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USSR Report

LIFE SCIENCES

BIOMEDICAL AND BEHAVIORAL SCIENCES

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JPRS-UBB-87-010
13 MAY 1987

USSR REPORT
LIFE SCIENCES
BIOMEDICAL AND BEHAVIORAL SCIENCES

CONTENTS

BIOPHYSICS

CONFERENCES

MISCELLANEOUS

/9835

AEROSPACE MEDICINE

UDC 612.112.91.014.41

CHANGES IN HEMOSTASIS SYSTEM OF ANIMALS UNDER CONDITIONS OF GRANULOCYTOPOIESIS INHIBITION UNDER EFFECT OF DECREASED BAROMETRIC PRESSURE

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 31, No 6, Nov-Dec 85
(manuscript received 16 Mar 84) pp 712-716

[Article by N.V. Lunina and A.F. Poltavskiy, Pedagogical Institute, Voroshilovgrad]

[Abstract] Establishment of the dependence of changes in the hemostasis system of the body under the effect of low barometric pressure on the neutrophil leukocytes count and the functional state of their lysosomal apparatus involved experiments on 60 rabbits of both sexes (weight 2-3.5 kg). In order to inhibit granulocytopoiesis, all rabbits received the cytostatic drug myelobromal (Budapest, Hungary) perorally in a dose of 80 mg/kg for 5-8 days until reduction of the number of leukocytes in 1 mm^3 of peripheral blood by 70-80 percent in comparison with the initial level. The rabbits were then kept for 1 hour in a ventilated pressure chamber at 304 mm of mercury (494 gPA). The single 1-hour effect of low barometric pressure after use of the drug did not activate the coagulation and fibrinolytic systems of the blood. This was atributed to an insufficient reaction of the lysosomic apparatus of the neutrophil leukocytes and their lowered level in the pheripheral blood to activate the regulatory systems which are dependent on the Hageman factor. References 17 (Russian).

2791/9835
CSO: 1840/239

UDC 581.4:523

CYTOMORPHOLOGY AND ULTRASTRUCTURE OF CORN ROOT MERISTEM IN WEIGHTLESSNESS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA BIOLOGICHESKAYA in Russian
No 5, Sep-Oct 86 (manuscript received 5 Dec 84) pp 680-687

[Article by M.G. Tairbekov, V.G. Grif, Ye.M. Bamicheva, and Ye.M. Balovich, Institute of Medical-Biological Problems, USSR Ministry of Health, Moscow; Institute of Botany, imeni V.L. Komarov, USSR Academy of Sciences, Leningrad]

[Abstract] An experiment performed in December, 1983 on the "Kosmos-1514" biological satellite studied the morphofunctional characteristics of plants in weightlessness using a biocalorimeter. The major purpose of the experiment was a comparative study of the dynamics of energy expenditure in plants in the early phase of ontogenesis, up to 7 day sprout growth. Experiments were performed on sprouting Sterling corn seeds. The experiment involved comparative cytologic and electron-microscope analysis of corn sprout cells grown in weightlessness and on earth, with primary attention given to the anatomic structure, cytologic characteristics and ultrastructural organization of root meristem and cover cells. All morphological parameters of the cells were virtually identical for both groups of plants, the only difference being in the dimensions of the cells of the meristems. These differences were also observed between two control versions, however. Slight observed differences in mitotic index frequency are also not considered reliable. The cytologic and ultrastructural analyses also showed that the slight differences between experimental and control versions fall within the limits of the physiological norm of the reaction of the plants to external effects. Figures 4; references 21: 10 Russian, 11 Western.

6508/9835
CSO: 1840/419

AGROTECHNOLOGY

UDC 577. 175.13,577.152.27

ACTIVATION OF PROTEINKINASE C IN PLANT CELLS DUE TO ACTION OF GIBERRILLIC ACID: ENZYME TRANSLOCATION FROM CYTOPLASM INTO MEMBRANES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 3, Jan 87 (manuscript received 7 Jul 86) pp 763-765

[Article by E.P. Ladyzhenskaya, N.P. Korableva, T.M. Morozova, O.M. Sidorkina and Corresponding Member, USSR Academy of Sciences R.I. Salganik, Institute of Biochemistry imeni A.N. Bakh, USSR Academy of Sciences, Moscow; Institute of Cytology and Genetics, Siberian Department, USSR Academy of Sciences, Novosibirsk]

[Abstract] It is shown that potato tuber cells contain proteinkinase C (PKC); activation occurs in plant cells under the action of a phytohormone giberrillic acid (GA) and then the enzyme is redistributed among various cell compartments. Proteinkinase activity was observed in fractions eluted from a DE-52 column with 0.1 M NaCl; this activity increased with Ca^{++} and phosphatidyl serine were added to the incubation medium. Proteinkinase activity from fractions eluted with 0.16-0.18 M NaCl was not stimulated by Ca ions or the serine. Incubation of potato tuber cells with GA increased activity of PKC in the membrane fraction and decreased it in cytosol. This activity of GA was specific. Evidently, PKC leads to phosphorylation of cell proteins and thus facilitates the action of GA on the effector systems of the plant cells. Figures 2; references 15: 5 Russian, 10 Western.

7813/9835
CSO: 1840/423

UDC 581

CYTOKININE REGULATION OF PROTEINKINASE BOUND TO CHROMATIN AND RNA-POLYMERASE I FROM BARLEY LEAVES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 3, Jan 87 (manuscript received 27 Mar 86) pp 766-768

[Article by S.Yu. Selivankina, Ye.G. Romanko, G.V. Novikova and O.N. Kulyayeva, Institute of Plant Physiology imeni K.A. Timiryazev, USSR Academy of Sciences, Moscow]

[Abstract] There are no literature data showing direct participation of phytohormones in regulating activity of proteinkinases. The goal of the present study was to show presence of proteinkinases in chromatin preparations from barley leaves and kinases bound to RNA-polymerase I isolated from chromatin, as well as to investigate the possibility of regulating proteinkinase activity by means of cytokinine. The experimental data did show that proteinkinase activity was bound to chromatin and to RNA-polymerase I. Addition of casein and histones did not change its activity; spermin also had no effect but spermidine led to definite activation of the enzyme. Analogously, addition of cytokinine to the reaction medium stimulated the enzyme substantially; this is the first observation of a direct action of cytokinine on enzyme activity. Figure 1; references 14: 2 Russian, 12 Western.

7813/9835
CSO: 1840/423

UDC 575.632.937.14

HETEROKARYOSIS IN ENTOMOPHAGIC FUNGUS VERTICILLIUM LECANII

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 20, No 5, Sep-Oct 86 (manuscript received 12 Nov 85) pp 362-365

[Article by D.I. Kotlyarevskiy and V.A. Pavlyushin, All-Union Institute of Plant Protection, Leningrad]

[Abstract] Studies were conducted on Verticillium lecanii with the intention of creating heterokaryotic strains in the hope of expanding this line of insecticides. One group of studies involved UV irradiation of the prototrophic monoconidial U-57 strain, with selection of auxotrophic mutants and monitoring for interhyphal anastomoses. The other concentrated on protoplast fusion experiments. In both cases heterokaryotic strains were developed, with the development of the heterokaryotic mycelia dependent on the peptone and yeast extract levels in the medium. High concentrations of peptone and the yeast extract served to inhibit heterokaryotic mycelial development. The availability of heterokaryotic forms should facilitate studies on expanding the scope of usage of V. lecanii under conditions other than high humidity. Tables 3; references 10: 1 Polish, 3 Russian, 6 Western.

12172/9835
CSO: 1840/321

UDC 577.74:636.086.25:582.288

MYCELIAL FUNGI AS SINGLE CELL PROTEIN SOURCE ON LIGNOCELLULOSE SUBSTRATE

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 20, No 5, Sep-Oct 86
(manuscript received 22 Jan 86) pp 377-385

[Article by V.G. Babitskaya, Institute of Microbiology, Belorussian SSR Academy of Sciences, Minsk]

[Abstract] Trials were conducted with straw as a lignocellulose substrate with low commercial value for the biosynthesis of single cell protein via a variety of mycelial fungi. One of the basic problems consists of the elimination of reduction of the lignin component, with current data showing that irradiation with a dose of 0.3 MGy dose of accelerated electrons constitutes one of the most effective methods. This level of irradiation increased the carbohydrate level to 25.1 mg/100 ml (vs. 7.3 mg/100 ml control value), with growth of Penicillium verruculusum yielding 0.14 g of protein per 1 gram of the substrate. Tabulated data are presented on the levels of free amino acids, essential amino acids, saturated and unsaturated fatty acids, and various proteins obtained with the different fungal cultures on such substrates. These observations indicate that straw, through its use as a substrate for the production of single cell protein, may become an important component in feed production. References 9: 7 Russian, 2 Western.

12172/9835
CSO: 1840/321

UDC 577.391;631,531.1;591.1.04

CHANGES IN RESPIRATORY INTENSITY OF GAMMA-IRRADIATED SEEDS ON STORAGE

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 4 Mar 85) pp 810-812

[Article by Z.N. Bychkova and V.S. Khlebnyy, Ryazan Agricultural Institute imeni P.A. Kostychev]

[Abstract] Moscow 35 spring wheat was used in a study designed to evaluate the effects of gamma irradiation on respiratory activity of seeds during storage, since the latter activity replenishes cell energy supplies. Irradiation with a 10 Gy dose led to maximum respiratory activity after 45 days of storage (50.8 ml CO_2/kg/h = 208% of control level), followed by a decline to 32.6 ml CO_2/kg/h (134%) after 80-85 days, and a recurrent rise to 182.2% of control activity after 105 days. Irradiation with a 100 Gy dose increased the respiratory activity to 45 ml CO_2/kg/h (187.5%) within 3 days, with peak activity in 60 days (83 ml CO_2/kg/h), followed by a decline to subbaseline levels after 150 days. Harvests obtained with seeds subjected to 10 Gy irradiation and planted after 15-45 days of storage exceeded control

harvests by ca. 115%, whereas shorter or longer storage periods were either ineffective or diminished the yield. Prolonged storage (600 days) of irradiated and control seeds demonstrated a greater weight loss of the former due to enhanced metabolic activity and, presumably, diminished viability. Figures 2; references 5 (Russian).

12172/9835
CSO: 1840/254

UDC 577.391;631.531.1

EFFECTS OF AUTUMNAL CLIMATIC CONDITIONS ON WINTER HARDINESS OF WINTER WHEAT GROWN FROM IRRADIATED SEEDS

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 12 Feb 85) pp 819-822

[Article by N.F. Batygin and A.K. Tatyanko, Agrophysical Scientific Research Institute, All-Union Academy of Agricultural Sciences imeni Lenin, Leningrad]

[Abstract] To set the parameters yielding winter wheat with maximum frost hardiness, a determination was made of the effects of the climatic conditions during autumnal vegetation on the hardiness of Mironovka 808 winter wheat grown from 10-50 Gy gamma-irradiated or UV illuminated ($1.77-8.85 \times 10^3$ ergs/mm^2) seeds. Bifactorial analyses revealed that the sum autumnal temperature was the key factor affecting winter hardiness. A total temperature sum of greater than 350°C reduced winter hardiness, a reduction that was further potentiated by either gamma or UV irradiation of the seeds before sowing. A radiation-dose related increase in hardiness was favored by short, relatively cold autumns with total temperatures in the 200-300°C range. Irradiation was essentially ineffective with temperatures of 233-305°C. These conditions, applicable to the Leningrad Oblast, when favorable would assure winter survival rates of 70-80%. Figures 1; tables 2; references 10 (Russian).

12172/9835
CSO: 1840/254

BIOCHEMISTRY

UDC 612.833.3-063:612.826.4

EFFECT OF TETANIC TOXIN ON CAPTURE OF ^{45}Ca BY SYNAPTOSOMES

Moscow PATOLOGICHESKAYA FIZIOLOGIYA I EKSPERIMENTALNAYA TERAPIYA in Russian No 1, Jan-Feb 85 p 90

[Abstract of article by I.G. Rebrov]

[Text] Tetanic toxin (TT), which depresses the secretion of mediator independent of its chemical nature, evidently affects the total unit of the secretor mechanism for all types of synapses. It is believed that the secretion of any mediator is a result of the entry of Ca^{2+} into a nerve ending and its interaction with the Ca^{2+}-activated link of the secretor mechanism. The impairment of any link in Ca exchange in the nerve ending is immediately reflected in its secretor capacity. It may be proposed that the secretion mechanism is conditioned by its interference in the process of Ca^{2+} exchange in the terminal. A study of the effect of TT on the capture of radioactive ^{45}Ca by the synaptosomes at rest and during K+ depolarization was undertaken in the aforementioned context. Synaptosomes were subjected to the action of TT for 2 hours, after which they were incubated in a medium containing ^{45}Ca for 15 s or 2 or 5 min. The capture of ^{45}Ca was studied at rest and under conditions of K+ depolarization. The time intervals selected make it possible to evaluate two important characteristics of Ca^{2+} exchange in the terminal: the rate of Ca^{2+} transport through the membrane and its total content in the synaptosomes. The accumulation of ^{45}Ca in the first 2 min of incubation make it possible to evaluate the initial rate of entry of Ca^{2+} into the nerve terminal and, consequently, the state of the Ca^{2+} channels. It appeared that TT does not affect the accumulation of ^{45}Ca in the initial period of time either at rest or under conditions of K+ depolarization. It may be concluded that TT does not affect the Ca^{2+} channels and the depression of mediator secretion is not related to the impairment of the entry of Ca^{2+}. When the incubation time was increased to 5 min, there were definite differences in the accumulation of ^{45}Ca by the infected synaptosomes compared with the control synaptosomes at rest and during depolarization. By the fifth minute of incubation, the content of ^{45}Ca stabilizes, and it is possible to judge the total content of Ca^{2+} in the synaptosomes based on the quantity of isotope accumulated. In the TT-infected synaptosomes, the content of ^{45}Ca is 1.8 times greater than the control level ($P < .001$). The increase in the accumulation of Ca^{2+} in the TT-infected synaptosomes that we discovered may be a consequence of activation of the accumulation of calcium by the Ca^{2+}-storing organelles or inhibition of the system for output of Ca^{2+} from the terminal.

The latter could lead to an increase in the concentration of Ca^{2+} ions in the synaptoplasma, which could explain the spontaneous liberation of norepinephrine under the effect of TT. At the same time, during K+ depolarization, the TT-infected synaptosomes contain 18% less ^{45}Ca than the controls ($P < .02$), which may be the result of the faster occulusion of potential-sensitive Ca^{2+} channels in the TT-infected synaptosomes resulting from the presence of a large quantity of Ca^{2+} in them initially. Based on the data obtained, it is possible to conclude that TT increases the content of Ca^{2+} in the nerve endings at rest and that this increase is not the result of the effect of TT on the entry of Ca^{2+} into the terminal. Illustration 1, references 14. (Manuscript deposited in the All-Union Institute of Scientific and Technical Information [VINITI] 22 Dec 83, No 6972-82 Dep.)

12794
CSO 1840/0156

REVERSIBLE BINDING OF SPIN-LABELED INHIBITORS TO ACTIVE SITE OF BUTYRYLCHOLINESTERASE (BChE)

Moscow BIOFIZIKA in Russian Vol 31, No 5, Sep-Oct 86
(manuscript received 15 Oct 84; in final form 29 Jul 85) pp 746-751

[Article by K.Ye. Dorokhov and G.L. Grigoryan, Scientific Research Institute for Biological Testing of Chemical Compounds, Kupavna, Moscow Oblast]

[Abstract] Spin-labeled inhibitors were used to study the active site of BChE in relation to the binding of Ca^{2+}, Co^{2+} and Ni^{2+} at different pH values, ionic strength and in various organic solvents. Spin-labeled Metacin (oxyphenonium) was found to bind to the anionic portion of the BChE active site, with the complex stabilized by both electrostatic and hydrophobic forces. The binding of this inhibitor was affected by an ionizing group with a pK of 6-7. Procaine functioned as a reversible competitive inhibitor with an inhibition constant of $K_i = 4 \times 10^{-5}$M, Ca^{2+} activated BChE. In addition, Co^{2+} and Ni^{2+} were demonstrated to bind to the anionic site in close proximity to the binding of the spin-labeled inhibitors. The latter ions bound at a site closer to the cationic segment of the inhibitor than to the hydrophobic portion, and both were displaced by an excess of Ca^{2+}. These observations indicated the presence of an anionic bindings site on the BChE molecules in a deep hydrophobic cleft, capable of binding both bivalent metals and aminoalkyl organic cations. Figures 3; references 12: 5 Russian, 7 Western.

12172/9835
CSO: 1840/431

CONFORMATION OF N-TERMINAL TRIDECAPEPTIDE OF BETA-ENDORPHIN

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 2 Jul 85) pp 561-563

[Article by N.A. Akhmedov, Ye.V. Suleymanova, E.I. Ibragimov and N.M. Godzhayev, Azerbaijan State University imeni S.M. Kirov, Baku]

[Abstract] Conformational studies were conducted on the N-terminal tridecapeptide of beta-endorphin, since low-energy conformational states of peptides have been shown to determine their biological properties. In addition, the N-terminal pentapeptide of beta-endorphin is identical to the sequence of metenkaphalin which possesses unique physiological properties. The theoretical studies on the N-terminal tridecapeptide involved identification of low-energy (0-29.2 jK/mole relative conformational energies) conformations and shapes on the basis of nonvalent, electrostatic and torsional interactions of hydrogens bonds. The most compact conformation was identified as 'efffeffffffe' with a relative conformation energy of 0.0 kJ/mole, indicating marked stabilization of interaction between distant residues. Such data may be used to define structure-activity parameters of endorphin molecules. Tables 1; references 9: 7 Russian, 2 Western.

12172/9835
CSO: 1840/429

EFFECTS OF PHASE STATE OF LIPIDS ON INTERACTION WITH COBRA CYTOTOXIN

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 1 Apr 85) pp 716-718

[Article by T.F. Aripov, I.A. Rozenshteyn, B.A. Salakhutdinov and A.S. Sadykov, Institute of Bioorganic Chemistry, Uzbek SSR Academy of Sciences, Tashkent]

[Abstract] Spin-labeled liposomes prepared from dimyristoylphosphatidylcholine and phosphatidic acid were employed in an ESR study to determine the site of interaction with the cytotoxin V_C5 of the Central Asian cobra. The data demonstrated that the effects of V_C5 were dependent on the phase state of the lipid membrane. Above the temperature of gel-liquid crystal transition the peptide V_C5 molecule is incorporated into the liquid crystal lipophilic region of the bilayer. In the gel state, i.e., below the transition temperature of ca. 23°C, the reaction between V_C5 and the liposomes is largely electrostatic. Figures 2; references 9: 5 Russian, 4 Western.

12172/9835
CSO: 1840/429

UDC 579.873.71:[579.222:577.115.3]

POLY(GLYCEROPHOSPHATE) TEICHOIC ACID OF STREPTOMYCES LEVORIS K-3053: SELECTIVE BIOLOGICAL EFFECTS

Moscow ANTIBIOTIKI I MEDITSINSKAYA BIOTEKHNOLOGIYA in Russian Vol 31, No 8, Aug 86 (manuscript received 29 Nov 85) pp 584-587

[Article by Ye.S. Vylegzhanina, N.F. Dmitriyeva, A.N. Polin, I.B. Naumova, Yu.N. Yepishin, L.V. Krupenina, V.I. Ogarkov and T.M. Oksman, Moscow State University imeni M.V. Lomonosov; 1st Moscow Medical Institute imeni S.M. Sechenov; All-Union Scientific Research Institute of Protein Synthesis, Moscow]

[Abstract] Chemical studies on the cell wall of Streptomyces levoris K-3053 led to the determination that 2% of the cell wall dry weight consisted of teichoic acid. The latter was identified as poly(glycerophosphate) with 15-20 unsubstituted monomeric units linked by 1,3-phosphodiester bonds. Administration of 2 mg/mouse to 18-20 g outbred mice was seen to attenuate tumor growth by 72% ($P<0.05$) 7 days later, when the drug itself was administered 7 days after a subcutaneous injection of 5×10^7 cells/mouse of S-180 sarcoma. However, in control mice the preparation caused death of 3 out of 8 mice within 8 days. The teichoic acid was also shown to be cardiotoxic in studies on perfused dog papillary muscle. Addition of 0.2 mg of the teichoic acid to the bath abolished contractions within 10 min. Figures 2; references 28: 8 Russian, 20 Western.

12172/9835
CSO: 1840/335

UDC 612.273.014.46:615.32:577.175.82

PROTECTIVE EFFECTS OF NEUROPEPTIDE HOMOCARNOSINE IN HYPERBARIC OXYGENATION

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian No 4, Jul-Aug 85 (manuscript received 23 May 84) pp 75-79

[Article by A.A. Krichevskaya, T.I. Bondarenko, M.G. Makletsova and I.I. Mikhaleva, Chair of Biochemistry, Rostov-on-Don University imeni M.A. Suslov; Institute of Bioorganic Chemistry imeni M.M. Shemyakin, USSR Academy of Sciences, Moscow]

[Abstract] Therapeutic trials were undertaken with outbred albino mice (150-180 g) to assess the protective effects of homocarnosine in convulsions induced by hyperbaric oxygenation. Homocarnosine was found most effective when administered intraperitoneally in a dose of 10 mg/100 g 15 min before hyperbaric oxygenation (0.7 MPa O_2 for 15 or 30 min), delaying onset of convulsions by 29 min. The protective effects were attributed to the fact

that administration of exogenous homocarnosine maintained brain and blood levels of this peptide and GABA at control levels. In the untreated animals, the earlier onset of convulsions was accompanied by depression of brain and blood levels of homocarnosine and GABA. A ten-fold higher concentration of GABA had to be administered to evoke a far weaker level of protection. In vitro studies with addition of homocarnosine to brain homogenates demonstrated that under control condition homocarnosine depressed lipid peroxidation by 35.1% (P 0.001). Addition of homocarnosine to brain homogenates derived from rats subjected to hyperbarix oxygenation reduced the level of lipid peroxidation by 21.8%. The effects of homocarnosine, therefore, appear to be due to its ability to minimize the toxic effects of oxygen. References 18: 2 Ukrainian, 13 Russian, 3 Western.

12172/9835
CSO: 1840/1032

UDC 613:30:577.1:615.9

EFFECTS OF NUTRITION ON METABOLISM AND MECHANISM OF ACTION OF AFLATOXIN B_1 IN RAT LIVER

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian No 4, Jul-Aug 85 (manuscript received 20 Apr 84) pp 94-99

[Article by P.S. Nikov and M.S. Parzyan, Kazakh Branch, Institute of Nutrition, USSR Academy of Medical Sciences, Alma-Ata]

[Abstract] Male WAG rats (initial weight 50-60 g) were employed in an assessment of the effects of nutritional factors on the metabolism and mechanism of action of aflatoxin B_1 in the liver. Different groups of animals were maintained either on a normal diet or one deficient in several essential amino acids (lysine, methionine, threonine) and lacking vitamins A, E and C for 2 months. Subsequently, experimental animals received either a single intragastric administration of 1 mg/kg of aflatoxin B_1, or 40 25 μg/kg doses of the toxin over the following two months for a cumulative dose of 1 mg/kg. Studies on the changes in the biochemical composition of the endoplasmic reticulum and analysis of microsomal enzyme functions in both the acute and long-term experiments, as well as metabolism of aflatoxin B_1, demonstrated that biochemical lesions were far more pronounced in animals with nutritional deficiencies, with metabolism of aflatoxin B_1 directed toward formation of highly reactive metabolites with carcinogenic potential. However, a nutritionally-balanced diet promoted increased formation of the free toxic metabolites M_1 and Q_1 and might lead to greater systemic toxicity. Figures 3; references 18: 7 Russian, 11 Western.

12172/9835
CSO: 1840/1032

BIOPHYSICS

UDC 577.3:591:104:612.813

EFFECT OF EXTRACELLULAR pH ON ELEMENTARY CHARACTERISTICS OF CHLORIDE CHANNELS IN CHOLINERGIC MEMBRANE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 3, Nov 86 (manuscript received 15 Apr 86) pp 712-715

[Article by T.T. Ivanova, V.I. Ilyin, F.E. Ilyasov and B.N. Veprintsev, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Experiments were performed on neurons isolated from large and small ganglia of the mollusc Limnaeus under conditions of extracellular dialysis and fixation of the membrane potential. Spectral analysis of fluctuations of current through the cholinergic membrane revealed the mean conductivity and mean duration of open states of Cl^- channels adjoining the choline receptor. Experiments were performed at 20-24°C. Acetylcholine chloride solutions were fed to the membrane by extracellular perfusion. Spectra of the power of fluctuations of acetylcholine-induced current were calculated on an Iskra-226.6 computer. Current reduction occurred in acid pHs in spite of almost 1.5-fold increase of elementary conductivity while the mean duration of the open state was unchanged. The drop of responses to acetylcholine at low pH was attributed to protonation of the functionally vital group in the recognizing sector of the choline receptor and to reduction of the probability of acetylcholine-receptor binding. This decrease of probability may be due to a purely statistical effect of the increase of mean conductivity at low pH. The mechanism of increase of mean conductivity was attributed to the presence, in the channel, of a group being subjected to protonation. If this group has a negative charge, its screening may increase the possibility of Cl^- anions transfer. The insensitivity of mean conductivity and mean lifetime to variations of intra-cellular pH indicates that this group is in the outer mouth of the channel or near it. It is possible that a decrease of pH synchronizes actuation of the channel if the Cl-channel of the choline is a channel cluster. Figures 3; references 11: 8 Russian, 3 Western.

2791/9835
CSO: 1840/180

UDC 577.37

INTRACELLULAR LOCATION OF EXOGENEOUS PHOSTOSENSITIZER-CHLORIN e_6

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 3, Nov 86 (manuscript received 9 Apr 86) pp 715-719

[Article by A.A. Frolov, Yu.M. Arkatov, G.P. Gurinovich, G.A. Kochubeyev, M.V. Sarzhevskaya and S.N. Cherenkevich, Institute of Physics, BSSR Academy of Sciences; Institute of Physiology, BSSR Academy of Sciences, Minsk]

[Abstract] The location of chlorin e_6 in cells was studied by luminescence microscopy and photometry after their pre-incubation with a pigment in vitro. Studies were performed on HeLa cells cultivated on cover glasses in penicillin flasks in medium 199 with addition of 10 percent calf embryo serum and antibiotics. The basic part of the pigment was located in the protoplasm segment directly adjacent to the nucleus. In structural-morphological relationship, it was assumed to be a membrane network of the Golgi apparatus and the endoplasmic reticulum. Large quantities of mitochondria and lysosomes may be present here. A comparison of distributions of chlorin e_6 and derivative hematoporphyrin [PGP] inside cells showed that PGP, binding slightly with the plasmatic membrane, is located basically in the cytoplasm and the most intense PGP luminescence is seen in the region near the nuclear membrane, where the pigment is bound with mitochondria. It was assumed that potential targets of photodynamic action of chlorin e_6 may be practically all ultrastructural components of the cell, including the plasmatic membrane and the nuclear membrane. In view of this and the high quantum yield of intercombination conversion of the sensitizer into a monomeric state justified the conclusion that excitation of the bound pigment will cause cell lysis. Figures 1; references 11: 5 Russian, 6 Western.

2791/9835
CSO: 1840/180

UDC 577.352.5+577.354

MEMBRANE FLUIDITY AS FACTOR MODULATING ANTI-GRADIENT TRANSPORT OF SODIUM IONS FROM CELL

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 2, Nov 86 (manuscript received 13 Jun 86) pp 469-472

[Article by S.N. Ayrapetyan, T. Takenaka, I.S. Bakunts, A.A. Sagiyan and S.S. Dadalyan, Institute of Experimental Biology, ArSSR Academy of Sciences, Yerevan; All-Union Scientific Center of Surgery, USSR Academy of Medical Sciences, Yerevan Branch]

[Abstract] A study of the dependence of Na ion output from a cell on the degree of fluidity of the cell membrane involved experiments performed on the

isolated nervous system of the grape snail. The degree of fluidity was modulated by incubation of ganglia in a medium containing ketamin (10^{-4}M), (a widely used intravenous anesthetic) and in a medium containing decylic acid (1.5 mM), an unsaturated fatty acid with 10 carbon atoms in the carbohydrate chain. In normal Ringer's solution, the rate of ^{22}Na ions output from the cells was reduced in the decylic acid but was increased in the ketamin medium in relation to control figures. Two components (ouabain-sensitive and auabain-insensitive) were observed in the process of Na ions output. The ouabain-sensitive component ensures Na-K-pump functions and the ouabain-insensitive component ensures Na-Ca metabolism, the functional activity of which is regulated by the cyclic nucleotide system. A decrease of membrane fluidity activated both ouabain-sensitive and ouabain-insensitive components of ^{22}Na output from the cells while an increase of fluidity inactivated these components. It was assumed that the anesthetic effect of ketamine is due to its capacity to activate the Na-K-pump and thus reduce the volume (functionally active surface) of the cell. The cardio-depressive effect and smooth-muscle relaxant effect of ketamin was attributed to its capacity to suppress Na-Ca metabolism. The functional activity of the Na-K-pump and Na-Ca metabolism may be modulated by a change of the phospholipid environment. Figures 1; references 14 (Western).

2791/9835
CSO: 1840/179

VORTEX RINGS IN THREE-DIMENSIONAL ACTIVE MEDIA WITH TWO-COMPONENT DIFFUSION

Moscow BIOFIZIKA in Russian Vol 31, No 5, Sep-Oct 86
(manuscript received 15 Oct 85) pp 850-854

[Article by A.V. Panfilov, A.N. Rudenko and V.I. Krinskiy, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] A mathematical analysis was conducted on the behavior of vortex rings in three-dimensional active media with two diffusion coefficients. The derived equations made possible prediction of vortex rings in various media. In excitable membranes, for example, with a single diffusion coefficient, a vertical drift of the vortex ring may be expected to prevail as well as, depending on other parameters, either expansion or construction of the vortex. In a chemical medium in which two diffusion coefficients are apparent and both are approximately of equal value, constriction of the vortex ring may be anticipated. Furthermore, the rate of the vertical drift should be much less significant than the rate of constriction. Figures 3; references 8: 1 Russian, 7 Western.

12172/9835
CSO: 1840/431

BOUNDARY EFFECTS IN INTERACTION OF ROTATING SPIRAL WAVES

Moscow BIOFIZIKA in Russian Vol 31, No 5, Sep-Oct 86
(manuscript received 12 Aug 85) pp 855-861

[Article by Ye.A. Yermakova and A.M. Pertsov, Institutes of Chemical Physics (Moscow) and of Biological Physics (Pushchino, Moscow Oblast), USSR Academy of Sciences]

[Abstract] A mathematical analysis was conducted on boundary effects in the interaction of rotating spiral waves (reverberators) in a two-dimensional homogenous medium, described by FitzHugh-Nagumo equations. In the case of an impermeable boundary, the interaction of the waves led to a drift of the spiral waves along the boundary and reduction in the period of rotation, provided that the distance from the wave core to the boundary is less than 2 to 3 wavefront lengths. In addition, the drift rate increases markedly with suppression of the excitability of the medium in which these interactions occur. These observations indicate that in situations involving mirror symmetry of the spiral waves with counter-rotations, a coupled system is formed that drifts along the axis of symmetry. Figures 5; references 17: 11 Russian, 6 Western.

12172/9835
CSO: 1840/431

MODELS OF SPATIALLY ORDERED STRUCTURES IN COLONIES OF MOTILE BACTERIA

Moscow BIOFIZIKA in Russian Vol 31, No 5, Sep-Oct 86
(manuscript received 17 Jan 86) pp 866-870

[Article by Ye.O. Budrene, A.A. Polezhayev and M.O. Ptitsyn, Institute of Semiconductor Physics, Lithuanian SSR Academy of Sciences, Vilnyus; Physics Institute imeni P.N. Lebedev, Moscow]

[Abstract] A mathematical model has been formulated to account for the formation of ordered structures, especially circular, in colonies of motile bacteria. The present analysis dealt with the situation in colonies of E. coli and Proteus, noted for the formation of circular areas differing in bacterial population densities. The model assumed that the dividing cells secrete a mediator into the medium, and that with increasing concentrations of the mediator in the medium the dividing cells enter a passive (anabiotic) phase. It is further assumed that the cells respond to changes in the concentration of the mediator after a definite lag period. On the basis of these considerations, it has been demonstrated that the growth of bacterial colonies may be described as a spread of a pulsating concentric wave of dividing cells. Behind the advancing front, circular formations remain, which are formed from aggregates of anabiotic cells. Figures 3; references 14: 4 Russian, 10 Western.

12172/9835
CSO: 1840/431

CATION-ANION SELECTIVITY OF STAPHYLOTOXIN CHANNELS IN LIPID BILAYERS

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 6 Mar 85) pp 606-610

[Article by O.V. Krasilnikov, V.I. Ternovskiy, R.Z. Sabirov, R.K. Zaripova and B.A. Tashmukhamedov, Institute of Biochemistry, Uzbek SSR Academy of Sciences, Tashkent]

[Abstract] An analysis was conducted on the changes in the cation-anion selectivity of ion channels in bilayer lipid membranes induced by staphylotoxin. The electrophysiological studies conducted with a variety of lipid membranes demonstrated that such changes in conductivity due to variations in the pH of the medium are predicated on the net charge on the toxin molecules, with the nature of the lipids in the target membrane playing a secondary role. The key factor involves a change in the charge on the toxin molecule as it reacts with the negative groups of the polar heads of the lipid molecules during channel formation, leading to a shift in the effective pI of the channel-forming toxin-lipid complex at low pH values. As a result, these changes correspond to a displacement of the selectivity titration curves reflected by a relative change in selectivity for cations and anions. Figures 5; references 9: 5 Russian, 4 Western.

12172/9835
CSO: 1840/429

EXPERIMENTAL ASSESSMENT OF CRITICAL REVERBERATOR SIZE IN MYOCARDIUM

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 19 Jul 85) pp 691-694

[Article by A.M. Pertsov and A.B. Medvinskiy, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] The critical size of a reveberator (d_c) represents the minimal dimension of myocardial tissue within which a reverberator could still exist. Studies on isolated preparations of auricles from New Zealand rabbits based on reverberator wavelength determinations yielded a mean value for d_c of ca. 8 mm, while measurement of an unexcitable obstacle yielded a value of ca 7 mm. Reverberation was not noted with lidocaine concentrations of ca. 2 mg/liter, but was reinducible following washing to remove lidocaine. Linear extrapolation of the d_c/D values (D = lidocaine dimensions), demonstrated that d_c began to exceed D at a lidocaine concentration of ca. 2 mg/liter. The pharmacologic studies served to substantiate the fact that 7-8 mm actually represents the d_c. Figures 3; references 15: 8 Russian, 7 Western.

12172/9835
CSO: 1840/429

EVALUATION OF UHF EFFECTS BY MEANS OF SPHERICAL MODELS

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 5 Apr 85) pp 695-700

[Article by V.V. Shorokhov, R.E. Tigranyan and P.V. Mashkin, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] A study was conducted on the mechanical fluctuations induced in spherical models by UHF fields, using glass flasks filled either with ethanol or 0.1 M NaCl. The data, derived for 915 and 2375 MHz frequencies, demonstrated that the radiofrequency effects are due to induction of mechanical fluctuations in targets such as the head, and that the energies are transferred to the auditory apparatus via bone conduction. The frequencies of the mechanical fluctuations are dependent on the duration of exposure and the succession frequency of the EMF pulses. Temperature distribution in the exposed spherical and some cylindrical models followed exponential kinetics of electromagnetic energy absorption indicating the absence of the so-called 'hot-spots'. The fundamental frequency of the excited mechanical fluctuations was shown to correspond to calculated Helmholtz resonator frequency. Figures 2; references 15: 5 Russian, 10 Western.

12172/9835
CSO: 1840/429

OVERALL BEHAVIOR OF INTERACTING CATALYTIC MACROMOLECULES (AUTOGENS) IN COACERVATES

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 3 Dec 84; in final form 25 Feb 85) pp 701-703

[Article by V.G. Redko]

[Abstract] A mathematical analysis was conducted on the behavior of autogens in homogenous media and in coacervates, in terms of a mechanism providing for rapid origin of a self-replicating biochemical system. The analytical findings provided indication that in a homogenous system the concentration of the matrix (polynucleotides) remains invariate, while the concentration of the two proteins (translatase, replicase) approach the concentration of the matrix. Since the replication of various autogens follows a universal mechanism, the concentration of the proteins is proportional to the matrix concentration. However, in coacervates division follows the attainment of a certain limit volume, and the concentration of matrix polynucleotides and translation and replication proteins is limited by the volume of the coacervate droplet. In view of these limitations, an equation was derived to demonstrate that autogens were selected on the basis of their selective values. Figures 1; references 9: 6 Russian, 3 Western.

12172/9835
CSO: 1840/429

BIOLOGICAL MICRODEVICES WITH ENZYME AMPLIFICATION

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 11 Feb 85) pp 704-710

[Article by M.M. Rakhimov, Tashkent State University imeni V.I. Lenin]

[Abstract] A brief review is presented of the principles underlying the use of enzymes for amplification of various signals, following from the fact that enzymes may increase the rate of reaction 10^6- to 10^{15}-fold. The biotechnological devices have been shown to be applicable to a variety of analyses, and the harnessing of enzyme reactions allows detection of the final products by a variety of physical and chemical means, with the former methods offering greater convenience. Recent advances in enzyme immobilization have transformed many single-use procedures into a reusable mode. Figures 6; references 26: 17 Russian, 9 Western.

12172/9835
CSO: 1840/429

SURFACE-ENHANCED RAMAN SPECTROSCOPY OF BIOPOLYMERS: MEMBRANE PROTEINS, BACTERIORHODOPSIN AND RHODOPSIN ADSORBED ON SILVER ELECTRODES AND SILVER HYDROSOLS

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 16 Jul 85) pp 724-734

[Article by I.R. Nabiyev, R.G. Yefremov and G.D. Chumanov, Institute of Bioorganic Chemistry imeni M.M. Shemyakin, USSR Academy of Sciences, Moscow; Moscow Institute of Engineering Physics]

[Abstract] Surface-enhanced Raman spectroscopy (ESRS) was carried out on membrane proteins and Halobacterium halobium bacteriorhodopsin and retinal rhodopsin following adsorption to 'smooth' silver electrodes and silver hydrosols. The data demonstrated that adsorption intensified the signals of bacteriorhodopsin and rhodopsin ca. 5×10^4-fold, leading to a lower detection limit for bacteriorhodopsin of ca. 2×10^{-7} M. Interpretation of spectra provided data indicating that the π-electron system of the chromophores in bacterial and retinal rhodopsin reacted directly with silver particles in the hydrosol. Such techniques make it possible to stop the reactions at any desired stage of the process and to study intermediate products in light-induced transformations. Intensification of the signal on smooth electrodes was largely due to long-acting components of the photoinduced process, while on 'pitted' electrodes (i.e., subjected to a redox cycle) intensification involved bands corresponding to oscillations in atoms in direct contact with the metal. The latter situation gives highly oriented preparations and makes possible an analysis of biopolymer topography in aqueous solutions and suspension. Figures 8; references 34: 13 Russian, 21 Western.

12172/9835
CSO: 1840/429

UDC 612.46.015.31:546.33].015.1:577.152.361].014.46:615.254.1

INHIBITION OF Na^+,K^+-ATPase ACTIVITY BY SODIUM CHANNEL BLOCKERS

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian No 4, Jul-Aug 85
(manuscript received 24 Jul 84) pp 122-124

[Article by L.V. Reznik and Ye.M. Myazina, Institute of Evolutionary Physiology and Biochemistry imeni I.M. Sechenov, USSR Academy of Sciences, Leningrad]

[Abstract] Renal cortical homogenates of outbred albino rats were used to assess the effects of sodium channel blockers on the activity of Na^+,K^+-ATPase. Amiloride, Triamterene and Tetrodotoxin were found to inhibit the activity of this enzyme by 40-50%, without affecting the activity of Mg^{2+}-ATPase. The loss of Na^+,K^+-ATPase activity was attributed to diminished access of Na^+ to the enzyme by the blockers, since the activity of the enzyme is Na^+-dependent. Figures 1; references 11: 2 Russian, 9 Western.

12172/9835
CSO: 1840/1032

UDC 576.8

COMPARATIVE STUDY OF GROWTH AND ENZYMATIC ACTIVITY OF FREE AND IMMOBILIZED CURVULARIA LUNATA BKM F-644 MYCELIUM

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA BIOLOGICHESKAYA in Russian
No 5, Sep-Oct 86 (manuscript received 26 Dec 86) pp 753-761

[Article by B.A. Angelova, G.V. Sukhodolskaya and K.A. Koshcheyenko, Institute of Biochemistry and Physiology, USSR Academy of Sciences, Puschino]

[Abstract] No data have previously been presented on the influence of the carrier and the immobilization process on the morphology, physiology and chemical composition of mycelium grown in a carrier, or the interrelationship of these factors to enzyme activity. The purpose of the present work was a comparative study of the growth of Curvularia lunata BKM F-644 mycelium in liquid Ca-alginate gel and its 11β-hydroxylase activity. These studies were performed on a culture of C. lunata BKM F-644 maintained on a solid agarized medium. The following parameters were analyzed during growth of the culture, both free and immobilized: pH, oxygen and saccharose content in the medium. The density of the mycelium in the carrier is greater for the immobilized culture, biomass output is lower and independent of the quantity of vegetative mycelium in the gel. Sucrose utilization rate is lower, pH higher in the immobilized culture. The 11β-hydroxylase activity in both cases is highest during the growth retardation and stationary phases. The initial rate of 11β-hydroxylated "S" substance by the immobilized mycelium is lower. A decrease was observed in the rate of formation of side products of transformation for the mycelium contained in the Ca-alginate gel. Figures 2; references 27: 14 Russian, 13 Western.

6508/9835
CSO: 1840/419

UDC 597.08.591.6.575.1.

USE OF RADIONUCLIDE-POLLUTED WATERS FOR FISH BREEDING

Moscow VOPROSY IKHTIOLOGII in Russian Vol 26, No 3, May-Jun 86
(manuscript received 19 Oct 84) pp 494-503

[Article by V.A. Shevchenko, V.L. Pechkurenkov, Ye.A. Fedorov, S.P. Peshkov, G.L. Pokrovskaya and A.N. Fetisov, Institute of General Genetics, USSR Academy of Sciences, Moscow]

[Abstract] Soviet and Western literature is reviewed on the possibility and effects of using radionuclide-polluted waters for fish breeding purposes. The problem is becoming all themore common in view of the rapid development of nuclear power stations and the use of local water resources for cooling purposes. The best information available to date has demonstrated that such reservoirs may be used for breeding desirable fish, such as the various species of carp, trout, perch, pike, roach, and so forth. Furthermore, although fish have been determined to be one of the aquatic life forms most susceptible to the effects of irradiation, there appears to be no danger of an increase in the frequency of mutations. In summary, hatcheries where the level of exposure appears to be limited to 0.5 rad/day, or less, pose no danger to fish breeding programs as regards desirable species. References 54: 37 Russian, 17 Western.

12172/9835
CSO: 1840/367

EPIDEMIOLOGY

UDC 618.19-006.6-036.13-031.14

PRIMARY-MULTIPLE BREAST CANCER

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 7, Jul 86
(manuscript received 9 Jan 86) pp 91-95

[Article by Ye.I. Bekhtereva, E.G. Tselikhman, A.V. Vazhenin, M.Z. Dinerman, L.P. Kuklenko and N.A. Abdullina, Chelyabinsk Oblast Oncological Dispensary; Chelyabinsk Medical Institute]

[Abstract] Patient charts at Chelyabinsk Oblast Oncological Outpatient Hospital were reviewed for the period 1976-1983, abstracting over 200 indices. During that period there were 102 patients with multicentric, bilateral or multiple cancers of the breast (4.2% of all breast cancers). In 48 cases the tumors were synchronous, in 54--metachronous (within one year). In 61 cases, this represented multicentric and bilateral disease, in 12 the second cancer was of the gynecological organs. A weak attempt was made to link the second tumor to radio-, chemo- or hormonal therapy. These tumors appeared in 40-50 years old women with an interval of 5.2 ± 0.3 years. References 8: 7 Russian, 1 Western.

7813/9835
CSO: 1840/405

UDC 618,16-006,6-036.22(574)

CANCER INCIDENCE OF FEMALE EXTERNAL GENITALIA BASED ON MATERIALS FROM KAZAKH SSR ONCOLOGICAL INSTITUTE

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 7, Jul 86
(manuscript received 10 Nov 84) pp 16-20

[Article by B.Ye. Abdrakhimov, N.A. Krivets and A.P. Pozdnyakova, Kazakh Scientific Research Institute of Oncology and Radiology, KaSSR Ministry of Health, Alma-Ata]

[Abstract] The spread and change of the incidence rate of cancer of external female genitalia in Kazakhstan was studied. This analysis is based on central

clinical records of Kazakhstan Scientific Research Institute of Oncology and Radiology for the period 1960-1980 and on primary medical documentation. It was found that this cancer is found rarely in Kazakhstan, similarly to the rest of the world, and it shows signs of gradual increase, which is not accidental. This disease occurs in cities as well as in rural areas. Some of the increase in incidence may be due to better diagnosis and more complete coverage of the population. In the Alma-Ata area, incidence is twice the average for the republic; it is lowest in Guryev Oblast. Highest incidence is in the 60+ age group. Longer life expectancy makes it necessary to include such women in prophylactic screenings and in educational program. References 13: 7 Russian, 6 Western.

7813/9835
CSO: 1840/405

UDC 616-006.04-036.88-07:351.777.8

CANCER MORTALITY IN LARGE SOVIET CITY

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 8, Aug 86
(manuscript received 20 Mar 85) pp 24-30

[Article by I.V. Polyakov and N.G. Petrova, 1st Leningrad Medical Institute imeni Academician I.P. Pavlov, USSR Ministry of Health]

[Abstract] An analysis was conducted on cancer mortality in a large Soviet city, encompassing the period 1979-1982. Malignancies were found to be the second most common cause of death, accounting for 21.5% of the total mortality. The majority (68%) of those dying from cancer were over 60 years of age, giving a mean age of 64.1 $\pm$ 0.13 years for this category of patients. The leading causes of death among the cancer patients were intoxication and cachexia (77.7 and 9.3%, respectively). Tabulated data are also summarized on the death rate of the different malignancies with season, time of day, and day of the week. In addition, case study analysis also demonstrated that for each 100 cases with a correct diagnosis of malignancy, 6.9 cases were incorrectly diagnosed as a malignancy, and in 73.4 cases the diagnosis of cancer was missed. These observations indicate a need for a higher index of suspicion, and the development of more-refined diagnostic approaches. References 27 (Russian).

12172/9835
CSO: 1840/406

UDC 616-006.04-036.21:(47+57)+(480)

COMPARATIVE ASSESSMENT OF CANCER MORBIDITY IN SELECTED AREAS OF USSR AND FINLAND

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 6, Jun 86
(manuscript received 21 Feb 85) pp 23-27

[Article by V.M. Merabishvili, T. Khakulinen and L.S. Serova]

[Abstract] Comparative data were derived from Finland on cancer morbidity in 1979 and for several areas of the USSR (Baltic Republics and adjacent areas of the RSFSR) for the incidence of cancer in 1978-1979. In terms of a population base of 100,000 the data revealed common trends and frequencies of various tumors, as well as significant local variations. For example, the incidence of gastric cancer in Finnish women was 13.4/100,000, while the rate for the various Soviet regions was 17.4-30.7/100,000. Similarly, the rate for men was 1.5- to 2 -fold greater in the USSR than in Finland. However, the incidence of breast cancer in Finland was calculated to be 43.6/100,000, while that in the USSR ranged from 18.8 (Karelian ASSR) to 34.1/100,000 (Leningrad), with a mean for the USSR of 21.1/100,000. Such comparisons underline the need and value of unified approaches to cancer epidemiology and standardized registry practices. References 13: 7 Russian, 6 Western.

12172/9835
CSO: 1840/404

UDC 575.1

ROLE OF EPIDERMAL GROWTH FACTOR (EGF) AND INSULIN IN REPAIR CONTROL OF GAMMA-INDUCED SINGLE-STRAND DNA BREAKS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 1, Jan 87 (manuscript received 3 Jun 86) pp 220-223

[Article by V.N. Bildin, R.S. Barkan, N.N. Nikolskiy and V.D. Zhestyanikov, Institute of Cytology, USSR Academy of Sciences, Leningrad]

[Abstract] Monolayer cultures of asynchronous, minimally transformed Swiss 3T3 mice cells were employed in a study designed to assess the contribution of insulin and EGF, alone or in combination, on gamma-radiation induced single-strand breaks in DNA. The cells were irradiated with a 170 Gy dose (17.9 Gy/min). Breaks were monitored in terms of the ^{3}H-thymidine activities of labeled DNA sedimentation peaks. The resultant data demonstrated that incubation of the cells with 1 μg/ml + 10 ng/ml EGF raised the relative DNA repair index to 1.83, versus values of ca. 1.00 with either insulin or EGF alone. These observations demonstrated that a combination of insulin and EGF may enhance DNA repair, provided that the target cells possess EGF receptors. Analogous studies with cells lacking EGF receptors failed to show enhanced DNA repair under analogous experimental conditions. Figures 1; references 12: 8 Russian, 4 Western.

12172/9835
CSO: 1840/301

UDC 577.29.616-006

MOLECULAR ORGANIZATION OF COMPLETE C-ONC GENE CODING FOR HUMAN CELLULAR TUMOR ANTIGEN p53

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 1, Jan 87 (manuscript received 17 Jul 86) pp 223-226

[Article by V.L. Bukhman, N.N. Ninkina, O.P. Samarina, O.V. Matveyeva, P.M. Chumakov and G.P. Georgiyev, corresponding member, USSR Academy of Sciences, Institute of Molecular Biology, USSR Academy of Sciences, Moscow]

[Abstract] Cloning studies were conducted on the c-onc gene responsible for the tumor p53 antigen to derive a structural organization of the gene in question. The study involved two genomic libraries, represented by EcoRI fragments of DNA derived from human placenta and Sau 3AI fragments of DNA from a human renal cancer. The use of murine and human cDNA probes revealed 11 identical recombinant clones among the fragments of the EcoRI library and 5 clones in the Sau 3AI library hybridizing with p53-cDNA. On the basis of the restriction and hybridization analyses, a detailed physical map was constructed, showing that the renal tumor possessed two variants of the p53 gene, representing allelic polymorphism of the BgIII site. Similar findings applied to the placental DNA. The data demonstrate that the p53 genes of humans and mice are organized in an analogous manner. A short first exon contains nontranslatable sequences and is separated from a cluster of protein-coding exons by a long intron segment. Figures 3; references 15: 1 Russian, 14 Western.

12172/9835
CSO: 1840/301

PHOTOCHEMICAL ACTIVITY OF GLUTATHIONE ON IRRADIATION WITH IR LASER

Moscow BIOFIZIKA in Russian Vol 31, No 5, Sep-Oct 86
(manuscript received 4 Apr 83; in final form 5 Jul 85) pp 913-914

[Article by B.G. Yavishev, Ya.Sh. Kishmariya and M.I. Tabagua, Kazan State University imeni V.I. Ulyanov-Lenin]

[Abstract] ^{13}C NMR studies were conducted on the effects of irradiation of glutathione in DMSO and D_2O by gallium arsenide IR laser (820-880 nm, 16 W impulses). Three lines were found to be shifted, which were attributed to groups containing N and S atoms. After irradiation was terminated the shifts disappeared to initial positions on the spectra. These observations are of interest in that S-atom-containing enzymes are often more radio-resistant than molecules lacking the S atom, and because pulses of weak IR laser lead to anomalous behavior of the S atoms in analogy to that previously-reported for the more powerful lasers. Tables 1; references 5: 1 Russian, 4 Western.

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CSO: 1840/431

UDC 617.731-002-085.849.19

ARGON LASER COAGULATION OF RETINA IN OPTIC NERVE NEURITIS

Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 4, 1986
(manuscript received 24 Jan 86) pp 198-199

[Article by A.A. Bochkareva, professor, Ye.A. Nesterov, physician and Yu.A. Ivanishko, candidate of medical sciences, Rostov Order of Peoples Friendship Medical Institute]

[Abstract] There is no generally-accepted classification of optic nerve diseases. The authors studied the reports on 26 patients treated in 1982-1985 for optic nerve neuritis to determine the possibility of using argon laser radiation to treat the disease. Laser coagulation was performed on 15 patients (15 eyes), coagulates applied around the optic nerve disk in

1-3 rows at a distance of 500-1000 μm, beam diameter 100 μm, pulse length 0.1-0.2s, power 300-400 mW. During the first 4-6 days, visual acuity remained unchanged, subjective improvement occurred on days 6-8, confirmed by an improvement in visual function by 0.13 ± 0.05. A second wave of improvement of central vision occurred on days 14-16, reaching 0.9-1.0 in 5 patients with complete disappearance of scotoma. Regression of clinical manifestations of the optic nerve disk was also observed at this same time.
References 6 (Russian).

6508/9835
CSO: 1840/374

UDC 617.732-085.849.19

PHOTO- AND LASER COAGULATION TREATMENT OF OPTIC NERVE DISK FOVEA AND ITS COMPLICATION

Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 4, 1986
(manuscript received 3 Mar 86) pp 199-203

[Article by I.N. Ganichenko, candidate of Medical Sciences, Odessa Order of Labor Red Banner Scientific Research Institute of Eye Disease and Tissue Therapy imeni Academician V.P. Filatov]

[Abstract] The author shares his 10 years experience in the use of photo- and laser coagulation in optic nerve disk fovea. 26 Patients (27 eyes) with the problem and its complications were treated, ranging in age from 9 to 40 years, most under 30 years of age. In only one case was proper diagnosis made before the patient was sent to the Institute. Significant loss of visual acuity was found in almost all cases. Laser coagulation of the retina was performed on 26 eyes. In 10 cases, double limiting laser coagulation around the central retinal detachment was also performed. Ruby, argon and xenon lasers were used. Retinal detachment barriers were created in all cases. In 9 cases, 3-8 months later the retina was fully reattached, in 10 eyes additional laser coagulation was required, and was eventually successful. In 5 cases, additional laser stimulation was performed after six months to 1.5 years to improve visual acuity. In 12 cases visual acuity remained as before over the long term, in 12 cases it improved by 0.05-0.8, in 3 cases it decreased by 0.06-0.1 due to progressive dystrophy of the macula lutea. A case of history is presented as an example. Figures 4; references 9: 3 Russian, 6 Western.

6508/9835
CSO: 1840/374

UDC 617.735-002:616.379-998.64-985.849.19

RESULTS OF LASER TREATMENT FOLLOWING CLOSED VITRECTOMY IN PATIENTS WITH PROLIFERATIVE DIABETIC RETINOPATHY

Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 4, 1986
(manuscript received 3 Nov 85) pp 203-207

[Article by Ya.I. Glinichuk, senior scientific associate, L.A. Deyev, (aspirant student), O.A. Plyukhova, junior scientific associate, and O.P. Pankova, physician, Moscow Scientific Research Institute of Microsurgery of the Eye, RSFSR Ministry of Health]

[Abstract] A study is presented of the clinical results of combined surgical treatment (vitrectomy + laser coagulation of the retina) in patients with proliferative diabetic retinopathy. The treatment was applied to 37 patients (42 eyes) with various stages of PDR. After vitrectomy in patients with early PDR, visual acuity increased in 12 cases by 0.2-0.5, in 2 cases by 0.05. In 4 cases it remained unchanged. Temporary reduction in visual acuity from 0.3 to 0.03 occurred in 1 patient 1 month after vitrectomy due to macular edema. In advanced PDR in 16 eyes visual acuity was increased by vitrectomy by 0.1-0.4, in 1 case by 0.05 and in 5 cases remained unchanged. In 1 patient after 1.5 months, visual acuity decreased from 0.1 to 0.04 due to changes in the macular area caused by edema. Laser treatment following vitrectomy helped to improve the visual function in 17 patients, improving acuity in 8 eyes with early PDR, in 7 cases by 0.1-0.5, in one case by 0.05. In 6 eyes visual acuity remained unchanged, in 5 cases it decreased by 0.1-0.2, as a result of continued progression of dystrophic changes in the retina and optic nerve. In advanced PDR after laser coagulation visual acuity increased in 9 patients, in 8 cases by 0.1-0.5, in 1 by 0.05, remaining unchanged in 11 cases and decreasing in 3 cases: In 1 case from 0.2 to 0.1 due to progression of turbidization of the cornea, in another from 0.1 to 0.03 due to an increase in cystose maculodystrophy and in the third case from 0.5 to 0.02 due to traction retinal detachment developing in the late post-operative period. Laser treatment following vitrectomy thus stops or decreases the progression of the pathologic process on the fundus oculi, helping to preserve the visual function of most patients for long periods of time. Figures 3; references 13: 7 Russian, 6 Western.

6508/9835
CSO: 1840/374

UDC 617.735-018-085.849.19-092.9

OPTIMIZATION OF PARAMETERS OF EXPERIMENTAL KRYPTON LASER RADIATION ON FUNDUS OCULI TISSUES

Odessa OFTALMOLOGICHESKIY ZHURNAL in Russian No 4, 1986
(manuscript received 5 Sep 85) pp 216-219 (Cat. 13)

[Article by L.A. Linnik, professor, S.K. Dmitriyev, junior scientific associate, F.I. Khmelik, junior scientific associate, and A.P. Privalov, senior engineer, Odessa Order of Labor Red Banner Scientific Research Institute of Eye Diseases and Tissue Therapy imeni Academician V.P. Filatov]

[Abstract] A study is presented of the optimal parameters of krypton laser radiation for retinal surgery and its therapeutic energy range is determined in experiments performed on 70 chinchilla rabbits (140 eyes). A type LGN-404B laser operating at 0.647 μm in the visible range was used, spot diameter at the cornea 3 mm, exposure 0.05 to 2.0 seconds, radiated power 5 to 160 mW. The energy leading to appearance of subretinal hemorrhages in 50% of cases was taken as the maximum permissible energy for retinal coagulation. Ophthalmscopic perifocal edema disappeared by 7 days, formation of foci was completed by 14 days following treatment. Long exposures were found to be preferable for coagulation of the retina. The risk factor remains practically unchanged for this time interval. Figures 1; references 20: 7 Russian, 13 Western.

6508/9835
CSO: 1840/374

MEDICINE

UDC 616.24-006.6-053.88-089

SURGICAL TREATMENT OF LUNG CANCER IN OLDER PATIENTS

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 7, Jul 86
(manuscript received 24 Sep 85) pp 99-103

[Article by M.L. Shulutko and I.Ya. Motus, Sverdlovsk Medical Institute, RSFSR Ministry of Health]

[Abstract] Retroactive analysis of 263 surgical treatments of lung cancer patients older than 60 years was performed. Postoperative mortality in such patients was: lung resection: 5.4%, pneumonectomy: 8.9%, extensive and combined pneumonectomy: 27.2%. It was concluded that the safety and effectiveness of surgical intervention depended on the accompanying diseases, the spread of cancer and the type of surgery. Patients whose cancer has not spread beyond the lungs show identical results in terms of 5-year survival or surgical complications be they under or over 60 years of age. Spread of the tumor to the mediastinum which requires extended or combined pneumonectomy leads to postoperative complications and increased mortality. None of the over-60 patients with this type of disease survived 3 years. Therefore, in such cases surgery is not recommended. To determine the spread of the tumor, x-ray tomography, bronchoscopy and mediastinoscopy are used. References 13: 8 Russian, 5 Western.

7813/9835
CSO: 1840/405

UDC 615.277.3:616-006-036.1

CLINICAL TRIALS OF ANTINEOPLASTIC AGENTS

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 8, Aug 86
(manuscript received 8 Oct 85) pp 93-98

[Article by M.R. Lichinitser, All-Union Oncological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] An approach to clinical trials used, and being continually refined, at the All-Union Oncological Scientific Center is described. It relies on a four-phase process from animal experimentation to patient evaluation. Phase I involves safe dosage determination on mice, leading subsequently to trials with minimal tolerance dose (1/20 of mouse minimal tolerance dose) in patients. Phase I is regarded as completed once a dose level leading to manifestations of limited toxicity in 10-20% of the patients has been defined. Phase II involves assessment of antineoplastic activity against several forms of malignancy ('signal' tumors), and comparison with available agents. Phase III involves more complex studies, assessment of cross-resistance, and refinement of dosage forms, deliveries, and vehicles. Phases II and III lead to identification of agents that are clinically useful in 20% of the patients. Finally, phase IV is concerned with various evaluations as to sequence of administration vis-a-vis other agents, use in adjuvant therapy, usefulness before and/or after surgery or irradiation, etc. References 20: 11 Russian, 9 Western.

12172/9835
CSO: 1840/406

UDC 616-006-08;616.15:615.015.45]:615.37

HEMOSORPTION AS DEBLOCKING IMMUNOTHERAPY

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 6, Jun 86
(manuscript received 27 Mar 85) pp 87-92

[Article by B.T. Bilynskiym, R.N. Tsolko and Yu.M. Shnitser (deceased), Lvov Order of People's Friendship State Medical Institute, Ukrainian SSR Ministry of Health; Lvov Oblast Oncological Dispensary]

[Abstract] Clinical trials were conducted with hemosorption as a deblocking immunotherapeutic modality in 34 male and female patients, ranging in age from 19 to 70 years. The study was conducted with SKN-4M or SKN-1K adsorbents with a perfusion rate of 80-120 ml/min. Circulating immune complexes were determined after precipitation with 3.5% polyethyleneglycol (6000 MW). The procedure was well tolerated by the patients and led to subjective improvement. The mean concentration of circulating immune complexes was reduced to 1.12 $\pm$ 0.09 mg/ml from a pretreatment value of 2.06 $\pm$ 0.21 mg/ml. Following hemosorption the patient tolerated radiotherapy better, and also presented with

enhanced T-cell immunity. Since the adsorbents used in this study bound some of the common chemotherapeutic agents, the procedure was conducted 24 h after the last administration of antineoplastic agents. This regimen also diminished untoward side effects of such agents. Under controlled conditions, hemosorption was found to be an effective modality in removing immune complexes, enhancing T-cell counts, mitigating some of the side effects of chemotherapy, and in promoting subjective improvements. References 21: 17 Russian, 4 Western.

12172/9835
CSO: 1840/404

UDC 620.193.8:582,28:632.952

ANTIFUNGAL ACTIVITIES OF SELECTED ORGANOBORON COMPOUNDS

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 20, No 5, Sep-Oct 86 (manuscript received 9 Oct 85) pp 405-409

[Article by A.N. Lukashik, A.A. Malama, V.I. Grachek, S.F. Naumova and G.R. Motolko, Institute of Microbiology, Belorussian SSR Academy of Sciences, Minsk]

[Abstract] Trials were conducted with 8 organoboron compounds to assess their fungistatic properties against mixed fungal cultures. The following agents were found effective against mixed mole cultures on solid media: phenyl-o-phenylene borate, p-aminophenyl-o-phenylene borate, 1-naphthyl-o-phenylene borate, 8-hydroxyquinolyl-o-phenylene borate, p-(4-hydroxyphenylsulfonyl)-phenyl-o-phenylene borate, benzimidazol-1-yl-methyl-o-phenylene borate, benzimidazol-1-yl-methyl-o-phenylene borate, p-benzoyl-o-phenylene borate, quinoline complex with di(o-phenylene)borate, 8-hydroxyquinoline complex with di(o-phenylene)borate, pentachlorophenol and boric acid. In addition, these compounds were also tested when incorporated into rubber cement, paraffin, and varnish, and were shown to retain antifungal activity. On these grounds, the organoboron compounds were deemed to be potentially as useful as the currently employed organochlorine compounds in the polymer industry. References 13: 10 Russian, 3 Western.

12172/9835
CSO: 1840/321

UDC 632.937.14(571.16)

MYCOTIC FLORA OF AEDES MOSQUITOES IN TOMSK REGION OF OB RIVER BANKS

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 20, No 1, Jan-Feb 86 (manuscript received 13 Apr 83) pp 23-25

[Article by T.G. Frants, O.A. Mertvetsova and O.B. Bachurina, Scientific Research Institute of Biology and Biophysics, Tomsk State University]

[Abstract] Mosquitoes in the Tomsk area of the Ob River were monitored for mycotic flora in 1981 and 1982, concentrating on the sanguivorous species (Aedes punctor, A. diantaeus, A. communis, A. excrucians, A. cantans). Six fungal species were identified: Aspergillus, Penicillium, Trichoderma, Cladosporium, Tilachlidium, and Rhinocephalum. The first three genera were observed both in the larval and adult stages, while the last three were identified only in the adults. Yeasts were identified inall the mosquito species in June, but were usually absent in August. The seasonal variation in yeasts was attributed to the low carbohydrate intake by mosquitoes in August. References 13 (Russian).

12172/9835
CSO: 1840/365

UDC 576.8

DEGRADATION OF KELTHANE IN SOIL BY P. AERUGINOSA STRAIN BS827, CONTAINING PLASMID pBS3

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA BIOLOGICHESKAYA in Russian No 5, Sep-Oct 86 (manuscript received 21 Nov 85) pp 747-752

[Article by L.A. Golovleva, R.N. Pertsova, V.M. Travkin, V.T. Grishenkov, A.M. Boronin, B.P. Baskunov and S.A. Kozlovskiy, Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Puschino]

[Abstract] Screening and molecular breeding of new active strains of bacteria capable of decomposing persistent toxicants is a major trend in modern ecological biotechnology. This article studies the capability of the strain P. Aeruginosa BS827 to decompose the acaricide kelthane under natural conditions, studies the dynamics of a population of this strain in the soil and the stability of heredity of the naphthalene biodegradation plasmid pBS3 in the cells of the strain. The studies were performed in natural soil ecosystems, cultivated to a depth of 10 cm. Kelthane, a DDT analogue, is difficult to decompose and may accumulate significantly in the soil. The present studies show that BS827 successfully decomposes kelthane not only in model soil columns, but also under natural soil conditions. Within two weeks, in the model columns, the kelthane residue in the eluate was 2%; in

the natural soil, after 6 weeks, its level was not over 18%, while after 3 months it had dropped to 8% of the original quantity present. Decomposition practically stopped during weeks 2 and 3 in the natural experiments, so that the total decomposition time in the natural soil was actually about 1 month. During this time, the soil moisture content was about 11%, as opposed to 20-22% during the first week and 18-10% during weeks 4 and 5, which may have had a negative influence on microbial decomposition of kelthane. Figures 2; references 8: 3 Russian, 5 Western.

6508/9835
CSO: 1840/419

UDC 578.245:578.5

CLONING AND SEQUENCING OF TWO HUMAN LEUKOCYTE INTERFERON GENES

Moscow ANTIBIOTIKI I MEDITSINSKAYA BIOTEKHNOLOGIYA in Russian Vol 31, No 8, Aug 86 (manuscript received 20 Aug 85) pp 592-596

[Article by V.I. Savelyev, M.L. Zlochevskiy, A.V. Sorokin, V.A. Naroditskaya, A.P. Bolotin, N.G. Demyanova, Yu.I. Kozlov, N.S. Neznanov, K.G. Gazaryan, G.S. Monastyrskaya and Ye.D. Sverdlov, All-Union Scientific Research Institute of Genetics and Breeding of Industrial Microorganisms; Institutes of Molecular Genetics and of Bioorganic Chemistry, USSR Academy of Sciences, Moscow]

[Abstract] Standard techniques of genetic engineering were utilized to create a bank of human genes derived from human Alexandria hepatoma cells following EcoRI treatment and cloned on Charon 4A vector. Recombinant phages were next subjected to Southern blot analysis using the Pvu2-Bgl2 fragment of interferon A gene as the probe. Eleven recombinant phages were isolated on the basis of positive hybridization results, of which two were analyzed for nucleotide sequence. One of these genes corresponded to the interferon A gene, with but a single replacement of an A-T pair for G-C at position 170, leading to replacement of His34 by Arg. The second gene correspond to the interferon C subfamily of genes. The gene corresponded most closely to interferon I gene and was designated gene II. Both of the cloned genes were inserted into plasmids and were expressed in E. coli. Figures 3; references 12: 2 Russian, 10 Western.

12172/9835
CSO: 1840/335

UDC 612.119:621.318.2

CIRCULATION HALF-LIFE AND MEDULLARY PRODUCTION OF ERYTHROCYTES DURING EFFECT OF HIGH-INTENSITY CONSTANT MAGNETIC FIELD

Moscow PATOLOGICHESKAYA FIZIOLOGIYA I EKSPERIMENTALNAYA TERAPIYA in Russian No 1, Jan-Feb 85 p 94

[Abstract of article by S.A. Grebennikov and A.D. Pavlov]

[Text] Experiments were conducted on 125 female Wistar rats. The animals were placed in a homogenous vertically directed constant magnetic field [CMF] with an intensity of 80 and 240 kA/m (magnetic inductance of 100 and 300 MKT respectively) for 3 and 24 hours. The intensity gradient did not exceed 4%, and the pulsation of the variable component of the current (100 Hz) did not exceed 0.05%. The selection of the specific physical parameters of the CMF and the conditions of its effect was conditioned by the requirements of space medicine. The isotope ^{51}Cr, which was injected intravenously immediately after the end of the exposure in the CMF, was used to study the half-life of the circulation of the erythrocytes. Paired blood samples were taken from the abdominal aorta 1, 3, 6, 9, and 12 days after injection of the ^{51}Cr, and their radioactivity was determined on a USD-1 universal scintillation counter by using a 20026 radiometer (GDR) as a scaling unit. Regression equations were calculated for the control, and experimental groups were calculated based on measurement of the erythrocytes' radioactivity. The half-lives were computed with the help of a graph of the regression equation in a semilogarithmic system of coordinates. The medullary production of erythrocytes was determined by a computational method based on the half-life and mean number of erythrocytes in the peripheral blood for the observation period (10 days after the effect of the CMF). The experiments indicated that the integral erythron indices (mean number, circulation half-life, and medullary production of erythrocytes) do not differ from the control level during the effect of a CMF. This speaks against the possiblity of hemolysis during the effect of a CMF with the intensity conditions studied. Tables 2, illustration 1, references 12. (Manuscript deposited in the All-Union Institute of Scientific and Technical Information [VINITI] 29 Mar 84, No 1731-84 Dep.)

12794
CSO: 1840/156

REVERSIBLE EFFECTS OF TIME-MODULATED MAGNETIC FIELD ON MOLLUSK NEURONS

Moscow BIOFIZIKA in Russian Vol 31, No 5, Sep-Oct 86
(manuscript received 15 Mar 85; in final form 22 Jul 85) pp 838-841

[Article by V.I. Danilov, V.V. Parshintsev, O.I. Trofimova, V.V. Turkin and N.V. Shvaneva, Joint Institute for Nuclear Research, Dubna, Moscow Oblast]

[Abstract] Electrophysiological studies were conducted on the giant neurons of the mollusc Limnaea stagnalis to assess the effects of 1 mTl trapezoidal magnetic fields on the electrical activity of the neurons. The electrical activity of the neurons was influenced by both the leading and trailing edges of the magnetic field, but pulses with small interpulse intervals were relatively ineffective in activation. The effectiveness of the magnetic pulses in stimulating neuronal electrical activity increased as the interpulse interval increased, reaching a maximum value at 10 sec intervals. The effects induced by the magnetic pulses were, therefore, deemed to be reversible within a time span of 10 sec. The fact that the effects induced by an advancing front of a trapezoidal magnetic field were abolished by the retreating front suggested that activation resulted from electrical eddy currents. Figures 2; references 2 (Russian).

12172/9835
CSO: 1840/431

EFFECTS OF EHF OSCILLATIONS ON ANIMAL BLOOD SYSTEM IN RELATION TO PREIRRADIATION STATUS AND SITE OF IRRADIATION

Moscow BIOFIZIKA in Russian Vol 31, No 5, Sep-Oct 86
(manuscript received 22 Jul 85) pp 882-885

[Article by N.P. Didenko, V.M. Perelmuter, M.Ye. Gurevich, Z.I. Rzhevskaya and V.A. Cha, Scientific Research Institute of Nuclear Physics, Tomsk State Polytechnic Institute imeni S.M. Kirov]

[Abstract] Male outbred and CBA and C57BL/10 mice were employed in a study designed to assess the effects of EHF oscillations on the blood system in relation to the site of exposure and preirradiation status. The mice were exposed for 1 h to 42.25 $\pm$ 0.1 GHz at 10 MW/cm^2. Cytologic examinations demonstrated that, in the outbred and the two inbred lines of mice, EHF stimulated the erythroid component of bone marrow in low-leukocyte-count mice (less than 12 x 10^9 WBC/liter in outbred mice). The response was also greater in CBA mice (11.2 x 10^9 WBC/liter) than in the C57BL/10 mice (21 x 10^9 WBC/liter). The effects were similar in relation to RBC counts: animals with high RBC counts (8 x 10^{12} RBC/liter) did not respond with enhanced erythropoiesis, but mice with lower normal counts did. Further definition of the effects demonstrated that irradiation of the left rear extremity led to enhanced erythropoiesis in the bone marrow of the left femur and the thorax, while exposure of the right extremity led to similar changes in the right femur and thorax. In addition, in the former case lymphopenia was observed, and in the latter case lymphocytosis. These changes were ascribed to specific innervation mechanisms and thepredominance of a 'glucocorticoid' mechanism with left-extremity stimulation, and a 'mineralocorticoid' mechanism with right-extremity stimulation. Figures 4; references 4 (Russian).

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UDC 577.391;591.111

EFFECTS OF NONIONIZING MICROWAVE IRRADIATION ON AUTOMIMMUNE REACTIONS AND ON ANTIGENIC PATTERN OF SERUM PROTEINS

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 4 Jan 85) pp 840-843

[Article by G.I. Vinogradov, G.V. Batanov, G.M. Naumenko, A.D. Levin and S.I. Trifonov, Scientific Research Institute of General and Communal Hygiene imeni A.N. Marzeyev, Ukrainian SSR Ministry of Health, Kiev]

[Abstract] An analysis was conducted on the immunologic sequelae of prolonged exposure to microwave irradiation of male and female Wistar rats. The data demonstrated that 10, 50, or 500 μW/cm^2 irradiation for 7 h/day for

30 days elicited autoimmune changes at the two higher doses, but that the 10 $\mu W/cm^2$ dose was innocuous. The 50 and 500 $\mu W/cm^2$ exposures induced degranulation of basophils on exposure to a 25% physiologic saline brain extract in a dose-related fashion, and a similarly related degree of neutrophil damage. In addition, the 500 $\mu W/cm^2$ exposure gave rise to a novel serum protein with a sedimentation constant of 8.6 and a MW of 180-200 kdalton (corresponding to IgA). Irradiation with these doses of microwaves also diminished the responsiveness of lymphocytes to the stimulatory effects of phytohemagglutinin. In addition, sera from animals exposed to the 500 $\mu W/cm^2$ regimen led to a statistically elevated incidence of post-implantation embryonic deaths, with concomitant cerebral hemorrhages among other complications. Thus, irradiation of Wistar rats with 50 and 500 $\mu W/cm^2$ for 30 days was shown to lead to exacerbation of autoimmune processes. References 7 (Russian).

12172/9835
CSO: 1840/254

UDC 577.391;538.56;591.44

ENDOCRINE EFFECTS OF INTERMITTENT SHORTWAVE ELECTROMAGNETIC FIELD EMISSIONS

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 1 Oct 84) pp 756-762

[Article by N.A. Minkina, G.N. Kuzminskaya, V.N. Nikitina and Ch.A. Garina, Scientific Research Institute of Labor Hygiene and Occupational Diseases, Leningrad; Institute of Physiology imeni Academician I.P. Pavlov, USSR Academy of Sciences, Leningrad]

[Abstract] Outbred male rats (160-180 g) were subjected to intermittent exposure to SW electromagnetic fields to provide information on the endocrine effect of this common environmental factor. The animals were exposed to SW (13 MHz, 250 or 500 V/m) for 2 h/day for 10 or 30 days, with the status of the endocrine system analyzed in terms of histochemical reactions and hormone assays. Among the more notable changes were an increase in the secretory activity of the hypothalamus, as well as depression of the adrenocortical and gonadotropic pituitary functions and of the adrenal cortex. In addition, dose- and time-related degenerative and dystrophic changes were observed in the testis. Exposure to 250 V/m SW led to a time-related and dose-related depression of thyroid function with moderate dystrophic changes. Depression of thyroid function was also evident during the first ten days of exposure to the 500 V/m field, to be replaced after 30 days of exposure by enhanced thyroid function, accompanied by marked dystrophic changes. These observations underscored the profound endocrine effects of intermittent exposure to SW fields. Figures 2; references 19: 16 Russian, 3 Western.

12172/9835
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UDC 577.171.4:175.859

LOCALIZATION OF BIOLOGICALLY ACTIVE PEPTIDES AND THEIR ANALOGS IN PROTEIN STRUCTURES--PROTECTIVE REACTION PARTICIPATORS

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: BIOLOGIYA in Russian No 1, Feb 86 pp 56-61

[Article by O. Yu. Yankovskiy and T. Ye. Dovnar]

[Text] The problem of immune system mediators has become the leading one in modern immunology [Mikhaylova, A. A., 1982]. At present, a sufficient number of facts has been accumulated indicating that, along with the traditionally considered immunoregulators (thymus hormones, monokins, lymphokins and others), the regulatory function may also be carried out by the products of incomplete catabolism of functionally mature proteins. Earlier, we discussed the various aspects of the physiological role of such substances, the potential mechansims of their purposeful production *in vivo*, as well as feasible approaches for detecting biologically active protein fragments [Yankovskiy, O. Yu. and Dovnar, T. Ye., 1984, 1985; Yankovskiy, O. Yu., 1985]. The main flow of information on the biological activity of protein degradation products stems from experiments on the enzymatic digestion of protein molecules under *in vitro* conditions with subsequent determination of biological activity according to appropriate test systems. However, due to the development of new theoretical concepts of the structural-functional organization of peptide regulators [Chipens, G. I. and others, 1980; Pankov, Yu. A., 1983] we have been able to come closer to solving problems relating to the purposeful search for proteins, which have an established primary structure of fragments, that are potentially capable of fulfilling bioregulator functions. An example of such an approach is the discovery of a rigin immunostimulator in the composition of the IgG polypeptide chain [Veretennikova, N. I. and others, 1981].

The purpose of this study was to find fragments in the structure of a number of proteins, realizing their action in the protective reactions of the body, that were capable of fulfilling the role of immunoregulators. Proteins that were a likely target for phagocyte proteinases and blood humoral systems under inflammation focus conditions were also analyzed. Certain peptides with an established immunotropic activity (basal peptides) served as the subjects of the search. The search was carried out on the basis of the amino acid sequence of a fragment coinciding completely with the primary structure of a basal peptide, as well as on the basis of taking into account the conservative[Shults, G., Shirmer, R., 1982] and equifunctional [Chipens, G. I. and others, 1980] substitutions of the amino acid residues. Considering that biological activity has been demonstrated for a

number of inverted analogs of the peptide regulators (see, for example, [Fedotov, V. P. and others, 1983]), a corresponding search was also conducted for retroanalogs of the basal peptides. The results of the conducted investigation are presented in Tables 1-3.

The materials, presented in the tables, demonstrate the feasibility of detecting fragments in protein composition that coincide in their amino acid sequence with peptide immunoregulators, their analogs and retroanalogs. The number of such fragments was found to be very significant, although the search was conducted only on a limited number of basal peptides. The presence of peptide immunoregulator analogs deserves special attention in light of the following facts [Yankovskiy, O. Yu., 1985]. For example, peptide regulator analogs are known that display more pronounced biological action. Among the analogs, peptides may be found that by virtue of some structural features may be more resistant to enzymes, specialized for the degradation of "professional" bioregulators; this may also provide a more prolonged effect. Besides, among the peptide regulator analogs there may be peptides with a narrower range of biolgical action, which is favorable for "channeling" the physiological process. Alongside the traditional immunoregulators, the formation of biologically active fragments ensures an excessiveness of signal information. This in turn may promote the reliability of physiological response realization, for example, in situations that are accompanied by a depletion of specialized peptide regulator precursors or regulator peptides which do not promote splitting and others [Yankovskiy, O. Yu., 1985]. Thus, if formation of such fragments takes palce under *in vivo* conditions, then their biological action, along with the influence of other immunoregulators, may make a specific contribution to the realization of immune protection cell functions. A requisite condition for the fulfillment of regulatory functions by these substances is the existence of a rational, purposeful, implementable method for their formation [Yankovskiy, O. Yu., Dovnar, T. Ye., 1984, 1985].

Along with the regulatory role of the biologically active protein fragments, the possibility of their uncontrollable splitting deserves special attention. In this case, in the course of nonspecific protein proteolysis, the production of biologically active fragments that imitate the action of regulator molecules may introduce "noise" into the normal functioning of the physiological systems. This situation takes place for a number of diseases, where the biologically active protein degradants (along with the uncontrollable accumulation of traditional bioregulators) play the role of one of the pathological process factors [Galaktionov, S. G. and others, 1984].

Conclusion. Thus, along with the specialized precursors of peptide bioregulators, biologically active peptides may also be included in the primary structure of proteins, fulfilling other important functions in the body. There is reason to believe that besides the "professional" peptide regulators the regulatory function may also be carried out by the degradation products of such proteins. In addition, under conditions of uncontrollable destructive proteolysis, these substances (the same as the "specialized" bioregulators) may produce an unfavorable effect on the physiological systems and serve as one of the pathological factors in diseases. The search for and the study of such substances is highly significant in solving the basic problems of regulating physiological systems, specifically immune protection systems, as well as in understanding a number of

pathogenetic aspects of practical medicine. In any case, the search for such substances, which are natural metabolites for the body, may also prove helpful for the development of new pharmacological agents for targeted action on the physiological systems, including the immune protection systems as well. With the development of computer technology and the increased number of proteins with an established primary structure, purposeful searches for biologically active fragments should assume particular importance in contrast to empirical methods of detecting such peptides in protein hydrolysates.

Table 1. Biologically Active Peptides--Fragments of Functionally Mature Proteins

Peptide	Biological Activity	Protein Precursor
Gly-His-Gly [Schaak, T. M. et al.,1980]	Induction of neutrophil chemotaxis	Factor B of complement, amyloid protein AS, hemoglobin
Ala-Gly-Ser-Glu [Goetz, E.J. et al.,1976]	Induction of eosinophil chemotaxis	Fibrin (α-chain of fibrinogen)
Leu-Gly-Ser-Glu [Goetz, E.J. et al.,1976]	Same	IgA, C4b-component of complement
Gly-Ser-Glu [Goetz, E. J., 1976]	Inhibitor of eosinophil chemotaxis	Fibrin (α-chain of fibrinogen), IgA, C4b-component of complement, interleucine 2
Val-Gly-Ser [Goetz, E. J., 1976]	" "	IgM, IgD, CIs-component of complement, histocompatibility antigen H- $2K^b$
Ala-Gly-Ser [Goetz, E. J., 1976]	" "	Fibrin (α-chain of fibrinogen), fibronectin, secretory component IgA, Hageman factor, CIr-component of complement, haptoglobin, histocompatibility antigens HLA-B2, B7, A2 and MIX
Leu-Gly-Ser [Goetz, E. J. et al., 1976; Goetz, E. J., 1976]	" "	Ig, CIr and C4b-components of complement, lactoferrin, α_2-macroglobulin
Thr-Lys-Leu-Arg [Cited from: Chipens, G. I. and others, 1980]	Stimulator of neutrophil phagocytosis	$C3_b$-component of complement
Gly-Gln-Pro-Arg [Chipens, G. I., 1984]	Same	CIr-component of complement

Peptide	Biological Activity	Protein Precursor
Val-Lys-Pro-Arg [Cited from: Chipens, G. I. and others,1980]	Stimulator of neutrophil phagocytosis	Factor B of complement
Gly-Lys-Pro-Arg [Chipens, G. I., 1984]	" "	C-reactive protein
Lys-Pro-Arg* [Cited from: Chipens, G. I. and others, 1980]	Concurrent inhibitor of the immunostimulator tuftsin (Thr-Lys-Pro-Arg)	Factor B of complement
Thr-Lys-Pro* [Auriault, C. et al., 1983]	Inhibitor of macrophage functional activity	C3b-component of complement, Histone, HI
Thr-Leu-Lys-Arg [Yankovskiy, O. Yu. et al., 1983]	Stimulator of neutrophil oxidative metabolism	Lysozyme

* Localization of tuftsin fragments Thr-Lys-Pro and Lys-Pro-Arg in the structure of the C-reactive protein was discovered earlier by M. Fridkin and P. Gottlieb, 1981

Table 2. Protein Fragments--Analogs of Biologically Active Peptides

Basal Peptide and Its Activity	Analog	Protein Precursor
Thr-Lys-Pro-Arg,(tuftsin), stimulator of phagocytosis and immunogenesis [Fridkin, M., Gottlieb, P., 1981]	Thr-Gln-Pro-Arg	IgE
	Thr-Lys-Pro-Gln	C-reactive protein
	Thr-Asn-Pro-Lys	Prealbumin
	Thr-Lys-Asn*-Gln	IgG_1, IgG_2
	Thr-Lys-Asn*-Arg	Ribonuclease
	Ser-Arg-Pro-Lys	IgM
	Ser-Arg-Asn*-Arg	Fibronectin
	Ser-Gln-Pro-Lys	β_2-microglobulin, λ-chain of immunoglobulins
Gly-Gln-Pro-Arg, stimulator of neutrophil phagocytosis [Chipens, G. I., 1984]	Gly-Gln-Pro-Lys	λ-chain of immunoglobulins
	Gly-Asn-Pro-Arg	IgM
	Gly-Gln-Val-Arg	α_2-macroglobulin
	Gly-Asn-Leu-Arg	Transferrin
	Gly-Gln-Val-Asn	Kalmodulin [Russian spelling]
	Gly-Asn-Pro-Gln	Salivary polypeptide R-D

Basal Peptide and Its Activity	Analog	Protein Precursor
Gly-Lys-Pro-Arg, stimulator of neutrophil phagocytosis [Chipens, G. I., 1984]	Gly-Arg-Pro-Arg	Fibronectin
	Gly-Lys-Pro-Lys	Haptoglobin
	Gly-Lys-Pro_Gln	Salivary polypeptides R-D and R-S
	Gly-Arg-Pro-Glu	Salivary polypeptide R-S
Ala-Lys-Pro-Arg, inhibitor of phagocytosis, stimulator of immunogenesis [Tzechoval, E., et al., 1979]	Ala-Lys-Pro-Lys	Histone HI
	Ala-Lys-Asn*-Arg	C3b-component of complement
Arg-Pro-Lys-Pro, stimulator of phagocytosis and immunogenesis [Bar Shavit, Z. et al., 1980]	Lys-Pro-Lys-Pro	Ala-Gly-Ser-Gly
	Lys-Pro-Arg-Val	Histone HI
	Arg-?[illeg]-Arg-Leu	C-reactive protein
	Lys-Val-Lys-Pro	Secretory component IgA
	Lys-Val-Arg-Val	Inhibitor of SH-proteinases from neutrophils
	Lys-Pro-Lys-Asn*	C3b-component of complement
	Arg-Asn-Lys-Pro	Haptoglobin, Hageman factor
Lys-Thr-Pro-Arg, stimulator of neutrophil phagocytosis [Cited from: Chipens, G. I. and others, 1980]	Arg-Thr-Pro-Lys	β_2-microglobulin
	Lys-Thr-Val-Arg	Transferrin
	Arg-Thr-Leu-Lys	Lysozyme
	Leu-Arg-Pro-Arg	Interleucine 2
	Leu-Lys-Val-Arg	C3b-component of complement
	Val-Lys-Pro-Lys	Histone HI
	Leu-Lys-Pro-Gln	Secretory component IgA
Arg-Pro-Ala-Lys, vasoactive action [Belew, M. et al., 1980]	Lys-Pro-Val-Lys	Transferrin
	Arg-Asn*-Leu-Arg	Transferrin
	Arg-Pro-Gly-Arg	Histocompatibility antigen HLA-B7
Ala(Val, Leu)-Gly-Ser-Glu, induction of eosinophil chemotaxis [Goetz, E. J. et al., 1976]	Val-Gly-Ser, Asp	IgD, histocompatibility antigen $H\text{-}2K^b$
	?[illeg]-Gly-Ser-Asp	Amyloid proteins AS and AA
	Pro-Gly-Ser-Asp	Lactoferrin
	Leu-Gly-Ser-Gly	Lactoferrin
	Ala-Gly-Ser-Gly	Fibronectin
Arg-Lys-Asp-Val-Tyr, stimulator and inhibitor of T- and B-lymphocytes respectively [Goldstein, G., Schlesinger, D. H., 1981]	Arg-Lys-Asp-Leu-Phe	Antithrombin-3

*Asn may be found in a "disallowed" conformation (stabilized by an intramolecular hydrogen bond) and may be equifunctional to proline [Ravichandran, V., Subramanian, E., 1981]

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Basal Peptide and Its Activity	Analog	Protein Precursor
Asp-Ser-Asp-Pro-Arg, immunogenesis stimulator, anti-allergen [Tzechoval, E., et al., 1979] [Hamburger, R. N., 1979]	Gly-Ser-Asp-Pro-Arg	Lactoferrin
His-Leu-Gly-Leu-Ala-Arg, stimulator of thromboxane A_2 formation by macrophages [Hartung, H. P. et al., 1983]	His-Ala-Val-Val-Ala-Arg	

Table 3. Protein Fragments--Retroanalogs of Biologically Active Peptides

Basal Peptide	Retroanalog	Protein Precursor
Thr-Lys-Pro(Leu)-Arg	Lys-Leu-Arg-Thr	Haptoglobin
	Asn-Val-Lys-Thr	IgE
	Lys-Pro-Lys-Ser	Histone HI
Gly-Gln-Pro-Arg	Arg-Pro-Gln-Gly	Factor B of complement, salivary polypeptide R-S
	Lys-Pro-Gln-Gly	Salivary polypeptides R-S and R-D
	Arg-Asn**-Gln-Gly	α_2-macroglobulin
Gly-Lys-Pro-Arg	Arg-Pro-Lys-Gly	IgM
	Arg-Val-Arg-Gly	Lactoferrin
	Lys-Val-Arg-Gly	"
Ala-Lys-Pro-Arg	Lys-Pro-Lys-Ala	Haptoglobin, histone HI, albumin
Val-Lys-Pro-Arg	Lys-Pro-Arg-Val	C-reactive protein
Ala(Val, Leu)-Gly-Ser-Glu	Glu-Ser-Gly-Ala	Plasminogen activator

* Biological activities of basal peptides are presented in Tables 1 and 2.

** See note in Table 2.

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MATHEMATICAL METHODS OF EXPERIMENT DESIGN FOR THE ESTIMATION OF THE PROTECTIVE PROPERTIES OF ANTIMICROBIAL DRUGS

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[Article by S.I. Dyakov, Ye.V. Churnosov, A.G. Pervomayskiy, S.V. Sidorenko, Military Medical Academy imeni S.M. Kirov, Leningrad: "Mathematical Methods of Experiment Design for the Estimation of the Protective Properties of Anti-Microbial Drugs"]

[Text] A leading factor determining the biological activity of antimicrobial drugs in infectious illnesses is the sensitivity of the etiologic agent to the given drug, which is determined in vitro. However, the in vivo protective effect of chemical preparations depends to a significant extent on such factors as the size of the infecting dose of the causative agent, the daily dose of the antimicrobial drug, the interval between the moment of infection and the beginning of preventive treatment, the rate of introduction and duration of the course of chemical therapy, the means of introducing the drug, etc. Using traditional methods of experimental chemotherapy, the influence of the enumerated factors on the protective properties of antibacterial agents is evaluated in localized experiments, varying the value of one factor and fixing the values of the remaining ones. In terms of the number of factors interesting to the researcher, the quantity of necessary localized experiments is growing in a geometrical progression. Table 1 cites an estimate of the number of localized experiments necessary to evaluate the protective properties of the drug under study, with combinations of 2, 3, 4, and 5 factors at 3-4 levels of magnitude by an exhaustive method. It is clearly irrational to stage such a large number of localized experiments.

In practice, researchers are usually limited to the study of one factor, the dose of the drug, on the protective effect with a small number of fixed values for the remaining 2 or 3 factors. With this kind of approach, the information that the experimenter obtains on the protective possibilities of the anti-microbial drug is far from complete, since the indicators of protective effect that are obtained are valid only for the conditions of the specific experiment, and cannot be extrapolated to other conditions in multifactor experiments. As a rule, researchers choose the combinations and values of the factors they are studying arbitrarily, which makes a comparative analysis more difficult. Evaluation of the influence of separate factors and their interaction on the

effectiveness of chemotherapy is conducted on an intuitive level, since the experimenter does not have the opportunity objectively to unite the separate experimental data into a single model of the protective activity of the drug that allows registration of protective indicators of the drug under various conditions of use.

The increase in demands on the level of execution of pre-clinical tests of developmental antibacterial agents raises the problem of developing a unified and economical methodology that would allow a substantial reduction in the volume of experimental studies and, at the same time, highly reliable and comparable results.

(1) Таблица 1

(2) Сравнительная оценка количества опытов, необходимых для проведения многофакторных экспериментов при традиционном подходе и в случае спланированного эксперимента по МТЭ

(3) Используемый метод эксперимента	(4) Число исследуемых факторов			
	2	3	4	5
(5) Традиционный подход	9—16	27—64	81—256	243—1024
МТЭ*	9	15	25	27

(6) * Эксперименты спланированы в соответствии с планами, приведенными в табл. 2.

Key:
1. Table 1
2. Comparative estimation of the number of experiments necessary for the execution of multifactor experiments in the traditional approach and in the case of an experiment planned according to MTE [Mathematical Experiment Design]
3. Method of experiment
4. Number of factors studied
5. Traditional approach
   MTE
6. Experiments designed in accordance with the plans cited in table 2

As our experience showed, it is possible to come significantly nearer to the solution of the problem by using, in experimental chemotherapy, methods based on mathematical experiment design (MTE), summarized in a number of works [4, 5, 7]. According to MTE, multifactor experiments are set up in terms of special plans (matrices), in which experiments are staged not for all possible values of the factors studied, but only for certain of them, strictly corresponding to a mathematically based plan. This allows a substantial reduction in the volume of studies conducted. As is clear from table 1, the advantage of MTE in comparison with the traditional approach is sufficiently evident.

The use of strictly determined combinations and values of influential factors, calculated according to MTE, allows the construction of a mathematical model of the chemotherapeutic activity of an antibacterial drug; this model describes the dependency of the preventive effect of the preparation being tested on a complex of active factors, and allows the results of a multifactor experiment on those combinations of factors for which experimental data have not been obtained to be disseminated.

(1) Таблица 2

(2) Квази-D-оптимальные планы второго порядка для 3-, 4- и 5-факторных экспериментов

(3) № опыта	(4) 3-Факторный эксперимент			(5) 4-Факторный эксперимент				(6) 5-Факторный эксперимент				
	1	2	3	1	2	3	4	1	2	3	4	5
1	—1	—1	—1	—1	—1	—1	—1	—1	—1	—1	—1	—1
2	—1	—1	1	—1	—1	—1	1	—1	—1	—1	1	—1
3	—1	1	—1	—1	—1	1	—1	—1	—1	1	—1	—1
4	—1	1	1	—1	—1	1	1	—1	—1	1	1	1
5	1	—1	—1	—1	1	—1	—1	—1	1	—1	—1	—1
6	1	—1	1	—1	1	—1	1	—1	1	—1	1	1
7	1	1	—1	—1	1	1	—1	—1	1	1	—1	1
8	1	1	1	—1	1	1	1	—1	1	1	1	—1
9	1	0	0	1	—1	—1	—1	1	—1	—1	—1	—1
10	—1	0	0	1	—1	—1	1	1	—1	—1	1	1
11	0	1	0	1	—1	1	—1	1	—1	1	—1	1
12	0	—1	0	1	—1	1	1	1	—1	1	1	—1
13	0	0	1	1	1	—1	—1	1	1	—1	—1	1
14	0	0	—1	1	1	—1	1	1	1	—1	1	—1
15	0	0	0	1	1	1	—1	1	1	1	—1	—1
16				1	1	1	1	1	1	1	1	1
17				1	0	0	0	1	0	0	0	0
18				—1	0	0	0	—1	0	0	0	0
19				0	1	0	0	0	1	0	0	0
20				0	—1	0	0	0	—1	0	0	0
21				0	0	1	0	0	0	1	0	0
22				0	0	—1	0	0	0	—1	0	0
23				0	0	0	1	0	0	0	1	0
24				0	0	0	—1	0	0	0	—1	0
25				0	0	0	0	0	0	0	0	1
26								0	0	0	0	—1
27								0	0	0	0	0

(7) Примечание. Величина факторов: 1 — максимальная, 0 — средняя и —1 — минимальная.

Key:
1. Table 2
2. Quasi-D-optimal plans of the second order for 3-, 4- and 5-factor experiments
3. Number of experiment
4. 3-factor experiment
5. 4-factor experiment
6. 5-factor experiment
7. Note. Magnitude of factors: 1--maximal, 0--average and -1--minimal

Multifactor experiments conducted according to MTE are sufficiently widespread in the various fields of science and technology. However, the sphere of their application in experimental chemotherapy is still not finally determined. We have accumulated definite experience in the application of MTE for evaluating the effectiveness of antibacterial agents in various experimental models.

The process of studying and evaluating the protective properties of antibacterial agents using MTE can be divided conditionally into the following basic stages: establishing the problem, choosing the multifactor experiment plan, defining the active factors and the range of their variation, executing the multifactor experiment, and constructing a mathematical model of chemotherapeutic activity of the antimicrobial preparation and its evaluation. The specific content of the enumerated stages will be illustrated in the example of an evaluation of the chemotherapeutic effectiveness of the antibiotic doxycycline in an anthracic infection in white mice caused by the vaccine strain of the causative agent of anthrax.

Establishing the problem. At this stage, a group of factors is determined that will have the most pronounced effect on the effectiveness of chemotherapy. In our example, most interest is aroused by the effect of such factors as the size of the infecting dose of the microbe, daily dose of antibiotic, duration of the course of chemotherapy and interval between infection and the beginning of treatment on the effectiveness of doxycycline in an anthracic infection. The effectiveness of chemotherapy is usually evaluated in terms of one or several indicators (by the response, for example, in terms of the survival rate of the experimental animals, duration of their life, infection of certain internal organs and of the test animals with the microbe-causative agent, etc.). We used one indicator as a response: the survival rate of infected animals (percent).

Choosing the plan (matrix) of a multifactor experiment. By now a large number of plans, which are described in the special literature [1-3, 6], have been developed and substantiated for the staging of multifactor experiments in various fields of science and technology. As our experience showed, the most convenient for evaluating the efficiency of antibacterial agents are the quasi-D-optimal plans of the second order. The matrices for 3-, 4-, and 5-factor experiments that we recommend for the study of the protective properties of chemotherapeutic preparations are cited in table 2. In table 2 the magnitudes of active factors are cited in a coded form, and every line of the plan stands for a distinct combination of indicated values for the test factors that influence 6-10 test animals. The effectiveness of doxycycline on the model of an anthracic infection is evaluated according to the plan for a 4-factor experiment.

Defining the active factors and the range of their variation. A basic condition in the choice of a range of variation for active factors is the need to embrace the entire interval of values that have practical significance. To satisfy this condition, the experimenter should have available certain additional information. First, a good knowledge of the experimental model is necessary, particularly the size of infecting doses causing clinically expressed or fatal illnesses, the time for symptoms of the disease to appear, the period to death of the animals, features of the pathogenesis of the infection, etc. Information on the activity of the antibiotic in relation to etiologic agent in vitro and on the pharmacokinetic character of the antibiotic preparation in vivo is highly

important. It is necessary to consider data on the activity of similar or analogous preparations on the experimental model in use, and on the test preparation in other models. As a result of the analysis of accessible information, it is advisable to develop a working hypothesis for the chemotherapeutic activity of the antibiotic in the given infection. It should be constructed on known facts that the effectiveness of chemotherapy is reduced proportionally to increases in the dose of the causative agent and lengthening the interval between infection and the beginning of treatment. Increasing the daily dose of antibiotic and duration of chemotherapy lead to an increase in the protective effect of the drug. With this calculation one should choose specific minimal and maximal values for the active factors in such a way that the least favorable combination of these factors produces survival of 5-20 percent of the animals, and the most favorable combination an 80-100 percent survival rate among the test animals. The correctness of the chosen range of variation of studied factors is checked in a limited number of localized experiments, especially when using models that are new to the experimenter and applying original preparations that do not have analogs. In the majority of cases, careful analysis of existing information proves sufficient for a correct choice of the range of variation of active factors.

The intermediate values for time factors, specifically the times until the beginning of preventive treatment and the duration of the course of chemotherapy, are determined as an arithmetical average of their maximal and minimal values. In choosing an intermediate value for the infecting dose of the biological agent, and sometimes the daily dose of the antibiotic as well, it is advisable to use a non-linear scale. In this case every subsequent value is equal to the preceding one divided by a constant coefficient (K), established by the experimenter. This correspondence between the extreme and intermediate values is determined according to the following formula:

$$X_0 = X_{-1} \cdot K \text{ or } X_{+1} = X_0 \cdot K = X_{-1} \cdot K^2.$$

The specific values for the active factors that were chosen for the study of the protective properties of doxycycline in an experimental anthrax infection are cited in table 3. As can be seen from table 3, calculating on the high effectiveness of doxycycline, the range of variation in the size of the infecting dose of the biological agent that was chosen was sufficiently broad: 10, 100 and 1000 LD_{50}. The daily dose of the antibiotic varies from 0.1 to 1 milligram per mouse. Included in the range of variation of the daily dose of doxycycline is a dose of 0.55 milligrams per mouse, which is equivalent to 200 milligrams per day for a human. Taking into consideration the high biological activity of doxycycline in relation to the causative agent in vitro (MPK [expansion unknown] 0.125 micrograms per milliliter) and the extracellular localization of the causative agent in the animals' bodies, we studied the effectiveness of short courses of chemotherapy: 1, 3 and 5 days. Because the untreated animals in the control group died after 36-48 hours, it was recognized as unadvisable to extend the interval between infection and the beginning of treatment beyond 24 hours.

Constructing a mathematical model of chemotherapeutic activity of the antibacterial drug and its evaluation. A mathematical model of the protective activity of the test substance is constructed according to the results of the

executed experiment, with the aid of a multiple regression method. Programs for processing experimental data using this method exist in virtually every computer center and are used with any type of computer. In evaluating the model, for greater clarity, it is advisable to make graphs of the lines of an equal level of effectiveness of the antibacterial drug with 2 factors varied and the rest fixed values.

(1) Таблица 3

(2) План и результаты 4-факторного эксперимента по оценке эффективности доксициклина при сибиреязвенной инфекции

(4) № группы	(3) Значения действующих факторов				(9) Выживаемость экспериментальных животных, %
	(5) инфицирующая доза, LD_{50}	(6) суточная доза доксициклина, мг на мышь	(7) длительность курса лечения, сут	(8) интервал между заражением и началом лечения, ч	
	X_1	X_2	X_3	X_4	
1	1	0,10	1	0	70
2	1	0,10	1	24	20
3	1	0,10	5	0	80
4	1	0,10	5	24	0
5	1	1,00	1	0	90
6	1	1,00	1	24	20
7	1	1,00	5	0	95
8	1	1,00	5	24	80
9	3	0,10	1	0	5
10	3	0,10	1	24	0
11	3	0,10	5	0	15
12	3	0,10	5	24	15
13	3	1,00	1	0	5
14	3	1,00	1	24	10
15	3	1,00	5	0	20
16	3	1,00	5	24	20
17	3	0,55	3	12	20
18	1	0,55	3	12	55
19	2	1,00	3	12	35
20	2	0,10	3	12	5
21	2	0,55	5	12	35
22	2	0,55	1	12	0
23	2	0,55	3	24	20
24	2	0,55	3	0	60
25	2	0,55	3	12	25

Key:
1. Table 3
2. Plan and results of a 4-factor experiment in terms of evaluation of the effectiveness of doxycycline in an anthracic infection
3. Values of active factors
4. Number of group
5. Infecting dose, LD_{50}
6. Daily dose of doxycycline, milligrams per mouse
7. Duration of the course of treatment, days
8. Interval between infection and the beginning of treatment, hours
9. Survival rate of test animals, percent

According to the results of the executed multifactor experiment, the data that were presented in table 3, a mathematical model was constructed of the activity of doxycycline in anthrax infection; the model is, after exclusion of insignificant coefficients, a polynomial of the second order of the following type:

$$y = 26{,}6 - 22{,}2X_1 + 9{,}2X_2 + 7{,}8X_3 - \\ - 14{,}2X_4 - 6{,}0X_1X_2 + 13{,}4X_1X_4 + 13{,}1X_2,$$

where y is the survival rate of experimental animals, percent; X_1, X_2, X_3, X_4 are coded values for the active factors.

Analysis of the model obtained is indicative of the fact that increasing the infecting dose of causative agent of anthrax and the interval between infection and the beginning of treatment leads to a reduction in the survival rate of test animals (adversely directed influence), and increasing the daily dose of doxycycline and the duration of the course of chemotherapy lead to an increase in the protective activity of the antibiotic (positively directed influence). The interaction of the factors of the magnitude of the infecting dose and the daily dose of the antibiotic is characterized by a negative trend, and the interaction of the magnitude of the infecting dose and the interval between infection and the beginning of treatment by a positive trend. It is noted that the square of the interval between infection and the beginning of treatment has a positive influence on the survival of white mice.

Out of the 4 studied factors, the most profound influence on survival indicators for the treated mice is the infecting dose of the causative agent of anthrax and the interval between infection and the beginning of treatment. The character of the influence of these factors on the effectiveness of doxycycline and their interaction among themselves and with other active factors are shown in fig. 1, which cites lines of an equal level of survival of test animals, where the values for the infecting dose and the interval between infection and treatment are varied, the course of chemotherapy lasts 1.3 and 5 days respectively, and the daily dose of doxycycline in all cases is 0.55 milligrams per mouse.

As can be seen in fig. 1a, at a minimal (one day) course of chemotherapy within the limits of the range of variation of the remaining factors, the effectiveness of doxycycline does not exceed 80-85 percent. A simultaneous increase in the interval between infection and treatment, as well as the size of the infecting dose up to the intermediate level, equivalent to 100 LD_{50}, leads to a reduction in the survival rate of more than 10 percent. Increasing only one of these 2 factors up to the intermediate level, leaving the other factor at the minimal level, brings about a less pronounced reduction in the survival rate of test animals. With a further increase in the interval between infection and treatment from 12 to 24 hours, the effectiveness of doxycycline is reduced insignificantly. A definite stabilization of the survival indicator for the test animals is observed.

In fig. 1b, c, those same characteristics of the protective effect of doxycycline are qualitatively revealed. However, the absolute indicators of animal survival with a 3-day course of chemotherapy and all other conditions equal are 20 percent higher than with a 1-day course. Increasing the course of chemotherapy from 3 to 5 days does not have a pronounced effect on the effectiveness of doxycycline.

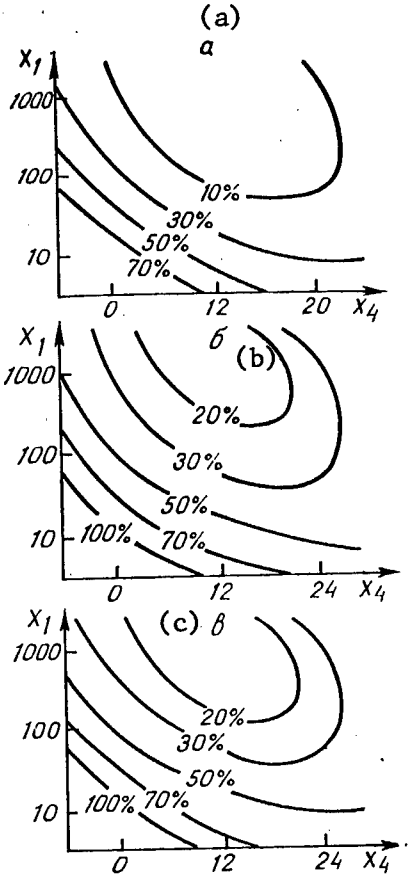

Fig. 1. Lines of equal survival of white mice at a daily doxycycline dose of 0.55 milligrams per mouse and various durations of course of treatment.

On the horizontal axis--the interval between infection and the beginning of treatment X_4, hours; on the vertical axis--the value for the size of the infecting dose (X_1, LD_{50}). Duration of the course of treatment: a--1 day, b--3 days, c--5 days.

Additional information on the features of the chemotherapeutic activity of doxycycline can be obtained from fig. 2, which cites lines of equal survival of white mice at varied values of the daily dose of doxycycline and duration of the course of chemotherapy at infecting dose values of 10, 100 and 1000 LD_{50} respectively, and the beginning of treatment directly following infection in all cases. In fig. 2 it is clear that at the minimal infecting dose, the effectiveness of doxycycline comprises 70 percent and more. It must be noted that the growth in the survival rate is observed only when the increase in the daily dose of the antibiotic and the duration of the course of its application are between the minimal and average (intermediate) values, i.e., within the limits of 0.1-.55 milligram per mouse and 1-3 days. An increase in the indicated factors from the intermediate to the maximal values, i.e., within the limits of 0.55-1 milligram per mouse and 3-5 days, does not affect survival rates. This characteristic of the protective activity of doxycycline is observed with all values of infecting dose of the biological agent. The maximal antibiotic effect achieved is reduced from 100 percent at 10 LD_{50} to 50 percent at 100 LD_{50} and to 30 percent at 1000 LD_{50}. Comparison of fig. 2a, b and c graphically demonstrates the existence of an optimal value for the daily dose of doxycycline and an optimal duration of its application. It is clear that increasing the daily dose of the antibiotic to more than 0.55 milligrams per mouse and the duration of the course of chemotherapy to more than 3 days is inadvisable, since it does not lead to further improvement in the survival rate of infected test animals.

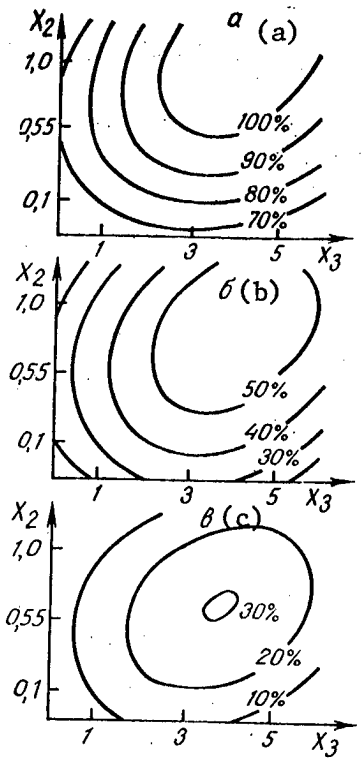

Fig. 2. Lines of equal survival of white mice where treatment begins simultaneously with infection and the sizes of the infecting doses are equal.

On the horizontal axis--duration of the course of treatment (X_3, days); on the vertical axis--daily dose of doxycycline (X_2, milligrams per mouse; a--10 LD_{50}; b--100 LD_{50}, c--1000 LD_{50}.

On the whole, it is possible to make the following conclusion in an analysis of the mathematical model for the protective activity of the antibiotic doxycycline in an experimental anthracic infection. The greatest effectiveness of doxycycline with this infection in white mice is achieved when it is applied in a daily dose of 0.55 milligrams per mouse over the course of 3 days and the beginning of treatment immediately follows infection. When used in the optimal scheme, the antibiotic protects 100 percent of the mice infected with the microbe-causative agent in a dosage of 10 LD_{50}, 50 percent of the animals infected with 100 LD_{50}, and 30 percent of those infected with 1000 LD_{50}. Increasing the course of chemotherapy to 5 days and the daily dose of doxycycline to 1 milligram per mouse does not lead to a significant increase in survival at infecting doses of 100 and 1000 LD_{50} of the microbe-causative agent. Increasing the interval between infection and the beginning of treatment from 10 to 12 hours with other active factors at various values leads to a significant (30-40 percent and more) reduction in the protective effect of doxycycline. Further increasing the interval from 12 to 24 hours from infection to treatment does not have a substantial effect on the survival of infected animals.

Further, the given example of the use of MTE in experimental chemotherapy allowed optimization of the scheme of applying doxycycline in infections of white mice, caused by a vaccine strain of the causative agent of anthrax, as well as allowing evaluation of the effectiveness of the scheme with various values for the magnitude of the infecting dose of the agent. For the execution of these studies, 250 animals were needed--3 times fewer than with the traditional method.

The opportunity to evaluate the "strength" and "orientation" of the activity of each of the factors that influences the protective effect of the drug, and to determine the effects of their interaction and separate from these factors the most material ones; to obtain an objective evaluation of the protective activity of the preparation studied in various application regimes; to optimize the application scheme of the preparation being studied, i.e., to establish the combination of values of factors studied at which the preparation gives the maximal protective effect--these are the undoubted advantages of the mathematical models constructed in accordance with MTE for the protective effects of antimicrobial preparations.

As our experience showed, it makes sense to attract specialists acquainted with this methodology to participate in and carry out the development of multifactor experiments planned in accordance with MTE. The undoubted value of MTE in experimental chemotherapy is an opportunity to conduct objective comparative evaluation of the protective properties of various antimicrobial preparations and the data from experimental study that can be preserved in the memory of a computer.

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12461
CSO: 1840/336

UDC 616.006

DERIVATIVES OF METHYLENEDIPHOSPHONIC ACID AS TUMOROTROPIC AGENTS. QUANTITATIVE ASPECTS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA BIOLOGICHESKAYA in Russian
No 5, Sep-Oct 86 (manuscript received 28 Apr 82) pp 773-776

[Article by M.V. Korsakov, A.V. Moskvin, O.P. Saveleva, A.N. Stukov, S.V. Kanayev, V.A. Filov and B.A. Ivin, Scientific Research Institute of Oncology, imeni N.N. Petrov, USSR Ministry of Health, Leningrad]

[Abstract] Tin-technetium complexes of alkylidene phosphonic acids have tumorotropic effects. In order to continue studies of the influence of the hydrocarbon radical structure on the effect, the authors synthesized tin-technetium complexes of para-substituted benzylidene diphosphonic acids by hydrolysis of their tetraethyl esters in concentrated hydrochloric acid. Aqueous solutions of the tin-technetium complexes were administered i/v to tumor-carrying rats, which were sacrificed after 1, 3 and 24 hours to determine the accumulation of the preparations in the organs and tissues. It was found that the optimal time for radiosiotope diagnosis of muscle tumors in these preparations is 2-3 hours after administration. Figures 1; references 7: 3 Russian, 4 Western.

6508/9835
CSO: 1840/419

UDC 612.822.3

DYNAMICS OF CONDITIONED-REFLEX REGULATION OF FUNCTIONAL STATE OF LOCAL ZONE OF CEREBRAL CORTEX, TESTED BY METHOD OF BIOLOGICAL FEEDBACK

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 3, Nov 86 (manuscript received 15 Apr 86) pp 741-745

[Article by N.S. Kositsyn and V.B. Dorokhov, Institute of Higher Nervous Activity and Neurophysiology, USSR Academy of Sciences, Moscow]

[Abstract] Experiments performed on 4 wakeful, slightly restrained cats with chronically implanted electrodes showed the possibilities of the use of biological feedback in analyzing conditioned reflex regulation of the state of the cerebral cortex and, especially, for quantitative description of the dynamic characteristics of transition of the cortex from one state into another. Implantation (fields 17, 18) of silver recording electrodes epidurally into the optic cortex of 2 cats and into the somatosensory cortex of 2 cats (zone C_1) permitted comparison of regularities of training in the different cortical zones. Stimulating bipolar electrodes were implanted into the external geniculate body and the posterial ventrolateral nucleus of the thalamus. Milk fed directly into the mouth served as a reinforcement. Measurement of the background variability amplitude of the cortico-latent negative component of the cortical evoked potential (A_n), after 100 stimulations of the thalamus without reinforcement, provided expressions of the threshold value A_{thre} which determined reinforced A_n values the cats received. Use of the experimental method caused a special form of conditioned reflex activity in the cats, directed at the search for, selection and reinforcement of states of the cerebral cortex which lead to reinforcement. Typical pictures of change of A_n corresponding to specific algorithms of such search could be singled out as a function of the initial state of the cat and the reinforcement parameters. Such changes appeared in similar situations in different cats and were recorded in both the optic cortex and in the sensomotor cortex. Search changes of the value A assumed a specific direction, leading to reinforcement in the cat, usually on the 2d or 3d day. The model used in this study makes it possible, by the conditioned reflex method, to directionally change the functional state of a specific region of the cerebral hemisphere and to assess the dynamics of these changes quantitatively by recording the evoked potentials. The model can be used to combine functional, microstructural and cytochemical approaches for complex study of mechanisms

of conditioned reflex activity of the brain. Figures 3; references 11: 6 Russian, 5 Western.

2791/9835
CSO: 1840/180

UDC 612.2

EFFECT OF ELABORATION OF CLASSICAL DEFENSIVE CONDITIONED REFLEX ON CHEMICALLY INDUCED SPECIES-SPECIFIC BEHAVIOR

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 3, Nov 86 (manuscript received 9 Jan 86) pp 745-748

[Article by I.Ya. Podolskiy and I.M. Santalova, Institute of Biological Physics, USSR Academy of Sciences, Pushchino, Moscow Oblast]

[Abstract] Experiments performed on Chinchilla rabbits of both sexes (2.5-3 kg) involved study of the effect of training on the action of small doses of physostigmine (0.25 mg/kg, subcutaneously) and pilocarpine (1 mg/kg subcutaneously). Effects of the drugs were tested by counting back-paw kicks by the rabbits. Control (untrained) animals received drug doses equal to those given trained rabbits. Systematic injection of threshold or sub-threshold doses of the drugs not only induced the kicking behavior but also made it stereotypic. This effect depended greatly on modification of the kicking behavior by classical training. The effect increased in proportion to elaboration of the conditioned relfex (1st to 5th session), peaked at the stage of consolidation of the conditioned reflex (10th-15th session) and remained at a high level after 8-13 days after cessation of training. The effect was seen in 1/3 of the rabbits. Rabbits in which the drugs induced a behavioral reaction after training elaborated conditioned reflex paw kicks twice as quickly as rabbits in which no such reaction occurred. The study showed that the system of neurons, after classical training, transcended into a new active, stable state. An increase of cholinergic activity may contribute greatly to this. Doses of the drugs which were sub-threshold in untrained animals may cause the species-specific behavior in this system of neurons in proportion to the degree of training. An increase of both cholinergic and non-cholinergic conductivity is necessary for recording information. If there is no increase of cholinergic conductivity in such a system, this will not prevent formation of the conditioned reflex but the training rate may be decreased. Figures 2; references 13: 3 Russian, 10 Western.

2791/9835
CSO: 1840/180

UDC 581.1+683.18:631.811.933

ROLE OF SILICON IN RESISTANCE OF RICE TO PIRICULARIOSIS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 2, Nov 86
(manuscript received 8 Feb 86) pp 499-502

[Article by N.Ye. Aleshin, E.R. Avakyan, S.A. Dyakunchak, Ye.P. Aleshin, V.P. Barshok and M.G. Voronkov, corresponding member USSR Academy of Sciences, All-Union Scientific Research Institute of Rice, Krasnodar; Irkutsk Institute of Organic Chemistry, Siberian Department, USSR Academy of Sciences, Irkutsk]

[Abstract] A study of the effect of inorganic and organic silicon compounds on resistance of resistant- and non-resistant varieties of rice to piriculariosis included the resistant Krasnodar 424 variety with a high level of free phenols and the non-resistant Kuban 3 variety with a low level of free phenols. Inorganic (sodium metasilicate) or organic (1-ethoxysilitrane) silicon compound was applied to the soil before sowing or sprayed on plants before infection or the seeds were soaked in the solution 1 hour before sowing. The use of either silicon compound by any method reduced the degree of piriculariosis infection in both rice varieties. Maximum resistance to piriculariosis by Krasnodar 424 variety occurred after application of sodium metasilicate to the soil or after soaking the seeds in a solution of either compound. A statistically reliable correlation was found between signs of infection and reduction of the silicon level in the resistant variety and between signs of infection and increase of the silicon level in the non-resistant variety. Resistance to the disease was associated with both phenols and silicon and it was assumed that rice has a dual silica-metabolic resistance system. If the fungus overcomes the mechanical barrier, the metabolic system in the resistant variety plays the major role in counteracting the disease. In non-resistant varieties, the metabolic system is weak and so silica mobilization continues in case of infection. The silica-metabolic system may determine the resistance of rice to viral diseases as well as to fungal or bacterial diseases. If the virus has entered the cell wall, only metabolic protection is effective.
References 6: 4 Russian, 2 Western.

2791/9835
CSO: 1840/179

UDC 612.111:612.112:615.014.41

COMBINED EFFECT OF HYPERBARIC PRESSURE AND LOW TEMPERATURES ON BLOOD CELL

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 2, Nov 86
(manuscript received 10 Apr 86) pp 476-479

[Article by I.I. Gitelzon, corresponding member, USSR Academy of Sciences, R.A. Pavlenko and Yu.A. Kudenko, Institute of Biophysics, Siberian Department, USSR Academy of Sciences, Krasnoyarsk]

[Abstract] Investigation of the effect of low temperaures and high pressure on living objects involved a study of blood cells assessed according to a set of reliable quantitative methods of determining the preservation of structure and functions. Healthy donor blood, stabilized by heparin, was used in the experiments while blood stabilized by cytroglucophosphate was used for comparison. There was found an optimum pressure-temperature region at which erythrocytes may be stored for several weeks without the use of a preservative and still retain their functional integrity. Leukocytes can be stored even longer under these conditions. The combined effect of low temperatures and high pressure created physical conditions under which the blood cells enter the stage of anabiosis which preserves their structure and functional capacity longer than is the case when temperatures are above but near 0°C. These findings may be applied to blood transfusion procedures, organ transplant procedures and may be used in various regions of bioengineering. Figures 3; references 11: 7 Russian, 4 Western.

2791/9835
CSO: 1840/179

UDC 615.212.7:576.8.096.1:612.843.31

DIFFERENCES IN BINDING OF OPIATES WITH LEFT AND RIGHT TURTLE OPTIC CORTEX

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 291, No 2, Nov 86
(manuscript received 18 Mar 86) pp 479-483

[Article by A.G. Kobylyanskiy, A.S. Pivorarov, P.N. Nesterenko, K.N. Yarygin and G.Ya. Bakalkin, Central Scientific Research Laboratory, USSR Ministry of Health; Moscow State University imeni M.V. Lomonosov; All-Union Cardiological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] A biochemical study of opiate receptors of the left and right turtle optic cortex involved comparison of binding of specific radioactive delta- and kappa-type opiate agonists D-Ala, D-Leu enkephalin [DADL] and ethylketocyclocin [EKTs] respectively, with Emys orbicularis cortical membranes. It was found that [^{3}H]-DADL binds to a greater degree (2.3-fold) with right optic cortex membranes and [^{3}H]-EKTs binds to a greater degree with

left optic cortex membranes (1.6-fold). [^{3}H]-DADL in right cortex homogenate exceeded that in left cortex homogenate 1.7-fold by [^{3}H]-EKTs was slightly (1.2-fold) greater to the left than to the right. Apparently, delta- and kappa-type opiate receptors and mechanisms of trapping of ligands of these types are asymmetrically disposed between the right and left optic cortex. Differences of the left and right optic cortex in the number of delta- and kappa-opiate receptors and in their affinity to opiate agonists may be responsible for lateralization of opiate receptors. The study revealed a new kind of asymmetry involving predominant location, in most of the turtles, of opiate receptors of the type (or with great affinity to their ligand) in one specific side of the brain and receptors of the other type (or with great affinity to the other ligand) in the other side. It is possible that asymmetrically located opiate receptors are involved in mechanisms of selective neurohumoral regulation of structures or neurons lying to the left or right side of the central sagittal plane. Figures 1; references 5: 3 Russian, 2 Western.

2791/9835
CSO: 1840/179

UDC 616.36-089.873-07:616.36-008.931:577.152.633]-074

EFFECT OF HEPATECTOMY ON ADENYLATECYCLASE SYSTEM OF DIFFERENT AGE RAT LIVER

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 33, No 1, Jan-Feb 87 (manuscript received 2 Jun 85) pp 19-21

[Article by O.K. Kulchitskiy, Laboratory of Biochemistry, Institute of Gerontology, USSR Academy of Medical Sciences, Kiev]

[Abstract] The cyclase system plays an important role in regulating proliferative processes: changes in their content and relationship affect biosynthesis of DNA, RNA, proteins and cell division. Therefore, changes were studied in the adenylatecyclase (AC) system resulting from activation of proliferation caused by hepatectomy during the period of maximum stimulation of DNA synthesis (S phase) in regenerating rat liver. A decrease in basic activity of AC and in the content of cAMP was observed after hepatectomy only in adult animals. The epinephrin-stimulated, enzymatic activity in old hepatectomized rats was lower than in the intact animals. The data showed that age-related characteristics of DNA synthesis regulation and functions of regenerating liver are caused by changes of the regulatory effect of the cyclase system resulting in diminished biosynthetic and energetic processes. These changes may influence, directly or indirectly, DNA synthesis processes by lowering their energy reserves. Figures 1; references 13: 7 Russian, 6 Western.

7813/9835
CSO: 1840/421

UDC 612.3/.8-06:612.332.74:547.963.2]

PEPTIDE BIOREGULATOR FROM k-CASEIN

Moscow VOPROSY MEDITSINSKOY KHIMII in Russian Vol 33, No 1, Jan-Feb 87 (manuscript received 29 Apr 86) pp 111-115

[Article by Ye.Ya. Stan and A.P. Yekimovskiy, Institute of Nutrition, USSR Academy of Medical Sciences, Moscow]

[Abstract] Recent data indicate that, along with traditional peptide regulators such as hormones and neuropeptides, the regulatory function could be performed by protein proteolysis products which normally are not considered to be precursors of such regulators. Milk caseins are included in this group. The goal of this work was to isolate a peptide bioregulator from enzymatic hydrolysate of K-casein capable of changing electric activity of brain structures. Gel filtration on Sephadex G-50, Biogel P-2 and Dowex WX2 columns yielded a number of peptides. Comparison of their physiological activity showed that it correlated to their content of tyrosine. The isolated peptide led to changes in EEG activity analogous to that observed during nutritional satiation. This peptide could serve as an agent decreasing the feeling of hunger during diet therapy and possibly act as a pacifying agent. Figures 6; references 27: 14 Russian, 13 Western.

7813/9835
CSO: 1840/421

UDC 612.23:612.111:612.135

MECHANICAL RESISTANCE OF ERYTHROCYTES AND OXYGEN MASS TRANSFER UNDER HYPOXIC STATES OF DIFFERENT GENESIS

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 31, No 6, Nov-Dec 85 (manuscript received 16 May 84) pp 650-657

[Article by A.A. Nenashev, I.M. Tishchenko and Z.A. Shidov, Kabardino Balkarian University]

[Abstract] Mechanical resistance of erythrocytes and mass transfer of oxygen in patients in hypoxic states of different etiology and before and after an exercise session by persons in different degrees of physical fitness are described and discussed. Data obtained concerning the subjects were used for mathematical modelling of mass transfer of oxygen in different states of the erythron. The study included 185 persons in six groups. The mechanical resistance of the erythrocytes as a function of the state of the organism was determined in members of the first four groups ranging in age from 45-55 years. The groups included: 1- 60 healthy persons; 2- 25 persons with chronic pneumonia and respiratory insufficiency, 2nd stage, in remission;

3- 25 patients with coronary insufficiency (angina pectoris at rest and under stress) and 4- 25 patients with bronchial asthma with respiratory insufficiency 2d-3d stage. Groups 5 and 6 included physically fit and relatively untrained students (age- 20 years). Erythrocyte resistance was determined before and after physical exercise. Mechanical resistance of erythrocytes in the patients increased greatly in comparison with that in healthy persons. After a single session of exercise, erythrocyte resistance decreased to a higher degree in poorly trained persons than that in physically fit persons. This was attributed to the different functional state of the erythrocytes in the depot in persons in different degrees of fitness. The studies justified the assumption that rejuvenation of erythrocyte populations during hypoxia involves a process improving oxygen mass transfer because of a decrease of the role of the oxygen shunt. Figures 2; references 29: 18 Russian, 11 Western.

2791/9835
CSO: 1840/239

UDC 612.833/591.1.001.6:613.68

EFFECT OF SHIP'S HABITATION ENVIRONMENT ON CONDITIONED-REFLEX ACTIVITY OF EXPERIMENTAL ANIMALS DURING A LONG VOYAGE

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 31, No 6, Nov-Dec 85 (manuscript redeived 5 Jun 84) pp 688-691

[Article by O.Yu. Netudykhatka, A.P. Stoyanov and V.N. Yevstafyev, Institute of Hygiene of Water Transport, Odessa]

[Abstract] A study of the effect of a ship-board environment (with special attention to the noise, vibration and high-temperature components) included 120 white male Wistar rats (weight 0.25-0.30 kg) aboard a transport ship during a 90-day voyage. Rats kept ashore served as a control. Experimental groups included: 1--rats exposed to greatest noise (110 dB), vibration and high temperature for 4 hours daily for 90 days; 2--rats exposed to day-round noise, vibration and heat; 3--rats exposed to usual ship-board conditions (ship-board control group). Conditioned-reflex activity was determined 7 days and 45 days after start of the cruise and at the end of the cruise. Rats exposed to powerful stimuli at the 1st stage of the experiment displayed pronounced stress of functioning of body systems while slight stimuli promoted an insignificant stress on adaptational mechanisms. Group 1 and group 2 rats displayed a state of relative adaptation and a new level of functioning of the central nervous system by the 45th day of the experiment. Group 3 rats displayed sequential worsening of functioning of the central nervous system from the constant effect of low intensity factors because of the cumulative effect of these factors. All experimental rats displayed deterioration of conditioned-reflex activity and lowered body resistance by the end of the voyage (90 days). Figures 1; references 9 (Russian).

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UDC 612.766.1+612.825.8

DIAPHORETIC REFLEX IN COMPLEX OF METHODS OF ASSESSING OPERATOR EFFICIENCY

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 31, No 6, Nov-Dec 85
(manuscript received 12 Nov 84) pp 678-682

[Article by P.P. Slynko, L.I. Bukvareva, S.V. Zaporozhets and P.M. Onishchenko, Institute of Physiology, Kiev University]

[Abstract] A special method of acquiring data concerning changes of functional state of a person by recording psychogenic perspiration was described and discussed. The adequacy of results of use of the method was compared to that of methods measuring heart rate and skin electroconductivity. An attempt was made to select the most informative and adequate index of functional activity in order to use the method to determine the degree of alertness of an operator. Subjects tested included 18 volunteer students. The subjects sat in comfortable conditions and performed various tasks and underwent testing while going through 7 periods of activity with gradual transition of the subject from one functional state to another up to a state of monotony and predormition. Heart rate, skin electroconductivity and psychogenic perspiration were recorded during these activities. The method involving recording psychogenic perspiration was found to be more sensitive, more reliable and simpler than the other methods studied. The great amount of information provided by the use of this method justified the recommendation of its use as a basic indicator of the capacity to work of persons such as truck drivers. Figures 1; references 15 (Russian).

2791/9835
CSO: 1840/239

UDC 591.1

INFLUENCE OF β-ENDORPHIN ON LEARNING PROCESSES AND MEMORY

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA BIOLOGICHESKAYA in Russian
No 5, Sep-Oct 86 (manuscript received 3 Dec 84) pp 697-703

[Article by T.N. Riga, V.M. Getsova and R.I. Kruglikov, Institute of Higher Nervous Activity and Neurophysiology, USSR Academy of Sciences, Moscow]

[Abstract] A study is reported of the influence of endogenous opioids on processes of learning and memory as a function of the nature of the conditioned reflexes being developed, on the example of the influence of β-endorphin on the development and preservation of various homogeneous and heterogeneous conditioned reflexes, singly and in groups. Experiments were performed on white rats trained to develop the passive avoidance reflex, bilateral avoidance reflex, defensive labyrinth conditioned reflexes and

feeding motor conditioned reflexes in response to light plus sound. β-endorphin was administered subcutaneously at 10 μg/rat 10 minutes before or immediately after learning sessions. Administration of the β-endorphin had no influence on development of conditioned reflexes, but its administration after training reduced retention of conditioned reflexes, to a varying extent depending on the nature ofthe reflexes being developed.
References 27: 9 Russian, 18 Western.

6508/9835
CSO: 1840/419

UDC 591.089.84:612

EFFECT OF ALLOTRANSPLANTATION OF EMBRYONIC NERVOUS TISSUE TRANSPLANTED INTO BRAINS OF INTACT AND HYPOXIC RATS ON PERMEABILITY OF BLOOD-BRAIN BARRIER TO BLOOD GLOBULINS

Msocow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 1, Jan 87
(manuscript received 27 Jun 86) pp 209-211

[Article by I.N. Saburina, I.L. Konorova, T.V. Gannushkina and L.V. Polezhayev, Institute of General Genetics imeni V.I. Vavilov, USSR Academy of Sciences, Moscow; Institute of Neurology, USSR Academy of Medical Sciences, Moscow]

[Abstract] A study was conducted on the relationship of the permeability of the blood-brain barrier (BBB) to the privileged-site status of the brain in female Wistar rats (180-240 g) vis-a-vis allotransplantation of embryonic cerebral cortical tissue. BBB permeability to serum globulins was evaluated in terms of standard immunohistochemical techniques, utilizing the Coons method. Exposure of the rats for 3 min to hypoxic hypoxia (pressure chamber at 180 mmHg) led to increased permeability between days 4 and 14 after the hypoxic session, with gradual return to normalcy within 30 days. Grafting cortical tissue from 18-19 days old feti into the anterior parietal area of 'hypoxic' rats 7 days after the hypoxic session led to immediate changes in BBB permeability. Within 1 day of the graft, permeability increased, peaked at 7 days, and persisted for 60 days. These observations suggest that patency of BBB constitutes an important factor in assuring a privileged-site status for the CNS, since it prevents serum globulins--including immunoglobulines--from gaining access to the brain. References 8: 3 Russian, 5 Western.

12172/9835
CSO: 1840/301

CRITERIA FOR HEART TRANSPLANTS IN USSR

Moscow TRUD in Russian 4 Jan 87 p 4

[Excerpt from round-table discussion. Comment by V. Shumakov, Corresponding Member of the USSR Academy of Medical Sciences and Director of the Transplantology and Artificial Organs Institute, USSR Ministry of Health]

[Excerpt] Our institute is the flagship institute among those scientific institutions which have been permitted to undertake heart transplant operations. We have all the essential equipment to perform not just a few such operations, but to perform them on a regularly scheduled basis. We have prepared teams of surgeons who have been constantly performing heart surgery and who have acquired the essential experience in experimental operations. The special services that are required for such surgery are fully prepared. These include the immunological selection of compatible "donor-recipient" pairs, immediate postoperative management of patients, and long-term follow-ups. We have all the necessary drug support, including cyclosporin (I should mention, incidentally, that the testing of domestically produced analogs is under way).

Of course, I might be asked, why, in that case, was the recent heart transplant that I performed relatively unsuccessful. I say "relatively" because the loss of our first patient was not due to surgical or other medical errors. The patient's elevated sensitivity to the toxicity of cyclosporin played a fatal role in the outcome. Alas, the body could not cope with that toxicity. This is an example of the fact that surgery, and for that matter medicine as a whole, cannot, and I believe never will, be able to guarantee 100 percent success. This is all the more so when we are dealing with patients whose bodies have been weakened by extremely grave injuries to the heart and whose vital resources are quite limited.

But our collective is quite ready to carry on. We are certain that successful heart transplants in the USSR will be a reality in the immediate future. We know, after all, that in a whole series of countries these kinds of operations are not experiments but constitute a therapeutic factor. That is, purely medical problems are being successfully resolved there just as they would be resolved in our country. The only thing we must overcome is a number of obstacles of a different nature, i.e., administrative and organizational ones.

What is involved here? First of all, there must be a better way of selecting persons who require heart transplant operations. We have no fewer such patients in our country than in other developed countries. But, unfortunately, a heart transplant cannot be performed on every dying patient with the expectation, as we say here, that a good quality of life will follow. There are many contraindications to this operation. But the selection of patients for whom such operations are indicated requires the examination of a very large number of patients. This means that the cardiologists must be more active in sending them to us. So far, we are not getting enough patients from them. Apparently, there is a psychological factor here, i.e., they simply are not accustomed to do it. That is why there are now only three patients in our institute who are awaiting transplants. There should be more. We surely recognize that satisfactory immunological pairing is only possible when there is a sufficiently large set of variants.

So far, the problem of donors is viewed differently than it is in the countries that have overtaken us. For many years now there has been a center in Moscow concerned with the selection and preservation of donor organs. Its primary mission has been the supply of donor kidneys. It is now faced with the problem of providing donor hearts for a number of clinics. This is a more difficult task inasmuch as many resuscitation divisions which receive patients with severe cranial-brain injuries are not equipped to maintain the viability of hopeless patients until such time as they are declared brain dead, i.e., until they can be considered donors for heart transplants. Whereas the Institute for First Aid imeni Sklifosovskiy, the Institute of Neurosurgery, the Hospital imeni Botkin, and a number of other therapeutic institutions have the required amount of modern equipment and set of preparations, the same cannot be said for many hospitals.

In short, corrective administrative measures should be taken by both the USSR Ministry of Health and Academy of Medical Sciences as well as the Main Public Health Administration of Moscow. In particular, instructions should be issued which obligate the city's therapeutic institutions to cooperate with the operations of the donor center.

If the aforementioned problems are solved rapidly, there will be no significant obstacles to a wide-scale development of transplantology in the country. Except, of course, the shortage of donors. I, like Dr. Murphy and most heart specialists in the world, am confident about the prospects of an artificial heart. In the years that have passed since its initial development, there have been many advances both in design and materials that are compatible with living tissue.

But even the presently available synthetic hearts, even if not fully perfected, can already yield real benefits. For example, when a person dies suddenly from the complications of cardiac ischemia and when a person is only hours away from death, it is obvious that there is no time to find an appropriate donor. In such cases, an artificial heart could save the patient and sustain him for days, weeks, or even months until such time as a donor heart can be transplanted.

In short, as we reflect today about the future course of transplantology, we can say quite frankly that there can be no stopping of its forward progress whether or not some people wish it. The cause will move on. We are confident about our ability and hope for effective international cooperation. We shall continue to work relentlessly. What else? I would say that we very much need genuine broadly based assistance from public health administrators and from those who can consolidate the efforts of heart surgeons within the framework of our academy. If this is done, then success will follow.

6289
CSO: 1840/303

UDC 618.19-006.6-036.13-084

EVALUATION OF EFFECTIVENESS OF PROPHYLACTIC EXAMINATIONS IN DETECTION OF EARLY FORMS OF BREAST CANCER

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 7, Jul 86
(manuscript received 14 Oct 85) pp 89-91

[Article by E.V. Merkulov, V.N. Golod and S.M. Demidov, Oblast Oncological Dispensary, Sverdlovsk]

[Abstract] Retrospective analysis of 537 case histories of breast cancer showed that 18.6% were diagnosed during medical examinations, while 81.7% were self-detected, even though 68% of these women were under physician care at that time. Fifty percent of breast cancer patients had some gynecological disorder. A three-stage prophylactic examination of 5,000 women over age 30 was performed aimed at isolating and concentrating on high risk group (12%). All of them were taught BSE [self-examination of breast]; only 39.6% performed it routinely but with varying frequencies (18% routinely, once a month). Of those that did not do BSE, 50% were afraid to perform it. Even among the high risk group, only 41.6% did BSE routinely. Breast cancer was detected in 17 of high risk women (2.8%) with 9 being in stage I (52.9%). References 2 (Russian).

7813/9835
CSO: 1840/405

UDC 618.12-006.6-084

POSSIBILITIES FOR BREAST CANCER PREVENTION

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 7, Jul 86
(manuscript received 18 Jun 85) pp 85-89

[Article by E.K. Khint, Institute of Experimental and Clinical Medicine, ESSR Ministry of Health, Tallin]

[Abstract] Breast cancer incidence in Estonia is the highest in the entire USSR. Great number of these cancers are in the stage III-IV at the time of

diagnosis. Single mammography proved to be an ineffective tool for early detection. A mammographic screening program was started in 1974 in Tallin covering 16,125 women, 6,710 were referred to mammography because of other medical examinations, mainly gynecologic, 4,740 came because of various self-motivating reasons and 4,675 were apparently healthy women. In all, 52 stage I breast cancers were discovered (3.2 per 1,000). Early detection improved during 1974 to 1983 period (0 to 4.6 per 1,000 stage I disease). Five-year survival of stage I group was 91.3 + 5.9% (all stages: 60.3 $\pm$ 4.0%). During this period the level of stage III-IV disease dropped in Tallin but not in other cities where this type of "referral screening" was not practiced. Figures 3; references 12: 8 Russian, 4 Western (2 by Estonian authors).

7813/9835
CSO: 1840/405

UDC 618.19-07

EVALUATION STAGE OF BREAST SELF-EXAMINATION TRAINING PROGRAM

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 7, Jul 86
(manuscript received 11 May 85) pp 82-85

[Article by E.A. Mikhaylov, V.N. Sagaydak, L.V. Remennik and V.P. Maksimova, All Union Scientific Oncological Center, USSR Academy of Medical Scienees, Moscow]

[Abstract] This is a report on a WHO-sponsored study on the role of BSE in diagnosis of breast cancer and in lowering mortality. The education program was carried out in Moscow institutions in groups of 5-25 women which included lectures by oncologists, films and practical demonstrations. During one year, 3,097 women were taught BSE in three institutions. From that number, 42 (1.3%) sought medical help because of discovered densities; in 29 there were pathological changes found, and 2 had cancer. Six months after instruction the women were surveyed: 37.8% did not perform BSE (didn't feel this to be important, forgot, didn't have time, fear, etc.); of those that practiced BSE 45.6% did not do it well. The frequency of BSE drops with age. References 6: 3 Russian, 3 Western.

7813/9835
CSO: 1840/405

UDC 591.81.87

ACTION OF HELIUM-NEON LASER ON INTACT AND X-RAY IRRADIATED MOUSE SPLEEN

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 292, No 3, Jan 87
(manuscript received 3 Jul 86) pp 729-733

[Article by N.S. Samokhvalova, Institute of Evolutionary Morphology and Ecology of Animals imeni A.N. Severtsov, USSR Academy of Sciences, Moscow]

[Abstract] Helium-neon lasers (He-NeL) are used as biostimulators in some pathological states. In animal organisms, appearance of radiation sickness depends on protective recovery properties of critical blood-forming tissues. The degree to which the red light of He-NeL affects spleen in intact and X-ray irradiated mice was studied determining cytogenetic effect of these rays applied continuously and in discrete pulses before and after X-ray irradiation. Continuous exposure to the laser beam led to a direct dose-related effect; pulsed irradiation did not show this. Concerning mitotic activity, only the pulse regimen intensified proliferation of blood-forming cells and changes in the intensification and depression phases. It was also shown that the therapeutic effect of He-NeL was related to its ability to repair potential damage due to the X-rays. In general, a therapeutic effect of the laser beam was observed in all permutations of experimental conditions. However, no preventive effect was noted in these experiments. Figures 3; references 14 (Russian) (2 by Western authors).

7813/9835
CSO: 1840/423

STRUCTURAL FACTORS IN RADIATION DAMAGE OF HUMAN HEMOGLOBIN

Moscow BIOFIZIKA in Russian Vol 31, No 4, Jul-Aug 86
(manuscript received 15 Feb 85) pp 592-595

[Article by A.Ye. Myshkin and V.A. Sharpatyy, Institute of Chemical Physics, USSR Academy of Sciences, Moscow]

[Abstract] The increasing clinical use of extracorporeal blood irradiation led to a study on the nature and degree of radiation damage of oxyhemoglobin (HbO_2) and partially denatured methemoglobin (Hb^+). The human samples of HbO_2 and Hb^+ were subjected to 0.15-19.9 Mrad gamma irradiation at 77K, employing 20% solutions of the Hb preparations. HbO_2 and Hb^+ were shown to behave differently on exposure to gamma irradiation, with the latter yielding twice as high a concentration of free and OH radicals. In addition, ESR spectra demonstrated that the Hb^+ solutions yielded a narrow singlet line at ca. g 2.00, which was absent in the HbO_2 solutions. The appearance of the ca. g 2.00 line in the Hb^+ solutions on irradiation was attributed to the formation of anion radicals arising from electron capture by carboxyl groups of the peptide chain. Figures 2; tables 1; references 9: 6 Russian, 3 Western.

12172/9835
CSO: 1840/429

UDC 577.391;612.112.94

CORRELATION BETWEEN DNA REPAIR AND FREQUENCY OF CELLS WITH MICRONUCLEI IN GAMMA-IRRADIATED PHA-STIMULATED AND UNSTIMULATED HUMAN PERIPHERAL LYMPHOCYTES

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 4 Mar 85) pp 733-7373

[Article by L.V. Shchedrina, S.N. Kolyubayeva and V.Ye. Komar, Central Scientific Research Roentgen-Radiological Institute, USSR Ministry of Health, Leningrad]

[Abstract] Comparative studies were conducted on DAN repair in Phyto-hemagglutinin (PHA)-stimulated and unstimulated human lymphocytes following gamma irradiation, in relation to the frequency of cells with micronuclei as an indicator of chromosomal damage. Determination of the frequency of micronuclei demonstrated that 20 Gy irradiation of unst mulated lymphocytes (G_0 phase) resulted in a much greater rate of chromosomal damage than did irradiation of PHA-stimulated cells (G_1 phase). The difference was presumed to be due to the stimulatory effect of PHA on DNA synthesis (and repair). Treatment of the cells with cytosine arabinoside (Ara-C), an inhibitor of DNA repair, led to a marked increase in the incidence of micronuclei in both the PHA-stimulated and unstimulated cells. The effects of Ara-C were to reduce DNA repair by 58% in the G_0 cells, and by 80% in the G_1 cells, with a

corresponding increase in cell death. Figures 4; tables 1; references 13: 5 Russian, 8 Western.

12172/9835
CSO: 1840/254

UDC 577.391;621.386.86;611.84/.88

RADIOPROTECTIVE MECHANISM OF ACTION OF CATECHOLAMINE RECEPTOR AGONISTS: IMPLICATION OF BETA-ADRENORECEPTOR SUBTYPES

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 25 Feb 85) pp 738-743

[Article by V.I. Kulinskiy, A.D. Klimova, V.G. Yashunskiy and T.V. Alpatova, Krasnoyarsk Medical Institute; Institute of Biophysics, USSR Ministry of Health]

[Abstract] Isoproterenol was administered to female (CBA x C57BL)F_1 mice to assess its radioprotective effects, in conjunction with other agents to define the type of beta-adrenoreceptors involved in the mechanism of action. In the present study, the radioprotective dose assuring survival of 50% of the animals following 7.5 Gy X-ray irradiation on subcutaneous administration was calculated at 0.16 μmoles/kg. The fact that the radioprotective mechanism involved beta-adrenoreceptors was confirmed in studies in which the effect was abolished by administration of beta-blockers, as well as by the protective effects obtained with other beta-adrenomimetics. Furthermore, isoproterenol analogs that failed to bind to beta-adrenoreceptors lacked radioprotective action. Comparative data on agents that react with either $beta_1$ or $beta_2$ receptors indicated that both receptor subtypes are involved in radioprotection. However, since bone marrow cells contain largely $beta_2$-adrenoreceptors, the efficacy of isoproterenol was attributed to its reaction with this subset. Figures 1; references 24: 18 Russian, 6 Western.

12172/9835
CSO: 1840/254

UDC 577.391;616.1

MECHANISM OF CIRCULATORY DISTURBANCES IN HIGH-DOSE IRRADIATION

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 19 Feb 85) pp 763-767

[Article by T.D. Pozharisskaya, T.P. Vasilyeva, Ye.N. Sokolova and I.I. Alekseyeva, Military Medical Academy imeni S.M. Kirov, Leningrad]

[Abstract] Vascular sequelae of high-dose gamma irradiation were studied in outbred dogs and albino rats in order to define the contribution of this system to the intestinal and cerebral phases of radiation injury. The data derived from dogs exposed to 18 to 145 Gy and rats subjected to 180 Gy gamma irradiation demonstrated extensive endothelial damage leading to petechiae, increased permeability, and thrombosis. Concomitant changes included massive blood element destruction with release of thromboplastic substances leading to, in the final analysis, disseminated intravascular coagulation. These changes were dose-related and substantiated the importance of tissue hypoxia in the intestinal and cerebral form of radiation injury. Figures 4; references 12: 11 Russian, 1 Western.

12172/9835
CSO: 1840/254

UDC 577.391;631.531.1

INTRASPECIES POLYMORPHISM OF HEXAPLOID WHEAT SEED RADIORESISTANCE

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 8 Feb 85) pp 768-773

[Article by N.A. Korneyev, B.I. Sarapultsev, Ye.A. Morgunova and Ye.Ya. Zyablitskaya, All-Union Scientific Research Institute of Agricultural Radiology, USSR Ministry of Agriculture, Obninsk]

[Abstract] A study was designed to identify the parameters correlating with radioresistance of 172 varieties of wheat seed, using growth data derived after exposure of the seeds to 5-300 Gy gamma irradiation. The resultant data demonstrated that analysis of a few key parameters that are adversely affected provided a suitable basis for assessing radioresistance. Among the factors identified as serving an indicator function were shoot length, rootlet length, rate of growth, fertility, and seed quantity and weight. The existence of intraspecies genotypic polymorphism also indicated that previously-selected parameters on empirical grounds, such as nuclear volume, number of interphase chromosomes, ploidy, DNA concentration and so forth, did not represent universal mechanisms of radioresistance. These observations provided the foundation for isolation of a group of hexaploid wheat varieties demonstrating, in a convenient fashion, the genotypic nature of intraspecies

polymorphism that may find use in experiments on the genetic basis of radioresistance. Figures 3; references 13: 9 Russian, 4 Western.

12172/9835
CSO: 1840/254

UDC 577.391;546.212.02;612.01.017.1

EFFECTS OF LONG-TERM TRITIUM INTAKE ON NK CELL FUNCTION IN CBA MICE

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 11 Feb 85) pp 792-795

[Article by Ye.N. Kirillova, Institute of Biophysics, USSR Ministry of Health, Moscow]

[Abstract] A study was designed to evaluate the effects of radiation on the function of NK (normal killer) cells and recovery following cessation of exposure. The model system consisted of CBA mice subjected to a 6 month intake of tritium with drinking water for a total dose of 8.73 Gy (4.5 cGy/day), followed by an additional 9-month period of evaluation. NK cell function was assessed in terms of human erythroleukemia K-562 cell lysis, using the ^{51}Cr release test. During the period of administration the NK activity of irradiated mice fell to 55-67% of the activity exhibited by unirradiated control animals. After termination of exposure to tritium, recovery of NK cell activity was seen, which 9 months later exceeded control activity by 178%. The data revealed that with moderate levels of exposure the inhibitory effect on the activity of NK cells is reversible in the CBA mice, followed eventually by a pronounced rebound phenomenon. Depression of NK cell activity would appear to be a significant factor in predisposition to malignancies in irradiated animals. References 13: 7 Russian, 6 Western.

12172/9835
CSO: 1840/254

UDC 577.391;612.014.43

HEAT AND RADIATION INDUCED (CROSS) RADIO- AND THERMOTOLERANCE IN ZEA MAY SEEDLINGS

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 24 Dec 84) pp 806-809

[Article by T.I. Gikoshvili, M.E. Vagabova, M.M. Vilenchik and A.M. Kuzin, Institute of Biological Physics, USSR Academy of Sciences, Pushchino]

[Abstract] Studies on induction of radio- and thermoresistance in Zea may seedlings led to the demonstration that, under proper conditions, gamma irradiation with a dose of 1-3 Gy dose led to enhanced thermoresistance. Concomitantly, exposure of the seedlings to 43°C for 15-30 min enhanced both radio- and thermoresistance. Additional studies with the protein synthesis inhibitor cycloheximide (10^{-4}%) demonstrated that both effects were apparently due to the formation of heat- and radiotolerance proteins. These proteins appear to function as enzymes in the repair of DNA damage.. The identity of these proteins, as well as the degree of overlap between those that are heat or radiation induced, remains to be clarified. Figures 3; references 10: 5 Russian, 5 Western.

12172/9835
CSO: 1840/254

UDC 577.391;636.7;611.23

BRONCHOSCOPIC EXAMINATION OF TRACHEAL AND BRONCHIAL MUCOSA IN COMBINED AND INDIVIDUAL EXPOSURE TO ^{239}Pu AND GAMMA RADIATION

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 11 Feb 85) pp 825-828

[Article by L.I. Fetisova, Z.I. Kalmykova and A.P. Nifatov, Institute of Biophysics, USSR Ministry of Health, Moscow]

[Abstract] This is a report of further studies to define the modifying effects of gamma irradiation on mucosal damage to tracheal and bronchial mucosa caused by alpha particles from inhaled $^{239}PuO_2$ aerosols. The bronchoscopic data were collected for outbred dogs exposed to external gamma radiation (51.6 mC/kg) alone, inhalation of $^{239}PuO_2$ 0.065 μm particles alone, or to a combination of gamma irradiation followed by inhalation of $^{239}PuO_2$. Examination of the animals for a 48 month period demonstrated that pretreatment with gamma radiation under the conditions employed attenuated the form of typical endobronchitis seen with $^{239}PuO_2$. Hyperemia and edema of the tracheal and bronchial mucosal surfaces was markedly diminished, with some increase in susceptibility to mechanical trauma due to

bronchoscopic manipulations. Six months after the combined exposure, the appearance of the mucosa was normal, becoming pale at much later stages with well-delineated 'rosy' areas and distinguishable vascular outlines. References 7 (Russian).

12172/9835
CSO: 1840/254

UDC 577.391;581.5

WHEAT RETENTION AND DISTRIBUTION IN ITS ORGAN OF FALLOUT RADIONUCLIDES

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 6, Nov-Dec 85
(manuscript received 4 Jan 85) pp 836-840

[Article by N.D. Zuyev and N.V. Korneyeva]

[Abstract] Experimental studies were conducted on the retention of Sr-90 in 15 varieties of wheat and organ and tissue distribution, depending on the stage of exposure. The study, designed to simulate radioactive fallout, revealed considerable strain variability in terms of Sr-90 accumulation and organ distribution. However, the tabulated data revealed an overall pattern in terms of uptake. During stem extension phase the aerial portion of the plant was found to contain 30% of the radioactivity, during earing 55%, and, in the final maturation stage, 41%. The levels of Sr-90 in the leaves and stems of plants exposed during earing were 4- to 5-fold greater than when the plants were exposed during stem extension, while in the spikes these concentrations were 2-fold greater. When exposure occurred during stem extension most of the radionuclide was localized in the leaves, ca. 3% in the stems, and 0.1% in the ears. References 7 (Russian).

12172/9835
CSO: 1840/254

UDC 577.391:621.386.86;599.323.4

THERAPEUTIC AND RADIOPROTECTIVE EFFECTS OF POTASSIUM OROTATE IN IRRADIATED RATS

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 21 Feb 84) pp 208-211

[Article by L.N. Zhemkova, G.S. Novoselova, I.V. Remizova and V.Ye. Komar, Central Scientific Research Institute of Roentgenology and Radiology, USSR Ministry of Health, Leningrad]

[Abstract] Therapeutic trials were conducted on outbred rats to assess potassium orotate (PO) for its prophylactic efficacy in experimental radiation sickness. Administration of PO I.P. in a dose of 7 mg/kg 1 h before 9 Gy (0.97 Gy/min) gamma irradiation prolonged the mean survival time to 17.6 days, from 14.7 days for untreated control rats. Per os administration of 100 mg/kg PO for 3 days before irradiation (11 Gy) was ineffective. Additional studies led to the determination that the probable protective mechanism of action of PO involved stimulation of proliferation of bone marrow cells. Figures 2; references 6: 5 Russian, 1 Western.

12172/9835
CSO: 1840/248

UDC 577.391.58.031.1

RADIOPROTECTIVE EFFECTS OF ETHYLENE IN GAMMA-IRRADIATED PLANTS

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 11 Aug 83) pp 212-215

[Article by D.M. Grodzinskiy, Ye.Yu. Fialkova and I.N. Gudkov, Institute of Plant Physiology, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Determinations were made to evaluate the scope of physiological effects of ethylene, a natural phytohormone, in concentrations in which it has been shown to exert a reversible inhibitory effect on cellular replication. Chernigov yellow pea shoots were exposed for 6 h in air to 2.6 mM ethylene gas concentration (ethylene: air = 1:16) before and during gamma irradiation (6-30 Gy at 3 Gy/min). All shoots survived irradiation with doses of 20 Gy and below. The survival rate fell to 70% with 22 Gy, and to 25% with 25 Gy, giving an $LD_{50/10}$ = 22.3 Gy. Analysis of half-lethal doses resulted in DMF = 2.4. Cytologic studies demonstrated that ethylene acted to block the mitotic cycle at the G_1/S and G_2/M transition stages. The protective mechanism is also likely to have involved ethylene's function as an antioxidant. Figures 3; references 10: 7 Russian, 3 Western.

12172/9835
CSO: 1840/248

UDC 577.391;599.323.4;539.125.5;591.48

ULTRASTRUCTURAL CHANGES IN CEREBROCORTICAL CAPILLARIES IN RATS FOLLOWING WHOLE-BODY NEUTRON IRRADIATION

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 30 May 84) pp 216-220

[Article by A.A. Abdrakhmanov, V.F. Mashanskiy and A.G. Sverdlov, Leningrad Institute of Nuclear Physics imeni B.P. Konstantinov, USSR Academy of Sciences, Gatchina]

[Abstract] With the development of neutron therapy in clinical practice, a study was conducted on the effects of neutron irradiation on capillary permeability in Wistar rat brain, as cerebral edema would constitute a serious complication. The rats were subjected to whole-body irradiation with 0.85 MeV neutrons to yield a 10 Gy dose (0.34 Gy/min), with the cerebral cortex subjected to electron microscopic examination over a 6 h postradiation period. The ultrastructural changes consisted of swelling of the capillary wall, increased permeability, and the onset of pericapillary edema. However, the absence of any significant destructive changes in that time frame suggested that these changes represented short-term reversible reactions. Figures 1; references 19: 13 Russian, 6 Western.

12172/9835
CSO: 1840/248

UDC 577.391;591.144

DEGRADATION OF DNA AND CHROMATIN IN MOUSE LYMPHOID ORGANS AFTER IRRADIATION AND PHYTOHEMAGGLUTININ (PHA) ADMINISTRATION

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 23 Aug 84) pp 224-227

[Article by N.N. Kuvshinov, G.A. Dokshina, B.P. Ivannik and N.I. Ryabchenko, Scientific Research Institute of Biology and Biophysics, Tomsk State University imeni V.V. Kuybyshev; Scientific Research Institute of Medical Radiology, USSR Academy of Medical Sciences, Obninsk]

[Abstract] Outbred mice were gamma irradiated to dosage levels of 2.5 to 9 Gy in order to define the potential therapeutic effectiveness of PHA [Hungary] when administered i.p. within 30-60 min of irradiation. The resultant determination of DNA degradation and accumulation of polydeoxynucleotides in the thymus, spleen and bone marrow failed to show any therapeutic benefits of PHA administration within the 24 h period of observation. With 5 Gy irradiation the concentration of double-stranded DNA decreased by 34% in the thymocytes within 6 h, and by 16-18% in the splenic and bone marrow cells. The rate of DNA degradation and accumulation

of deoxyribonucleotides decreased by 24 h. The reported therapeutic effects of PHA are apparently due to late effects involving metabolic changes in the target cells that accelerate recovery in late stages of radiation injury. Figures 2; references 13: 7 Russian, 6 Western.

12172/9835
CSO: 1840/248

UDC 577.391;661.719

RADIOPROTECTIVE MECHANISM OF ACTION OF CYSTEAMINE

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 23 Jul 84) pp 238-241

[Article by N.Ya. Gilyano, O.V. Malinovskiy and S.I. Stepanov, Leningrad Institute of Nuclear Physics imeni B.P. Konstantinov, USSR Academy of Sciences, Gatchina]

[Abstract] Various studies were conducted with human and animal culture cells to define the mechanism of action of cysteamine as a radioprotector. Using Chinese hamster CHEL and V-79 cells and HeLa J-63 cells, addition of 0.002 M cysteamine 30 min before 4.3 Gy (1.8 Gy/min) gamma irradiation markedly reduced the yield of chromosomal abnormalities. However, the radioprotective effect was abolished by pretreatment of the cell cultures with 0.55 mg/ml sodium butyrate, which has the effect of increasing the level of histone acetylation as a result of inhibition of deacetylases. In addition, flow cytofluorometric studies demonstrated that cysteamine dminished the binding of ethidium bromide to DNA. These two observations demonstrated that the radioprotective mechanism of action of cysteamine involves diminishing the accessibility of DNA to endonucleases through compaction of the chromatin. As a result, the phosphodiester bonds of DNA are protected from enzymatic rupture and the DNA molecule is protected from degradation. Figures 2; references 16: 14 Russian, 2 Western.

12172/9835
CSO: 11840/248

UDC 391;615.375

EFFECTS OF GAMMA AND GAMMA/NEUTRON IRRADIATION ON BLOOD ANTIPROTEOLYTIC ACTIVITY AND FREE AMINO ACID POOL COMPOSITION IN RELATION TO SURVIVAL RATES

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 29 May 84) pp 241-245

[Article by S.F. Vershinina, L.A. Konnova and Ye.A. Zherbin, Central Scientific Research Roentgen-Radiological Institute, USSR Ministry of Health, Leningrad]

[Abstract] The biological sequelae of gamma and mixed gamma/neutron irradiation were assessed in outbred rats in terms of changes in the serum pool of free amino acids and antiproteolytic activity (alpha$_1$-antitrypsin and alpha$_2$-macroglobulin) in relation to survival figures. The animals were subjected to 1, 3 or 6 Gy gamma irradiation or 1 or 3 Gy mixed gamma/neutron irradiation (67% 0.9 MeV neutrons), with the results of clinical chemistries presented in a tabular form. The survival figure for 1 Gy mixed irradiation was 426 $\pm$ 37 days, versus 587 $\pm$ 25 days for pure gamma irradiation (611 $\pm$ 21 days for control animals). The adverse effects of the mixed irradiation in a sub-lethal dose were due to profound metabolic changes which were absent in the case of 1 Gy gamma irradiation. The biochemical sequelae of the 3 Gy mixed gamma/neutron irradiation were even more pronounced and correlated with a survival time of 204 $\pm$ 33 days. These observations provided unequivocal evidence for a direct correlation between early (within 24 h) metabolic changes and the outcome of gamma/neutron irradiation. References 13: 7 Russian, 6 Western.

12172/9835
CSO: 1840/248

UDC 577.391;577.15

EFFECTS OF LETHAL GAMMA IRRADIATION ON ACTIVITIES OF FRUCTOSODIPHOSPHATE ALDOLASE AND GLUCOSE-6-PHOSPHATE DEHYDROGENASE

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 22 Mar 84) pp 245-249

[Article by I.V. Savitskiy, V.A. Musiyko and S.G. Yerigova, Odessa Medical Institute imeni N.I. Pirogov]

[Abstract] Male Wistar rats were subjected to lethal 29.1 Gy gamma irradiation to assess the effects over a 48 h period in terms of glycolysis and the pentose phosphate pathway. Measurements of the changes in aldolase and glucose-6-phosphate dehydrogenase (GPH) activities in the myocardium, liver and skeletal muscles showed a basic pattern of elevation of GPH and depression of aldolase activities. Brain constituted an exception, in that the GPH

activity diminished and aldolase activity remained essentially unaltered. These observations were consonant with changes in carbohydrate metabolism consisting of depression of glycolysis and enhancement of the pentose phosphate route. References 11: 1 Ukrainian, 10 Russian.

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UDC 577.391.547.963.3:591.81

EFFECTS OF GAMMA AND NEUTRON IRRADIATION ON MAMMALIAN DNA-MEMBRANE COMPLEXES

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 28 May 84) pp 249-252

[Article by I.L. Lapidus, V.M. Nazarov and G. Ertsgreber, Joint Nuclear Research Institute, Dubna]

[Abstract] An analysis was conducted on the relative sedimentation rates (RSR) of DNA-membrane complexes isolated from Chinese hamster V79-4 cells following neutron irradiation in the biophysical channel mode of the IBR-2 reactor at Dubna. The resultant RSR data were analyzed in comparison with previously derived data for the effects of gamma irradiation. Generally, the graphical presentation of RSR vs. Gy plots yielded similar figures with the neutron plot falling higher than the gamma plot. The initial decrease in the RSR values for dosages approaching ca. 5-10 Gy were due to the appearance of single-strand breaks. Following a low plateau in the 10-80 Gy range, the RSR began to rise due to the formation of double-strand breaks in the DNA and a more compact complex structure. These processes were noted earlier and occurred more rapidly in the case of neutron irradiation. As a result, RSR = 1 was attained with ca. 100 Gy neutron dose, vs. a ca. 300 Gy gamma dose. Figures 1; references 14: 6 Russian, 8 Western.

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EFFECTS OF IRRADIATION ON SERUM FIBRONECTIN LEVELS

Moscow RADIOBIOLOGIYA in Russian Vol 25, No 2, Mar-Apr 85
(manuscript received 20 Feb 84) pp 265-267

[Article by S.R. Budagov, A.V. Konov, V.N. Petrov and V.K. Podgorodnichenko, Scientific Research Institute of Medical Radiology, USSR Academy of Medical Sciences, Obninsk]

[Abstract] This study represents the first reported evaluation of the effects of ionizing radiation on serum fibronectin levels, conducted on male Wistar rats exposed to 1-10 Gy gamma irradiation. Serum levels of fibronectin decreased within 3-24 h of irradiation, but by day 3 had increased to 176 $\pm$ 7.4% of baseline value when measured by immunoelectrophoresis. Administration of cycloheximide, a protein synthesis inhibitor, within 2 days of irradiation depressed the fibronectin level to 89 $\pm$ 7.7% of the baseline level. The information currently available is insufficient to explain the mechanism by which ionizing radiation induced an increase in serum fibronectin, a glycoprotein with opsonic activity. However, it is conceivable that the immunoelectrophoretic assay method measured breakdown products of fibronectin that had retained antigenic features of the intact molecule. Figures 2; references 11: 1 Russian, 10 Western.

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PHAGOCYTIC REACTION OF GUINEA PIG MACROPHASES FROM ANIMALS IMMUNIZED AGAINST BRUCELLOSIS

Moscow VETERINARIYA in Russian No 12, Dec 85 pp 27-30

[Article by N.Z. Khazipov, N.M. Vasilevskiy, O.P. Ionova and V.A. Shoshokin, Kazan Veterinary Institute]

[Abstract] A study is reported of the interaction of brucella with phagocytic cells. The experiments were performed using cultures of Brucella abortus of varying virulence. Guinea pigs were used as donors of peritoneal macrophages. The cells were cultivated on cover glasses at 37°C in a medium with 10% inactivated bovine serum. A one-day culture was infected with a suspension of brucella at 50 microbe bodies per macrophage, contact time 4 hours, after which the cell layer was washed and fresh culture medium introduced. Activated peritoneal macrophages were obtained from the animals 15, 30, and 60 days after immunization with antibrucellosis vaccine strains 19 and 82. The studies showed that in the early stages, the phagocytic activity of the cells was high, 57-80%, increasing with time. Differences in phagocytosis were observed as a function of virulence. Macrophages from the animals immunized with antibrucellosis vaccines had higher capacity for phagocytosis of virulent brucella. Intensity of phagocytosis correlated iwth virulence: Brucella of weakly or nonvirulent strains were absorbed by the macrophages more intensively than the virulent strain brucella. Morphologic changes in the macrophages also varied with virulence. Large phagocytic vacuoles containing large quantities of bacteria were characteristic for macrophages exposed to the virulent brucella, while smaller vacuoles were characteristic for phagocytes absorbing less virulent brucella. Figures 3; references 15: 11 Russian, 4 Western.

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VIRAL EQUINE ENCEPHALITIS (LITERATURE REVIEW)

Moscow VETERINARIYA in Russian No 12, Dec 85 pp 38-44

[Article by I.A. Bakulov, V.V. Makarov and D.A. Petrachev]

[Abstract] The viral equine encephalites are a group of similar diseases with acute course, damage to the central nervous system, icteric mucosa and gastrointestinal disorders. The epizootiology of Venezuelan encephalomyelitis, Western encephalomyelitis, Japanese encephalitis, Western Nile meningoencephalitis and Murray Valley encephalitis is discussed. The pathogens of all these diseases are members of the alpha and flavivirus families of togaviruses, the major, typical representatives of the ecologic group of pathogens called arboviruses. The transmissive mechanism supports constant alternating presence of the viruses in the organism of the homoiothermic host or arthropid vector without ever contacting the environment. Diagnosis, prophylaxis and control measures are discussed.

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BRIEF

CARDIOLOGY CONFERENCE IN TBILISI--Participants gathered at a conference in Tbilisi to exchange data and research methods in the treatment and prevention of cardiovascular diseases. Prominent cardiologists and clinicians from many of the country's cities were invited to attend. The conference was dedicated to the 40th anniversary of the founding of the country's first Scientific-Research Institute for Clinical and Experimental Cardiology imeni Academician M. D. Tsinamdzgvrishvili of the Georgian SSR Ministry of Health. The conference's agenda included vital questions concerned with the control of arterial hypertension, cardiac ischemia, myocardial infarcts, discussions of research on cardiac arrhythmias, preventive cardiology, and others. The conference was opened by the Georgian SSR Minister of Health I. Menagarishvili. Director of the Cardiology Institute and Georgian SSR State Prize laureate Professor V. Kavtaradze told the GRUZ INFORM correspondent that "the formation of a cardiology service in the republic is one of the most important recent achievements of the Institute's collective. "Specialized cardiology 'first aid' teams are operating in Tbilisi, Kutaisi and a number of other cities in the republic. The improvement of medical assistance to cardiovascular patients, particularly those with acute myocardial infarcts, has resulted in a considerable reduction in the mortality rate for this disease. The last few years have been marked by major advances in global cardiology that reflect a transition to research at the molecular and cellular level. A medical biophysics laboratory has been organized in our institute. The investigations of the laboratory staff are making it possible to undertake significant analyses of cardiac function and dysfunction. The CEMA member nations are also participating in this program." [Text] [Tbilisi ZARYA VOSTOKA in Russian 5 Dec 86 p 3] 6289

CSO: 1840/303

MISCELLANEOUS

HANDS-ON HEALING PHENOMENON

Moscow SOVETSKAYA ROSSIYA in Russian 13 Aug 86 p 3

[Article by Ye. Davitashvili under the rubric: "I Want to Say"; first paragraph in italics in source]

[Text] After SOVETSKAYA ROSSIYA published "Hands that Heal," an article which discussed research by scientists on the radiation generated by human beings and the need for serious study of this phenomenon, we received many letters to the editor, in which our readers asked for the details of these experiments, expressed their views about this phenomenon, and requested help in obtaining treatment from Ye. Davitashvili (Dzhune).

As a result of the publication of "Healing Hands," I received a large number of letters, in which readers asked me questions such as: could I make diagnoses on the basis of a photograph; could I cure people from a distance; was I was a believer in spiritualism; or could I move objects...

I want to say first off in all frankness that I possess absolutely no powers such as these.

Certain readers are interested in the nature of my techniques, and exactly how I influence the process of disease...

I think that the scientists, physicists, and physicians which whom I have worked and continue to work closely would be better able to answer such questions. A group of physicists of the Institute of Radiotechnology and Electronics of the USSR Academy of Sciences, headed by Academician Yu. V. Gulyayev and Doctor of Sciences E.E. Godik, have used special apparatus to compare the physiological fields of a group I worked with to that of a control group. The following changes were recorded in the physiological fields [of the group I treated] in the vicinity of my wrists while I worked on them: infrared thermal radiation, an increase in the intensity of very weak optical luminescence, and an increase in the magnetic field.

The medical scientists believe that the characteristics which have been identified are related to neuroendocrine regulation, primarily by deptide hormones [sic], especially, melatonin, a pituitary hormone, and also with the peripheral endocrine system, (the so-called APUD [expansion unknown] system).

But at present this is just a hypothesis on the part of the scientists and requires serious experimental confirmation.

I myself can say that my hands have always been able to feel other people's pain. When I touch the place where it hurts, in a number of cases I have been able to eliminate the pathological process. This phenomenon has been confirmed not only clinically, but also by sensitive laboratory tests using modern equipment.

I would like to draw a comparison to a nursing mother who is able to sense when and where something begins to be amiss in her baby's body. Furthermore, when she touches her beloved child with her hands, stroking the painful spot, she soothes and normalizes the condition of the child. It seems to me that this comparison to a mother's hands gives some idea of the biological nature of my effects on a sick person.

Like a physician, I am opposed to false sensationalism, advertisements, diagnoses based on intuition and supposition, and unjustified promises of cures when the process of disease is far advanced. I am speaking primarily about oncological diseases. In these cases, [time spent on alternative treatments] may cause it to be too late for radical (surgical) treatment of the affected organ.

The method of contact and non-contact massage which I use can be employed only in combination with other methods of treatment. In medicine there is not, and cannot be, a panacea for all diseases.

In conclusion, I want to say that I am very grateful to the USSR Ministry of Health and the medical specialists with whom I have collaborated closely for a long time. Our collaboration has made it possible to advance a number of new hypotheses explaining the nature of this phenomenon.

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COST OF ANIMAL TESTS FOR CARCINOGENECITY OF CHEMICAL COMPOUNDS

Leningrad VOPROSY ONKOLOGII in Russian Vol 32, No 7, Jul 86
(manuscript received 17 May 85) pp 72-76

[Article by G.B. Pliss, N.N. Antashkova, K.P. Romanov and V.V. Khudoley, Order of the Labor Red Banner Scientific Research Institute of Oncology imeni Professor N.N. Petrov, USSR Ministry of Health, Leningrad]

[Abstract] Only short term, acute toxicity animal tests were costed out in the USSR. Using data from the Laboratory of Scientific Research Institute of Oncology imeni N.N. Petrov, which is the leading Institute in the field in the USSR, the economy of long term animal studies (rats: 3 years, mice: 2.5 years) of chemical carcenogenicity was analyzed. Costing out included purchase of animals, feeding and housing as well as the cost of professional and technical staff and amortization of housing and equipment, heating, cleaning, etc. The cost of the chemicals being tested was excluded. The total animal cost was 16,988 Rubles. The breakdown is as follows: 32.4% - salaries; 30.6% - feed; 8.4% - administrative/housekeeping; 8.1% - amortization, and 8.2% - maintenance. References 4 (Russian).

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REVIEW OF BOOK ON PROTECTION OF MACHINERY FROM BIODEGRADATION

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 20, No 1, Jan-Feb 86
(manuscript received 17 Dec 84) pp 76-78

[Review by N.P. Yelinov, Leningrad Institute of Pharmaceutical Chemistry, of book "Zashchita Mashin Ot Biopovrezhdeniy" (Protection of Machinery from Biodegradation) by A.A. Gerasimenko, Mashinostroyeniye, Moscow, 1984, 112 pages]

[Abstract] This small book consists of four chapters and contains a bibliography of 47 references. It addresses one of the more important problems affecting the performance and reliability of machines, as well as their

service life. It has been estimated that approximately 50% of all corrosion is due to microorganisms. The first chapter deals with the microorganisms themselves, their habitats, and activities. The second chapter deals with biodegradation of materials and coatings, and the third chapter covers research methods in studies on biodegradation. Finally, the fourth chapter analyzes the methods used in preventing biodegradation at different stages of manufacture and in the field. It is pointed out that a book of this size, it is inevitable that there will be omissions and cursory treatment of some topics. The book commits numerous mistakes in the spelling of Latin names of microorganisms. On the whole, however, it is of interest and its appearance fills a definite need.

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