6 years, and for the women 117 years. It was established that the greatest number of old people lived in the mountains, in the middle belt. There was not a single old person from flat lands and very few from the high mountain region of Northwest Dagestan. This is explained by the fact that while the foothills and mountainous zones have good climatic conditions and favorable geographic milieu which are conducive to longevity, the flatlands have a hot debilitating climate and strong winds (epidemics of malaria have raged in the past) and the northwestern area has been the scene of prolonged wars and the continual hearth of mass spread of endemic goiter.

All of the old people, with the exception of 8 city dwellers, spent their entire lives in the mountains engaged in animal husbandry and farming. They had the simplest diet of milk, vegetables, and meat (mutton). We did not find one person among the old people who did not eat meat his entire life as a basic ingredient of the mountaineers daily diet. We, therefore, could not confirm the idea that meat is harmful for old people. A notable place among the old people was the strict observance of several sensible hygienic rules, moderate physical labor, active rest, and traditions passed from generation to generation: hygienic gymnastics, sensible distribution of labor in everyday life, love of work, and the like.

The severe mountain conditions have forged the mountain folk into physically strong, morally firm

individuals devoid of laziness and other human weaknesses which tend to shorten life. Almost all of the old people were good-natured and fond of life; the majority of them have never been sick at all and even now are distinguished by good health.

The anthropometric and clinical studies made of the old people differ little from the same data on people of average age. Blood pressure on the average was: for the men 144/85, and for the women 137/79. Many of the old people still work and continue to labor on the kolkhozes or other parts of the economy.

The following factor of longevity is considered to be inherited. The parents and close relatives of 59 out of 200 of the old people were also marked by their longevity living beyond 100 years. As is seen, biological characteristics of the organism, formed by the living conditions and passed on from generation to generation, are of definite importance to longevity.

The betterment of the socioeconomic conditions and the raising of the cultural level during the years of Soviet rule are also important to longevity. This is evidenced not only by the increased number of old people, based on population data, and a lessened mortality rate, but by the significant increase in natural growth in recent years as well.

In birth rate Dagestan ASSR occupies first place in the RSFSR and according to basic indices on health has left the USA, Great Britain, France, Belgium, and other countries far behind.

LENGTH OF THE LIFE CYCLE OF REPRESENTATIVES OF I THE PRIMATE ORDER

M. F. Nestrakh

(Moscow Society of Natural Scientists, Anthropology Section)

1. In the mammal class, primates, particularly apes, are distinguished by their longevity. Information from zoos, laboratory-types and those of private owners confirm this.

2. The particular long life of apes is, to a considerable degree, related to their way of life, gregariousness, characteristics of reproduction and ontogeny, and small number of offspring.

3. Higher primates through the tarsiers, lemurs, and Tupaia are phylogenically related to the Insectivora, which have a short life cycle.

4. Most of the lower apes live 15 - 25 years, some members of the lower narrow-nose type (Simiae catarrhinae) or marmoset, live longer.

5. The life cycle of manlike apes, or anthropoids, is somewhat longer than that of the marmoset, or cercopithecoids. There is reason to suppose that the smaller anthropoids, i.e., the gibbons live 30 years, and that the large anthropoids, viz. the orangutang, chimpanzee, and gorilla live 30, - 40 years and perhaps more.

6. It may be assumed that for the species of fossil large anthropoid-australopithecus, the fore-runner of man, the life span reached several tens of years.

7. Relative to the Neanderthal man, there is a theory that his life lasted 40 years. This is not small if one considers the difficult conditions of existence during the ice age or in open camp sites.

8. The duration of life for different groups of contemporary man and for individual representatives of long-living groups leads to the conclusion that any evolution must proceed from:

1) the evolutionary biological basis of human longevity inherited from extinct forebearers - apes and ancient homonids and equal to about fifty years and

2) the qualitative and distinctive segment of equally long human life which, together with the notable development of societal element among ancient man, and particularly among Cromagnon man, began to develop very recently in human history and is now reaching a still higher level.

THE OXIDIZING RESTORATION THEORY OF AGING

ORGANISMS

M. P. Surikov

(Dagestan Medical Institute. Department of Biochemistry)

The oxidizing restoration theory of aging organisms is presented as a development of Mechnikov's intoxication theory and the cyclic theory of Pikte. However it differs essentially from these theories by its content.

Facts obtained by experiment and observation during the 1939 - 1958 period serve as the basis for the construction of the new theory.

The dominance of biochemical oxidation processes over restoration processes is seen as the leading factor in the development and aging of live organisms.

The longevity of various live organisms is determined by the extent of development of the fermentative systems and is dependent upon the completeness of oxidation of energy substances. This is confirmed by a quantitative determination of the insufficiently oxidized products in organisms belonging to different species and having a different life span.

Underoxidized products of metabolism are under definite conditions subjected to cyclization, polymerization, and complex formation. Here they are transformed into inert nonsoluble substances, the appearance of which in cytoplasm determines the beginning of regressive metamorphism of the organisms. The amount of these substances in histological determination corresponds to the age state and species life duration of the organism.

The correctness of the theory is confirmed by the results obtained in action on oxidation and restoration processes in an aged organism. Changes in the biochemical indices of the blood and urine and changes in the general status attest the possibility of actively increasing the duration of life in this way.

FALL WITH AGE IN THE OXIDATION PROCESSES IN
THE HUMAN ORGANISM AS ONE OF THE MAIN CON-
DITIONS OF AGING

V. V. Yefimov

(Central Institute of Traumatology. Physiological Laboratory.)

1. Much data in medical literature shows that the human organism absorbs less oxygen with age. After birth the curve of pure oxygen absorption (per 1 kg of body weight) rises sharply and holds the same level from the first to the fourth year, and then begins, rapidly at first and then slowly and evenly to decline up to the 70th year and beyond. Thus, at the same weight and height an old man, without noticing himself, takes in less and less oxygen. At the same time the work of oxidizing ferments in the tissues also declines.

2. The oxygen in the organism is used in processes of syntheses, therefore synthetic activity in an old man's organism is gradually lessened. An oxygen deficiency destroys the nerve cells of the brain. When the heart stops during an operation for 5 - 6 minutes the nerve cells can be irretrievably destroyed. This can cause the death of the organism.

3. Our ten-year investigations of the bio-potentials of the brain in young and old people show that the electrical activity of the nerve cells of the brain is lessened sharply in old men, alpha-rythem is usually missing. In young people, on the other hand, an increased electroactivity was observed with a distinct alpha-rythem. But in old men too a well defined alpha-rythem was observed if they had spent much time out-of-doors (eg. kolkhoz workers). Today physiologists believe that oxidation processes, which weaken with age, are the basis for the generation of alpha-rythem.

4. The battle against age can be waged by raising the oxidation processes: by deep breathing, work out-of-doors, exercise, inhaling pure oxygen, and by introducing oxygen into the venous blood, by taking substances to increase interstitial breathing, by sleeping out-of-doors, and by maintaining normal body weight (fighting obesity).

CHANGES IN THE EXCHANGE OF MICROELEMENTS IN
THE ANIMAL AND HUMAN ORGANISM WITH AGE

A. Voynar

(Stalinsk Medical Institute. Department of Biochemistry)

1. In recent times it has been more surely determined that microelements - the mineral substances - met in insignificant concentrations in organisms, play an important biological role, owing to an interrelation with several enzymes, vitamins, hormones, together with an influence on the excitability of the nervous system, tissular breathing, blood formation processes, ossification, and others.

2. Age changes in the content of the important microelements in the biological regard - copper, manganese, cobalt, nickel, zinc, molybdenum, etc. in humans and animal blood and organs is clearly shown in connection with changes in metabolism with age. Consistent with this, differences in requirements and changes in the balance of microorganism in the human organism during the aging process were established.

3. Endemic illnesses in biogeochemical provinces characterized by a surplus or lack of definite microelements appear unequally depending upon the age of the stricken human or animal.

4. The same is noted in regard to the toxicological effect of high concentrations of microorganisms able to enter the human organism under industrial conditions.

EFFECT OF SODIUM BROMIDE ON THE CONTENT OF
CERTAIN MICROELEMENTS IN RATS OF DIFFERENT

AGES

A. P. Kukhtina

(Stalinsk Medical Institute. Department of Biology)

1. Bromine, as I. P. Pavlov pointed out, is one of the levers with which man can control the processes taking place in the cerebral cortex. Intensifying and concentrating inhibition processes, bromine brings

about a restoration of the cerebral cortex ability to work, and through it to effect an influence on the organism's metabolism. Starting from the importance of microelements as components of many fermentative systems, interest naturally arises to study the kind of influence bromine has on their content.

2. To do this we studied 163 rats of three age groups: 6-month, 14-month, and 20-month. In each age group control and experimental animals were separated. An experimental rat received bromine in milk at a rate of 30 mg to 100 g of live weight in the course of 15 days. Tissue was investigated by the emission spectral method.

3. Data obtained attest that in the cerebral cortex of the animals the overwhelming amount of copper and manganese was found in a bound state with organic substances, i.e., in a non-ultrafiltrate form. The amount of copper and manganese in ion (ultrafiltrate) form increases with age, while organically bound (non-ultrafiltrate) decreases.

4. Under the influence of bromine treatment an increase in the content of ion and albumino-bound copper occurs in the cerebrum of rats of all ages. The relative increase of organically bound copper grows with age.

5. The content of manganese decreases in artificial inhibition of the cerebral cortex with sodium bromide.

6. Under the action of bromine on an organism a lessening of the content of copper and an increase in the amount of manganese occurs in the liver.

7. Investigations of the content of copper and manganese in the cerebral cortex and in the liver in the period of aftereffects of bromine on the organism attest that the bromine causes a redistribution of given microelements.

THE EFFECT OF HYDROGEN SULFIDE ON TISSULAR PROTEINS OF ANIMALS OF DIFFERENT AGES

G. A. Uzbekov

(Ryazan' Medical Institute imeni I. P. Pavlov.
Department of Biochemistry)

Hydrogen sulfide waters are widely used in the cure of the most desperate diseases. Sulfide is one of the most important elements participating in the build-up of protein molecules. There are numerous enzymes and proteins, most important chemical, physicochemical, and biological properties of which are conditioned by the content of sulhydryl groups (SH groups) in them. The question of the importance of hydrogen sulfide which is able to raise the biochemical activity of proteins and enzymes remains little settled to this day.

We have studied the action of hydrogen sulfide on the tissular proteins of animals in different periods of their growth and development. The tests were conducted on white male rats. One series of tests was carried out on rats ranging in age from 3 - 3.5 months, another on rats ranging in age from 16 - 17 months. Hydrogen sulfide was introduced orally into rats of both series over a period of 3 months, 3 times weekly in doses of 5.9×10^{-4} m per kg of body weight.

After the systematic oral introduction of hydrogen sulfide the tissues and organs of the rats were investigated for the content of total proteins according to the Lakk method, for the content of general and residual nitrogen according to the Kjeldahl micromethod, of amino nitrogen by the colorimetric method (Uzbekov, 1958). With the aid of the iodometric method change in the content of the proteins of sulhydryl groups was studied. Change in the content of the amino groups was studied by the colorimetric ninhydrin method, and the change in the content of the carboxyl groups by the Sorensen method. The changes in the activity of tissular dehydrogenases were studied by the Tunberg method, and cathepsins by the Crabs method. Certain physicochemical properties of proteins were also studied. Careful observation was made for change in the general condition of the animals.

1. Aging of the organism is characterized by a lowering of the activity of dehydrogenase enzymes which catalyze the processes of intracellular breathing, and cathepsins, under whose influence processes of hydrolytic decomposition of proteins and, probably, their biosynthesis processes are stimulated.

2. In senility a lowering of the content of the functional groups (-SH, -NH₂, -COOH groups) upon which the most important chemical, physico-chemical, and biological properties of proteins depend, occurs in the proteins of the blood and liver, and especially in the proteins of the cerebrum, lungs, and kidneys.

3. An increase in the processes of decomposition of tissular proteins is not as characteristic of an aging organism as the depression of their restorative and creative processes.

4. Aging of an organism is connected with qualitative and quantitative changes in proteins. Most characteristic for the senile period of development of an organism are, however, qualitative changes in tissular proteins.

5. When small doses of hydrogen sulphide are systematically introduced into the brain, lungs, liver, and kidneys of old rats, the activity of dehydrogenases and cathepsins raises in comparison to the activity of designated enzymes in the same organs of control rats of the same age. The increase of catalytic activity of the dehydrogenases and cathepsins is accompanied by a lowering of proteolysis and an increase in the processes of restoration and production of proteins distinguished by a high stability in regard to the action of denaturing agents, by a considerable solubility, by a high content of active functional groups (-SH, -NH₂, COOH groups).

6. In growing rats (age 3 - 3.5 months) a considerably high increase in body weight, more intensive formation of proteins distinguished by high stability, a high content of active sulfhydryl, amino, and carboxyl groups were noted after introduction of the same doses of hydrogen sulphide.

7. Systematic introduction of small doses of hydrogen sulfide enables an increase of stability in old rats in regard to external harmful factors (cold) and a lengthening of life span.

EFFECT OF NOVOCAIN ON THE NITROUS METABOLISM

IN OLD WHITE RATS

Ye. Ye. Fedosova

(Stalinsk Medical Institute. Department of Biology)

1. Study of the influence of novocain on nitrous metabolism in old white rats was carried out in connection with the work of Roumanian academician K. Parhon who asserts that novocain (vitamin H₃) is a "youth-restoring" agent.

2. Nitrous metabolism was studied because the rejuvenescence of an organism, independent of the factor causing it, is chiefly reflected in the metabolism, in particular, in the nitrous metabolism.

3. Study of nitrous metabolism was carried out by determining the total nitrogen in the daily urine according to the Asel' method as modified by Kul'tygin and Gubarev.

4. Experiments were carried out on white rats 2 years and 2 months of age in two series of 12 injections every other day for each series, with a break of two months between series. Novocain was administered to the rats intramuscularly in the form of a 0.5% solution, 3-4 ml per kg of body weight.

5. Results of the tests showed that novocain exerts no influence on the nitrous metabolism in old white rats.

6. Parallel with these tests we studied the influence of bromine salts on nitrous metabolism. The tests were set to accord with the investigations of Prof. Anuchin, the bromine salts exert a certain positive reaction on the metabolism of nitrogen and, in addition, produce some signs of external rejuvenation in the old rats, thereby increasing the length of life. The rats received bromine in the amount of 0.3 g per kg of weight for 15 days. Nitrous metabolism was studied 5 days before bromine treatment, 15 days during bromine treatment, 5 days immediately after bromine treatment, and 5 days 2 months after the treatment.

7. From a comparison of the results of the influence of novocain and bromine on the metabolism of nitrogen in old white rats it is seen that the level of nitrous metabolism increases under the influence of bromine.

QUESTIONS ON THE CORRELATION OF HIGHER NERVOUS
ACTIVITY AND SEX HORMONES IN AGING

M. V. Propp and A. V. Santsova

(Leningrad Institute of Physiology. Laboratory
of Human Physiology and Pathology)

1. In several works published by members of the laboratory, it was shown that healthy and completely able-bodied individuals of from 59 - 72 years of age have disorders in the processes of excitation and inhibition of the cerebral cortex, disorders of the correlation of the work of the cortex and the lower nervous formations with weakening in the activity of the latter. These data were obtained using the conditioned reflex vascular and blinking method.

2. Using the salivation method of conditioned reflexes (according to Krasnogorskiy) a weakening of the stimulating process and a sharp weakening of the inhibition process was also established in individuals 55 - 69 years of age.

3. Use of testosterone-propionate on middle-aged men exerted no influence on age changes in higher nervous activity. In the work of Ya. V. Blagosklonnaya carried out in our laboratory folliculin in women with menopausal neurosis, removing symptoms connected with crises of increased excitation of hypothalamic centers, did not affect conditioned reflex activity.

4. In the experimental part of the work the castration of young sexually-mature male rats caused considerable disorders in the speed of formation of conditioned reflexes and of differentiating a pair of combined reflexes.

5. Old male rats show considerable disorder in effecting and differentiating conditioned reflexes. Castration of members of this group did not cause changes in the higher nervous activity.

6. Use of testosterone-propionate on old male rats influenced the sexual activity of the rats but did not influence age changes on the higher nervous activity.

DEVELOPMENT AND AGING OF PERIPHERAL NERVES

R. F. Stepanov

(Chita Medical Institute. Department of Normal Anatomy)

The development, aging, and death of an organism is a constant biological phenomenon in which aging and dying connected with both the development and rebuilding of the organs' structures in conformity with species characteristics and the concrete conditions of the organisms' life are noted from the earliest periods of the organism's development.

The structure of peripheral nerves also suffers considerable age changes throughout the entire life of the organism. These changes have been insufficiently studied, however, and sometimes are simply unknown. Our observations based on the study of the morphology of different peripheral nerves of different age groups lead us to believe that age changes in the nerve trunk are reflected not only in changes in the nerve and mesodermal structure, but in their interrelations as well.

The nerves of early embryos consist of bare axial cylinders having a retiform arrangement of fibres, and mesodermal derivatives as represented by cells of mesenchyma of various forms, in different stages and differentiations, surrounding the periphery of the nerve fiber and forming a foundation of epineurium. As development progresses, the cells of mesenchyma penetrate deep into the nerve fiber, forming layers of peri- and epineurium. Further organization of nerve fibers is connected with the process of myelination (3 - 5 months), as a result of which the fibers gradually, by the end of the intrauterine period, assume a relatively parallel inter-arrangement, and the retiform arrangement of the fibers are rearranged into a pleocus of interlaced bundles of nerve fibers.

The appearance of intra-fibers vessels is connected with the development of the mesodermal membranes of the nerve fibers. Intra-fibers vessels appear during the second half of intra-uterine development. The first to appear are epineurium vessels, and later - perineurium and endoneurium. Towards the

end of the intra-uterine period the vascular system of the nerve is formed.

The first years of the postembryol period are characterized by further growth, a thickening of the sheath of the nerve fiber and a further process of myelinization. In the subsequent age groups a thickening of the axial cylinders occurs, and the membranes of the nerve fiber, epi-, peri-, and endoneuriums become concentrated owing to an increase in the amount of fiber structures. Parallely with this a further development of the intra-fiber vessels occurs in order to preserve the metabolic processes of the nerve stem. In middle age the appearance of fat cells is characteristic in cellular-fibrous structures of the nerve fiber.

Aging of the structure of peripheral nerves is reflected in myelinization, induration of the cellular-fibrous structures of the peripheral nerve wherein in old age the amount of fibrous structures predominates, and from the cellular elements - the fat cells. Simultaneously with this a greater development of the vascular system to supply the metabolic processes of the nerve fiber occurs.

LESSENERD PERMEABILITY OF SANGUIFEROUS CAPIL-
LARIES AS ONE OF THE COMPONENTS OF AN ORGAN-
ISM'S AGING MECHANISM

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1. The reconstruction of the functional correlations in an organism during aging as a result of adaptation, substitution, and trophic changes occurs against a background of systematic destruction of the blood vessels (arteriosclerosis, atherosclerosis).

2. As our observations and those of other authors have shown, this systematic destruction of the vessels is simultaneously accompanied by a pronounced lowering of the permeability of the basic

substance of connective tissue and sanguiferous capillaries. This finds its reflection in a whole series of symptoms of aging in an organism.

3. Considering the particular role of the basic substance of connective tissue lying on the way of interstitial metabolism and entry of nutritive substances from the hematic channel to the parenchymatous organs and tissues, it must be supposed that mechanisms that disrupt normal conditions of interstitial mechanism and nourishment of the organs and tissues are the cause of an organism's aging.

4. Works abroad and by native authors and our investigations have established that the state of permeability of the basic substance of connective tissue and sanguiferous capillaries is to a considerable degree conditioned by the state of the enzyme system of hyaluronic acid entering into the composition of the basic substance of connective tissue.

5. Lessened permeability of sanguiferous capillaries and of the basic substance of connective tissue is closely connected with the functional state of the ferment substatum complex of hyaluronidase-hyaluronic acid.

With lessened permeability a lowering of the activity of hyaluronidase and an appearance in the blood of inhibitors of hyaluronidase are noted.

6. As is known, preparations containing hyaluronidase (bee venom, hyrudine, rhonidase, testicular extract, spermine, etc.) induce an increase in the permeability of the basic substance of connective tissue and sanguiferous capillaries, and consequently, facilitate an improvement of interstitial metabolism and entry of products of nutrition into the organs and tissues of the organism. This, for the main, explains the effectiveness of using these preparations in disorders accompanied by a lowered permeability of the basic substance of connective tissue and sanguiferous capillaries.

7. We found confirmations of this in using certain gonadotrophic preparations on invalided workers and aged workers of Trekhgornaya textile mill.

III. GERIATRICS

ON TREATING SENILITY IN RUSSIAN

FOLK MEDICINE

S. A. Mukhin

(Moscow Society of Natural Science. Commission on Longevity)

1. A brilliant galaxy of talented gerontologists like Mechnikov, Bogomolets, Voronov, Steinach, Broun-Sekar, and others, have confirmed a new era in the science of longevity - the study of treating senility - geriatrics.

2. Various paths and methods of geriatrics have been pointed out: Mechnikov and Bogomolets have indicated one of the possible ways of treating senility - the preparation of special serums.

3. A second path of geriatrics - the novocain therapy method founded by the school of Academician Parhon - is the way of reacting on the central nervous system.

4. A third path of development is possible in geriatrics - the path of borrowing the experience and possibilities from the curative funds of folk medicine.

5. In folk medicine there are various approaches and ways of treating individual old-age disorders: achylia catarrhs of the gastro-intestinal tract, emphysema of the lungs, asthmas, loss of hearing and sight, various tumors, and the like - together with this there are special prescriptions for long life.

6. One of these prescriptions - a document from the early Middle Ages - remained widely distributed among the peoples of Europe throughout several centuries right up to the 19th century. (Khager - Manual on Pharmaceutical and Medico-chemical Practice. St. Petersburg, 1890, pp. 337 - 338). Another was found in a manuscript of Russian folk medicine of the XVII century (Manuscript Division of the State Historical Museum, Moscow).

7. A geriatric preparation of folk medicine is a means of integrated action on the aging organ: besides renewing the extinguished sex function, there are remedies for toning up the nervous system, and

treating in many ways the stomach, intestines, liver, metabolism, lymphatic system and the system of connective tissue, cardio-vascular system.

The geriatric preparation of Russian folk medicine based on the principle of a complex (integrated) influence upon the aging organism is worthy of an experimental scientific check and further perfection.

BREPHOPLASTIC TRANSPLANTATION OF
TISSUE ON GRANULATING WOUNDS
AND TROPHIC ULCERS IN ADVANCED
AGE

G. A. Dudkevich

(Yaroslav Medical Institute. Department of
General Surgery)

1. Transplantation of 6 - 8 month embryonic tissue on granulating wounds and trophic ulcers in old age, besides significantly improving the regenerative process in the wound or ulcer, and also often the adaptation of the graft, effects a general influence on the organism of the patient. After the transplantation of the skin of the fetus, pain disappears, general condition improves, weakness disappears, and the depression characteristic of old age also disappears, the appetite improves quickly, interest in diversions increases, and the ability to work is restored.

2. Patients who have lost their sex desire in connection with changes brought on with age show sexual desire after the transplantation of 6 - 8 month fetal tissue. In addition, an erection of the sex organ is noted in men.

3. In cases of premature aging of the organism (impotence, general weakness, depression, lessening of the ability to work) we observed, after brephoplastic transplantations, a rapid increase in strength in the patient, an improvement of the general condition, restoration of the ability to work, Sexual

desire and the possibility of a sex life also appeared.

4. The effect of brephoplastic transplantations observed in old-age can not be applied to cases with implantation of preserved tissue according to Filatov's method because the brephoplasty was performed with fresh tissue. The beneficial effect of brephoplastic transplantations can be related to the action of embryonic tissue on the entire human organism.

Our observations have shown that brephoplastic transplantation have led, to a considerable degree, to rejuvenation. Related to this is the question of a still deeper clinical and experimental check of these manifestations, which is, at the present time, being carried out in the clinic.

PROPHYLAXIS AND TREATMENT OF
PROSTATIC HYPERTROPHY AS ONE OF
THE FACTORS IN AN OVERALL COMPLEX
IN THE STRUGGLE AGAINST PREMATURE
AGING OF THE MALE ORGANISM

V. T. Karpukhin

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Hypertrophy of the prostate gland appears generally in men between 50 and 60 years of age, and clinically, it appears chiefly in 60 and 70 year olds.

Hypertrophy of the prostate gland develops very slowly. In the initial stages of the disorder there are no clinical manifestations, but by the second and third stages more or less serious distresses are already developing: asthenia universalis appears, sluggishness, rapid fatigability, the memory dulls, and ability to work is lost. In the final analysis the man suffers geromarasms, and against the background of general symptoms of sickness stand

out more clearly as manifestations of the chief disorder, - the function of the organs of the urogenital system are clearly disrupted: urine is not completely discharged from the organism (the residual urine is in the II stage of the disease), and then paradoxical ischuria occurs.

These phenomena are reversible. After surgical intervention - prostatectomy - the patients are literally reborn: they become more active, lively, fit for work, memory is restored: the man again becomes a full-fledged member of the collective, he is again able to join in the carrying out of productive and societal functions. The effect of the prostatectomy is not short-lived, but stays for many years.

Considering the frequency of this disorder among middle-aged men, we believe that it is necessary to study it more, to become concerned in a systematic way with prophylaxis, and to begin immediate treatment when the first clinical symptoms appear. Among the prophylactic measures a leading role must belong to the hygienic regimen and proper nutrition. Men between 40 and 50 must submit to a prophylactic examination by a urologist at least once a year.

It is necessary to observe the proper balance between work and relaxation. Physical labor and sports activities at least once a week are recommended for all individuals engaged in intellectual pursuits. In middle and old age sports must be strictly rationed. An operation is a radical way of treating prostatic adenoma at the present time. In cases of contraindications to surgical treatment we conduct a conservative therapy of synestrol /?/ with novocain. In the course of two months, every other day, intramuscular injections of 2% oleo solution of synestrol (3 mg), and on the days free from synestrol injections the patient is given intramuscularly a 2% solution of novocain (5 mg). After a two-week period the injections are repeated.

In cases of acute retention of urine or where there are inflammatory manifestations in the gland we use novocain blocks; presacral novocaine block or a short novocaine block of the gland from the perineum.

The method of conservative therapy of adenoma of the prostate gland broadens our therapeutic prospects.

PULMONARY TUBERCULOSIS IN MIDDLE AGE

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1. Among pulmonary tuberculosis patients (in particular, its destructive forms) the high ratio of middle age is quite significant, especially among male patients.

2. In recent years the tendency towards aging of pulmonary tuberculosis patients is increasing. This is explained: a) by an increase in the life span of these patients; b) by the smaller percent of tuberculosis cures in middle age in comparison with younger age groups.

3. In regard to middle-aged pulmonary tuberculosis patients different methods of treatment are used less than the active possibility, as the result of an insufficiently broad interpretation of the age contraindications by the treating physicians.

4. A significant part of the middle-aged patients with chronic forms of pulmonary tuberculosis preserve their ability to work. This is especially the case among those engaged in intellectual pursuits.

5. One of the most important principles of arranging work for middle-aged pulmonary tuberculosis cases is to transfer them to work where their long experience and skills can be utilized, but which does not demand too much effort from them.

6. To maintain the ability to work in middle-aged pulmonary tuberculosis patients the proper organization of their work is unusually important (shortened work day, selection of suitable profession, setting up special workshops, etc.).

7. Among the goals for a more correct understanding of the problems involved in the treatment of middle-aged patients would be to acquaint the various physicians (including phthisiologists) with general

questions in gerontology and geriatrics.

ULCERS IN MIDDLE AND OLD AGE

O. S. Radbil'

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of Physicians. Chair of Therapy.)

1. Among patients suffering from stomach and duodenum ulcers, 15% of the ulcer cases arise in middle age (over 50 years), and in 25% of these - over 60 years of age.

2. When ulcers arise in middle age a significant percent of the ulcers are located in the stomach, particularly in its upper regions. This is explained a) by disorders in the blood circulation which develop in connection with general arteriosclerosis, including sclerosis of the stomach vessels; b) by expressed disorders of a neuro-trophic character which are met most often in middle age; c) by various disorders of protein and vitamin nutrition.

3. Patients with ulcers in middle and old age are observed to have frequent and varied disorders of a general character, including neuro-vegetative, trophic, allergic, and vitamin deficiency.

4. Ulcers in middle and old age often become worse, with various complications: hemorrhage, perforation, motor deficiencies (both clinical and pathologo-anatomical data substantiates this).

5. Ulcer patients in middle and old age, particularly those with stomach ulcers, show a clear tendency to a lessened secretory function of the stomach.

6. Among ulcer patients stricken in middle age it is possible to define several clinical types with a different development of the disorder and a different origin;

a) stomach and duodenum ulcers developed in connection with organic damage of the brain of vascular origin;

b) ulcers developed against a background of more or less defined atherosclerosis without marked focal damage to the central nervous system (two clinical variants - stomach and duodenum ulcers).

7. Dietotherapy of ulcers in middle and old age must be done with regard to the accompanying disease of atherosclerosis.

CLINICAL ASPECTS OF ACUTE SURGICAL DISORDERS OF THE PERITONEAL CAVITY

IN THE MIDDLE AND OLD-AGED

A. I. Kotov

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Diagnosis of acute cholecystitis and acute appendicitis in the middle- and old-aged under ambulatory conditions and in clinical examination presents many difficulties. Patients of 66 years and above are more often incorrectly diagnosed for acute cholecystitis and acute appendicitis than are patients between 50 and 65.

Patients with acute cholecystitis 66 years and above more often go to the hospital within the first four days after an attack than do patients between 50 and 65. Only a third of the patients with acute appendicitis from 66 years of age and above are hospitalized within a day of the seizure.

Among the middle- and old-aged the higher the age the more often do those with acute cholecystitis and, as a rule, acute appendicitis, enter the hospital in a critical or extremely critical condition.

Among patients 66 years and above with acute appendicitis pains, at the onset of the disorder, rarely appear in the right femoral and right iliac region, but has a diffuse character in the peritoneal cavity. In acute appendicitis pains generally begin in the epigastric region, the right half of the stomach. In acute cholecystitis cases in 66 year olds and above irradiation of pains to the scapula, clavicle, and dorsum is rarely noted.

Nausea, vomiting, temperature and leukocyte reactions, reaction of sedimentation of erythrocytes, and quickened pulse are more often encountered in

acute cholecystitis patients with advanced age.

In acute appendicitis in patients between 50 and 55 and 66 and above temperature reaction is weaker than in other age brackets of the middle- and old-aged. Patients between 55 and 60 and 66 and above have a more pronounced leukocyte reaction and quickened pulse.

With increased age in acute cholecystitis patients a dry, and coated tongue is often noted. Local soreness and strained muscle in the right femoral is relatively rarely seen in patients 66 and above.

Acute appendicitis in patients 66 and above, as a rule, is accompanied by nausea and vomiting. Strained muscle of the abdominal wall is chiefly noted in patients between 56 and 60 and 66 and above. With increased age patients rarely show a moist and clear tongue.

Local soreness in palpating the right iliac region is observed somewhat less often in acute appendicitis patients 66 years and above in comparison with patients of other age groups. The frequency of detecting the Shchetkin-Blyumberg symptom increases with the age of the patient. Rovsing's symptom is less often positive in older patients.

It is necessary to note that the quality of diagnosis of acute cholecystitis and acute appendicitis, painful syndrome, general and local reaction of the patient in these disorders are influenced by the time of patient hospitalization at the onset of the trouble and the character of the morphological changes in the gall bladder and the veriform appendix.

SOME CHARACTERISTICS OF THE
DEVELOPMENT OF AN OLD-AGE CATARACT FROM
80 TO 100 YEARS AND ABOVE

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(North Osetin Medical Institute. Chair of Eye Diseases)

1. Above 80 years of age the development of old-age cataracts proceeds very slowly (V. P. Odintsov), often it never leaves the initial stage. A dilatation of the pupils from the application of mydriatics (atropine, scopolamine, etc.) is frequently not observed in these patients.

2. Investigations conducted with a rimal lamp in these cases show a complete or partial disintegration of the pigment with the formation of posterior, often round, non-pigmented synechia, sometimes having a scalloped shape. The stroma of the iris is usually colorless, the pattern of the crypts is less defined, which is also indicative of pigment disintegration.

3. Removal of the crystalline lens by operation is difficult in these cases. Its removal is complicated by the posterior, non-pigmented synechia which formed on the pigmented border. On the front capsule of the removed crystalline lens a pigment is often seen localized somewhat peripherally from the rim of the pupil. At the moment of incision it is often possible to observe the collapse of the cornea.

4. For the most part these characteristics are observed in individuals whose organism is in a state of senile hypotonia. This is confirmed by blood-pressure data (80 year olds - 145/65; 82 year old - 130/60; 95 year olds 130/85; 97 year olds - 120/60) (Measured with the Riva-Rocci apparatus according to the Korotkov method).

FUNCTIONAL TEST OF THE CARDIOVASCULAR SYSTEM FOR

MIDDLE-AGED

N. B. Tambian

(Moscow Society of Natural Scientists. Commission on Longevity)

1. To evaluate fitness to work functional tests of the cardiovascular system have great importance. This is because the said tests give an idea of the functional ability of the blood circulation, and also

an indication of the condition of the organism in general.

2. Evaluation of the results of the functional test of the heart of middle-aged recommended by us is carried out according to the following signs and based on the following conditions.

3. Slowing down of the pulse under the effect of physical exercises and sport results from changes in the nervous system and is considered a positive result of long and regular training.

4. Under the effect of physical exercise and sport the difference between the pulse taken in a reclining position (orthostatic test) gradually lessens. This is considered a good sign.

5. In a physician's examination the orthostatic test is often unable to uncover any deviations from the normal activity of the cardiovascular system. Solution of this question is greatly helped by applying rationed physical loads.

6. Twenty knee-bends is considered the most suitable load for most people of this age engaged in physical exercises.

7. Checking the time it takes for the pulse to return to its initial point after physical exertion serves as a good indicator of the level of fitness of the individual. The healthier and better trained the man, the shorter will be the period of time for his pulse to return to normal.

8. All the enumerated indices, namely: pulse count at rest, pulse in a standing position, difference between standing and reclining pulse count, level of excitability, i.e., pulse count immediately after 20 knee-bends and at the time of its return to normal. The lower the readings for these tests, the higher are their indices.

9. Special scientific research has shown that the total of the results of all these tests gives a more reliable estimation than any separate test. Therefore the readings of all are combined for a final index.

10. Our observations showed that the indicated functional test reflects very well the fitness of the individual. The lower the final index, the higher the level of fitness, all other things being equal.

11. Not the absolute final index but its

change under the effect of systematic physical exercise and sport is more important for one and the same person or the mean final index for a group of individuals.

12. All other things being equal a decrease of the final index attests an improvement in the functional condition of the cardiovascular system and general physical readiness; increase in the index reveals a worsening of the general condition.

13. In the final evaluation it is not necessary to add the absolute value of the final index received in the test. In order to avoid errors in interpreting and analysing the results of the investigation, they must always be correlated with other data of the medical examination.

14. Results of checking the described functional test with a change in the position of the body in combination with rationed physical activity in the form of 20 knee-bends show the superiority of this test over others applied to old people.

CHANGES IN THE BRAIN WITH AGE

AND RELATED DISEASES

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1. Diseases of advanced age, including senile dementia, are different, completely independent diseases characterized by definite development pictures and syndromes and also characteristic pathologic-anatomical changes of the central nervous system and internal organs.

2. Not all diseases of advanced age are simply intensification of normal psychic changes common to senility. It is impossible to talk about an identity between changes of the brain in physiological senility and old-age psychoses.

3. Pathologic anatomical and histological investigations showed a distinction between changes of the brain in physiological senility and in old-age psychoses which bears a qualitative rather than a quantitative character.

4. Morphological observations attest that a deep difference exists between age-related (including senile) and actual pathological changes of the arteries, in particular, atherosclerosis. It is incorrect to relate atherosclerosis to the physiological signs of senility and to view it as a wearing of the arteries. Morphological observations attest that in several cases of senile dementia, notwithstanding the advanced age, there are no atherosclerotic changes in the arteries. Together with this there are many cases where atherosclerotic changes are already pronounced in youth.

It is necessary to distinguish physiological age changes in arteries from pathological atherosclerotic changes; the latter are not unavoidable manifestations of senility, but merely accompany it frequently.

5. Histopathological analysis of changes in the central nervous system in senile psychosis can be characterized as senile dystrophic encephalatrophy with sharp metabolic changes reflected in enormous hyperplasia of argentophile "senile" patches, hardening of argentophilic fibers, the appearance of paraplasmic spheres, a sharp hardening of oxidase grains in various tissular structural elements of the brain and in interstitial substances. A sharp hyperplasia and hypertrophy of the glial elements in the brain, in particular in the cells of microglia is noted.

6. The importance of the argentophilic patches for the diagnosis of senile dementia, Alzheimer's sickness is established and the connection between argentophilic patches and microglia has been explained.

7. Pathologic anatomical characterization of Pick's and Alzheimer's diseases has been carried out on the basis of which is the process of progressive senile atrophy in combination with toxic and genetic factors.

SENILITY AND THE PROBLEM OF SENILE

PSYCHOSES

I. I. Lukomskiy

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Moscow)

1. The increase in the USSR of the mean life span of man conditions the increase in the ratio of middle aged individuals among the various categories of patients, including psychiatric. The problem of senile psychoses, their genesis and relation to the processes taking place in the organism during senility takes on a special immediacy.

2. In the light of new former views on the nature of the phenomena of senile reduction of all, including psychiatric, functions are subject to re-examination. Chiefly three conceptions have to this time influenced these views:

a) On the alleged regular connection of old-age changes with arteriosclerosis. This conception found its most consequent expression in the Demange theory reducing all senile changes to changes in the arteries.

b) Theory of the role of endocrine disorders, particularly the fading of the activity of the sex glands and a cessation of its stimulating affect on the functions of the central nervous system.

c) the conception of the role of senile changes in the tissues themselves, including the nerve tissue, with the extinction of active elements and their replacement by gliosis formations.

3. Of great importance are the experimental investigations of the I. P. Pavlov school which have shown that in senility active internal inhibition and mobility of the nerve processes suffer most. This comprises the physiological basis of so-called normal senility.

4. In addition the investigations of the Soviet psychiatrists (N. P. Tatarenko, S. G. Zhislin and his associates) have established that in senile dementia not only an enormous worsening of the above-mentioned disorders takes place, but qualitatively new characteristics as well, which leave no doubt that it is a matter, not of a simple increase in age disorders of the higher nervous system, but of a serious destructive process with mass destruction of the cerebral cortex. These coarse destructive changes also comprise the pathologic anatomical substratum of senile psychosis and senile dementia.

Studies of recent years have helped to delimit vascular brain disorders which most often develop in middle age from senile atrophic processes in the true

sense. The latter of the named groups, in its turn, is curtailed by taking out of it certain forms representing independent sicknesses (eg. Pick's disease).

6. In its present day form a group of senile psychoses shows, not different variants of increase in the manifestations of physiological senility, but something qualitatively new - a pathological process arising in the presence of several conditions, but in no way being an obligatory comitant of senility.

7. One of the current problems of clinical gerontology and geriatrics is not only the study of the nature of senile psychoses, but working out methods for their treatment and prophylaxis as well with the use of that plasticity of nerve tissue, its high adaptability, as noted by I. P. Pavlov. It is an important factor compensating for the reduction of the life's tonus brought on by changes with age.

The creation under the socialist structure of life of conditions protecting old-age, with its confidence in tomorrow, with its use of labor ability at all its levels, with its broad, far from realized possibilities of using a protective regimen for people of advanced age, opens boundless prospects for productive work in the business of preventing senile psychoses.

ON PREMATURE SENILITY, ATTEMPTS

AT TREATMENT AND PROPHYLAXIS

I. V. Strel'chuk

(Institute of Higher Nervous Activity, Academy of Science USSR, Moscow)

1. The problem of solving the riddle of senility as well as its prevention and treatment has attracted the attention of outstanding biologists and medical men (I. I. Mechnikov, A. A. Bogomolets, Steinach, Voronov, Parhon, Aslan, et al.). These questions are being debated in different fields of science. Despite disappointment after disappointment, mistake after mistake, work in this field relentlessly continues and does not let up for a minute.

2. Social factors: poorly balanced diet, hunger, cold, bad living conditions, over-demanding work and related over-exhaustion, unemployment, - these things which are the lot of workers in the capitalist countries as the classics of Marxism have pointed out, weaken the organism, lead to increased illnesses from which a significant part of humanity dies prematurely. Thanks to the constant care of the Communist Party and the Soviet Government for the people's welfare, the mean life span of citizens in the USSR has increased more than twice and in 1956 reached 67 years. In 1913 it was 32 years.

3. Existing theories on senility suffer from one-sidedness. They do not consider the activity of the organism as a single whole, nor the leading role of the nervous system, only the insufficiency of one or another system is examined, nor do they consider the influence of social factors, of the social environment.

4. A great role in the development of premature aging of the organism is played by disorders in the normal activity of the important organs and systems, and first of all, of the central nervous system and cardiovascular system; of the endocrine glands, the digestive system, breathing organs and others affected by harmful factors (infections, intoxications, neoplasms, etc.). When any organ is stricken, especially any of the above mentioned, the life of the entire organism is disturbed. A large role in the development of premature senility is played by excess use of alcohol and tobacco. Premature decline is the usual companion of alcoholism.

5. The observations we have been carrying on throughout many years in treating premature aging (nonspecific therapy with gravidane, therapeutic sleep, bioquinol, therapeutic diet, vitamin therapy, etc.) yielded a significant clinical improvement.

Study of the influence of the preparation of saponin of Caucasian Dioscorea made by B. K. Kostotskiy in the VILAR (All-Union Institute of Medicinal and Aromatic Herbs) for experimental atherosclerosis in animals yielded positive results (A. D. Turova, L. N. Sokolova). In treating patients with atherosclerosis of the brain in the clinic positive results were obtained in using preparation of saponins of Caucasian Dioscorea (D. V. Pankov,

I. V. Strel'chuk).

5. Modern science directs chief attention not on rejuvenating an already aged organism, but in preventing premature senility. The proper organization of work and rest, sensible diet, sports, exercise, struggle against illnesses, the struggle for a healthy way of life for Soviet citizens - all this is the struggle for longevity.

ON TREATING ATHEROSCLEROSIS

PATIENTS WITH SAPONINS OF

CAUCASIAN DIOSCOREA

D. V. Pankov

(Institute of Higher Nervous Activity of the Academy of Sciences USSR. Laboratory of Pathophysiology and Therapy of the Higher Nervous Activity of the Adult, Moscow)

1. We studied 25 patients with atherosclerosis of the vessels of the brain ranging from 43 to 78 with freedom from sickness extending from 2 to 15 years. These patients received treatment with saponins of Caucasian dioscorea.

In the patients we studied we observed signs of premature aging of the skin and hair, arcus senilis of the cornea, sclerosis of the vessels of the retina and aorta and atherosclerosis, with corresponding changes in electrocardiograms. Arterial pressure was unsteady, the level of cholesterol in the blood went up.

Damage to the neuropsychic sphere is expressed by complaints of head aches, dizziness, loss of memory. Emotional instability, depressed mood, dementia, irritability, increased physical and mental fatigue, lessened ability to work, and inability to sleep were noticed.

2. In investigating higher nervous activity we detected a reduction in the excitability process, the active inhibition process (particularly the differentiation process), increase in the processes of passive inhibition, phase signs in the first signal

system in the form of the equalizing and paradoxial. In the second signal system signs of increased inhibition were noted.

Treatment with saponins of caucasian dioscorea in several series lasting 7 - 10 days was conducted. The preparation was dosed out individually to a given patient at the rate of : 0.15 mg; 0.3; 0.6 mg per day.

As a result of the treatment improvement in the neuropsychic sphere was observed in the majority of patients: head aches and dizziness disappeared, and memory improved. The emotional sphere became more stable, irritability and dementia were reduced. The level of arterial pressure normalized, the amount of cholesterol in the blood lessened.

Study of higher nervous activity after treatment with saponins showed an increase in the excitability process and the processes of active inhibition, and a disappearance of phase signs. In studying the vocal reactions by the associative method an improvement in the activity of the second signal system was detected.

Supplementary signs observed in certain patients during treatment with saponins of caucasian dioscorea were reflected in the form of catarrhal signs from the side of the upper respiratory tracts and the gastro-intestinal tract, increased perspiration, and insignificant muscular pains.

Catamnesic and dynamic observation in the course of a year indicate a stable therapeutic effect in the overwhelming majority of patients.

Treatment with saponins of caucasian dioscorea must be conducted with a check on the state of health of the patient, the content of cholesterol in the blood and the level of arterial pressure, individually for each patient.

EFFECT OF SAPONINS OF CAUCASIAN
DIOSCOREA ON THE DEVELOPMENT
OF EXPERIMENTAL ATHEROSCLEROSIS
IN RABBITS

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1. Among cardiovascular diseases the most wide-spread is atherosclerosis.

2. The basis for the pathogenesis of atherosclerosis, according to N. N. Anichkov and S. S. Khalatov, are disruptions in lipoidal metabolism. The main role in these disorders belongs to cholesterol

Ransom, Windows and others have established that saponins interact with cholesterol forming a complex difficultly soluble compounds: digitonin, cholesterolide, diocine-cholesteride. On this foundation Professor A. D. Turova proposed the possible use of saponins in disorders of cholesterol metabolism, in particular in atherosclerosis experimentally and clinically.

3. The task of the present study is to investigate the influence of saponins on the development of experimental atherosclerosis in rabbits.

Saponins of *Caucasian dioscorea* belonging to the group of steroid saponins isolated in the chemistry section of VILAR by senior scientific worker B. K. Rostotskiy were investigated

Experimental cholesterol atherosclerosis was produced in rabbits of both sexes with weights from 2.5 to 3 kg according to the method of Academician N. N. Anichkov. Clinical observations were conducted on the rabbits; the level of cholesterol in the blood was determined by the Engelhardt and Smirnova method, the maximum arterial blood pressure was checked in the carotid artery leading out to a skin flap. The influence of saponins on the heart, peripheral vessels and daily diuresis was studied. At the end of the tests the rabbits were killed and macro-morphological investigations of the aortas, coronary vessels and internal organs were performed (histological studies were conducted by V. I. Bichenina).

4. Three series of tests (prophylactic, prophylactic-therapeutic, and curative) were carried out on 80 rabbits. In the first series of tests the rabbits were administered cholesterol internally to the

amount of 0.2 g/kg in a 10% solution of sunflower oil for 120 days (control group), two other groups received cholesterol and saponins of dioscera simultaneously intravenously in doses of 5 mg/kg and internally 10 mg/kg for 120 days.

The content of cholesterol in the blood of the control rabbits at the end of the experiment increased from 50 - 70 mg % to 800 - 1,000 mg %, the arterial pressure of the blood increased to 140 - 170 mm mercury, alopecia of the neck, chest, front and back extremities appeared.

The rabbits which had received cholesterol and saponins of dioscerea simultaneously showed the level of cholesterol to rise only to 100 - 220 and only two out of ten showed the level to rise to 380 - 400 mg %. Blood pressure remained within normal bounds. Alopecia was not observed.

5. In the second series (prophylactic-therapeutic) two groups of rabbits were given cholesterol internally: for the rabbits in the second group, beginning from the 63rd day of the experiment saponins were administered intravenously in a dosage of 5 mg/kg. Saponins of dioscerea continued to be introduced another 17 days after cholesterol had ceased to be introduced. The length of treatment lasted 74 days. At the end of the saponin dioscerea treatment the level of cholesterol in the blood with 360 - 500 mg % (before treatment) decreased to 50 - 95 mg %; from 150 - 160 mm Hg blood pressure went down to 116 - 120 mm.

In the control group of animals the content of cholesterol in the blood remained increased to 300 - 330 mg %, notwithstanding the fact that cholesterol introduction was stopped, the arterial pressure also remained increased to 188 - 140 mm Hg.

6. In the third series of experiments all the rabbits were administered cholesterol for 5.5 months. By this time the level of cholesterol in the blood increased to 400 - 660 mg %, blood pressure went up to 160 - 180 mm Hg. Alopecia was observed in all the rabbits, trophic ulcers on the extremities (the result of depositions of lipoids on the skin), and depositions of lipoids on the cornea and sclera of the eyes. The animals became irritable and bad tempered. At this period the animals began to be treated with saponins of caucasian dioscerea (10 mg/kg internally daily) for 3 months; a physiological solution (a sol-

vent of saponins) was administered to the control animals internally.

In the 20 - 30 days of treatment with saponins the level of cholesterol went down from 400 - 660 mg % to 95 - 105 mg %, blood pressure went down to 130 - 140 mm of mercury. On the 60th day of treatment the content of cholesterol in the blood and the blood pressure had gone down to normal. In the control animals the level of cholesterol and blood pressure remained high.

In addition, at the end of the treatment hair appeared on the alopecia parts, the ulcers on the extremities disappeared, the deposition of lipoids on the cornea and sclera decreased. The lipid depositions on the intima of the aorta, liver, kidneys, and adrenal glands were less than in the control animals.

7. Experiments of the three series of tests showed that saponins of caucasian dioscorea lower the level of cholesterol in the blood, and cholesterol infiltration of the aorta and other internal organs, bring down arterial pressure of the blood, expand the peripheral vessels, increase the force of heart contractions, slow the rythem of the heart, and increase the daily diuresis in rabbits with experimental atherosclerosis.

The positive effect of saponins of dioscorea on the course and development of experimental atherosclerosis serves as a base for using the preparation in clinical experimentation on atherosclerosis.

THE ROLE OF PHYSICAL EXERCISE

IN THE PREVENTION OF

ATHEROSCLEROSIS

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1. Physiological and clinical investigations have established that the speed of propagation of a

pulse wave directly reflects the degree of elasticity of the vascular walls. This method, in the opinion of a large number of investigators, is the most reliable of all methods used to measure the elasticity of arterial walls.

2. From data in medical literature it is known that the speed of propagation of a pulse wave increases with the induration of the walls of the vessels. In childhood this speed is lowest and gradually grows with the years in connection with the worsening of the elastic qualities of the vessels.

3. At the present time it is known that in all stages of development of atherosclerosis not only an accumulation but a gradual removal of lipoids from the walls of the arteries occurs. The phenomenon of the "washing out" of lipoids from the atherosclerotic patches under the effect of a group of factors has great practical significance.

4. The aim of our work was to explain the effect of physical exercise on the state of elasticity of the walls of arterial vessels in people of middle and advanced age, since it is known that in the majority of cases atherosclerosis increases more or less with the number of years.

5. For this purpose we recorded on the apparatus for functional diagnosis 4-PFD-7 the speed of pulse wave propagation according to a method we devised for this apparatus, which included in a momentary record the second deflection of the electrocardiogram, the pulse shock from the artery of the forearm and finger as well as a time notation. Conditionally assuming peak of wave R on the electrocardiogram for a constant reflection of the same phase of systole, measuring the distance from the apex of the heart to the point at which we recorded the passage of the pulse wave and knowing the time demanded for this, we computed the speed of pulse wave propagation.

6. To obtain control figures according to this method, we registered the speed of pulse wave propagation from 50 young (18 to 20 year olds) healthy individuals, taking the lowest mean figures quite close to those appearing in texts. The same records were made of 100 reasonably healthy middle-aged individuals (45 to 74 years of age), finding a regular pattern in the increase in the speed of pulse wave propagation in them corresponding to age.

7. To explain the influence of physical exercise on the elasticity of the vascular walls, we made the same records from 56 reasonably healthy individuals of middle age who performed physical exercise at the clinic of the Medical Physical Culture and Medical Control of GIsOLIFK (State Central "Order of Lenin" Physical Culture Institute) three times a week. After 5 - 6 months, finding a lowered speed of propagation in the second examination in the overwhelming majority of cases we took it as evidence that the elasticity of the vessels had increased, the manifestations of atherosclerosis characteristic of this age has lessened. Clinical studies of this group, in particular the dynamic indices of the oscillograph, electrocardiogram and other devices also evidenced a general functional improvement in the organisms of those examined.

8. To explain the effect of physical exercise systematically practiced for many years, we examined a group of honored masters and masters of sport, past champions and record breakers in the USSR - 42 in all who had given up intensive training with oncoming age. In analysing the data obtained attention was thrown on the low speed of propagation of the pulse wave in comparison with data received earlier from individuals of the same age who had not been engaged in sports in the past. Certain of the masters of sport showed a speed of pulse wave propagation even lower than in the control group of youths. Clinical examination of these masters also revealed the good functional state of their organisms.

Conclusions

1. Prolonged and systematically conducted physical exercises help to preserve a good elasticity in the vessels, and this apparently is one of the factors hindering the development of atherosclerotic manifestations in the vessels.

2. Rationed physical exercise in middle age enables an increase in the elasticity of the vascular walls. This may be connected with the active "washing out" of lipoids from the arteries.

3. This work confirms the present-day idea of the possibility of the reverse development of atherosclerosis. Here physical culture and sports create great prospects for the possibility for preventing and treating this sickness.

CLINICAL ELECTROPHYSIOLOGICAL
INVESTIGATIONS OF OLD PEOPLE *
NORMAL AND PATHOLOGICAL

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(Report Reader P.
I. Shpil'berg)

In previous studies two of us (P. I. Shpil'berg and S. I. Subbotnik 1957, 1958) described the characteristics of electroencephalograms (EEG) and clinical analyses of normal old people from 70 to 95 years of age. Data obtained led to the conclusion that in senility cortical activity and the mobility of the nervous processes weaken and, respectively, effects of the weakened reticular system of the brain stem increase. This corresponds to the general principles of evolution put forth by Jackson, Pavlov, and Orbeli holding that phylogenetically more youthful and fragile properties are stricken earlier and harder, giving way to lower forms of activity. The use of novocain for therapeutic purposes yielded improvement - clinical and EEG.

The condition of the internal organs and the fitness to work in old people has been described by one of us (Luk'yanov, V. S. - 1952, 1957).

This communication is a continuation of these works and is the result of a complex of investigations conducted in the Clinical Department of the Institute im. Erisman and the Psycho-neurological Section of the Moscow Station Hospital. Electroencephalograms, electrocardiograms of normal middle and old aged patients were studied and also of neuro-psychic patients as well as the effect of the novocain treatment. Objective

data of EEG and EKG were correlated with the data from clinical investigations.

The typical characteristic of the EEG of normal old people is the predominance of alpha waves, 8 - 9 per second and the decline in the number of alpha waves, 10 - 12 per second. Rapid beta waves also showed, often mixed with the alpha waves. Slow waves were also met. An alternation of depressions and outbursts of wave groups was noted. Changes of EEG are diffuse; inhemispherical asymmetry was noted in certain cases. Reaction to light and sound irritation stem from a high latent period or is absent. With light flashes the range of learned frequencies is limited to low frequencies 4 - 8 cycles. Amplitude modulation is lowered.

The significant stability of waves, hypo and unresponsiveness, the elongation of latency indicate a weakening of lability of nervous processes of the cortex in senility. Use of novocain for therapeutic purposes yielded positive results according to clinical data, EEG and EKG.

Use of novocain in middle-aged people in transport yielded an improvement in state of being and an increase in the ability to work. Patients with climateric neurosis, patients with presenile psychosis showed changes in the EEG as correlated with clinical data. Use of novocain in combination with other means yielded clinical as well as EEG improvement.

The EEG of patients with senile psychosis, and arteriosclerosis are characterized by the absence of normal alpha waves, by the presence of slow waves; some patients had rapid and paroxysmal waves. The reactions changed. Pathological changes are diffuse; localized were also noted against a background of diffuse pathology. Pathological EEG changes were correlated with clinical data.

Use of novocain for therapeutic purposes was effective in normal old men; in presenile patients and those with climateric neurosis it is best to combine novocain with other agents.

It is necessary to consider the great importance of individual peculiarities.