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AEROSPACE MEDICINE AND BIOLOGY

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Introduction

This issue of *Aerospace Medicine and Biology, A Continuing Bibliography with Indexes* (NASA SP-7011) lists 70 reports, articles, and other documents recently announced in the NASA STI Database.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

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Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

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Includes human engineering; biotechnology; and space suits and protective clothing.

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Author Index PA-1

Selecting an index above will link you to that comprehensive listing.

Appendix

Select **Appendix** for important information about NASA Scientific and Technical Information (STI) Office products and services, including registration with the NASA Center for AeroSpace Information (CASI) for access to the NASA CASI TRS (Technical Report Server), and availability and pricing information for cited documents.

Typical Report Citation and Abstract

ACCESSION NUMBER ↓

DOCUMENT ID NUMBER → **19960021053;** 96N24540 NASA Langley Research Center, Hampton, VA USA. ← CORPORATE SOURCE

TITLE → **An Extended Compact Tension Specimen for Fatigue Crack Propagation and Fracture**

AUTHORS → Piascik, R. S., NASA Langley Research Center, USA; Newman, J. C., Jr., NASA Langley Research Center, USA; ← AUTHORS' AFFILIATION

PUBLICATION DATE → Mar. 1996, pp. 16; In English

CONTRACTS/GRANTS → Contract(s)/Grant(s): RTOP 538–02–10–01

REPORT NO.(S) → Report No.(s): NASA–TM–110243; NAS 1.15:110243; No Copyright; Avail: CASI A03, Hardcopy; A01, Microfiche ← AVAILABILITY AND PRICE CODE

ABSTRACT → An extended compact tension specimen, EC(T) has been developed for fatigue and fracture testing. Documented herein are stress-intensity factor and compliance expressions for the EC(T) specimen.

ABSTRACT AUTHOR → Author

SUBJECT TERMS → *Crack Propagation; Stress Intensity Factors; Fatigue (Materials)*

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 422)

SEPTEMBER 16, 1996

51
LIFE SCIENCES (GENERAL)

19960028778; 96N29438 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Investigation on self-organizing materials ***Jiko soshikika zairyo ni kansuru chosa***
Mar. 1995113p; In Japanese
Report No.(s): NEDO-IT-93008; DE96-746205; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

For mounting high-level functions at higher density, considerations, investigations, and discussions were given on structuring functional organizations at molecular levels as the ultimate technology. Living organisms synthesize protein of functional units based on DNA information, and have a high-level self-organizing function. Living organisms embody a possibility to extract such a function of biological molecules artificially and provide polymers with the function, so that the molecules can create spontaneously the structure at a molecular level that is impossible to structure mechanically. Such a technology can work effectively also in view of resources, energies, and environmental problems. The conception for creating self-organizing molecular materials is an entropy engineering to perform structure forming by letting molecules enclose a large number of information. It is also a molecular techtonics to seek norms in biological functions transcending inorganic and organic materials. The materials were divided into three categories of organic molecules, protein, and inorganic molecules, and each was investigated for more detailed descriptions.
DOE
Enzyme Activity; Bioengineering; Biosynthesis; Protein Synthesis; Biopolymers; Organic Materials

19960028990; 96N29585 Colorado State Univ., Animal Reproduction and Biotechnology Lab., Fort Collins, CO USA
Experiment K-7-16: Effects of Microgravity or Simulated Launch on Testicular Function in Rats
Amann, R. P., Colorado State Univ., USA; Clemens, J. W., Pennsylvania State Univ., USA; Deaver, D., Pennsylvania State Univ., USA; Folmer, J., Johns Hopkins Univ., USA; Zirkin, B., Johns Hopkins Univ., USA; Veeramachaneni, D. N. R., Colorado State Univ., USA; Grills, G. S., Columbia Univ., USA; Gruppi, C. M., Columbia Univ., USA; Wolgemuth, D., Columbia Univ., USA; Serova, L. V., Institute of Biomedical Problems, USSR; Sapp, W. J., Tuskegee Inst., USA; Williams, C. S., Tuskegee Inst., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 3-24; In English; Also announced as 19960028989
Contract(s)/Grant(s): NCC2-12; NCC2-455; NAG2-597; NAG2-612; NAG2-613; NAGw-1579; NGT-50315; NIH-G12-RR-03059-01A1; NIH-HD-07313; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Fixed or frozen testicular tissues from five rats per group were analyzed by: subjective and quantitative evaluations of spermatogenesis; Northern-blot analysis for expression of selected genes; quantification of testosterone and receptors for LH; and morphometric analysis of Leydig cells. Based on observations of fixed tissue, it was evident that some rats in the flight and vivarium groups had testicular abnormalities unassociated with treatment, and probably existing when they were assigned randomly to the four treatment groups; the simulated-launch group contained no abnormal rat. Lesions induced in testes of caudal-elevation rats precluded discernment of any pre-existing abnormality. Considering rats without pre-existing abnormalities, diameter of seminiferous tubules and numbers of germ cells per tubule cross section were lower (E less than 0.05) in flight rats than in simulated-launch or vivarium rats. However, ratios of germ cells to each other, or to Sertoli cells, and number of homogenization-resistant spermatids did not differ from values for simulated-launch or vivarium controls. There was no effect of flight on normal expression of testis-specific hsp gene products, or evidence for production of stress-inducible transcripts of the hsp70 or hsp90 genes. Concentration of receptors for rLH in testicular tissue, and surface densities of smooth endoplasmic reticulum and peroxisomes in Leydig cells, were similar in flight and simulated-launch rats. However, concentrations of testosterone in testicular tissue or peripheral blood plasma were reduced (P less than 0.05) in flight rats to less than 20 percent of values for simulated-launch or vivarium controls. Thus, spermatogenesis was essentially normal in flight rats, but production of testosterone was severely depressed. Sequela of reduced androgen production on turnover of

muscle and bone should be considered when interpreting data from mammals exposed to microgravity.
Author
Microgravity; Testes; Spermatogenesis; Genes; Cells (Biology); Endoplasmic Reticulum; Tissues (Biology); Biological Effects; Spaceborne Experiments; Gravitational Effects

19960028991; 96N29586 Colorado State Univ., Dept. of Physiology., Fort Collins, CO USA
Experiment K-7-17: Effects of Spaceflight on the Proliferation of Jejunal Mucosal Cells
Phillips, R. W., Colorado State Univ., USA; Moeller, C. L., Colorado State Univ., USA; Sawyer, H. R., Colorado State Univ., USA; Smirnov, K. L., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 25-32; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The purpose of this project was to test the hypothesis that the generalized, whole body decrease in synthetic activity due to microgravity conditions encountered during spaceflight would be demonstrable in cells and tissues characterized by a rapid rate of turnover. Jejunal mucosal cells were chosen as a model since these cells are among the most rapidly proliferating in the body. Accordingly, the percentage of mitotic cells present in the crypts of Lieberkuhn in each of 5 rats flown on the COSMOS 2044 mission were compared to the percentage of mitotic cells present in the crypts in rats included in each of 3 ground control groups (i.e., vivarium, synchronous and caudal-elevated). No significant difference (p greater than .05) was detected in mitotic indices between the flight and vivarium group. Although the ability of jejunal mucosal cells to divide by mitosis was not impaired in flight group, there was, however, a reduction in the length of villi and depth of crypts. The concommitant reduction in villus length and crypth depth in the flight group probably reflects changes in connective tissue components within the core of villi.
Author
Cells (Biology); Microgravity; Mitosis; Tissues (Biology); Biological Effects; Spaceborne Experiments; Gravitational Effects

19960028992; 96N29587 NASA Ames Research Center, Moffett Field,CA USA
Experiment K-7-18: Effects of Spaceflight in the Muscle Adductor Longus of Rats Flown in the Soviet Biosatellite Cosmos 2044, Part 1, A Study Employing Neural Cell Adhesion Molecules (N-CAM) Immunocytochemistry and Conventional Morphological Techniques (Light and Electron Microscopy)
Daunton, N. G., National Aeronautics and Space Administration. Ames Research Center, USA; DAmelio, F., National Aeronautics and Space Administration. Ames Research Center, USA; Wu, L., National Aeronautics and Space Administration. Ames Research Center, USA; Ilyina-Kakueva, E. I., Institute of Biomedical Problems, USSR; Krasnov, I. B., Institute of Biomedical Problems, USSR; Hyde, T. M., National Inst. of Mental Health, USA; Sigworth, S. K., National Inst. of Mental Health, USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 33-71; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The effects of spaceflight upon the 'slow' muscle adductor longus was examined in rats flown in the Soviet Biosatellite COSMOS 2044. Three groups - synchronous, vivarium and basal served as controls. The techniques employed included standard methods for light microscopy, N-CAM immunocytochemistry and electron microscopy. Light microscopic observations revealed myofiber atrophy, contraction bands and segmental necrosis accompanied by cellular infiltrates composed of macrophages, leucocytes and mononuclear cells. N-CAM immunoreactivity was seen (N-CAM-IR) on the myofiber surface, satellite cells and in regenerating myofibers reminiscent of myotubes. Ultrastructural alterations included Z band streaming, disorganization of myofibrillar architecture, sarcoplasmic degradation, extensive segmental necrosis with preservation of the basement membrane, degenerative phenomena of the capillary endothelium and cellular invasion of necrotic areas. Regenerating myofibers were identified by the presence of increased amounts of ribosomal aggregates and chains of polyribosomes associated with myofilaments that displayed varied distributive patterns. The principal electron microscopic changes of the neuromuscular junctions consisted of a decrease or absence of synaptic vesicles, degeneration of axon terminals, increased number of microtubules, vacant axonal spaces and axonal sprouting. The present observations indicate that major alterations such as myofibrillar disruption and necrosis, muscle regeneration and denervation and synaptic remodeling at the level of the neuromuscular junction may take place during spaceflight.
Author
Space Flight; Cells (Biology); Tissues (Biology); Neuromuscular Transmission; Muscles; Biological Effects; Spaceborne Experiments

19960028993; 96N29588 NASA Ames Research Center, Moffett Field,CA USA
Experiment K-7-18: Effects of Spaceflight in the Muscle Adductor Longus of Rats Flown in the Soviet Biosatellite Cosmos 2044, Part 2, Quantitative Autoradiographic Analysis of Gaba (Benzodiazepine) and Muscarinic (Cholinergic) Receptors in the Forebrain of Rats Flown on Cosmos 2044
Wu, L., National Aeronautics and Space Administration. Ames Research Center, USA; Daunton, N. G., National Aeronautics and Space Administration. Ames Research Center, USA; Krasnov, I. B., Institute of Biomedical Problems, USSR; DAmelio, F., National Aeronautics and Space Admin-

istration. Ames Research Center, USA; Hyde, T. M., National Inst. of Mental Health, USA; Sigworth, S. K., National Inst. of Mental Health, USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 73-81; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Quantitative autoradiographic analysis of receptors for GABA and acetylcholine in the forebrain of rats flown on COSMOS 2044 was undertaken as part of a joint US-Soviet study to determine the effects of microgravity on the central nervous system, and in particular on the sensory and motor portions of the forebrain. Changes in binding of these receptors in tissue from animals exposed to microgravity would provide evidence for possible changes in neural processing as a result of exposure to microgravity. Tritium-labelled diazepam and Quinuclidinyl-benzilate (QNB) were used to visualize GABA (benzodiazepine) and muscarinic (cholinergic) receptors, respectively. The density of tritium-labelled radioligands bound to various regions in the forebrain of both flight and control animals were measured from autoradiograms. Data from rats flown in space and from ground-based control animals that were not exposed to microgravity were compared.

Author

Central Nervous System; Quantitative Analysis; Microgravity; Autoradiography; Brain Circulation; Spaceborne Experiments; Biological Effects; Gravitational Effects

19960028994; 96N29589 San Jose State Univ., Dept. of Biological Sciences., CA USA

Experiment K-7-19: Pineal Physiology After Spaceflight: Relation to Rat Gonadal Function

Holley, D. C., San Jose State Univ., USA; Soliman, M. R. I., Florida Agricultural and Mechanical Univ., USA; Krasnov, I., Institute of Biomedical Problems, USSR; Asadi, H., San Jose State Univ., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 83-99; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The function of pineal exposed to microgravity and spaceflight is studied. It is found that the spaceflight resulted in a stress response as indicated by adrenal hypertrophy, that gonadal function was compromised, and that the pineal may be linked as part of the mechanisms of the response noted.

Derived from text

Microgravity; Space Flight; Glands (Anatomy); Serotonin; Biological Effects; Spaceborne Experiments; Gravitational Effects

19960028995; 96N29590 NASA Ames Research Center, Moffett Field,CA USA

Experiment K-7-20: Pituitary Oxytocin and Vasopressin Content of Rats Flown on Cosmos 2044

Keil, L., National Aeronautics and Space Administration. Ames Research Center, USA; Evans, J., National Aeronautics and Space Administration. Ames Research Center, USA; Grindeland, R., Editor, National Aeronautics and Space Administration. Ames Research Center, USA; Krasnov, I., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 101-108; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Pituitary levels of oxytocin (OT) and vasopressin (VP) were measured in rats exposed to 14 days of spaceflight (FLT) as well as in ground-based controls; one group synchronously maintained in flight-type cages with similar feeding schedules (SYN), one group in vivarium cages (VIV), and a group of tail suspended (SUS) animals. Flight rats had significantly less (p less than 0.05) pituitary OT and VP (4.48 +/- 0.31 and 7.48 +/- 0.53 mg hormone / mg protein, n = 5) than either the SYN (6.66 +/- 0..59 and 10.98 + 1.00, n = 5), VIV (6.14 +/- 0.40 and 10.98 +/- 0..81, n = 5) or SUS (5.73 +/- 0.24, n = 4) control groups, respectively. The reduced levels of pituitary OT and VP are similar to measurements made on rats from the previous 12.5 day Cosmos 1887 mission and appear to be a direct result of exposure to spaceflight.

Author

Pituitary Hormones; Proteins; Pituitary Gland; Microgravity; Biological Effects; Spaceborne Experiments; Gravitational Effects

19960028996; 96N29591 Washington Univ., School of Medicine., Saint Louis, MO USA

Experiment K-7-21: Effect of Microgravity on 1: Metabolic Enzymes of Type 1 and Type 2 Muscle Fibers, and on 2: Metabolic Enzymes, Neurotransmitter Amino Acids, and Neurotransmitter Associated Enzymes in Selected Regions of the Central Nervous System, Part 1, Metabolic Enzymes of Individual Muscle Fibers

Lowry, O. H., Washington Univ., USA; Ilyina-Kakueva, E. I., Institute of Biomedical Problems, USSR; Krasnov, I. B., Institute of Biomedical Problems, USSR; Carter, J. G., Washington Univ., USA; Chi, M. M.-Y., Washington Univ., USA; Choksi, R., Washington Univ., USA; Manchester, J. K., Washington Univ., USA; McDougal, D. B., Washington Univ., USA; Nemeth, P. M., Washington Univ., USA; Pusateri, M. E., Washington Univ., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 109-135; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Individual fibers of any given muscle vary widely in enzyme composition, a fact obscured when enzyme levels of whole muscle are measured. Therefore, the purpose of this part of the study was to assess the effects of microgravity and hind limb suspension on the enzyme patterns within a slow twitch muscle (soleus) and a fast twitch muscle (tibialis anterior).

Author

Enzymes; Metabolism; Muscles; Microgravity; Physiological Effects; Gravitational Effects

19960028997; 96N29592 Washington Univ., School of Medicine., Saint Louis, MO USA

Experiment K-7-21: Effect of Microgravity on 1: Metabolic Enzymes of Type 1 and Type 2 Muscle Fibers, and on 2: Metabolic Enzymes, Neurotransmitter Amino Acids, and Neurotransmitter Associated Enzymes in Selected Regions of the Central Nervous System, Part 2, The Distribution of Selected Enzymes and Amino Acids in the Hippocampal Formation

Lowry, O. H., Washington Univ., USA; Krasnov, I., Institute of Biomedical Problems, USSR; Ilyina-Kakueva, E. I., Institute of Biomedical Problems, USSR; Nemeth, P. M., Washington Univ., USA; McDougal, D. B., Jr., Washington Univ., USA; Choksi, R., Washington Univ., USA; Carter, J. G., Washington Univ., USA; Chi, M. M. Y., Washington Univ., USA; Manchester, J. K., Washington Univ., USA; Pusateri, M. E., Washington Univ., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 137-154; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Six key metabolic enzymes plus glutaminase and glutamate decarboxylase, as well as glutamate, aspartate and GABA, were measured in 11 regions of the hippocampal formation of synchronous, flight and tail suspension rats. Major differences were observed in the normal distribution patterns of each enzyme and amino acid, but no substantive effects of either microgravity or tail suspension on these patterns were clearly demonstrated.

Author

Amino Acids; Enzymes; Hippocampus; Neurotransmitters; Spaceborne Experiments; Biological Effects; Metabolism; Normal Density Functions; Microgravity

19960028998; 96N29593 NASA Ames Research Center, Moffett Field,CA USA

Experiment K-7-22: Growth Hormone Regulation Synthesis and Secretion in Microgravity, Part 1, Growth Hormone Regulation Synthesis and Secretion in Microgravity

Hymer, W. C., Pennsylvania State Univ., USA; Grindeland, R., National Aeronautics and Space Administration. Ames Research Center, USA; Vale, W., Salk Inst., USA; Sawchenko, P., Salk Inst., USA; Ilyina-Kakueva, E. I., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 155-171; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Changes in the musculoskeletal, immune, vascular, and endocrine system of the rat occur as a result of short-term spaceflight. Since pituitary gland growth hormone (GH) plays a role in the control of these systems, and since the results of an earlier spaceflight mission (Spacelab 3, 1985) showed that GH cell function was compromised in a number of post-flight tests, we repeated and extended the 1985 experiment in two subsequent spaceflights: the 12.5 day mission of Cosmos 1887 (in 1987) and the 14 day mission of Cosmos 2044 (in 1989). The results of these later two flight experiments are the subject of this report. They document repeatable and significant changes in the GH cell system of the spaceflown rat in several post-flight tests.

Derived from text

Pituitary Hormones; Spaceborne Experiments; Postflight Analysis; Microgravity; Pituitary Gland; Gravitational Effects; Biological Effects

19960028999; 96N29594 NASA Ames Research Center, Moffett Field,CA USA

Experiment K-7-22: Growth Hormone Regulation Synthesis and Secretion in Microgravity, Part 2, Hypothalamic Growth Hormone-Releasing Factor, Somatostatin Immunoreactivity, and Messenger RNA Levels in Microgravity

Sawchenko, P. E., Salk Inst., USA; Arias, C., Salk Inst., USA; Krasnov, I., Institute of Biomedical Problems, USSR; Grindeland, R. E., National Aeronautics and Space Administration. Ames Research Center, USA; Vale, W., Salk Inst., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 173-182; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Immunohistochemical analyses of hypothalamic hormones carried out on tissue from rats flown on an earlier flight (Cosmos 1887) suggested preferential effects on hypophysiotropic principles involved in the regulation of growth hormone secretion and synthesis. We found that staining in the median eminence for peptides that provide both stimulatory (growth hormone-releasing factor, or GRF) and inhibitory (somatostatin, SS) influences on growth hormone secretion were depressed in flight animals relative to synchronous controls, while staining for other neuroendocrine peptides, cortocotropin-releasing factor and arginine vasopressin, were similar in these two groups. While this suggests some selective impact of weightlessness on the two principal central nervous system regulators of growth hormone dynamics, the fact that both GRF- and SS-immunoreactivity (IR) appeared affected in the same direction is somewhat problematic, and makes tentative any intimation that effects on CNS control mechanisms may be etiologically significant contributors to the sequelae of reduced growth hormone secretion seen in prolonged space flight. to provide an additional, and more penetrating, analysis we attempted in hypothalamic material harvested from animals flown on Cosmos 2044 to complement immunohistochemical analyses of GRF and SS staining with quantitative, in situ assessments of messenger RNAs encoding the precursors for both these hormones.

Derived from text

Staining; Microgravity; Spaceborne Experiments; Gravitational Effects; Hormones; Biological Effects; Hypothalamus; Immunoassay

19960029000; 96N29595 NASA Ames Research Center, Moffett Field,CA USA

Experiment K-7-22: Growth Hormone Regulation Synthesis and Secretion in Microgravity, Part 3, Plasma Analysis Hormone Measurements

Grindeland, R. E., National Aeronautics and Space Administration. Ames Research Center, USA; Popova, I. A., Institute of Biomedical Problems, USSR; Grossman, E., National Aeronautics and Space Administration. Ames Research Center, USA; Rudolph, I., National Aeronautics and Space Administration. Ames Research Center, USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 183-192; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Plasma from space flight and tail suspended rats was analyzed for a number of constituents in order to evaluate their metabolic status and endocrine function. The data presented here cover plasma hormone measurements. Corticosterone, thyroxine, and testosterone were measured by radioimmunoassay. Prolactin and growth hormone were measured by double antibody immunoassays using hormones and antisera prepared in house. Data were evaluated by analysis of variance.

Derived from text

Blood Plasma; Microgravity; Gravitational Effects; Biological Effects; Metabolism; Immunoassay; Pituitary Hormones

19960029001; 96N29596 NASA Ames Research Center, Moffett Field,CA USA

Experiment K-7-23: Effect of Spaceflight on Level and Function of Immune Cells, Part 1, Immunology Studies

Sonnenfeld, G., Louisville Univ., USA; Mandel, A., National Aeronautics and Space Administration. Ames Research Center, USA; Konstantinova, I. V., Institute of Biomedical Problems, USSR; Berry, W. D., Louisville Univ., USA; Taylor, G. R., NASA Johnson Space Center, USA; Lesnyak, A. T., Institute of Biomedical Problems, USSR; Fuchs, B. B., Akademiya Meditsinskikh Nauk SSSR, Russia; Rakhmilevich, A. L., Akademiya Meditsinskikh Nauk SSSR, Russia; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 193-206; In English; Also announced as 19960028989

Contract(s)/Grant(s): NAG2-614; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Two different experiments were carried out in this segment of the immunology protocol for samples received from rats flown on Cosmos 2044. Control groups included vivarium, synchronous and antiorthostatically suspended rats. In the first experiment, rat bone marrow cells were examined in Moscow for their response to recombinant murine colony stimulating factor-granulocyte / monocyte (CSF-GM). In the second experiment, rat spleen and bone marrow cells were stained in Moscow with a variety of antibodies directed against cell surface antigenic markers. These cells were preserved and shipped to the USA for analysis on a flow cytometer. The results of the studies indicated that bone marrow cells from flown and suspended rats showed a decreased response to CSF-GM as compared to bone marrow cells from control rats. Spleen cells from flown rats showed increased percentages of suppressor-cytotoxic-T and helper-T cells amongst the entire cell population. Bone marrow cells showed an increase in the percentage of helper-T cells in the myelogenous population and increased percentages of anti-asialo GM-1 bearing, interleukin-2 receptor bearing, pan-T and helper-T cells in the lymphocytic population. Cell populations from rats suspended antiorthostatically did not follow the same pattern of distribution of leukocytes as cell populations for flown rats. These results are similar, but not identical to, earlier results from Cosmos 1887, and confirm that space flight can have profound effects on immune system components and activities.

Author

Immune Systems; Immunology; Bone Marrow; Spleen; Microgravity; Spaceborne Experiments; Cells (Biology); Gravitational Effects; Biological Effects

19960029002; 96N29597 Pennsylvania State Univ., Dept. of Molecular and Cell Biology., University Park, PA USA

Experiment K-7-23: Effect of Spaceflight on Level and Function of Immune Cells, Part 2, Proliferation and Cytokines

Nash, P. V., Pennsylvania State Univ., USA; Konstantinova, I. V., Institute of Biomedical Problems, USSR; Fuchs, B. B., Akademiya Meditsinskikh Nauk SSSR, Russia; Rakhmilevich, A. L., Akademiya Meditsinskikh Nauk SSSR, Russia; Lesnyak, A. T., Institute of Biomedical Problems, USSR; Mastro, A. M., Pennsylvania State Univ., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 207-219; In English; Also announced as 19960028989

Contract(s)/Grant(s): NAG2-599; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Lymphocytes from the superficial inguinal lymph nodes of rats flown on the Cosmos 2044 space mission were tested for proliferation in response to polyclonal activators. Cells were cultured with T or B cell mitogens, phorbol ester and calcium ionophore, or T cell mitogen and the lymphokines interleukin-1 (IL-1) or interleukin-2 (IL-2), and assayed for DNA synthesis by (3)H-thymidine incorporation. Lymphocytes also were incubated with concanavalin A (Con A), a T cell mitogen, and tested for IL-2 production. Mitogen-stimulated proliferation of lymphocytes from rats exposed to microgravity was not significantly different from synchro-

nous or vivarium controls. Responses to Con A and IL-2, and Con A and IL-1 likewise were unaffected by space flight. Lymphocytes from all of these groups responded well to phorbol ester and calcium ionophore stimulation. Furthermore, lymph node cells (LNC) from control rats and rats flown on Cosmos 2044 produced similar amounts of IL-2. The results obtained using hindlimb suspended rats were notably different from those of flight and control animals. LNC from suspended rats generally had greater proliferative responses to T cell mitogens than did lymphocytes from other groups. Responsiveness to a B cell mitogen was not enhanced. Con A-stimulated LNC from hindlimb suspended rats also produced more IL-2 than did lymphocytes from the other groups. This difference was statistically significant at both IL-2 induction times tested.

Author

Lymphocytes; Immune Systems; Immunoassay; Biological Effects; Gravitational Effects; Spaceborne Experiments; Microgravity; Regeneration (Physiology)

19960029003; 96N29598 California Univ., San Diego, Dept. of Medicine., La Jolla, CA USA

Experiment K-7-28: Lung Morphology Study

West, J. B., California Univ., San Diego, USA; Elliott, A. R., California Univ., San Diego, USA; Mathieu-Costello, O., California Univ., San Diego, USA; Kaplansky, A. S., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 221-231; In English; Also announced as 19960028989

Contract(s)/Grant(s): NAG2-616; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

There are no previous studies investigating the effect of microgravity exposure during spaceflight on lung tissue. We examined the ultrastructure of the left lungs of 5 Czechoslovakian Wistar rats flown on the 13 day, 19+ hr. Cosmos 2044 mission, and compared them to 5 vivarium and 5 synchronous controls at 1-g conditions, and 5 rats exposed to 14 days of tail-suspension. Within 10 minutes of sacrifice by decapitation, the lungs were removed and immersed in 3% glutaraldehyde in 0.1M phosphate buffer (total osmolarity of the fixative: 560 mOsm; pH = 7.4). The tissue stored at 5 C was transported to our laboratory where it was processed for light and electron microscopy. No significant perivascular cuffing caused by interstitial edema was present in the tissue samples. Some of the flight, tail-suspended, and synchronous control rats showed alveolar edema, while vivarium controls did not. The pulmonary capillaries appeared to be more congested in the flight animals than in the other groups. This could be related to the increased hematocrit due to the microgravity exposure. In all 5 flight, 4 tail-suspended, and 3 synchronous rats, red blood cells (RBC) were present in the alveolar spaces. The RBC were either suspended free in the alveoli or observed lining the alveolar wall. The frequency of RBC lining the alveolar walls appeared greater in the dorsal (gravity non-dependent) than in ventral (gravity dependent) regions of the lung in these three animal groups. In 3 of the vivarium controls, a few RBC were found in the alveolar spaces. Intra-capillary fluid-filled vesicles were observed in the flight, tail-suspended and synchronous animals, but not in the vivarium controls. The formation of intra-capillary fluid-filled vesicles has been previously associated with pulmonary hypertension induced by high altitude exposure and mitral stenosis. In conclusion, pulmonary hemorrhage and alveolar edema of unknown origin occurred to a greater extent in the flight, tail-suspended, and synchronous control animals, and in the dorsal regions of the lung when compared to the vivarium controls. The etiology of these changes, which are possibly due to an increase in pulmonary vascular pressure, requires further investigation.

Author

Lungs; Lung Morphology; Microgravity; Physiological Effects; Gravitational Effects; Spaceborne Experiments

19960029004; 96N29599 NASA Ames Research Center, Moffett Field,CA USA

Experiment K-7-29: Connective Tissue Studies, Part 1, Rat Skin, Normal and Repair

Vailas, A. C., Wisconsin Univ., USA; Grindeland, R., National Aeronautics and Space Administration. Ames Research Center, USA; Ashman, R., Texas Univ., USA; Choy, V., Wisconsin Univ., USA; Durnova, G., Institute of Biomedical Problems, USSR; Graf, B., Wisconsin Univ., USA; Griffith, P., Wisconsin Univ., USA; Kaplansky, A. S., Institute of Biomedical Problems, USSR; Kolis, S., Wisconsin Univ., USA; Martinez, D., Wisconsin Univ., USA; Rao, J. S., Veterans Administration Hospital, USA; Rayford, A. R., Veterans Administration Hospital, USA; Reddy, B. R., Veterans Administration Hospital, USA; Sears, J., Iowa Univ., USA; Thielke, R., Wisconsin Univ., USA; Ulm, M., Wisconsin Univ., USA; Vanderby, R., Wisconsin Univ., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 233-238; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The skin repair studies started to be problematic for the following reasons: (1) It was very difficult to locate the wound and many lesions were not of the same dimensions. A considerable amount of time was devoted to the identification of the wound using polarized light. We understand that this experiment was added on to the overall project. Marking of the wound site and standard dimensions should be recommended for the next flight experiment. (2) The tissue was frozen, therefore thawing and fixation caused problems with some of the immunocytochemical staining for obtaining better special resolution with light microscopy image processing. Despite these problems, we were unable to detect any significant qualitative differences for the following wound markers: (1) Collagen Type 3, (2) Hematotoxylin and EOSin, and (3)

Macrophage Factor 13. All protein markers were isolated from rat sources and antibodies prepared and tested for cross reactivity with other molecules at the University of Wisconsin Hybridoma Facility. However, rat skin from the non lesioned site 'normal' showed interesting biochemical results. Skin was prepared for the following measurements: (1) DNA content, (2) Collagen content by hydroxyproline, and (3) uronic acid content and estimation of ground substance. The results indicated there was a non-significant increase (10%) in the DNA concentration of skin from flight animals. However, the data expressed as a ratio DNA/Collagen estimates the cell or nuclear density that supports a given quantity of collagen showed a dramatic increase in the flight group (33%). This means flight conditions may have slowed down collagen secretion and/or increased cell proliferation in adult rat skin. Further biochemical tests are being done to determine the crosslinking of elastin which will enhance the insight to assessing changes in skin turnover.
Derived from text
Cells (Biology); Skin (Anatomy); Deoxyribonucleic Acid; Collagens; Physiological Effects; Gravitational Effects; Spaceborne Experiments

19960029005; 96N29600 Kansas Univ., Kansas City, KS USA
Experiment K-7-29: Connective Tissue Studies, Part 2, Changes in Muscle Serine Proteases, Serpins and Matrix Molecules
Festoff, B. W., Kansas Univ., USA; Ilyina-Kakueva, E. I., Institute of Biomedical Problems, USSR; Rayford, A. R., Veterans Administration Hospital, USA; Burkovskaya, T. E., Institute of Biomedical Problems, USSR; Reddy, B. R., Veterans Administration Hospital, USA; Rao, J. S., Veterans Administration Hospital, USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 239-254; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

In zero or micro-gravity, type 1 muscle fibers atrophy and lose predominance, especially in slow-twitch muscles. No increase in mononuclear cells has been observed, just as in simple denervation, where both types 1 and 2 fibers atrophy, again without infiltration of cells, but with clear satellite cell proliferation. However, extracellular matrix (ECM) degradation takes place after denervation and if re-innervation is encouraged, functional recovery to near control levels may be achieved. No information is available concerning the ECM milieu, the activation of serine proteases, their efficacy in degrading ECM components and the production of locally-derived natural protease inhibitors (serpins) in effecting surface proteolytic control. In addition, no studies are available concerning the activation of these enzymes in micro- or zero gravity or their response to muscle injury on the ground and what alterations, if any, occur in space. These studies were the basis for the experiments in Cosmos 2044.
Derived from text
Protease; Microgravity; Connective Tissue; Cells (Biology); Physiological Effects; Gravitational Effects; Muscles

19960029006; 96N29601 West Virginia Univ., Morgantown, VA USA
Experiment K-7-29: Connective Tissue Studies, Part 3, Rodent Tissue Repair: Skeletal Muscle
Stauber, W., West Virginia Univ., USA; Fritz, V. K., West Virginia Univ., USA; Burkovskaya, T. E., Institute of Biomedical Problems, USSR; Ilyina-Kakueva, E. I., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 255-269; In English; Also announced as 19960028989
Contract(s)/Grant(s): NAG2-590; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Myofiber injury-repair was studied in the rat gastrocnemius following a crush injury to the lower leg prior to flight in order to understand if the regenerative responses of muscles are altered by the lack of gravitational forces during Cosmos 2044 flight. After 14 days of flight, the gastrocnemius muscle was removed from the 5 injured flight rodents and various Earth-based treatment groups for comparison. The Earth-based animals consisted of three groups of five rats with injured muscles from a simulated, tail-suspended, and vivarium as well as an uninjured basal group. The gastrocnemius muscle from each was evaluated by histochemical and immunohistochemical techniques to document myofiber, vascular, and connective tissue alterations following injury. In general the repair process was somewhat similar in all injured muscle samples with regard to extracellular matrix organization and myofiber regeneration. Small and large myofibers were present with a newly organized extracellular matrix indicative of myogenesis and muscle regeneration. In the tail-suspended animals, a more complete repair was observed with no enlarged area of non-muscle cells or matrix material visible. In contrast, the muscle samples from the flight animals were less well differentiated with more macrophages and blood vessels in the repair region but small myofibers and proteoglycans, nevertheless, were in their usual configuration. Thus, myofiber repair did vary in muscles from the different groups, but for the most part, resulted in functional muscle tissue.
Author
Muscles; Injuries; Connective Tissue; Physiological Effects; Gravitational Effects; Regeneration (Physiology); Spaceborne Experiments; Microgravity

19960029007; 96N29602 NASA Ames Research Center, Moffett Field,CA USA
Comparison of the Physiology of the Spaceflight and Hindlimb Suspended Rat
Grindeland, R. E., National Aeronautics and Space Adminis-

tration. Ames Research Center, USA; Booth, F. W., Texas Univ., USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 273-281; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The suspended rat has been used extensively as a simulation of the spaceflight animal. In suspension, hindlimbs are unloaded from the acceleration of gravity, much as they are in spaceflight. Comparisons of data from spaceflight (microgravity) and suspended (1G) rats have suggested that suspension my be an appropriate model, but no direct comparisons had been made between the spaceflight and suspended rat. Cosmos 2044 afforded the first opportunity to directly compare the effects of hindlimb suspension (HS) and spaceflight (SF) on a broad range of physiological and histological parameters. This paper reports on the comparison of skelton, skeletal muscle, heart, neural, pulmonary, kidney, liver, intestine, blood plasma, immune function, red blood cells, and endocrine and reproductive functions and systems.

Derived from text

Suspending (Hanging); Physiological Effects; Gravitational Effects; Spaceborne Experiments; Microgravity; Weightlessness Simulation

19960029008; 96N29603 Mount Sinai School of Medicine, New York, NY USA

Experiment K-7-30: Effects of Spaceflight in the Cosmos Biosatellite 2044 on the Vestibular-Ocular Reflex (VOR) of Rhesus Monkeys

Cohen, B., Mount Sinai School of Medicine, USA; Cohen, N., Mount Sinai School of Medicine, USA; Helwig, D., Mount Sinai School of Medicine, USA; Solomon, D., Mount Sinai School of Medicine, USA; Kozlovskaya, I., Institute of Biomedical Problems, USSR; Sirota, M., Institute of Biomedical Problems, USSR; Yakushin, S., Institute of Biomedical Problems, USSR; Raphan, T., City Univ. of New York, USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 285-302; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This technical paper discusses the following: (1) The VOR of two rhesus monkeys was studied before and after 14 days of spaceflight to determine effects of microgravity on the VOR. Horizontal, vertical and roll eye movements were recorded in these and six other monkeys implanted with scleral search coils. Animals were rotated about a vertical axis to determine the gain of the horizontal, vertical and roll VOR. They were rotated about axes tilted from the vertical (off-vertical axis rotation, OVAR) to determine steady state gains and effects of gravity on modulations in eye position and eye velocity. They were also tested for tilt dumping of post-rotatory nystagmus. (2) The gain of the horizontal VOR was close to unity when animals were tested 15 and 18 hours after flight. VOR gain values were similar to those registered before flight. If the gain of the horizontal VOR changes in microgravity, it must revert to normal soon after landing. (3) Steady state velocities of nystagmus induced by off-vertical axis rotation (OVAR) were unchanged by adaptation to microgravity, and the phase of the modulations was similar before and after flight. However, modulations in horizontal eye velocity had more variation after landing and were on mean about 50% larger for angles of tilt of the axis of rotation between 50 and 90?/s after flight. This difference was similar in both animals and was significant. (4) A striking finding was that tilt dumping was lost in the one animal tested for this function. This loss persisted for several days after return. This is reminiscent of the loss of response to pitch while rotating in the M-131 experiments of Skylab, and must be studied in detail in future spaceflights. (5) Thus, two major findings emerged from these studies: after spaceflight the modulation of horizontal eye velocity was larger during OVAR, and one animal lost its ability to tilt-dump its nystagmus. Both findings are consistent with the postulate that adaptation to microgravity causes alterations in the way that otolith information is processed in the central nervous system. The experiments lay the groundwork for studying the vertical and roll VOR before and after future space flights, as well as for studying modulations in vertical and roll eye position during OVAR and tilt dumping.

Author

Space Flight; Gravitational Effects; Microgravity; Monkeys; Vestibules; Reflexes; Physiological Effects; Aerospace Environments

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Experiment K-7-31: Studies of Vestibular Primary Afferents and Eye Movements in Normal, Hypergravity and Hypogravity - Axon Cosmos Flight 2044

Correia, M. J., Texas Univ., USA; Perachio, A. A., Texas Univ., USA; Dickman, J. D., Mississippi Univ., USA; Kozlovskaya, I., Institute of Biomedical Problems, USSR; Sirota, M., Institute of Biomedical Problems, USSR; Yakushin, S., Institute of Biomedical Problems, USSR; Beloozerova, I. N., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 303-331; In English; Also announced as 19960028989

Contract(s)/Grant(s): NAG2-446; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Fourteen days of active head movements in microgravity appear to modify the gain and neural adaptation properties of the horizontal semicircular canals in the rhesus monkey. This is the first demonstration of adaptive plasticity in the sensory receptor. Reversing prisms, for example, do not modify the gain of the primary afferent response. Pulse yaw rotation, sinusoidal rotation, and sum of sinusoidal rotation testing during the first day following recovery revealed that the gain of a sample of afferents was significantly greater than the gain

derived from afferent responses obtained during pre-flight and control monkey testing. There was no strong evidence of tilt sensitivity in the sample of afferents that we tested either during the pre-flight or control tests or during the first day post-flight. Two irregular afferents tested on postflight day 2 showed changes with tilt but the responses were not systematic. The spontaneous discharge did not change following flight. Mean firing rate and coefficient of variation remained constant during the post flight tests and was near the value measured during pre flight tests. The change in gain of horizontal canal afferents might be adaptive. The animals were required to look at a target for food. This required active head and eye movements. Active head movements have been shown to be hypometric and eye movements have been shown to be hypermetric during the first few days of past Cosmos flights (see introduction). It might be that the increased gain in the horizontal semicircular canals permit accurate target acquisition during hypometric head movements by driving the eyes to greater angles for smaller angles of head movement. The mechanism by which the semicircular canals recalibrate (increase their gain) is unknown. The efferent vestibular system is a logical candidate. Horizontal nystagmus during rotation about an earth vertical axis with the horizontal semicircular canals in the plane of rotation produced the same response during postflight day 1 and post-flight day 9. But when the head was pitched down 45? the nystagmus slow phase velocity was greater and the duration was about twice during post-flight day 1. Apparently, this response involving the interaction of the horizontal and vertical semicircular canals and the otoliths did not recalibrate during post-flight day 1. The 'DC' bias of the slow phase velocity of the horizontal nystagmus during constant velocity horizontal axis rotation was roughly 4 times for one flight monkey and roughly 2 times for the other on post-flight day 1 compared to post-flight day 9. These results suggest that the otolith mediated response during constant velocity rotation also did not recalibrate on post-flight day 1.
Derived from text
Microgravity; Afferent Nervous Systems; Eye Movements; Head Movement; Space Flight; Vestibules; Monkeys; Gravitational Physiology

19960029010; 96N29605 California Univ., Los Angeles, CA USA
Experiment K-7-33: Functional Neuromuscular Adaptation to Spaceflight
Edgerton, V. R., California Univ., USA; Bodine-Fowler, S., California Univ., USA; Hodgson, J. A., California Univ., USA; Roy, R. R., California Univ., USA; Kozlovskaya, I. B., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 333-352; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The following data were collected from two Rhesus monkeys (782 and 2483) that were flown aboard a 14-day biosatellite mission (COSMOS 2044). The proposed study was designed to determine the effects of the absence of weight support on flexor and extensor muscles of the hindlimb. These effects were assessed morphologically and biochemically from muscle biopsies taken from a slow extensor, the soleus; a fast extensor, the medial gastrocnemius; and a fast flexor, the tibialis anterior. A second objective of this study was to determine the relative importance of activity (as determined by intramuscular electromyography, and force (as determined by joint torque) on the adaptation of muscle.
Author
Muscles; Monkeys; Space Flight; Gravitational Physiology; Microgravity; Gravitational Effects; Flexors

19960029011; 96N29606 California Univ., Dept. of Animal Physiology., Davis, CA USA
Experiment K-7-35: Circadian Rhythms and Temperature Regulation During Spaceflight, Part 1, Circadian Rhythms and Temperature Regulation
Fuller, C. A., California Univ., USA; Alpatov, A. M., Institute of Biomedical Problems, USSR; Hoban-Higgins, T. M., California Univ., USA; Klimovitsky, V. Y., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 353-360; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Mammals have developed the ability to adapt to most variations encountered in their everyday environment. For example, homeotherms have developed the ability to maintain the internal cellular environment at a relatively constant temperature. Also, in order to compensate for temporal variations in the terrestrial environment, the circadian timing system has evolved. However, throughout the evolution of life on earth, living organisms have been exposed to the influence of an unvarying level of earth's gravity. As a result changes in gravity produce adaptive responses which are not completely understood. In particular, spaceflight has pronounced effects on various physiological and behavioral systems. Such systems include body temperature regulation and circadian rhythms. This program has examined the influence of microgravity on temperature regulation and circadian timekeeping systems in Rhesus monkeys. Animals flown on the Soviet Biosatellite, COSMOS 2044, were exposed to 14 days of microgravity while constantly monitoring the circadian patterns temperature regulation, heart rate and activity. This experiment has extended our previous observations from COSMOS 1514, as well as providing insights into the physiological mechanisms that produce these changes.
Derived from text
Monkeys; Circadian Rhythms; Microgravity; Space Flight; Thermoregulation; Physiological Effects; Aerospace Environments

19960029012; 96N29607 California Univ., Dept. of Animal Physiology., Davis, CA USA

Experiment K-7-35: Circadian Rhythms and Temperature Regulation During Spaceflight, Part 2, Metabolism

Fuller, C. A., California Univ., USA; Dotsenko, M. A., Institute of Biomedical Problems, USSR; Korolkov, V. I., Institute of Biomedical Problems, USSR; Griffin, D. W., California Univ., USA; Stein, T. P., Medicine and Dentistry Univ. of New Jersey, USA; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 361-383; In English; Also announced as 19960028989

Contract(s)/Grant(s): NAG2-587; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Energy expenditure can be regarded as the sum of two components; the basal metabolic rate and the energy costs of activity. Weight loss is usually associated with an energy deficit. A negative energy balance exists when energy intake is less that energy utilization. The deficit is made up by tissue catabolism (principally fat, but also some protein). by analyzing food and water intake, urine and fecal output, and changes in body weight, the Skylab investigators reached the unexpected conclusion that energy expenditure during spaceflight was about 5% greater than at 1 G (Leonard, 1983; Rambaut et al., 1977). Possible explanations for the human metabolic responses are an increased workload during spaceflight (Leonard, 1983), or as Rambaut and co-workers (1977) suggested, a progressive decrease in metabolic efficiency. It is likely to be very difficult to distinguish between these two possibilities in man because the activity component may be different during spaceflight than it is the ground. The problem is to measure energy expenditure with efficient precision during spaceflight in a non-invasive manner which will not interfere with other investigations or take an time. The doubly labeled water (DLW) method meets these criteria. The DLW method is the only method available for continuously measuring energy expenditure during spaceflight given the severely restricted conditions in the spaceflight environment. Therefore, this study focuses on the development and use of this procedure on nonhuman primates during spaceflight. Energy expenditure and total body water was determined in two Rhesus monkeys by the doubly labeled water (2H2'80) method. Three determinations were made. Monkey B (#2483) was studied twice, during the flight of COSMOS 2044 and during a follow-up ground control study a month later. A second monkey was studied on the ground only (Monkey D, #782). Derived from text

Energy Conservation; Metabolism; Space Flight; Workloads (Psychophysiology); Monkeys; Body Weight

19960029013; 96N29608 San Francisco Univ., Physics Research Lab., CA USA

Experiment K-7-41: Radiation Experiments on Cosmos 2044

Benton, E. V., San Francisco Univ., USA; Benton, E. R., San Francisco Univ., USA; Frank, A. L., San Francisco Univ., USA; Dudkin, V. E., Institute of Biomedical Problems, USSR; Marenny, A. M., Institute of Biomedical Problems, USSR; Kovalev, E. E., Institute of Biomedical Problems, USSR; US Experiments Flown on the Soviet Biosatellite Cosmos 2044; Sep. 1994, pp. 387-424; In English; Also announced as 19960028989; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The Cosmos 2044 biosatellite mission offered the opportunity for radiation measurements under conditions which are seldom available (an inclination of 82.3 degrees and altitude of 294 x 216 km). Measurements were made on the outside of the spacecraft under near-zero shielding conditions. Also, this mission was the first in which active temperature recorders (the ATR-4) were flown to record the temperature profiles of detector stacks. Measurements made on this mission provide a comparison and test for modeling of depth doses and LET spectra for orbital parameters previously unavailable. Tissue absorbed doses from 3480 rad (252 rad/d) down to 0.115 rad (8.33 mrad/d) were measured at different depths (0.0146 and 3.20 g/sq. cm, respectively) with averaged TLD readings. The LET spectra yielded maximum and minimum values of integral flux of 27.3 x 10-4 and 3.05 x 10(exp -4) cm(exp -2).s(exp -1).sr(exp -4) of dose rate of 7.01 and 1.20 mrad/d, and of dose equivalent rate of 53.8 and 11.6 mrem/d, for LET(infinity).H2O is greater than or equal to 4 keV/micro-m. Neutron measurements yielded 0.018 mremld in the thermal region, 0.25 mrem/d in the resonance region and 3.3 mrem/d in the high energy region. The TLD depth dose and LET spectra have been compared with calculations from the modeling codes. The agreement is good but some further refinements are in order. In comparing measurements on Cosmos 2044 with those from previous Cosmos missions (orbital inclinations of 62.8 degrees) there is a greater spread (maximum to minimum) in depth doses and an increased contribution from GCR's, and higher LET particles, in the heavy particle fluxes. Author

Biosatellites; Radiation Effects; Cosmic Rays; Spaceborne Experiments; Spacecraft Shielding; Radiation Dosage

19960029065; 96N29628 NASA Kennedy Space Center, Cocoa Beach, FL USA

Performance and reliability of the NASA Biomass Production Chamber

Sager, J. C., NASA Kennedy Space Center, USA; Chetirkin, P. V., Bionetics Corp., USA; Jan. 1994; ISSN 0273-11774p; Repr. from Adv. Space Res., vol. 14, no. 11, pp. (11)327-(11)330, 1994; In English

Report No.(s): NASA-TM-111240; NAS 1.15:111240; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Biomass Production Chamber (BPC) at the Kennedy Space Center is part of the Controlled Ecological Life Support System (CELSS) Breadboard Project. Plants are grown in a closed environment in an effort to quantify their contributions

to the requirements for life support. Performance of this system is described. Also, in building this system, data from component and subsystem failures are being recorded. These data are used to identify problem areas in the design and implementation. The techniques used to measure the reliability will be useful in the design and construction of future CELSS. Possible methods for determining the reliability of a green plant, the primary component of a CELSS, are discussed.
Author
Biomass; Breadboard Models; Closed Ecological Systems; Ecosystems; Plants (Botany); Food Production (In Space); Reliability

19960029118; 96N29653 Universities Space Research Association, Div. of Space Life Sciences., Houston, TX USA
NASA space life sciences research and education support program ***Final Report, 1 Dec. 1990-30 Sep. 1995***
Jones, Terri K., Universities Space Research Association, USA; Sep. 30, 199570p; In English
Contract(s)/Grant(s): NAS9-18440
Report No.(s): NASA-CR-199854; NAS 1.26:199854; Report # MA-262T; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

USRA's Division of Space Life Sciences (DSLS) was established in 1983 as the Division of Space Biomedicine to facilitate participation of the university community in biomedical research programs at the NASA Johnson Space Center (JSC). The DSLS is currently housed in the Center for Advanced Space Studies (CASS), sharing quarters with the Division of Educational Programs and the Lunar and Planetary Institute. The DSLS provides visiting scientists for the Johnson Space Center; organizes conferences, workshops, meetings, and seminars; and, through subcontracts with outside institutions, supports NASA-related research at more than 25 such entities. The DSLS has considerable experience providing visiting scientists, experts, and consultants to work in concert with NASA Life Sciences researchers to define research missions and goals and to perform a wide variety of research administration and program management tasks. The basic objectives of this contract have been to stimulate, encourage, and assist research and education in the NASA life sciences. Scientists and experts from a number of academic and research institutions in this country and abroad have been recruited to support NASA's need to find a solution to human physiological problems associated with living and working in space and on extraterrestrial bodies in the solar system.
Derived from text
Solar System; Life Sciences; Project Management; NASA Programs; Aerospace Medicine

19960029177; 96N29685 Lockheed Martin Engineering and Sciences Co., Moffett Field, CA USA
Specimen Sample Preservation for Cell and Tissue Cultures
Meeker, Gabrielle, Lockheed Martin Engineering and Sciences Co., USA; Ronzana, Karolyn, Lockheed Martin Engineering and Sciences Co., USA; Schibner, Karen, Lockheed Martin Engineering and Sciences Co., USA; Evans, Robert, Lockheed Martin Engineering and Sciences Co., USA; Feb. 199682p; In English; Original contains 12 color illustrations
Contract(s)/Grant(s): NAS2-14263
Report No.(s): NASA-CR-196698; A-961095; NAS 1.26:196698; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The era of the International Space Station with its longer duration missions will pose unique challenges to microgravity life sciences research. The Space Station Biological Research Project (SSBRP) is responsible for addressing these challenges and defining the science requirements necessary to conduct life science research on-board the International Space Station. Space Station will support a wide range of cell and tissue culture experiments for durations of 1 to 30 days. Space Shuttle flights to bring experimental samples back to Earth for analyses will only occur every 90 days. Therefore, samples may have to be retained for periods up to 60 days. This presents a new challenge in fresh specimen sample storage for cell biology. Fresh specimen samples are defined as samples that are preserved by means other than fixation and cryopreservation. The challenge of long-term storage of fresh specimen samples includes the need to suspend or inhibit proliferation and metabolism pending return to Earth-based laboratories. With this challenge being unique to space research, there have not been any ground based studies performed to address this issue. It was decided hy SSBRP that experiment support studies to address the following issues were needed: Fixative Solution Management; Media Storage Conditions; Fresh Specimen Sample Storage of Mammalian Cell/Tissue Cultures; Fresh Specimen Sample Storage of Plant Cell/Tissue Cultures; Fresh Specimen Sample Storage of Aquatic Cell/Tissue Cultures; and Fresh Specimen Sample Storage of Microbial Cell/Tissue Cultures. The objective of these studies was to derive a set of conditions and recommendations that can be used in a long duration microgravity environment such as Space Station that will permit extended storage of cell and tissue culture specimens in a state consistent with zero or minimal growth, while at the same time maintaining their stability and viability.
Author
Cells (Biology); Microgravity; Preserving; Space Transportation System Flights; Tissues (Biology); Viability; Spaceborne Experiments; Samples

19960029190; 96N29696 Old Dominion Univ., Dept. of Oceanography., Norfolk, VA USA
Physical-biological modeling studies ***Final Report, 1 Jul. 1990 - 31 Dec. 1995***
Hofmann, Eileen E., Principal Investigator, Old Dominion

Univ., USA; Jan. 09, 199610p; In English
Contract(s)/Grant(s): N00014-90-J-1930
Report No.(s): AD-A303624; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The primary accomplishment from the CTZ modeling work is the development and implementation of a combined biological, bio-optical and circulation model. This model is the first of this type to be applied to coastal ocean processes. The Lagrangian calculations showed that Taylor Caps are important in retaining plankton populations over seamounts. The combined biological, bio-optical and circulation models for the CTZ will likely serve as a prototype for future development of interdisciplinary models for coastal marine systems. The seamount Lagrangian particle simulations provided a better understanding of the relative contribution of circulation and biological processes to particle retention around these topographic features.
DTIC
Oceanography; Oceans; Activity (Biology); Plankton; Populations; Seamounts; Lagrangian Function

19960029244; 96N29741 Mount Sinai School of Medicine, Dept. of Biomathematical Science., New York, NY USA
Structure and sequence coding in proteins: Methods and applications ***Final Report, 1 Oct. 1994-30 Sep. 1995***
Rackovsky, Shalom R., Mount Sinai School of Medicine, USA; Jan. 23, 19965p; In English
Contract(s)/Grant(s): N00014-95-1-0002
Report No.(s): AD-A303676; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The characteristics of the inverse protein folding code,specifying the sequences which can be associated with a particular local fold, have been investigated. Methods development continues on the use of amino acid clustering for data compression. We are also investigating the relationship between protein structural symmetry and the distribution of amino acid properties along sequences.
DTIC
Amino Acids; Symmetry; Proteins

19960031917; 96N29909 NASA Washington, Washington, DC USA
Life Sciences Program Tasks and Bibliography ***Topical Report, Fiscal Year 1995***
Jun. 1996473p; In English
Contract(s)/Grant(s): NASw-5000
Report No.(s): NASA-TM-4751; NAS 1.15:4751; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

This document includes information on all peer reviewed projects funded by the Office of Life and Microgravity Sciences and Applications, Life Sciences Division during fiscal year 1995. Additionally, this inaugural edition of the Task Book includes information for FY 1994 programs. This document will be published annually and made available to scientists in the space life sciences field both as a hard copy and as an interactive Internet web page
Author
Bibliographies; Life Sciences; Bioastronautics; Aerospace Medicine; Spaceborne Experiments; Biological Effects; Microgravity; Exobiology; Life Support Systems

19960031955; 96N29943 Norwegian Defence Research Establishment, Forsvarets Forskningsinstituttt; Div. of Toxicology., Kjeller, Norway
The cerebral metabolism of amino acids and related metabolites as studies by C-13 and C-14 labelling
Hassel, Bjornar, Norwegian Defence Research Establishment, Norway; Nov. 22, 1995103p; In English
Report No.(s): AD-A304187; NDRE/PUBLICATION-95-05140; ISBN 82-464-0032-0; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The present investigations show the feasibility of analyzing the cerebral metabolism of amino acids and related metabolites by C-13 and C-14 labelling using labelled acetate and glucose as markers for glial and neuronal metabolism, respectively. Using (C-13) acetate, it was shown that glial cells export 60% of their TCA cycle intermediates, mostly as glutamine, and that this glutamine is used by neurons partly as an energy reserve, partly it is converted directly to glutamate and GABA. Using (C-13) glucose, the glial process of pyruvate carboxylation was shown to compensate fully for the loss of glutamine. The mechanism of action of two neurotoxins, fluorocitrate and 3-nitropropionate, was elucidated. The latter toxin was shown to inhibit the TCA cycle of GABAergic neurons selectively. Formation of pyruvate and lactate from glial TCA cycle intermediates was demonstrated in vivo. This pathway may be important for the glial inactivation of transmitter glutamate and GABA. The results illustrate glia- neuronal interactions, and they suggest the applicability of 13CNMR spectroscopy to the detailed study of the cerebral metabolism of amino acids in the intact, unanesthetized human brain.
DTIC
Neurophysiology; Neurons; Metabolism; Glucose; Cerebrum; Carboxylation; Carbon 14; Carbon 13; Brain; Amino Acids

19960032629; 96A63345
Supported membranes: scientific and practical applications
Sackmann, E., Technische Universitaet, Germany; Science; January 5 1996; ISSN 0036-8075; vol. 271, no. 5245, pp. 43-48; In English; Copyright; Avail: Issuing Activity

Scientific and practical applications of supported lipid-protein bilayers are described. Membranes can be covalently coupled to or separated from solids by ultrathin layers of water or soft polymer cushions. The latter systems maintain the

structural and dynamic properties of free bilayers, forming a class of models of biomembranes that allow the application of a manifold of surface-sensitive techniques. They form versatile models of low-dimensionality complex fluids, which can be used to study interfacial forces and wetting phenomena, and enable the design of phantom cells to explore the interplay of lock-and-key forces (such as receptor-ligand binding) and universal forces for cell adhesion. Practical applications are the design of (highly selective) receptor surfaces of biosensors on electrooptical devices or the biofunctionalization of inorganic solids.
Author (EI)
Lipids; Membranes; Proteins; Solids; Thin Films; Tissues (Biology)

19960033519; 96A64034
Pre-failure toughening mechanisms in the dentine of the narwhal tusk: microscopic examination of stress/strain induced microcracking
Zioupos, P., Univ of York, UK; Currey, J. D.; Journal of Materials Science Letters; June 1 1996; ISSN 0261-8028; vol. 15, no. 11, pp. 991-994; In English; Copyright; Avail: Issuing Activity

Microscopic examination suggests that narwhal (Monodon monoceros) dentine has three quite different mechanisms for toughening. One makes use of the difference in properties of fully mineralized dentine and the hypomineralized, interglobular dentine. The second mechanism makes it easier for a crack to form along the fibrillar direction. A third, more classical mechanism makes use of the fact that dentine is arranged in layers, coaxial to the long axis of the tusk. The latter two mechanisms act so as to deflect a macrocrack off its main route.
Author (EI)
Bones; Crack Initiation; Elastic Properties; Failure; Laser Applications; Microscopy; Yield Strength

19960033785; 96A64300
Monte Carlo study of the acceptance to scattered events in a depth encoding PET camera
Moisan, C., TRIUMF, Canada; Tupper, P.; Rogers, J. G.; De Jong, J. K.; IEEE Transactions on Nuclear Science; June 1996; ISSN 0018-9499; vol. 43, no. 3, pt. 2, pp. 1974-1980; In English; Copyright; Avail: Issuing Activity

We present a Monte Carlo study of the acceptance to scattered events in a Depth Encoding Large Aperture Camera (DELAC), a hypothetical PET scanner with the capacity to encode the depth-of-interaction (DOI) of incident gamma -rays. The simulation is initially validated against the measured energy resolution and scatter fraction of the ECAT-953B scanner. It is then used to assess the response to scattered events in a PET camera made of position encoding blocks of the EXACT HR PLUS type, modified to have DOI resolution through a variation in the photopeak pulse height. The detection efficiency for 511 keV gamma -rays, as well as for those that scattered in the object or left only part of their energy in the block, is studied for several combinations of DOI sensitivities and block thicknesses. The scatter fraction predicted by the simulation for DELACs of various ring radii is compared to that of the ECAT-953B as a function of the energy threshold. The results indicate that the poorer discrimination of object scatters with depth sensitive blocks does not lead to a dramatic increase of the scatter fraction.
Author (EI)
Cameras; Computerized Simulation; Gamma Rays; Monte Carlo Method; Positrons; Pulse Amplitude; Scintillation Counters; Tomography

19960033786; 96A64301
Effects of energy space smoothing and projection space normalization on multispectral PET image quality
Yao, R., Univ of Sherbrooke, Canada; Msaki, P.; Bentourkia, M.; Lecomte, R.; IEEE Transactions on Nuclear Science; June 1996; ISSN 0018-9499; vol. 43, no. 3, pt. 2, pp. 1988-1994; In English; Copyright; Avail: Issuing Activity

Independent processing of multispectral positron emission tomography (MSPET) data in individual energy frames has the potential to improve system sensitivity and the accuracy of energy dependent scatter correction. However, statistical fluctuations due to the use of multiple energy windows and low system detection efficiency severely undermine this potential. These limitations have been overcome without resolution loss by smoothing data in the energy space to suppress statistical fluctuations and by normalizing detector efficiency in the spatial domain to minimize systematic errors. The effectiveness of these corrections was evaluated by comparing images acquired in different energy frames with and without energy space smoothing. Smoothing improved the sharpness and contrast and decreased noise of images. The FWHM and FWTM evaluated from line source images confirmed an earlier postulate which stated that smoothing in the energy space has no effect on image resolution since such process does not move counts across lines of response (LORs). It was concluded that smoothing in the energy space in conjunction with normalization in the projection space is a prerequisite for subsequent energy-dependent data processing such as scatter correction.
Author (EI)
Image Analysis; Image Resolution; Positrons; Sensitivity; Statistical Analysis; Tomography

19960033787; 96A64302
Calculation of lung-heart ratios for single-photon emission computed tomography
Soares, E. J., Univ of Massachusetts Medical Cent, USA; King, M. A.; Glick, S. J.; Villegas, B. J.; IEEE Transactions on Nuclear Science; June 1996; ISSN 0018-9499; vol. 43, no.

3, pt. 2, pp. 1995-1999; In English; Copyright; Avail: Issuing Activity

The effectiveness of simple iterative reconstruction techniques in calculating lung-heart activity ratios (LHRs) was investigated. The LHR was shown to be an effective indicator of the severity of coronary artery disease in cardiac SPECT. A study was conducted with a mathematical cardiac torso phantom that modelled uptake of (sup 201)Tl in the heart and lung regions. The projection data included only the effects of nonuniform photon attenuation. The data were first reconstructed with zeroth-order Chang and a variant of the Bellini method, both of which utilize information from the nonuniforms attenuation map. These recommendations were then used as initial estimates in the iterative Chang, variable step-size Chang, and Morozumi methods, for one and five iterations. Using the same reconstruction procedure, the sample mean LHR and standard deviation from 21 noisy 3D reconstructions were also calculated.

Author (EI)

Cardiology; Computer Aided Tomography; Coronary Artery Disease; Heart Function; Imaging Techniques; Iterative Solution; Medical Equipment

19960033788; 96A64303

Myocardial perfusion imaging with a correlated X-ray CT and SPECT system: an animal study

Kalki, Kathrin, UCSF Physics Research Lab, USA; Brown, J. Keenan; Blankespoor, Stephen C.; Hasegawa, Bruce H.; Dae, Michael W.; Chin, Michael; Stillson, Carol A.; IEEE Transactions on Nuclear Science; June 1996; ISSN 0018-9499; vol. 43, no. 3, pt. 2, pp. 2000-2007; In English; Copyright; Avail: Issuing Activity

We have performed a quantitative SPECT study in a porcine model of myocardial perfusion with the correlated X-ray CT transmission and SPECT emission (ETCT) system developed at UCSF. Pixel values in the reconstructed SPECT images were calibrated in units of activity concentration and compared with the activity concentration determined from corresponding excised myocardial tissue samples. An object specific attenuation map was obtained by linear scaling from the X-ray CT. Attenuation maps with lower spatial resolution and higher signal to noise ratio were also derived from the X-ray CT image. The pixel values and intensity distribution in reconstructed myocardial SPECT image was not sensitive to spatial resolution or noise in the transmission map for the given examples. An MLEM algorithm with regularization was used to determine mean and maximum pixel values for ROIs in the myocardial SPECt images. The use of the maximum pixel value did not sufficiently compensate for contrast degradation due to partial volume errors. A separate measurement of the myocardial wall thickness was used to adequately correct for partial volume errors.

Author (EI)

Attenuation; Calibrating; Computer Aided Tomography; Image Reconstruction; Imaging Techniques; Isotopic Labeling; Medical Equipment; Spatial Resolution; X Rays

19960033795; 96A64310

Small-field imaging properties of narrow energy band x-ray beams for mammography

Gambaccini, M., 'Universita', Italy; Taibi, A.; Del Guerra, A.; Frontera, F.; IEEE Transactions on Nuclear Science; June 1996; ISSN 0018-9499; vol. 43, no. 3, pt. 2, pp. 2049-2052; In English; Copyright; Avail: Issuing Activity

X-ray imaging with low-energy, narrow-band, and tunable radiation offers the possibility of reducing dose and improving image contrast. We are investigating the production of narrow energy band X-ray beams with a standard X-ray tube by using Bragg diffraction on mosaic crystals for mammography application. Quasi-monochromatic X-ray beams (Delta E/E approximately 0.1) have been produced in the mammography energy range. Small-field (1.1 x 3.0 cm(sup 2)) radiographs of a plexiglas phantom 3.6 cm thick were obtained with 18, 20, and 22 keV quasi-monochromatic beams and a conventional film/screen combination for mammography. Images showed a non-uniformity in the irradiation field. A digital detector was used as imaging system to correct the phantom radiographs for this uneven illumination across the image. The overall contrast of the images decreases with increasing the energy of the beam from 18 keV to 22 keV. A measurement of the resolving power of the reflected beam has shown as asymmetric unsharpness along the two dimensions of the image plane. The actual focal spot has a size of about 0.2 x 0.05 cm(sup 2).

Author (EI)

Bragg Angle; Dosimeters; Image Contrast; Imaging Techniques; Medical Equipment; Radiography; X Ray Tubes; X Rays

19960033796; 96A64311

Digital mammography at the Trieste synchrotron light source

Arfelli, F., 'Universita, Italy; Barbiellini, G.; Bonvicini, V.; Bravin, A.; Cantatore, G.; Castelli, E.; Dalla Palma, L.; Di Michiel, M.; Longo, R.; Olivo, A.; IEEE Transactions on Nuclear Science; June 1996; ISSN 0018-9499; vol. 43, no. 3, pt. 2, pp. 2061-2067; In English; Copyright; Avail: Issuing Activity

The SYRMEP collaboration is developing a digital mammography project using a synchrotron radiation monochromatic X-ray beam and a silicon pixel detector. The combination of a monochromatic laminar beam with a high efficiency laminar detector, capable of single-photon counting, allows one to minimize the radiation dose delivered to the sample, while maximizing contrast resolution and dynamic range. The SYRMEP detector is a silicon microstrip device used in an innovative configuration in which radiation impinges on the side rather than on the surface of the chip and

is therefore totally absorbed within the detector active volume. The high contrast resolution and spatial resolution (less than 100 microns) of the system have been demonstrated by producing images of details from an Ackermann Mammographic Phantom RMI 160 illuminated by a conventional X-ray tube.
Author (EI)
Imaging Techniques; Light Sources; Medical Equipment; Synchrotron Radiation; X Rays

19960033880; 96A64395
Compensation methods for head motion detected during PET imaging
Menke, M., TRIUMF, Canada; Atkins, M. S.; Buckley, K. R.; IEEE Transactions on Nuclear Science; February 1996; ISSN 0018-9499; vol. 43, no. 1, pt. 2, pp. 310-317; In English; Copyright; Avail: Issuing Activity

We describe two methods to correct for motion artifacts in head images obtained by positron emission tomography (PET). The methods are based on six-dimensional motion data of the head that have to be acquired simultaneously during scanning. The data are supposed to represent the rotational and translational deviations of the head as a function of time, with respect to the initial head position. The first compensation method is a rebinning procedure by which the lines of response are geometrically transformed according to the current values of the motion data, assuming a cylindrical scanner geometry. An approximation of the rebinning transformations by use of large look-up tables, having the potential of on-line event processing, is presented. The second method comprises post-processing of the reconstructed images by unconstrained or constrained deconvolution of the image or image segments with kernels that are generated from the motion data. We use motion data that were acquired with a volunteer in supine position, immobilized by a thermoplastic head holder, to demonstrate the effects of the compensation methods. Preliminary results obtained with test data indicate that the methods have the potential to improve the resolution of Positron Emission Tomography images in cases where significant head motion has occurred, provided that the head position and orientation can be accurately measured.
Author (EI)
Cylindrical Bodies; Data Acquisition; Head Movement; Positrons; Scanning; Tomography; Transformations (Mathematics)

19960033882; 96A64397
Hybrid attenuation correction technique to compensate for lung density in 3-D total body PET
Tai, Y.-C., UCLA Sch of Medicine, USA; Lin, K.-P.; Dahlbom, M.; Hoffman, E. J.; IEEE Transactions on Nuclear Science; February 1996; ISSN 0018-9499; vol. 43, no. 1, pt. 2, pp. 323-330; In English; Copyright; Avail: Issuing Activity

A hybrid attenuation correction technique (ACT) is under development for (sup 18)F-FDG total body positron emission tomography (PET). With a short transmission scan of the thorax, any time within a few days of the imaging session, this technique can correct for attenuation in the entire body. Segmentation, registration, and active contour finding techniques are applied to both emission and short transmission images to locate and map the major attenuating structures in the body. This technique eliminates the need for the patient to remain still from the start of the transmission scan to the end of the emission scan without the added noise of simultaneous or post emission transmission scan measurements. The results of volunteer studies are comparable to standard measured ACT, both visually and quantitatively. The efficient use of scanner time and improved patient comfort make this technique particularly suitable for clinical imaging.
Author (EI)
Attenuation; Image Processing; Light Emission; Light Transmission; Positrons; Tomography

19960033883; 96A64398
Adaptive, segmented attenuation correction for whole-body PET imaging
Xu, M., Washington Univ, USA; Cutler, P. D.; Luk, W. K.; IEEE Transactions on Nuclear Science; February 1996; ISSN 0018-9499; vol. 43, no. 1, pt. 2, pp. 331-336; In English; Copyright; Avail: Issuing Activity

A technique is presented for segmented attenuation correction in positron emission tomography (PET) based on the local thresholding technique (LTS) described previously. to accommodate the substantially different body sections encountered in whole-body PET, an adaptive thresholding has been added to yield more uniform results throughout the body. by evaluating the intensity distribution of a set of transverse transmission images, the algorithm determines an optimal threshold for separating two or three different groups or classes of similar pixels. Interclass variance is maximized and intra-class errors are minimized. The algorithm also switches automatically between a three-class mode (background, lungs/air pockets, soft tissue) and a two-class mode (background, soft tissue), thereby achieving more uniform segmentation where lung spaces and bowel air pockets are alternately present then absent from the volume of interest. The addition of adaptive thresholding virtually eliminates the need for operator intervention. The clinical implementation requires short-duration, count-limited, transmission images that would otherwise be too noisy for direct attenuation correction. Emission images corrected with adaptive LTS were shown to be equivalent, both quantitatively and qualitatively, to those corrected using conventional measured attenuation correction.
Author (EI)
Algorithms; Attenuation; Gas Pockets; Imaging Techniques; Medical Equipment; Positrons; Tomography

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19960028704; 96N29388 Texas Univ., Dept. of Otolaryngology., Galveston, TX USA
Vestibular compensation studies ***Final Report***
Perachio, Adrian A., Principal Investigator, Texas Univ., USA; May 14, 199625p; In English
Contract(s)/Grant(s): NAG2-26
Report No.(s): NASA-CR-201405; NAS 1.26:201405; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The following topics are reported: neurophysiological studies on MVN neurons during vestibular compensation; effects of spinal cord lesions on VNC neurons during compensation; a closed-loop vestibular compensation model for horizontally canal-related MVN neurons; spatiotemporal convergence in VNC neurons; contributions of irregularly firing vestibular afferents to linear and angular VOR's; application to flight studies; metabolic measures in vestibular neurons; immediate early gene expression following vestibular stimulation; morphological studies on primary afferents, central vestibular pathways, vestibular efferent projection to the vestibular end organs, and three-dimensional morphometry and imaging.
CASI
Neurophysiology; Neurons; Morphology; Vestibules; Physiological Responses

19960028959; 96N29562 Department of Energy, Office of Human Radiation Experiments., Washington, DC USA
Human radiation studies: Remembering the early years
Fisher, Thomas Jr., Compiler, Department of Energy, USA; Yuffee, Michael, Compiler, Department of Energy, USA; Jan. 18, 1995346p; In English
Report No.(s): DOE/EH-0464; DE96-009849; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

In September 1994, the Department of Energy began an oral history project as part of the Openess initiative on the documentation of the human radiation experiments. This paper presents the oral history of Waldo E Cohn, Ph.D., a Biochemist who worked for the Oak Ridge National Laboratory and the Manhattan Project.
DOE
Radiation Effects; Human Beings

19960028987; 96N29583 Logicon Technical Services, Inc., Dayton, OH USA
The effects of one night's loss of sleep and recovery on physiological, performance, and subjective indices ***Interim Report, 1 Dec. 1993 - 1 Oct. 1994***
Palmer, Barbara, Logicon Technical Services, Inc., USA; Wilson, Glenn F., Armstrong Lab., USA; Reis, George, Logicon Technical Services, Inc., USA; Gravalle, Michael, Dayton Univ. Research Inst., USA; Nov. 1994108p; In English
Contract(s)/Grant(s): F41624-94-D-6000; AF Proj. 7184
Report No.(s): AD-A303751; AL/CF-TR-1995-0128; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The effects of one night's sleep loss were tested on subjects who were tested again after a night's recovery sleep. Several physiological measures were taken while subjects were administered the AGARD SIRES Battery (to assess performance changes) and the NASA-ThX (a subjective index). In general, all measures showed changes with sleep loss which then recovered with one night's sleep. On several of the SIRES Battery tasks, reaction times increased and accuracy decreased after a night without sleep, and then recovered with a night's sleep. Tracking performance especially was consistently affected. Blink rate reliably increased with a night's sleep loss, and recovered with sleep; blink duration tended to increase with sleep loss. Heart rate decreased with sleep loss, while heart rate variability at high and medium bands was found to increase consistently. Power in the EEG alpha band tended to be greater after a night's loss of sleep when it was measured in terms of absolute power and as relative to total EEG power. Evoked potential results were equivocal. Subjectively, subjects ranked the individual SIRES Battery tasks as harder after a night without sleep. Just one night without sleep affected task performance, physiological measures, and subjective assessments of task requirements; recovery generally occurred with one night of sleep.
DTIC
Sleep Deprivation; Physiological Tests; Heart Rate; Human Performance; Physiological Effects; Blinking

19960029179; 96N29687 NASA Scientific and Technical Information Facility, Baltimore-Washington International Airport, MD USA
Aerospace Medicine and Biology: A Continuing Bibliography with Indexes. (Supplement 404)
Aug. 01, 199594p; In English
Report No.(s): NASA-SP-7011(404); NAS 1.21:7011(404); No Copyright; Avail: Issuing Activity, Hardcopy, Microfiche

This report lists 185 reports, articles and other documents recently announced in the NASA STI Database. Subject coverage includes aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance.
CASI
Aerospace Medicine; Bibliographies; Exobiology; Indexes (Documentation); Life Sciences; Biological Effects

19960029191; 96N29697 Dayton Univ. Research Inst., OH USA
An exploration of simulator sickness in the MH-60G operational flight trainer, an advanced wide field-of-view

helicopter trainer ***Final Report, Nov. 1993 - Oct. 1994***
Slaughter, Robert A., Air Force Operational Test and Evaluation Center, USA; Silverman, Denise R., Dayton Univ. Research Inst., USA; Jun. 199542p; In English
Contract(s)/Grant(s): F33615-90-C-0005; AF Proj.1123
Report No.(s): AD-A303619; AL/HR-TR-1994-0173; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A simulator sickness research effort was undertaken as an important addition to the Qualification Operational Test and Evaluation (QOT&E) for the MH/60G Operational Flight Trainer (OFT). The primary impetus for the experiment was the configuration of the device (wide field of view and limited motion) and pilot reports of simulator sickness symptoms during device development. The authors assessed (1) post-flight simulator sickness symptoms, (2) prolonged simulator sickness symptoms, and (3) the effects of simulator sickness on the training provided in the MH/60G OFT. Despite limitations of the experimental design and the small sample size, some interesting trends were found. Post-flight simulator sickness symptoms occurred across all types of missions, with greater frequency on more visually dependent scenarios. Only two crewmembers did not report any symptoms. Pilots consistently changed control inputs to lessen the effects of simulator sickness symptoms. Finally, the occurrence of prolonged simulator sickness symptoms was comparatively infrequent. The authors concluded that increased attention must be channeled toward simulator sickness to better understand its origins and effects on training.
DTIC
Flight Simulators; Flight Training; Signs and Symptoms; Motion Sickness; Experiment Design; Crews

19960029220; 96N29722 Science Applications International Corp., McLean, VA USA
An epidemiologic investigation of health effects in Air Force personnel following exposure to herbicides, Volume 6, 1992 Followup Examination Results ***Triennial Report, May 1992 - May 1995***
Grubbs, W. D., Science Applications International Corp., USA; Lustik, M. B., Science Applications International Corp., USA; Brockman, A. S., Science Applications International Corp., USA; Henderson, H. C., Science Applications International Corp., USA; Burnett, F. R., Science Applications International Corp., USA; Land, R. G., Science Applications International Corp., USA; Osborne, D. J., Science Applications International Corp., USA; Wolfe, W. H., Armstrong Lab., USA; Michalek, J. E., Armstrong Lab., USA; Miner, J. C., Armstrong Lab., USA; May 02, 1995305p; In English
Contract(s)/Grant(s): F41624-91-C-1006
Report No.(s): AD-A304315; AL-TR-920107; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Of the many chemical compounds known to cause immune system dysfunction in laboratory animals, the polyhalogenated aromatic hydrocarbons have been the most extensively studied and, among these, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD, or dioxin) has proven to be the most toxic. Since the early 1970s, when TCDD was shown to cause marked involution of the thymus gland in numerous experimental animals (1A), an extensive body of literature pertinent to TCDD-induced immunotoxicity has been summarized in the recent comprehensive review article by Holsapple and colleagues. In laboratory animals, TCDD has proven to have a wide range of toxic effects on all components of the immune system including the following: Compromised cell mediated and humoral immune function; Impaired myelo and lymphoproliferative responses; Suppressed complement activity; Compromised host resistance to bacterial, parasitic, and viral infections. In an attempt to provide data more relevant to humans, two laboratories have conducted experiments into the effects of TCDD on numerous immunologic indices in marrnoset and rhesus monkeys. These studies, carried out in vitro in lymphocyte cell cultures and in vivo with single dose injections of TCDD in various concentrations, have yielded inconsistent results that in many cases do not fit a typical dose-response pattern. The relevance of these acute phase studies to the long term occupational exposure more typical in humans remains to be proven. In none of the in vivo studies have the animals shown evidence of overt illness.
DTIC
Armed Forces (USA); Toxicity; Health; Infectious Diseases; Chemical Composition

19960029242; 96N29739 JAYCOR, San Diego, CA USA
Health hazards assessment for blast overpressure exposures ***Final Report, 2 Nov. 1992 - 31 Oct. 1995***
Stuhmiller, James H., Principal Investigator, JAYCOR, USA; Nov. 199523p; In English
Contract(s)/Grant(s): DAMD17-93-C-3005
Report No.(s): AD-A303649; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The well being of the soldier, which has always been the primary concern of the US Army Medical Research & Materiel Command (MRMC), is rapidly becoming a concern of the entire Army. The development of new, high-power weapons and the need to establish safe training practices has revealed the importance of the non-auditory effects of blast overpressure. In addition, blast injury is an important component of battlefield trauma. In the future, as the size of the fighting force decreases and the sophistication of the weaponry increases, the performance and effectiveness of the individual soldier becomes increasingly important. Both of these trends underscore the need for a rational basis for making health hazards assessment and performance estimation. Through a combination of data analysis, blast simulation, mechanical surrogates, and biomechanical modeling a predictive method-

ology has been developed that is now used by MRMC to make quantitative hazard assessments in a wide variety of military circumstances.
DTIC
Biodynamics; Hazards; Health; Injuries; Medical Science; Human Beings; Human Body

19960029245; 96N29742 Department of National Defence, Defence and Civil Inst. of Environmental Medicine., Ottawa, Ontario Canada
Evaluation of the Res-Q-Air inhalation rewarming system on non-shivering hypothermic subjects
Ducharme, M. B., Department of National Defence, Canada; Frim, J., Department of National Defence, Canada; Goheen, S. L., Manitoba Univ., Canada; Giesbrecht, G. G., Manitoba Univ., Canada; Johnston, C. E., Manitoba Univ., Canada; Nov. 199527p; In English
Report No.(s): AD-A303674; DCIEM-95-48; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of the present study was to test the efficacy of inhalation rewarming (IR) in simulated field conditions using a newly developed model of non-shivering hypothermia in humans. Eight subjects (2 of them female) were cooled in 8-10 C water for 25 min on two occasions. Ten minutes prior to withdrawal from the water, a total of 1.5 mg/kg of Meperidine, a shivering inhibitor, was injected intravenously into the subjects. The subjects were then removed from the water, settled in a sleeping bag and moved to a cold chamber set at -20 C for a 2.5 hour rewarming period. In the control trial, no external source of heat was available to the subject while in the IR trial, IR was provided (water saturated air at 43 C). In both trials, shivering was successfully suppressed since the metabolic rates during the rewarming phases were not different from baseline values. The duration and magnitude of the post-exposure decrease in esophageal temperature (afterdrop) were not different between the control (78 +/- 11 min; 1.4 +/- O.1 C) and the IR trials (76 +/- 10 min; 1.2 +/- 0.2 C). The rates of rewarming were not different between the two treatments (0.4 +/- 0.1 C/h for control; 0.2 +/- O.1 C/h for IR). After the 2.5 hr rewarming phase, the esophageal temperature did not return to the pre-immersion level for either treatment (35.79 +/- O.17 C for control; 35.85 +/- O.13 C for IR). It was concluded that IR does not decrease the magnitude of the afterdrop and does not enhance rewarming rate in conscious non-shivering hypothermic subjects as compared to no external heat source.
DTIC
Body Temperature; Temperature Control; Simulation; Low Temperature; Human Body; Metabolism; Inhibitors; Respiration

19960029325; 96N29784 Marshall Univ., School of Medicine., Huntington, WV USA
Vitamin D endocrine system after short-term space flight ***Final Report, 1 Sep. 1994 - 2 Feb. 1996***
Rhoten, William B., Principal Investigator, Marshall Univ., USA; Sergeev, Igor N., Principal Investigator, Marshall Univ., USA; May 17, 199634p; In English
Contract(s)/Grant(s): NAG2-967
Report No.(s): NASA-CR-201406; NAS 1.26:201406; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The exposure of the body to microgravity during space flight causes a series of well-documented changes in Ca(2+) metabolism, yet the cellular/molecular mechanisms leading to these changes are poorly understood. There is some evidence for microgravity-induced alterations in the vitamin D endocrine system, which is known to be primarily involved in the regulation of Ca(2+) metabolism. Vitamin D-dependent Ca(2+) binding proteins, or calbindins, are believed to have a significant role in maintaining cellular Ca(2+) homeostasis. We used immunocytochemical, biochemical and molecular approaches to analyze the expression of calbindin-D(sub 28k) and calbindin-D(sub 9k) in kidneys and intestines of rats flown for 9 days aboard the Spacelab 3 mission. The effects of microgravity on calbindins in rats in space vs. 'grounded' animals (synchronous Animal Enclosure Module controls and tail suspension controls) were compared. Exposure to microgravity resulted in a significant decrease in calbindin-D(sub 28k) content in kidneys and calbindin-D(sub 9k) in the intestine of flight and suspended animals, as measured by enzyme-linked immunosorbent assay (ELISA). Immunocytochemistry (ICC) in combination with quantitative computer image analysis was used to measure in situ the expression of calbindins in kidneys and intestine, and insulin in pancreas. There was a large decrease in the distal tubular cell-associated calbindin-D(sub 28k) and absorptive cell-associated calbindin-D(sub 9k) immunoreactivity in the space and suspension kidneys and intestine, as compared with matched ground controls. No consistent differences in pancreatic insulin immunoreactivity between space, suspension and ground controls was observed. There were significant correlations between results by quantitative ICC and ELISA. Western blot analysis showed no consistent changes in the low levels of intestinal and renal vitamin D receptors. These findings suggest that a decreased expression of calbindins after a short-term exposure to microgravity and modelled weightlessness, may affect cellular Ca(2+) homeostasis and contribute to Ca(2+) and bone metabolism disorders induced by space flight.
Author
Endocrine Systems; Microgravity; Gravitational Effects; Vitamins; Calcium Metabolism; Proteins; Chemical Bonds; Spaceborne Experiments

19960031909; 96N29902 Istituto Superiore di Sanita, Lab. di Epidemiologia e Biostatistica., Rome, Italy
SEIEVA Integrated Epidemiological System for Acute Vital Hepatitis ***Progress Report, 1985-1994***
Mele, Alfonso, Istituto Superiore di Sanita, Italy; Stroffolini,

Tommaso, Istituto Superiore di Sanita, Italy; Pasquini, Paolo, Istituto Superiore di Sanita, Italy; Mar. 1996; ISSN 1123-311752p; In English
Report No.(s): ISTISAN-96/03; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Surveillance of type specific acute viral hepatitis (SEIEVA) started in Italy in 1985, coordinated by the Laboratory of Epidemiology and Biostatistics at Istituto Superiore di Sanita. The aims were: 1) monitor epidemiological trends of different hepatitis types; 2) evidence eventual epidemic clusters; 3) identify risk factors associated with each hepatitis type in order to formulate strategies and policies for the prevention of these infections. There are 650 local health districts (USL) in Italy distributed throughout the country. The number of USL's participating in the surveillance system has greatly increased since 1985, reaching 261 districts in 1994, corresponding to 40% of the Italian population. The main objective of this report is to present data for 10 years of surveillance regarding incidence and risk factors distribution of the different types of viral hepatitis.
Author
Epidemiology; Hepatitis; Viral Diseases; Public Health; Vaccines; Italy; Risk

19960034057; 96A64572
Laser-induced fluorescence spectroscopy at endoscopy: tissue optics, Monte Carlo modeling, and in vivo measurements
Qu, Jianan, British Columbia Cancer Agency, Canada; Macaulay, Calum E.; Lam, Stephen; Palcic, Branko; Optical Engineering; November 1995; ISSN 0091-3286; vol. 34, no. 11, pp. 3334-3343; In English; Copyright; Avail: Issuing Activity

The optical properties (absorption coefficient, scattering coefficient and the anisotropic factor of scattering) and fluorescence characteristics of normal and abnormal bronchial tissue were measured in vitro. After adding additional blood optical properties to in vitro optical properties of tissue, the in vivo bronchial fluorescence was simulated and analyzed by Monte Carlo modeling. The Monte Carlo simulation results shows that with an appropriate illumination and fluorescence collection geometry, the distortion of in vivo fluorescence spectra of tissue caused by variations of optical properties at different wavelengths could be much reduced. Based on these results, a spectrofluorometry system was developed for the collection of in vivo laser-induced fluorescence spectra of tissue during endoscopy. In comparing the in vivo fluorescence spectral shape of bronchial tissue collected by this system with the intrinsic one obtained in vitro, we found no obvious distortion in the in vivo spectra. This was completely consistent with the analysis of Monte Carlo modeling. The in vivo measurement results demonstrated that significant differences in fluorescence intensity between normal and diseased bronchial tissue (dysplasia, carcinoma in situ) can be used to differentiate them from each other. Also, changes in fluorescence intensity are more robust for detecting abnormal tissues than the differences in spectral characteristics.
Author (EI)
Endoscopes; Fluorescence; Imaging Techniques; Laser Applications; Medical Equipment

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19960028787; 96N29446 Systems Engineering Associates, San Diego, CA USA
Training methodology for logistic decision making ***Interim Report, Feb. 1993 - Dec. 1993***
Brecke, Fritz H., Systems Engineering Associates, USA; Garcia, Sharon K., Air Force Human Resources Lab., USA; Oct. 1995100p; In English
Contract(s)/Grant(s): F33615-91-C-0007; AF Proj.1121
Report No.(s): AD-A303617; AL/HR-TR-1995-0098; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Logistics units must ensure that core and augmentee personnel are fully trained in the combat-critical skill of complex decision making. At present, training consists of expensive, manpower-intensive exercises, which afford only sporadic training opportunities. The need exists for more accessible, more affordable, and less manpower-intensive training. Logistics Command and Control (LC2) technology makes use of desktop computer hardware and software to produce simulation environments. Within these environments, personnel can experience real-world problems. The objective of this research is to design, develop, and test an experimental desktop decision trainer, incorporating simulation environments allowing for the practice of decision-making skills before, during, and after field exercises. This report documents the derivation of the instructional strategy and decision-making modeling approach for training decision-making skills.
DTIC
Logistics; Decision Making; Command and Control; Training Devices; Computerized Simulation; Computer Assisted Instruction

19960028917; 96N29530 Armstrong Lab., Occupational and Environmental Health Directorate. Bioenvironmental Engineering Div., Wright-Patterson AFB, OH USA
The coordination of dynamic visual and auditory spatial percepts and responsive motor actions: A review and integration of current theory and research ***Interim Report, Oct. 1994 - Sep. 1995***

Bartholomew, Elias, Armstrong Lab., USA; Dec. 01, 1995147p; In English
Contract(s)/Grant(s): AF Proj. ILIR
Report No.(s): AD-A302989; AL/OE-TR-1995-0190; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This review is intended to serve as an integration of current research and thought regarding visual and auditory spatial perception in an effort to consolidate diverse theoretical viewpoints and empirical findings. The aim of this technical report is to derive a unified account of bimodal spatial perception and responsive motor actions. The model of bimodal information processing developed in this report will serve as a basis for defining issues of concern regarding the implementation of bimodal spatial displays that require the individual to integrate dynamic spatial information acquired both aurally and visually. This model draws upon theory and research from ecological and information processing perspectives of auditory and visual perception. The model posits that information regarding the spatial layout and spatial dynamics of the environment is incrementally accrued through multiple modalities including vision and audition to form a common functional representation of spatio-temporal parameters. The key parameters of dynamic spatial position and motion conveyed in this functional representation are subsequently utilized to formulate plans and programs for responsive actions. Currently, a research program examining the process of cross-modal integration of dynamic auditory and visual information is underway. The findings of this research will have important implications for the implementation of 3-D auditory display technology for conveying dynamic spatial information in high visual workload environments.
DTIC
Auditory Perception; Visual Perception; Spatial Distribution; Information Processing (Biology); Auditory Signals

19960029188; 96N29694 Pennsylvania Univ., Dept. of Bioengineering., Philadelphia, PA USA
Receptive field neural network analysis of color constancy and color contrast (FY91 AASERT) ***Final Report, 1 Jul. 92 - 30 Jun. 1995***
Buchsbaum, Gershon, Pennsylvania Univ., USA; Dec. 18, 19954p; In English
Contract(s)/Grant(s): F49620-92-J-0316
Report No.(s): AD-A303631; AFOSR-TR-96-0041; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Color constancy, or the ability of the visual system to perceive color independently of the ambient illumination, was investigated in the context of a biologically-based neural network. In particular, the role of retinal adaptation and higher level visual operations in mediating color constancy was investigated. The study incorporated properties of individual cells and how they combine to make complex color and spatial operations. The neural network simulations indicate how early visual stages complement each other to compensate and maintain relatively constant color perception under conditions of varying illumination and spatial context in the image. The network takes advantage of several mechanisms in the human visual system, including retinal adaptation, spectral opponency, and spectrally-specific long-range inhibition. This last stage is a novel mechanism based on cells which have been described in cortical area v4. All stages include non-linear response functions. The model emulates human performance in several psychophy sical paradigms designed to test color constancy and color induction. We measured the amount of constancy achieved with both natural and artificial simulated illuminants, using homogeneous gray backgrounds and more complex backgrounds, such as Mondrians.
DTIC
Neural Nets; Visual Perception; Human Performance; Retinal Adaptation

19960029198; 96N29703 Florida Maxima Corp., Winter Park, FL USA
Training decision-intensive tasks: A constructivist approach ***Final Report***
Hays, Robert T., Naval Air Warfare Center, USA; Driskell, James E., Florida Maxima Corp., USA; Olsen, David W., Florida Maxima Corp., USA; Mullen, Brian, Syracuse Univ., USA; Nov. 01, 199573p; In English
Contract(s)/Grant(s): N61339-95-C-0006
Report No.(s): AD-A303694; NAWCTSD-TR-95-007; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Constructivist learning theories represent a new approach to instructional design, and at face value, the constructivist perspective appears to offer an innovative and potentially valuable approach to enhance the effectiveness of Naval training. This report describes the results of a Small Business Innovation Research (SBIR) Phase 1 study to examine the applicability of constructivist approaches to Naval training. In this report, research is reviewed to identify key concepts that are central to the constructivis t approach, examine the application of constructivist approaches to Naval training requirements, and identify high priority research topics and opportunities implied by the constructivist approach. The primary obstacle to realizing the potential value of constructivist applications to Naval training is the fact that very little empirical research has been conducted in a training environment. Research recommendations arc made to test the effectiveness of constructivist approaches in a military training setting.
DTIC
Computerized Simulation; Education; War Games; Knowledge Based Systems; Knowledge Bases (Artificial Intelligence)

19960029253; 96N29749 Armstrong Lab., Human Resources Directorate; Manpower and Personnel Research Div., Brooks AFB, TX USA

Factor analysis of the ASVAB: Confirming a Vernon-Like structure ***Interim Report, Oct. 1993 - Oct. 1994***

Ree, Malcolm James, Armstrong Lab., USA; Carretta, Thomas R., Armstrong Lab., USA; Jun. 19959p; In English

Contract(s)/Grant(s): AF Proj. 7719

Report No.(s): AD-A303599; AL/HR-TP-1995-0007; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Armed Services Vocational Aptitude Battery (ASVAB), has been used in its current item and content form for more than a decade. Its latent structure, although explored in factor analyses, has never been confirmed. Several confirmatory factor analyses were conducted on Form 8a in a nationally representative sample. These included a g-only model, a three-factor hierarchical Vernon-like model, 2 four-factor first-order models, and 2 four-factor hierarchical models. Based on fit indexes, simple structure, and parsimony in parameter estimation, the three-factor hierarchical model was chosen to represent the data. The higher-order factor was psychometric g, and the first-order factors were interpreted as Speed, Verbal/Math, and Technical Knowledge. The latter two factors were similar to Vernon factors of Verbal/Educational and Practical.

DTIC

Aptitude; Education; Human Performance; Verbal Communication

19960029337; 96N29791 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, TNO Human Factors Research Inst., Soesterberg, Netherlands

Operator performance in multi-maritime unmanned air vehicle control ***Final Report***

Van Breda, L., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; Dec. 14, 199518p; In English

Contract(s)/Grant(s): A92/KM/305

Report No.(s): TD 95-1496; TNO-TM 1995 A-76; Copyright; Avail: Issuing Activity (TNO Human Factors Research Institute, Kampweg 5, 3769 DE Soesterberg, Netherlands), Hardcopy, Microfiche

Under contract to the Royal Netherlands Navy, an exploratory study was conducted concerning the man-machine interface and task characteristics for controlling Maritime Unmanned Air Vehicles (MUAVs). This report describes a simulator experiment investigating how effective operators can track a moving target in a multi MUAV supervisory control task, under different verbal/cognitive workload conditions. Results of the experiment show that moderate and even high workload conditions did not affect the mean target coverage of the sensor image. This was about 100 percent at image update frequencies of 4 Hz and more, decreasing to about 60 percent at 1 Hz update frequency. This may be explained by the fact that in the latter case the tracking task became more discontinuous, which demanded more attention for anticipation. Since the subjects were instructed to give primary attention to the verbal/cognitive task, this extra attention was not fully available, in particular not during high workload conditions. This resulted in an increase of the mean viewing (tracking) error. It is suggested to focus further research on ways to improve operator performance and awareness at low image update rates, for instance by integrating synthetic information on orientation and MUAV status into the sensor image ('synthetic image augmentation').

Author

Man Machine Systems; Operator Performance; Pilotless Aircraft; Aircraft Control; Workloads (Psychophysiology); Flight Simulation; Human Factors Engineering

19960029480; 96N29884 Bolt, Beranek, and Newman, Inc., Cambridge, MA USA

Research, Development, Training and Evaluation (RDT&E) support: Operability model architecture ***Final Report, Mar. 1993 - Dec. 1994***

Deutsch, Stephen E., Bolt, Beranek, and Newman, Inc., USA; Cramer, Nichael L., Bolt, Beranek, and Newman, Inc., USA; Feerhrer, Carl E., Bolt, Beranek, and Newman, Inc., USA; Jun. 199581p; In English

Contract(s)/Grant(s): F33615-91-D-0009; AF Proj. 1710

Report No.(s): AD-A303594; AL/HR-TP-1995-0018; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Operator Model Architecture (OMAR) project under took the definition, implementation, test, and validation of an integrated suite of software tools to support the construction of Human Performance Process (HPP) models and the instantiation of the psychological framework previously developed by Bolt, Beranek, and Newman, Inc. (BBN). The project was undertaken in three phases. The objective of Phase 1 was to prepare a Software Functional Specification for the toolbox architecture. The Specification drew on analyses of requirements both to build and to support the testing of computational cognitive models, and on the anticipated requirement to operate within the QASYS simulation environment. During Phase 2, the software design and tools specified in Phase 1 were developed using a rapid prototyping approach. Tests demonstrating the functionality of OMAR were conducted near the end of the phase, and an OMAR User's/Programmer's manual was written. In Phase 3, elements of the BBN psychological framework previously developed were instantiated with the aid of the OMAR tools developed in Phase 2, and an Air Traffic Control scenario identified during the earlier effort was used to test the resulting model.

DTIC

Software Engineering; Computer Networks; Computer Programs; Functional Design Specifications

19960033272; 96N30076 Japan Society of Aerospace and Environmental Medicine, Tokyo, Japan

Japanese Journal of Aerospace and Environmental Medicine, Volume 32, No.3

Mano, Tadaaki, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Asukata, Ichiro, Editor, Japan Society of Aerospace and Environmental Medicine, Japan; Sep. 1995; ISSN 0387-072354p; In Mixed; In Japanese; In English; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Contents include articles on the extremely low prevalence of non-insulin dependent diabetes among cockpit crews of Japanese airlines; the effects of exercise on calcium metabolism in simulated weightlessness, and hemodynamic estimation of G levels for a short-arm centrifuge in the Space Station. Abstracts of aerospace medicine related articles from other publication sources are appended.

Derived from text

Aerospace Medicine; Weightlessness Simulation; Airline Operations; Calcium Metabolism; Insulin; Space Stations; Centrifuges; Metabolic Diseases; Diabetes Mellitus

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19960028781; 96N29441 Massachusetts Inst. of Tech., Cambridge, MA USA

Inertial head-tracker sensor fusion by a complementary separate-bias Kalman filter

Foxlin, Eric, Massachusetts Inst. of Tech., USA; 1996; ISSN 1087-827010p; In English; IEEE 1996 Virtual Reality Annual International Symposium, 30 Mar. - 3 Apr. 1996, Santa Clara, CA, USA

Contract(s)/Grant(s): NCC2-771

Report No.(s): NASA-CR-201055; NAS 1.26:201055; ISBN-0-8186-7295-1; Copyright Waived (NASA); Avail: CASI; A02, Hardcopy; A01, Microfiche

Current virtual environment and teleoperator applications are hampered by the need for an accurate, quick responding head-tracking system with a large working volume. Gyroscopic orientation sensors can overcome problems with jitter, latency, interference, line-of-sight obscurations, and limited range, but suffer from slow drift. Gravimetric inclinometers can detect attitude without drifting, but are slow and sensitive to transverse accelerations. This paper describes the design of a Kalman filter to integrate the data from these two types of sensors in order to achieve the excellent dynamic response of an inertial system without drift, and without the acceleration sensitivity of inclinometers.

Author

Kalman Filters; Multisensor Fusion; Gravimetry

19960029113; 96N29650 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Development of an earplug equipped with active noise reduction *Ontwikkeling van een oordop met actieve geluidreductie*

Steeneken, H. J. M., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; Verhave, J. A., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; Goverts, S. T., Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands; Dec. 18, 199536p; In Dutch

Contract(s)/Grant(s): A94/D/326

Report No.(s): TD 95-1497; TNO-TM 1995 A-77; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An earplug equipped with an active noise reduction system was developed in cooperation with Philips Asset and Groeneveld Elcea. The goal of achieving an extra active attenuation of 20 dB, is almost reached. An attenuation of 18 dB was obtained for frequencies below 500 Hz. Reduction of the loop-gain results in an extension of the frequency range with a lower attenuation. The system uses a specific telephone with an improved frequency response compared with the standard walkman telephones. The costs of both telephone types are equivalent. The special designed telephone, however, has a low impedance which requires a complex adaptation to the electronic control unit. The use of a personal moulded earplug as connection between the ear canal and the electro-acoustic part of the system gives some leakage. Application of a standard earplug gives better results and is, generally, applicable, however, the fixation with the ear canal is not as robust as with a personal moulded plug.

Author

Noise Reduction; Ear Protectors; Frequency Response; Electroacoustics

19960029246; 96N29743 Department of National Defence, Defence and Civil Inst. of Environmental Medicine., Ottawa, Ontario Canada

Effects on scrubber endurance of storing soda lime in CF rebreathers

Eaton, David J., Department of National Defence, Canada; Nov. 199520p; In English

Report No.(s): AD-A303673; DCIEM-95-47; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Canadian Forces divers using rebreather diving apparatus are currently restricted to pre-dive preparation times of only 6 hours. A proposal was made to increase this time to 7 days. Theoretically, this was possible; h owever, no empirical

data were available to indicate that the chemical carbon dioxide absorbent could survive an extended storage period in Canadian Forces rebreathers. Consequently, the Experimental Diving Unit of the Defence and Civil Institute of Environmental Medicine conducted a study to determine if storage of soda lime would reduce the carbon dioxide scrubber endurance. The tests measured scrubber endurance using proposed NATO standard procedures under three conditions: (1) no storage; (2) seven days of storage; and (3) 1 hour under the endurance test conditions, followed by 7 days storage and then completion of the endurance test. The results indicated no difference between the three conditions; thereby, supporting the proposal for up to 7 days of storage. On the other hand, issues related to cold weather operations biological hazards, heavy exertion and accelerated material wear imposed some restrictions on rebreather storage.
DTIC
Scrubbers; Diving (Underwater); Absorbers (Materials); Absorbents; Calcium Oxides; Rebreathing

19960031966; 96N29954 Department of the Navy, Washington, DC USA
Manually Tunable, Closed-Circuit Underwater Breathing Apparatus
Joyce, Donald D., Inventor, Department of the Navy, USA; Mints, William H., Inventor, Department of the Navy, USA; Clarke, John R., Inventor, Department of the Navy, USA; Wechgelaer, Peter, Inventor, Department of the Navy, USA; Jan. 23, 19969p; In English
Patent Info.: US-Patent-Appl-SN-289022; US-Patent-5,485,834
Report No.(s): AD-D017896; No Copyright; Avail: US Patent and Trademark Office, Microfiche

This invention is a manually tunable underwater breathing apparatus (UBA) in which the resonant frequency of the UBA may be adjusted to meet the diver's breathing frequency by controlling the inertance component of the UBA impedance. The principles of the present invention may be adapted to existing UBA by adding a tuning apparatus comprising a valve, a tee and a tuned length of hose. Water displaced by volume change in the breathing bag due to exhalation/inhalation is partly diverted through the valve. Depending on the valve operating set by the diver the inertance and resonant frequency of the UBA can be altered to reduce breathing load.
DTIC
Underwater Breathing Apparatus; Resonant Frequencies; Respiration

19960033145; 96N29976 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Review of Chlorine and Organohalides and Their Significance to the Royal Australian Navy
Upsher, John F., Defence Science and Technology Organisation, Australia; Fletcher, Lyn E., Defence Science and Technology Organisation, Australia; Mar. 199655p; In English
Report No.(s): DSTO-TR-0311; AR-009-643; Copyright; Avail: Issuing Activity (Defence Science and Technology Organisation, Melbourne, Australia), Hardcopy, Microfiche

There is increasing global disquiet about the concentration of chlorine compounds found in the natural environment. When chlorine is mixed with ship sewage up to 10% of applied chlorine can be converted to organohalides. Chlorine and residual oxidants are readily dissipated and their environmental effects are of lesser significance than the potential toxicity of the organohalides. Organohalides readily bio-accumulate and are persistent in the environment. Their presence has been associated with tumours and cancers, birth defects, interference with reproduction and behavioural problems. These effects are greatest in animals at the end of the food chain, including sea birds, whales and dolphins. The Royal Australian Navy (RAN) is currently chlorinating ship sewage on some ships prior to discharge. This review was undertaken to assess whether this could pose an unacceptable environmental risk and subsequently be subject to future regulation. It is concluded that chlorinating sewage may pose an environmental risk, however, the level of that risk is unclear. In addition, it is conceivable that further regulation may occur. Moreover, the OMNIPURE units in use by the RAN are not effectively meeting the International Maritime Organization's regulations for sewage discharge at present. Consequently, it is advisable that alternative sewage treatment systems be adopted.
Author
Sewage Treatment; Chlorination; Environment Effects; Food Chain; Organometallic Compounds; Toxic Hazards; Sea Water; Regulations; Contamination; Chlorine; Water Pollution

19960033220; 96N30034 Crew Systems Consultants, San Marcos, TX USA
Helmet-Mounted Display Symbology and Stabilization Concepts
Newman, Richard L., Crew Systems Consultants, USA; Jun. 1995115p; In English
Contract(s)/Grant(s): NAS2-13811
Report No.(s): NASA-CR-196697; A-950073; NAS 1.26:196697; AD-A303212; USAATCOM-TR-94-A-021; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The helmet-mounted display (HMD) presents flight, sensor, and weapon information in the pilot's line of sight. The HMD was developed to allow the pilot to retain aircraft and weapon information and to view sensor images while looking off boresight.
DTIC
Helmet Mounted Displays; Line of Sight; Display Devices

19960033280; 96N30081 NASA Johnson Space Center, Houston, TX USA

Control System for Prosthetic Devices

Bozeman, Richard J., Inventor, NASA Johnson Space Center, USA; Jan. 02, 199611p; In English; Division of US-Patent-Appl-SN-937325, filed 31 Aug. 1992 (US-Patent-5,376,128) Patent Info.: NASA-Case-MSC-21941-2; US-Patent-5,480,454; US-Patent-Appl-SN-282843; US-Patent-Appl-SN-937325; No Copyright; Avail: US Patent and Trademark Office, Hardcopy, Microfiche

A control system and method for prosthetic devices is provided. The control system comprises a transducer for receiving movement from a body part for generating a sensing signal associated with that of movement. The sensing signal is processed by a linearizer for linearizing the sensing signal to be a linear function of the magnitude of the distance moved by the body part. The linearized sensing signal is normalized to be a function of the entire range of body part movement from the no-shrug position of the moveable body part through the full-shrg position of the moveable body part. The normalized signal is divided into a plurality of discrete command signals. The discrete command signals are used by typical converter devices which are in operational association with the prosthetic device. The converter device uses the discrete command signals for driving the moveable portions of the prosthetic device and its sub-prosthesis. The method for controlling a prosthetic device associated with the present invention comprises the steps of receiving the movement from the body part, generating a sensing signal in association with the movement of the body part, linearizing the sensing signal to be a linear function of the magnitude of the distance moved by the body part, normalizing the linear signal to be a function of the entire range of the body part movement, dividing the normalized signal into a plurality of discrete command signals, and implementing the plurality of discrete command signals for driving the respective moveable prosthesis device and its sub-prosthesis.

Official Gazette of the U.S. Patent and Trademark Office

Prosthetic Devices; Transducers; Controllers; Motion

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

19960028989; 96N29584 NASA Ames Research Center, Moffett Field,CA USA

US Experiments Flown on the Soviet Biosatellite Cosmos 2044, Volume 2, Experiments K-7-16 - K-7-41 *Final Report*

Connolly, James P., Editor, National Aeronautics and Space Administration. Ames Research Center, USA; Grindeland, Richard E., Editor, National Aeronautics and Space Administration. Ames Research Center, USA; Ballard, Rodney W., Editor, National Aeronautics and Space Administration. Ames Research Center, USA; Sep. 1994440p; In English; Also announced as 19960028989 through 19960029013

Contract(s)/Grant(s): RTOP 199-08-12

Report No.(s): NASA-TM-108802; A-94031; NAS 1.15:108802; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

Cosmos 2044 was launched on September 15, 1989, containing radiation dosimetry experiments and a biological payload including two young male rhesus monkeys, ten adult male Wistar rats, insects, amphibians, protozoa, cell cultures, worms, plants and fish. The biosatellite was launched from the Plesetsk Cosmodrome in the Soviet Union for a mission duration of 14 days, as planned. The major research objectives were: (1) Study adaptive response mechanisms of mammals during flight; (2) Study physiological mechanisms underlying vestibular, motor system and brain function in primates during early and later adaptation phases; (3) Study the tissue regeneration processes of mammals; (4) Study the development of single-celled organisms, cell cultures and embryos in microgravity; and (5) Study radiation characteristics during the mission and investigate doses, fluxes and spectra of cosmic radiation for various types of shielding. American and Soviet specialists jointly conducted 29 experiments on this mission including extensive preflight and postflight studies with rhesus monkeys, and tissue processing and cell culturing postflight. Biosamples and data were subsequently transferred to the USA. The U.S. responsibilities for this flight included development of flight and ground-based hardware, the preparation of rat tissue sample procedures, the verification testing of hardware and experiment procedures, and the postflight analysis of biospecimens and data for the joint experiments. The U.S. investigations included four primate experiments, 24 rat experiments, and one radiation dosimetry experiment. Three scientists investigated tissue repair during flight for a subgroup of rats injured preflight by surgical intervention. A description of the Cosmos 2044 mission is presented in this report including preflight, on-orbit and postflight activities. The flight and ground-based bioinstrumentation which was developed by the U.S. and U.S.S.R. is also described, along with the associated preflight testing of the U.S. hardware.

Author

Biosatellites; Spaceborne Experiments; Microgravity; Acceleration Stresses (Physiology); Space Flight; Tissues (Biology); Space Flight Stress; Cosmos

Subject Term Index

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(904) 392–0366 Fax: (904) 392–7251

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UNIV. OF GEORGIA LIBRARIES
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Athens, GA 30602–1645
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UNIV. OF HAWAII
Hamilton Library
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Moscow, ID 83844–2353
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ILLINOIS STATE LIBRARY
Federal Documents Dept.
300 South Second Street
Springfield, IL 62701–1796
(217) 782–7596 Fax: (217) 782–6437

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Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204–2296
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UNIV. OF IOWA LIBRARIES
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(319) 335–5926 Fax: (319) 335–5900

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UNIV. OF KANSAS
Govt. Documents & Maps Library
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(913) 864–4660 Fax: (913) 864–3855

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Chapel Hill, NC 27514–8890
(919) 962–1151 Fax: (919) 962–4451

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NORTH DAKOTA STATE UNIV. LIB.
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University Station
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Logan, UT 84322–3000
(801) 797–2678 Fax: (801) 797–2677

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