NASA SP-7011 (389)
June 1994

P-98

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 234 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)	N94-26333 — N94-28826
Open Literature (A-10000 Series)	None in this issue

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.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract number, report number, and accession number—are included.

A cumulative index for 1994 will be published in early 1995.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

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TYPICAL REPORT CITATION AND ABSTRACT

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ACCESSION NUMBER → **N94-11045*#** Pennsylvania State Univ., Hershey. Coll. of Medicine. ← **CORPORATE SOURCE**

TITLE → **EFFECTS OF CSF HORMONES AND IONIC COMPOSITION ON SALT/WATER METABOLISM Final Technical Report, 1 Mar. 1981 - 31 Dec. 1992**

AUTHOR → WALTER B. SEVERS 31 Dec. 1992 32 p ← **PUBLICATION DATE**

CONTRACT NUMBER → (Contract NCC2-127)

REPORT NUMBERS → (NASA-CR-193232; NAS 1.26:193232) Avail: CASI HC A03/MF A01 ← **AVAILABILITY AND PRICE CODE**

The consequences of headward fluid shifts during manned spaceflight was studied. Such shifts were recognized early by both U.S. and Soviet scientists because of signs and symptoms referable to the head. Some of these include disturbed vision, puffiness in the face and periorbital areas, headache, vestibular dysfunction, and distended jugular veins. We posited that the fluid shift had an immediate effect on the brain and a long-term action requiring a neural interpretation of the flight environment. This would re-adjust both efferent neural as well as hormonal mechanisms to sustain cardiovascular and fluid/electrolyte balance consonent with survival in microgravity. Work along these lines is summarized. A synopsis of some of the main research is presented. The following topics were studied: (1) angiotensin and vasopressin action in the central nervous system; (2) intracranial pressure control; (3) research on subcommissural organ; and (4) research on the eye.

Author (revised)

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 389)

June 1994

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LIFE SCIENCES (GENERAL)

N94-26470 Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).
STUDIES ON THE APPLICATION OF RADIATION FOR GENETIC TRANSFORMATION IN HIGHER PLANTS
YOUNG IL LEE, HI SUP SONG, JAE SUNG KIM, IN CHUL SHIN, SANG JAE LEE, KI WOON LEE, and YONG TACK LIM Feb. 1993 70 p In KOREAN Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE93-632656; KAERI/RR-1214/92) Avail: Issuing Activity (Department of Energy (DOE)) (US Sales Only)

The present research discusses the use of radiation in genetic engineering to increase productivity. Some variants were selected from the M2 generation of Namzack and the M3 generation of Sumi. The variants were derived from the plantlet of the microtuber culture of two potato cultivars irradiated with gamma rays. The rate of variation in the irradiated microtuber indicated that there were very few differences among the cultivars. The optimum gamma ray dosage for inducing mutations was found to be in the range of 30-50 Gy of gamma rays. DOE

N94-26517# Texas Univ. Health Science Center, San Antonio. Dept. of Radiology.
THE ROLE OF HYPERBARIC OXYGEN AS A PROPHYLAXIS FOR RADIATION ENTERITIS Final Report, 15 Feb. 1992 - 14 Feb. 1993
JOHN J. FELDMEIER 14 Feb. 1993 6 p
(Contract F49620-92-J-0183)
(AD-A274974; AFOSR-94-0016TR) Avail: CASI HC A02/MF A01

C3H mice were used to study the effects of post radiation treatments of hyperbaric oxygen (HBO) on preventing onset of radiation enteritis. Fifty mice were irradiated in the abdominal pelvic regions with identical radiation doses of 3000 CGY in 10 fractions over two weeks. The mice were randomly divided into a control and a study group of 25 each. The control group received no other treatment while being maintained with standard nutritional support. The study group preceived 30 HBO treatments (90 min of 100% oxygen at 2.4 ATA for 5 days/week for 6 weeks) starting 7 weeks after radiation therapy. All mice were sacrificed at 7 months and examined for signs of radiation damage. A numerical scoring system was used to quantitatively evaluate radiation damage to tissue. A score of +30 was determined for the radiation control group consisting of 21 surviving animals while a score of only +3 was noted for the HBO treated study group consisting of 25 surviving animals. Stretch meter examination showed that 7 of 21 control animals possessed stenotic lesions while only 4 of 25 HBO-treated animals were affected. Histological examination for submucosal fibrosis is presently in progress with no apparent differences noted thus far. This study indicates that post-radiation HBO treatments can significantly reduce small bowel radiation damage in mice. DTIC

N94-26623# Los Alamos National Lab., NM.
NEUTRON AND X RAY SCATTERING STUDIES OF THE INTERACTIONS BETWEEN CA(2+)-BINDING PROTEINS AND THEIR REGULATORY TARGETS: COMPARISONS OF TROPONIN C AND CALMODULIN
J. TREWHELLA and G. A. OLAH 1993 15 p Presented at the 4th International Conference on Biophysics and Synchrotron Radiation, Tsukuba, Japan, 30 Aug. - 5 Sep. 1992
(Contract W-7405-ENG-36)
(DE94-002706; LA-UR-93-3851; CONF-920821-4) Avail: CASI HC A03/MF A01

The regulatory proteins calmodulin and troponin C share a strikingly unusual overall structure. Their crystal structures show each protein consists of two structurally homologous globular domains connected by an extended, solvent exposed alpha-helix of approximately eight turns. Calmodulin regulates a variety of enzymes that show remarkable functional and structural diversity. This diversity extends to the amino acid sequences of the calmodulin-binding domains in the target enzymes. In contrast with calodulin, troponin C appears to have a single very specialized function. It is an integral part of the troponin complex, and Ca(2+) binding to troponin c results in the release of the inhibitory function of troponin I, which eventually leads to actin-binding to myosin and the triggering of muscle contraction. Small-angle scattering has been particularly useful for studying the dumbbell shaped proteins because the technique is very sensitive to changes in the relative dispositions of the two globular domains. Small-angle scattering, using x rays or neutrons, gives information on the overall shapes of proteins in solution. Small-angle scattering studies of calmodulin and its complexes with calmodulin-binding domains from various target enzymes have played an important role in understanding the functional role of its unusual solvent exposed helix. Likewise, small-angle scattering has been used to study troponin C with various peptides, to shed light on the similarities and differences between calmodulin and troponin C. DOE

N94-26991# Aerospace Medical Research Labs., Brooks AFB, TX. Crew Systems Directorate.
PERFORMANCE RECOVERY IN THE BABOON FOLLOWING (+)G SUB Z-INDUCED LOSS OF CONSCIOUSNESS Final Report, Jul. 1985 - Sep. 1990
JOHN W. BURNS, PAUL M. WERCHAN, JOHN W. FANTON, and ANDREW B. DOLLINS Dec. 1993 17 p
(Contract AF PROJ. 7930)
(AD-A274411; AL/CF-TR-1993-0110) Avail: CASI HC A03/MF A01

Seven male baboons (avg. wt. 20.6 +/- 1.6 kg) were trained in a simple shock-avoidance performance task on the Armstrong Laboratory human/animal centrifuge for subsequent (+)G sub z-induced loss of consciousness (G-LOC) exposure. A red light was presented to the baboon at approximate 2-s intervals. The animal was allowed 1 s to turn off the light or receive a 1-s shock. The shock could be abbreviated by a late trigger pull (escape). Thus, the animal could avoid, escape, or accept the full shock. EEG was monitored from three transcranial stainless steel electrodes. Loss of consciousness (LOC) was induced by a rapid onset (4 or 6 G/s) exposure to 8 (+)G sub z, (head-to-feet inertial load), and sustained until LOC was identified by a near isoelectric EEG signal. Performance recovery time was measured from the return of EEG activity to the time when the animal resumed the

performance task. These data were compared with previously obtained human data and found to be very similar. Also, it was found that performance recovery time significantly (p less than .001) increased with increased duration of unconsciousness. This study demonstrates the utility of the baboon as an animal model for G-LOC research. DTIC

N94-27045# National Defence Research Establishment, Umea (Sweden). Huvudavdelning foer ABC-Skydd.
BAKTERIELLA TOXINER-MORGONDAGENS HOT (BACTERIAL TOXINS-THE THREAT OF TOMORROW)
KARIN HJALMARRSSON, LENA NORLANDER, and ROLAND ROSQVIST May 1993 62 p In SWAHILI
(PB94-124229; FOA-C-40310-4.4) Avail: CASI HC A04/MF A01

Toxins from pathogenic bacteria have been studied for the last century and have remained objects for intense research over the last decade. The power of gene technology has been used to increase the understanding of structure and mechanism of action of bacterial toxins. This review describes what is known for some of the most potent bacterial toxins. Aspects that are discussed are production of toxins in different systems, the use of toxins as new therapeutic agents and vaccines, and methods for identification of toxins. NTIS

N94-27165# Iowa Univ., Iowa City.
NCVS, VOLUME 5 Status and Progress Report, Nov. 1993
INGO TITZE, ed., JULIE LENKE, ed., JULIE OSTREM, ed., and MARTIN MILDER, ed. Nov. 1993 106 p Sponsored by National Inst. on Deafness and Other Communication Disorders Prepared in cooperation with Denver Center for the Performing Arts, CO; Wisconsin Univ., Madison; and Utah Univ., Salt Lake City
(AD-A274975) Avail: CASI HC A06/MF A02

This 5th Status and Progress Report comes at a time when we are all thinking of the long term future of the National Center for Voice and Speech. Many things are changing right now in the health science arena. All of us are familiar, of course, with the day to day developments of President Clinton's health care package. One thing is certain - each year we have to become more clever as researchers. The Advisory Board to NIDCD wishes us to get deeper into the molecular structure of all the organs of the human body involved in speech communication. At the same time, they wish us to understand the whole body as a system. Yet it is becoming more and more difficult to do invasive procedures, either on humans or on animals. This means that the critical data that we all need have to come from very carefully conducted experiments, those that have a high benefit to risk (or cost) ratio. On the one hand, we need large numbers of human subjects or animals to make our results statistically reliable; on the other hand, we need to conserve and protect humans and animals involved in research. This puts all of the pressure on the experimenter to obtain only those pieces of information that are absolutely vital and then to integrate the fragments in the most clever ways. DTIC

N94-27171 National Defence Research Establishment, Umea (Sweden). Huvudavdelning foer ABC-Skydd.
MICROBIOLOGY RESEARCH AT SOME RESEARCH INSTITUTES IN THE FORMER SOVIET UNION: A SURVEY OF SCIENTIFIC PUBLICATIONS [MIKROBIOLOGISK FORSKNING VID ETT ANTAL FORSKNINGSINSTITUT I DET FORNA SOVJETUNIONEN: EN SAMMANFATTNING AV LITTERATURDATA]
G. BOSTROEM, B. ENGBERG, L. NORLANDER, A. NORQVIST, and A. OSTERMAN May 1993 22 p In SWAHILI
(PB94-123320; FOA-C-40309-4.4) Avail: Issuing Activity (National Technical Information Service (NTIS))

The survey of the publications of some research institutes of the former Soviet Union has been performed. The study has focused on scientific publications found in the bibliographic database BIOSIS during 1980-89. NTIS

N94-27227*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PROPRIOCEPTIVE ISOKINETIC EXERCISE TEST
P. T. DEMPSTER (Loredan Biomedical, Inc., Davis, CA.), E. M. BERNAUER (California Univ., Davis.), M. BOND (Loredan Biomedical, Inc., Davis, CA.), and J. E. GREENLEAF Jun. 1993 12 p
(Contract RTOP 199-18-12-07)
(NASA-TM-104015; A-93070; NAS 1.15:104015) Avail: CASI HC A03/MF A01

Proprioception, the reception of stimuli within the body that indicates position, is an important mechanism for optimal human performance. People exposed to prolonged bed rest, microgravity, or other deconditioning situations usually experience reduced proprioceptor and kinesthetic stimuli that compromise body balance, posture, and equilibrium. A new proprioceptive test is described that utilizes the computer-driven LIDO isokinetic ergometer. An overview of the computer logic, software, and testing procedure for this proprioceptive test, which can be performed with the arms or legs, is described. Author

N94-27411*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
EFFECT OF CARBON DIOXIDE ENRICHMENT ON RADISH PRODUCTION USING NUTRIENT FILM TECHNIQUE (NFT)
C. L. MACKOWIAK (Bionetics Corp., Cocoa Beach, FL.), L. M. RUFFE (Bionetics Corp., Cocoa Beach, FL.), N. C. YORIO (Bionetics Corp., Cocoa Beach, FL.), and R. M. WHEELER (Bionetics Corp., Cocoa Beach, FL.) Mar. 1994 17 p
(NASA-TM-107198; NAS 1.15:107198) Avail: CASI HC A03/MF A01

Radish plants (Raphanus sativus L. cvs. Cherry Belle, Giant White Globe, and Early Scarlet Globe) were grown in four different CO2 enriched environments, 0.04, 0.10, 0.50, and 1.00 kPa (400, 1000, 5000, 10000 ppm). Cultivar responses to CO2 treatments varied, where cv. Cherry Belle showed no significant response to CO2 enrichment, cv. Giant White Globe was moderately affected and Early Scarlet Globe was strongly affected. Enrichment at 0.10 kPa led to greater root dry matter (DM) than 1.00 kPa for cv. Giant White Glove, whereas 0.10 kPa produced greater storage root, shoot, and root DM than 1.00 kPa for cv. Early Scarlet Globe. The data suggest that 1.00 kPa CO2 may be detrimental to the growth of certain radish cultivars. Root:shoot ratios tended to increase with increasing CO2 concentration. Water use efficiency (g biomass/kg H2O) increased with increasing CO2 enrichment, up to 0.5 kPa but then declined at the 1.00 kPa treatment. The total nitric acid used to maintain nutrient solution pH was lowest at the 1.00 kPa treatment as well, suggesting a decreased demand of nutrients by the plants at the highest CO2 level. Author

N94-27412*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
DEVELOPMENT OF A SPARGING TECHNIQUE FOR VOLATILE EMISSIONS FROM POTATO (SOLANUM TUBEROSUM)
ELIZABETH BERDIS (Bionetics Corp., Cocoa Beach, FL.), BARBARA VIEUX PETERSON (Bionetics Corp., Cocoa Beach, FL.), NEIL C. YORIO (Bionetics Corp., Cocoa Beach, FL.), JENNIFER BATTEN (Bionetics Corp., Cocoa Beach, FL.), and RAYMOND M. WHEELER 8 Dec. 1993 23 p
(Contract NAS10-11624)
(NASA-TM-109199; NAS 1.15:109199) Avail: CASI HC A03/MF A01

Accumulation of volatile emissions from plants grown in tightly closed growth chambers may have allelopathic or phytotoxic properties. Whole air analysis of a closed chamber includes both biotic and abiotic volatile emissions. A method for characterization and quantification of biogenic emissions solely from plantlets was developed to investigate this complex mixture of volatile organic compounds. Volatile organic compounds from potato (Solanum tuberosum L. cv. Norland) were isolated, separated and identified using an in-line configuration consisting of a purge and trap concentrator with sparging vessels coupled to a GC/MS system.

Analyses identified plant volatile compounds: transcaryophyllene, alpha-humulene, thiobismethane, hexanal, cis-3-hexen-1-ol, and cis-3-hexenyl acetate. Author

N94-27444# Nagoya Women's Univ. (Japan).
ENDOCRINOLOGICAL EVALUATIONS OF MUSCLE AND BONE ATROPHY IN TAIL-SUSPENDED RATS [BIBU KENSUI RATTO NI OKERU KIN-KOTSU ISHUKU NO NAIBUNPIGAKU TEKI KENTO]
SETSUKO KAWANO, KAZUMI KANDA (Sanwa Kagaku Kenkyusho Co. Ltd., Kasugai, Japan.), YOSHIHARU MURATA (Nagoya Univ., Japan.), SACHIKO OMORI (Nagoya Univ., Japan.), NORIHIRO MIYAMOTO (Nagoya Univ., Japan.), KAORI SUEDA (Nagoya Univ., Japan.), and HISAO SEO (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 5-8 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Metabolic change and endocrine variation of tail-suspended rats were studied as a model of atrophy in weightless state or long term bedding. Subjects were Wistar strain rats, suspended from the ceilings of the cages by wires pierced through the tails, and urine was collected every 12 hours. Seven days after the suspension, all rats were killed, and wet weight of associated organs, and testosterone, activated vitamin D3, hydroxyproline, Ca and Pi (Inorganic Phosphorus) concentration were measured, as well as Alkali Phosphatase (ALP) activity. As a result, in suspension groups, significant decrease was observed in body weight and in wet weights of the thymus, testicle and bones, whereas the adrenal gland weight was significantly increased. In suspension groups, there was also significant decrease in testosterone concentration, as well as tendency of decrease in vitamin D3. Ca and Pi concentrations in blood were significantly decreased within the normal range. In the bones of suspended group, ALP activity, the amounts of hydroxyproline, Ca and Pi were all decreased. These results suggest the correlation of muscle and bone atrophy with decrease of testosterone. The change of the bone components also reveals the decrease of bone density, which may result from the decrease of vitamin D3 in blood. Author (NASDA)

N94-27464# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
MODULATION BY GALACTOSAMINE-INDUCED HEPATITIS OF BIOLOGICAL RESPONSES OF THE RAT EXPOSED TO HIGH ALTITUDE HYPOXIA [KYUSEI TEIATSU-TEISANSO KANKYOKA NI OKERU GARAKUT OSAMIN YUHATSU KANEN RATTO NO SEITAI HANNO]
CHIKASHI YAMAMOTO, MASATAKA YOSHINO (Institute for Developmental Research, Kasugai, Japan.), SHIGEO MORI, and HISAO SEO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 97-98 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Under hypobaric hypoxic condition, liver function is expected to be affected by induction of enzymes to adapt anaerobic condition. These biological responses were studied using rats induced hepatitis by galactosamine under the condition with altitude of 8,000 m. To examine liver metabolism, the activity of mitochondrial enzymes (citrate synthase, fumarase), cytosol glycolysis enzyme (hexokinase), glyconeogenesis enzyme FBPase (Fructose 1,6-bisphosphatase Steroid-Induced Enzyme) (tyrosine aminotransgerase) were measured. As a result, the activity of mitochondrial enzymes were decreased in hepatitis group, whereas that of hexokinase and FBPase was not changed by galactosamine. Both hepatitis and control group were not affected by exposure of high altitude hypoxia. However, tyrosine aminotransferase activity was increased twice as much as that of control group by exposure of high altitude hypoxia, while no change was observed in hepatitis group. The fact that mitochondrial enzymes were changed but not cytosol glycolysis enzymes in hepatitis group suggests that mitochondrial membrane could be damaged by galactosamine. In addition, galactosamine inhibited the steroidal induction of tyrosine aminotransferase under the condition of high altitude hypoxia. This implies that galactosamine was damaged endoplasmic reticulum, too. These results suggests that galactosamine-induced hepatitis is useful to examine how to switch the anaerobic metabolism to aerobic metabolism. Author (NASDA)

N94-27465# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
PROTECTIVE ACTION OF PLATELET-ACTIVATING FACTOR ANTAGONIST, TCV-309, AGAINST ISCHEMIA REPERFUSION INJURY IN ISOLATED RABBIT HEARTS [KESSHOBAN KASSEIKA INSHI (PAF) KIKKOZAI TCV-309 NO KYOKETSU SHINKIN HOGO KOKA: IEUSAGI TEKISHUTSU KANRYUSHIN O MOCHITA JIKKENTEKI KENTO]
SATORU KATO, AKIRA KOIKE, TOSHIO ABE, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 99-101 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

It has been revealed that Platelet Activating Factor (PAF) has a direct effect on the heart, as well as possibility to be associated with reperfusion injury in the heart. This study examined the effect of TCV-309, an PAF antagonist, on isolated rabbit heart and on CPK (Creatine Phosphokinase) release during reperfusion. For this study, isolated rabbit hearts were perfused aerobically for 30 minutes, followed by blocking of perfusion for 120 minutes, then, reperfused again for 60 minutes. TCV-309 was administered in perfusate before and after the block. In this experiment, Left Ventricular Developed Pressure (LVDP) and the amount of CPK released in perfusate for 5 minutes after the reperfusion were measured. As a result, LVDP recovery rate was 54.3 percent in control group, whereas it was remarkably improved up to 77.6 percent in TCV-309 administered group. The amount of CPK was significantly decreased in TCV-309 administered group. From these results, it can be concluded that TCV-309 can improve cardiac function after ischemia and inhibit CPK release. These results support the possibility that PAF might be associated with reperfusion injury of cardiac ischemia. Author (NASDA)

N94-27466# Nagoya Univ. (Japan). Dept. of Cardiol-Surgery.
PROTECTIVE ACTION OF AN AMILORIDE DERIVATIVE (AMILORIDE, 5-(N, N-DIMETHYL) HYDROCHLORIDE) AGAINST IN ISOLATED ISCHEMIA/REPERFUSION NEWBORN RABBIT HEARTS [MIJUKU SHINKIN NO KYOKETSU SAIKANRYU SHOGAI NI TAISURU AMIRORAIDO YUDOTAI (AMIRORAIDO,5-(N-, N-JIMECHIRU) HIDOROKURORAIDO) NO HOGO KOKA]
AKIRA KOIKE, SATORU KATO, TOSHIAKI AKITA, TOSHIO ABE, ITSUO KODAMA, and JUNJI TOYAMA *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 102-104 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

It is known that excess intracellular Ca(2+) causes cytotoxic reaction after reperfusion of cardiac ischemia. Ca(2+) is transported into the cell by Na(+)/Ca(2+) exchange propelled by H(+) concentration gradient, followed by Na(+)/H(+) exchange. It was reported that amiloride improved cardiac function in newborn rabbit hearts where intracellular Na(+) might be accumulated more than matured hearts probably due to anaerobic glycolysis. This effect depends on inhibition of Na(+)/H(+) and Na(+)/Ca(2+) exchanger. This study concerns protective action of a amiloride derivative, amiloride, 5-(N, N-dimethyl) hydrochloride (DMA) against reperfusion injury after ischemia, which can inhibit Na(+)/H(+) exchanger selectively. In this study, perfusion was blocked for 45 minutes after 15 minutes of preperfusion in isolated newborn rabbit heart, followed by reperfusion for 30 minutes, and Left Ventricular Developed Pressure (LVDP) was measured, as well as the amount of CPK (Creatine Phosphokinase) in perfusate for 15 minutes after the reperfusion was determined. It was also revealed that DMA barely effected non-ischemic heart from one to 10 micromoles, but 100 micromoles of DMA caused cardiac arrest. LVDP recovery rate was 51 percent in control group, whereas DMA improved it up to 1 percent. Comparing the amount of CPK, DMA group was decreased significantly than control group (68 unit/g vs. 10 unit/g). These results suggest that DMA improved

LVDP recovery rate after reperfusion, and decreased CPK release, without any adverse effect on the heart. This effect was as much strong as amiloride. Author (NASDA)

N94-27467# Nagoya Univ. (Japan). Research Inst. of Environmmental Medicine.

EFFECTS OF HIGH-INTENSITY ELECTRIC FIELD STIMULATION ON THE ELECTROMECHANICAL PERFORMANCE OF CARDIAC MUSCLE: INFLUENCE OF FIBER ORIENTATION Report No. 6 [KOENERUGI DENKI SHIKKU GA SHINKIN NO MAKU KATSUDO DENI TO CHORYOKU NI OYOBOSU SAYO: SHINKIN SENI SOKO NO EIKYO]

ITSUO KODAMA, AKIKO ARAI, RYOKO SUZUKI, NITARO SHIBATA (Tokyo Woman's Medical Coll., Japan.), KIYOMI NIKI (Tokyo Woman's Medical Coll., Japan.), ICHIRO SAKUMA (Tokyo Woman's Medical Coll., Japan.), TADASHI HARAGUCHI (Tokyo Denki Univ., Japan.), KENJI FURUKAWA, YASUHIKO FUKUI, SAICHI HOSODA (Tokyo Woman's Medical Coll., Japan.) et al. *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 105-109 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

This study examined the responses of a cardiac muscle in the longitudinal (L) direction and transverse (T) direction stimulated by electric shock pulses (SP) using the cardiac muscles of guinea pigs. As a result, it was revealed that they responded differently by orientation of muscle fibers; i.e., the diastolic threshold of excitation in L direction was 1.4 - 1.6 times the strength as that in T direction. This suggests that L direction was more responsive to high intensity electric stimulation than T direction, probably resulting from electric potential (membrane potential) that is varied by the length of conductor in the same direction as electric field. However, in case of stimulating by 25 V/cm or more of SP's, the delayed responses were contrary to these results; i.e., decrease of resting potential and increase of contractility were larger in T direction than L direction, and vibration of membrane potential and spontaneous activity tend to occur in T direction. This is probably because electroporation that can pass ions unselectively after high-intensity electric stimulation does not present or presents slightly at the ends of longitudinal axis. Thus, electric coupling via gap junction of intercellular constitution that are different by orientation of muscle fibers may cause the different conductivity between T and L direction. Author (NASDA)

N94-27468# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

ON THE MECHANISM OF REENTRANT ARRHYTHMIAS FOLLOWING DC DEFIBRILLATION: INFLUENCE OF FIBER ORIENTATION TO THE EFFECTS OF LOW-ENERGY ELECTRIC FIELD STIMULATION ON THE EFFECTIVE REFRACTORY PERIOD OF CARDIAC MUSCLE [CHOKURYU JOSAIDO GO NO RIENTORI HUSEIMYAKU HASSEI KIJO NI KANSURU KENKYU: TEI ENERUGI DENBA SHIGEKI NIYORU SINKIN FUOKI ENCHO TO SENI SOKO NO KANKEI]

ITSUO KODAMA, NITARO SHIBATA (Tokyo Woman's Medical Coll., Japan.), ICHIRO SAKUMA (Tokyo Denki Univ., Japan.), KIYOMI NIKI (Tokyo Woman's Medical Coll., Japan.), AKIKO ARAI, RYOKO SUZUKI, TADASHI HARAGUCHI (Tokyo Denki Univ., Japan.), KENJI FURUKAWA (Tokyo Denki Univ., Japan.), YASUHIKO FUKUI (Tokyo Denki Univ., Japan.), SAICHI HOSODA (Tokyo Woman's Medical Coll., Japan.) et al. *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 110-113 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

In this study, the correlation between effects of low energy electric field stimulation on Effective Refractory Period (ERP) and cardiac fiber orientation was reviewed in order to clarify the mechanism of reentrant arrhythmias following DC (direct current) defibrillation. The ERP was measured using a cardiac muscle of guinea pigs stimulated by shock pulses (PS) provided to the longitudinal (L) direction and the transverse (T) direction. As a result, it was revealed that repolarization and ERP were delayed according to the intervals between basic stimulation and PS and intensity of low energy electric field stimulations. This effect was marked in the L direction than the T direction, probably resulting from the shape of cardiac fibers. They are usually longer in the L direction than the T direction by 8 - 10 times so that the maximum membrane potential in the L direction is estimated to be several times as much as that in the T direction. The difference of conductivity by directions causes anisotropy of tissue resistance. In addition, electrical coupling occurred effectively and extracellular resistance was lowered in the L direction, which might also cause the difference of electric density by the directions. Low energy DC electric field stimulation can delay ERP and repolarization, and the delay was modified by strength of electric field, interval of stimulation, and orientation of cardiac fibers, leading to inequal refractory period in different sites. This could be a cause of reentrant arrhythmias. Author (NASDA)

N94-27469# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

POSITIVE CHRONOTROPIC EFFECT OF MECHANICAL STRETCH ON THE SINOATRIAL NODE: ROLES OF NEUROTRANSMITTERS AND STRETCH ACTIVATED CHANNELS [KIKAITEKI SHINTEN NI YORU DOKESSETSU JIDONO KOSHIN NO KIJO NI KANSURU KENKYU]

AKIKO ARAI, RYOKO SUZUKI, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 114-116 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

It is known that stretch stimulation causes positive chronotropic effect on the sinoatrial node probably mediated by Stretch-Activated (SA) channels. This study examined the mechanism using the SA-channel blocker, gadolinium (Gd(3+)). The sinoatrial node of rabbit was extracted and the Spontaneous Cycle Length (SPCL) was determined during and after the stretch stimulation. As a result, it was revealed that the mechanical stretch caused positive chronotropic effect in proportion to the strength of the tension. The maximum effect was achieved immediately after the stretch stimulation and then decreased exponentially. When the neurotransmitter in the tissue was blocked pharmacologically by propranolol and atropine, residual effect after the stimulation disappeared. However, Gd(3+) did not decrease the positive chronotropic effect. These results suggests that this effect might result from not only neurotransmitters, especially noradrenaline, but also another factor. However, Gd(3+) sensitive SA channel might not play an important role in this process.

Author (NASDA)

N94-27470# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

DISTURBED NEURONAL MIGRATION IN THE CEREBRAL CORTEX OF MICE BY LOW-DOSE GAMMA RADIATION [TEISENRYO HOSHASEN NI YORU MAUSU DAINO HISHITSU SHINKEI SAIBO NO YUSO SHOGAI]

MINORU INOUE, SHIZU HAYASAKA, XUE-ZHI SUN, and HIDEKI YAMAMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 117-121 25 Mar. 1993 In JAPANESE

(Contract MOE-03680181)

Avail: CASI HC A01/MF A04

There is a possibility that gamma-radiation may affect a development of nerve cells by disturbance of neuronal migration. In the cerebral cortex, ganglionic layer is formed from inside to outside, and young nerve cells developed in the ventricule migrate through the primodial cortex to form the outer layer. This study examined the effect of low dose gamma-radiation on this migration using mice. Proliferative cells in S stage were labeled by Bromodeoxy Uridine (BrdU) at the 16th or 17th day of pregnancy, and 0.26 Gy of gamma-ray was radiated at the 17th day. These mice were killed at hours after the radiation or two days or six weeks after the birth, and each brain was examined. As a result, cell death was not observed in the ventricle hours after radiation. However, in the cerebral cortex of two day-old mice, migration of

nerve cells in S-stage were disturbed, while those in G1 or G2 stage migrated normally. In six week-old mice, migration was disturbed in cells in both S-stage and G0/G2 stage. These results suggest that low-dose gamma-radiation disturbs the migration of premature nerve cells to the cerebral cortex. In this process, cells during DNA (Deoxyribonucleic Acid) replication were more sensitive to the radiation effect than those during differentiation.
Author (NASDA)

N94-27471# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
DISTRIBUTION OF GABA IMMUNOREACTIVE NEURONS IN THE BRAIN OF ROLLING MOUSE NAGOYA AND GAMMA-IRRADIATED MOUSE [IDENSEI UNDO SHICCHO MAUSU TO GANMASEN HIBAKU MAUSU NO NO NI OKERU GABA NYURON NO BUNPU]
TAKAYOSHI IMAI, YOSHIKO TAKAGISHI, SHIZU HAYASAKA, MINORU INOUYE, and HIDEKI YAMAMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 122-124 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

A rolling mouse Nagoya has been used as a model of human spinocerebellar degeneration presenting hereditary ataxia. In this study, distribution of neurons containing Gamma-Aminobutyric Acid (GABA) in the brain of a rolling mouse Nagoya was determined immunologically using anti-GABA antibodies. In addition, mice with microcephaly by embryonal gamma-irradiation was also studied in the same manner. The brain of both mice were sliced, immunostained and observed microscopically. As a result, the cerebrum of the rolling mice appeared normal, and no histological abnormality was observed in the cerebellum in spite of some reports that presented the possibility of hypoplasia of the frontal lobe and decrease of granule cells. On the contrary, the gamma-irradiation mice had obviously smaller cerebrum and thinner cortex layer than control, but other parts of the brain was histologically normal. In the immunostain study, GABA-positive neurons were mainly observed in the cerebral cortex in both mice, striate body, thalamus and cerebellar cortex. In the cerebral cortex, they were distributed predominantly in the two and four layers of control mice, whereas they were distributed in all layers of the gamma-irradiated mice and rolling mice. In other parts of the brain, no particular difference was observed in the distribution of GABA-positive neurons between control group and gamma-irradiated and rolling mice group.
Author (NASDA)

N94-27472# Suzuka Univ. of Medical Science and Technology (Japan).
EFFECTS OF GAMMA RAY RADIATION ON THE DEVELOPING MOUSE CEREBELLUM: APOPTOTIC CELL DEATH AND INDUCTION OF TISSUE TRANSGLUTAMINASE [GANMASEN SHOSHA NO MAUSU SHINSEISHI NO SHONO GENKI NI OYOBOSU EIKYO: SAIBOSHI TO SOSHIKI TORANSUGURUTAMINAZE NO YUDO]
MASAO TAMARU, MASATO ANDO (Fujita Health Univ., Toyohashi, Japan.), YUTAKA NAGATA (Fujita Health Univ., Toyohashi, Japan.), and MINORU INOUE (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 125-127 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

It is known that developing nerve cells are so sensitive to radiation that apoptotic death often occurs. In this process, condensation of chromatin and pykonosis, followed by reduction of cells, finally results in destruction of cells. It is considered that Transglutaminase (TG) plays an important role to form apoptotic body via cross-link of protein. In order to reveal the TG function, it was examined whether the TG activity was changed or induced during the apoptosis. One-day old mice were irradiated by gamma-rays to cause apoptosis in the outer granule layer of the cerebellum. As a result, pykonosis increased 3 hours after the radiation, achieved the peak after 5 hours, then gradually decreased in the cerebellum, while the TG activity was changed in accordance with the change of pyknosis. TG activation and induction might strengthen the cross-link of protein which stabilizes apoptotic body and prevent leak of intracellular substances. Thus, these results support the idea that TG may function in occurrence of apoptosis.
Author (NASDA)

N94-27477# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
THE INTRACELLULAR SECOND MESSENGER SYSTEM IN C-FOS GENE INDUCTION BY ACTH [ACTH NI YORU C-FOS IDENSHI YUDO NO SAIBONAI SEKANDO MESSENJA]
NORIHIRO MIYAMOTO, KAZUMI KANDA, HIROYOSHI HIDAKA, and HISAO SEO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 145-147 25 Mar. 1993 In JAPANESE
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In the previous report, it was demonstrated that Adrenocorticotroic Hormone (ACTH) induced to express the c-fos gene, a cellular tumor gene, transiently in the early stage in hypophysectomy rats. Several intracellular second messengers might participate in the c-fos gene induction, including cAMP (cyclic Adenosine 3', 5'-monophosphate) dependent kinase (A-kinase), proteinkinase C (C-kinase), and Ca(2+)/calmodulin-dependent kinase (CaM-kinase). This study examined the function of these messengers in c-fos gene induction. To the primary culture of rat's adrenal cells, an activator of either A-kinase, C-kinase or CaM-kinase was added, as well as an A-kinase inhibitor. As a result, c-fos mRNA (messenger Ribonucleic Acid) was remarkably increased 60 minutes after A-kinase activator, cAMP, addition, and decreased to the level before the addition at 180 minutes. The amount of corticosterone in the culture was increased in proportion to time. The A-kinase inhibitor, H-89, inhibited the increase of mRNA, as well as production of corticosterone, in dose-dependent manner. However, the activators of C-kinase and CaM-kinase did not increase the mRNA and corticosterone. These results suggest that the c-fos gene induction by ACTH may mediated by cAMP as a intracellular second messenger, and that C-kinase and CaM-kinase may not participate in c-fos gene induction as a second messenger.
Author (NASDA)

N94-27479# Nagoya Univ. (Japan). Dept. of Surgery.
CLONING OF RAT RXR ALPHA CDNA AND THE EXPRESSION OF ITS MRNA IN REGENERATING LIVER AND PRIMARY CULTURED HEPATOCYTES [RATTO RXR ARUFA CDNA NO KURONINGU TO SAISEIKAN OYOBI SHODAI BAIYO SAIBO NI OKERU MRNA NO HATSUGEN]
MASAFUMI MENJO, YOSHIHARU MURATA, FUKUSHI KAMBE, TAICHI KATO, TSUYOSHI KATO, and HISAO SEO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 151-153 25 Mar. 1993 In JAPANESE
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It was demonstrated that the response to thyroid hormone was weakened in hepatocytes of proliferation phase due to inhibiting the expression of T(sub 3) response genes. This study examined the gene expression of rat alpha-Retinoid X Receptor (RXR-alpha) cDNA (complementary Deoxyribonucleic Acid) that is a T(sub 3) receptor auxiliary protein presenting in the liver, in order to clarify the mechanism of the thyroid hormone response in hepatocytes. For cDNA, RXR alpha cDNA was amplified by RT (Reverse Transcription)-PCR (Polymerase Chain Reaction) from total mRNA extracted from mice liver, and was cloned, and the sequence was determined. As a result, it was proved that the cDNA was homologous to the human RXR alpha DNA in 2.1 percent. Gene expression of RXR alpha was examined using regenerating liver, primary cultured hepatocytes, and sham-operated liver. The three cells were cultivated by monolayer culture and spheroid culture, amplified by PCR, and the RXR alpha mRNA was identified on electrophoresis. As a result, no difference was observed in respect to mRNA expression among three kinds of cells, and between two culture methods. Therefore, it can be concluded that gene expression of RXR alpha mRNA (messenger Ribonucleic Acid) are not related with the decrease of the thyroid hormone response in proliferating hepatocytes. Author (NASDA)

N94-27480# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
CLONING OF A NOVEL POU FAMILY GENE BY RT-PCR METHOD [RT-PCR HO O MOCHIITA ATARASHII POU IDENSHI NO KURONINGU NO KOKOROMI]
FUKUSHI KAMBE, SHINICHIRO TSUKAHARA, TAICHI KATO, NORIHIRO MIYAMOTO, YOSHIHARU MURATA, and HISAO SEO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 154-157 25 Mar. 1993 In JAPANESE
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Recently, it has been demonstrated that expression of Pit-1, an homeobox gene, is necessary for differentiation and proliferation of growth hormone, prolactin and thyroid-stimulating hormone in the anterior pituitary of rats, and that Pit-1 functioned as a transcription regulatory factor for the expression of hormone genes in each cell. Furthermore, a group of proteins called the POU family, that have a highly homologous domain with the Pit-1 gene, were found in the central nerve system, testicle, and B-cells. In this study, mRNA's (Messenger Ribonucleic Acid) were extracted from several organs, to find new POU gene. As a result, mRNA's of the hypothalamus, thyroid gland, thymus, adrenal grand and testicle were amplified by RT (Reverse Transcription)-PCR (Polymenase Chain Reaction), and their cDNA (complementary Deoxyribonucleic Acid) were revealed to be highly homologous to the human Oct-1 gene, which is of the POU family. The cDNA amplified from mRNA of the pituitary was identified as the Pit-1 POU domain. The mRNA of the pancreas could not be amplified. These results suggest that the cDNA's cloned in this study were rat Oct-1 cDNA, and that the Oct-1 POU domain sequence could be ubiquitous in vertebrates. In respect to organs, the Oct-1 gene was found in almost all organs except for the pancreas.
Author (NASDA)

N94-27482# Nagoya Univ. (Japan). Dept. of Internal Medicine.
EXPRESSION ANALYSIS OF THYROXINE-BINDING GLOBULIN COMPLETE DEFICIENCY IN JAPANESE (TBG-CDJ) [NIHONJIN NO TBG KANZEN KESSONSHO (TBG-CDJ) NO HASSHO KIJO NI KANSURU KENKYU]
YOSHITAKA MIURA, FUKUSHI KANBE, YUICHI MORI, IKUO YAMAMORI, YOSHIYUKI TANI, YOSHIHARU MURATA, YUTAKA OISO, and HISAO SEO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 161-165 25 Mar. 1993 In JAPANESE
(Contract MOE-04671468)
Avail: CASI HC A01/MF A04

Thyroxine-binding globulin complete deficiency is a hereditary disease that is defined by a serum Thyroxine-Binding Globulin (TBG) level of less than 5 mg/l. It has several subtypes including Thyroxine-Binding Globulin Complete Deficiency in Japanese (TBG-CDJ) which produces TBG with a deficit of 22 amino acids from the C-terminal, probably because of mistranslation of genetic code resulting from a deficit of one base. The purpose of this study was to reveal the mechanism of TBG-CDJ by examining the synthesis and release of TBG in COS-1 cells derived from a monkey's renal cells to which normal TBG (TBG-N) or mutant TBG (TBG-CDJ) was induced. As a result, the presence of intracellular TBG was identified in the cell induced TBG-CDJ for a relative long period. This suggests that something interfered with the release of normal TBG in the TBG-CDJ cells. From results of cell fractionation and sensitivity to endoglycosidase H, it was revealed that TBG was stored in RER (Rough-Surfaced Endoplasmic Reticulum) and was not transported to Golgi bodies. This is probably due to the C-terminal which might be important for intracellular transportation was varied in TBG-CDJ, and the tertiary structure was also considered to be changed.
Author (NASDA)

N94-27483# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
DEVELOPMENT OF PURKINJE CELLS IN VITRO [BAIYOKEI NI OKERU PURUKINE SAIBO NO BUNKA]
YOSHIKO TAKAGISHI, MANABU INOUE (Mie Univ., Japan.), TAKAHITO SUGIMOTO (Mie Univ., Japan.), and HIDEKI YAMAMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 166-169 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

This study examined the development of Purkinje cells in a serum-free medium. The cerebellum of newborn mice or one week-old mice were trypsinized, and the free cells were cultivated in the serum-free medium at 37 C and under 5 percent CO2. To identify Purkinje cells, the antibodies for vitamin D-dependent Ca Binding Protein (CaBP) that are present in Purkinje cells were used for immunostain. As a result, slightly large sphere cells were stained at the first day of the cultivation. At the seventh day, Purkinje cells were observed with long axons and short dendrites that became longer at the 14th day and at the 21st day. Purkinje cells with branched axons were observed. The process of cell development in vitro was almost similar to that in vivo. It was reported that synapses of granule cells and Purkinje cells were observed electrophysiologically in vitro. Therefore cultivation of undeveloped Purkinje cells might be a useful model system to study the developing of nerve cells in the cerebellum.
Author (NASDA)

N94-27484# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
DEVELOPMENTAL EXPRESSION OF PROTEIN KINASE C TYPE 1 ISOZYME IN SUNCUS AND RAT CEREBELLA [SUNKUSU TO RATTO NO SHONO NI OKERU PUROTEINKINAZE C1 GATA AISOZAIMU NO HATSUGEN]
SHIZU HAYASAKA, YOSHIKO TAKAGISHI, SENICHI ODA, MINORU INOUE, and HIDEKI YAMAMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 170-173 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

This study compared the development of the cerebellum between suncuses and rats by the expression of protein kinase C type 1 isozyme which is only present in the nervous system, especially in the Purkinje cells of rats and rabbits. The expression was identified by immunohistological method and immuno-blot method; i.e., the cerebellums were extracted from zero, one, three, five, 10, 15, 21, and 42 day-old suncuses and rats were sliced, immunostained, and observed microscopically, or homogenated and analyzed by electrophoresis. Purkinje cells were observed in the cerebellum of newborn suncuses, and their numbers increased as time passed, while they were not found until the third day in rats. In the immunohistological study, Purkinje cells were identified by type 1 isozyme in newborn suncuses and in 15 day-old rats. In the immuno-blot study, these cells were expressed in newborn suncuses and in 10 day-old rats. This suggests that the development of Purkinje cells was underway in suncuses at birth because their pregnancy period is longer than rats.
Author (NASDA)

N94-27485# Nagoya Univ. (Japan). School of General Education.
ABNORMAL DEVELOPMENT OF SEROTONIN NERVE FIBERS IN THE CEREBRAL CORTEX OF YOUNG RATS WITH METHYLAZOXYMETHANOL INDUCED MICROCEPHALY [MECHIRUAZOKISHIMETANORU NI YORU JIKKENTEKI SHOTOSHO RATTO NO DAINO HISHITSU NI OKERU SEROTONIN SHINKEI SENI NO SEIGO SHOKI HATTATSU IJO]
ATSUSHI FUNAHASHI, MINORU INOUE, and HIDEKI YAMAMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 174-176 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

In a previous study, it was demonstrated that rats in which microcephaly was induced by intraperitoneal injection of Methylazoxymethanol (MAM) on the 15th day of pregnancy (MAM rat) had underdeveloped serotonin nerve fibers in the raphe nuclei. There are some reports that monoamine concentration, including

serotonin, is increased in the cerebral cortex and other subcortex regions of MAM rats. This study compared the distribution of serotonin nerve fibers in the visual cortex between a MAM rat group and control group. Both groups rats were killed on the first, third, or fifth day after birth, the brain was extracted, and the brain was examined for abnormal development of serotonin nerve fibers and nerve endings in the visual cortex by immunohistological method. Author (NASDA)

N94-27486# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF ML-9, A MYOSIN LIGHT-CHAIN KINASE INHIBITOR, ON PREIMPLANTATION DEVELOPMENT OF THE MOUSE [MAUSU NO CHAKUSHOMAE HASSEI NI OYOBOSU MIOSHIN KEISA KINAZE SOGAIZAI ML-9 NO EIKYO]

NURUL KABIR, HIDEKI YAMAMURA, YOSHIKO TAKAGISHI, MINORU INOUE, SENICHI ODA, and HIROYOSHI HIDAKA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 177-179 25 Mar. 1993 In JAPANESE

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The purpose of this study is to reveal whether myosin light-chain kinase participates in preimplantaion development. Rat embryos were extracted 44 hours after fertilization, and they were cultivated for four days at 37 C in air containing 5 percent CO2. In the medium, an inhibitor of myosin light-chain kinase, 1-(5-chloronaphthalene 1-sulfonyl) 1H-hexahydro 1,4-diazepine hydrochloride (ML-9), was added at concentrations of 1, 10, or 50 micro M. The development was expressed by biological ages corresponding to each developing stage, and the relation with the biological age and time was examined. As a result, development of the embryo was inhibited by ML-9 in a dose-dependent manner. This implies that myosin light-chain kinase may participate in the preimplantation development of a mouse, and the intracellular regulation may be mediated by Ca-calmodulin-myosin light-chain kinase pathway. Author (NASDA)

N94-27487# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

COMPACTION-LIKE BLASTOMERE AGGREGATION CAUSED BY 1-OLEOYL-2-ACETYLGLYCEROL IN MOUSE EMBRYOS: AN ELECTRON MICROSCOPIC OBSERVATION [1-OREOIRU-2-ASECHIRUGURISERORU NI YORI CONPAKUSHON YO NO KAKKYU GYOSHU O OKOSHITA MAUSUHAI NO DENKENTEKI KANSATSU]

TOSHIHIKO KUMAZAWA, YOSHIKO TAKAGISHI, MAMI OSUGI (Mie Univ., Japan.), and HIDEKI YAMAMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 180-182 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

It is known that 1-oleolyl-2-acetylglycerol (1,2-OAG), an activator of proteinkinase, causes compaction-like aggregation in embryos in two, four, and eight-celled stages. This study examined the compaction-like aggregation induced by 1,2-OAG using an electron microscopy, especially the boundary surface of the blastomere and the microvillus on the outer surface, and compared it with physiological compaction. Embryos were extracted from B6C3F1 mice, cultivated till two, four, eight, or compaction stage, and 1,2-OAG was added. The embryos cultivated in the 1,2-OAG free medium had microvillus on the surface of blastomeres in two, four, and eight-celled stages, but they did not have a intracellular junction. In the 1,2-OAG treated embryos, microvillus was observed on the outer surface of blastomeres but not in the boundary surface, and the intracellular junction was not observed. The embryos with physiologically induced compaction had microvillus on the outer surface, and the intracellular junction was formed between the boundary surfaces. Author (NASDA)

N94-27488# Seinan Gakuin Univ., Fukuoka (Japan).

INDUCTIVE DIFFERENTIATION OF NERVE CELLS IN MOUSE EMBRYONIC ECTODERM AT EARLY PRIMITIVE STREAK STAGE BY RETINOIC ACID [RECHINOINSAN NI YORU SHOKI GENSHI SENJOKI HAISEIGAIHAIYO KARANO SHIMKEI SAIBO NO YUDOTEKI BUNKA]

KIYOKO YAMAMOTO and HIDEKI YAMANURA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 183-185 25 Mar. 1993 In JAPANESE Sponsored by Narishige Zoological Science Award

Avail: CASI HC A01/MF A04

Retinoic acid has a strong teratogenic effect, and it participates in embryonic development extensively. In previous studies, the mouse embryonic ectoderm was cultivated in vitro at the early primitive streak stage, and it was found that most embryos differentiation was observed morphologically, and nerve cells were identified by the immunohistological method using embryonic ectoderm can differentiate to nerve cells in the presence of Retinoic Acid (RA). The embryos were extracted from mice at the early primitive streak stage, cultivated in a medium with RA for 20 hours, then removed to an RA-free medium. Cell differentiation was observed morphologically, and nerve cells were identified by the immunohistological method using anti-neurofilament monoclonal antibodies. As a result, the differentiation of nerve cells was observed at the fifth day of cultivation, and this was identified immunohistologically. However, the number of differentiated nerve cells was not constant among each culture. Author (NASDA)

N94-27489# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

ANORECTAL MALFORMATIONS INDUCED BY INTRAPERITONEAL INJECTION OF ALL-TRANS RETINOIC ACID IN SUNCUS [SUNKUSU NI OKERU ORU TORANSU RECHINOIN SAN FUKUKONAI TOYO NI YORU SAKO NO YUHATSU]

RYOZO HASHIMOTO, SENICHI ODA, MINORU INOUE, and HIDEKI YAMAMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 186-188 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

All-trans Retinoic Acid (RA) is a strong teratogenic agent that causes several malformations including anorectal malformation. The incidence of human anorectal malformation is reported to be relatively high (0.02 percent), so that it is important to study the development mechanism using animal models. The purpose of this study was to clarify whether a suncus is available for a experimental model of malformation development. Therefore, the suitable amount and timing of RA administration was determined to achieve high incidence of anorectal malformation. RA was injected 50, 100, or 200 mg/g weight to suncuses intraperitoneally at the 10th, 11th, 12th, or 13th day of pregnancy. Corn oil was injected as a control in the same way. The fetuses were extracted at the 27th day and observed microscopically. The highest incidence of anorectal malformation was observed in the group administered 100 mg/g weight RA at 12th day (88.2 percent). Administration at 10th day did not cause anorectal malformation. Administration at the 13th day caused tail malformation and only one case of anorectal malformation. In the case of 200 mg/g weight RA administration, all of the fetuses were dead. As a result, anorectal malformation can be induced by RA in suncuses with high incidence. This could be useful for pathological study of the development of anorectal malformation. Author (NASDA)

N94-27490# Eisai Co. Ltd., Hashima (Japan). Dept. of Drug Safety Research.

CROSS-SECTIONAL ANATOMY OF DAY 30 SUNCUS FETUSES [SUNKUSU 30 NICHI TAIJI NI OKERU ODAMEN NI YORU NAIBU KIKAN KANSATSU]

NOBUHIRO NIWA, TAKAO MATSUBARA, SENICHI ODA (Nagoya Univ., Japan.), MINORU INOUE (Nagoya Univ., Japan.), and HIDEKI YAMAMURA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of

the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 189-192 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

The study of the safe administration of drugs is important in the area of preclinical studies. Rats are usually used to evaluate teratogeny of drugs, and the test methods have already been established. Although teratogeny has been observed in suncuses, the use of suncuses in safety studies has not been established. This report describes the observation of cross-sectional anatomy using normal 30 day suncus fetuses. Author (NASDA)

N94-27491# Aichi Agricultural Research Center, Naga (Japan).
SKELETAL DEVELOPMENT AND OSSIFICATION OF THE SWINE FETUSES [BUTA TAIJI NO KOKKAKU KEISEI KATEI NO KANSATSU]
AYUMI T. ICHIKAWA, SENICHI ODA (Nagoya Univ., Japan.), and MINORU INOUE (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 193-196 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Recently, the experimental demand for swine has increased, especially in the field of medicinal biology. For experimental use, it is necessary to understand normal fetal development, and ossification can be used as an index after organogenesis. This report presents the observational results of the timing of ossification and order in swine fetuses. The fetuses were extracted from the 32nd to 53rd day of pregnancy, fixed in ethanol, stained for the bones, and observed microscopically. As a result, ossification began in the mandible and the regions around the orbits on the 34th day. Until the 39th day, ossification of the cranium and facial bones had begun except for hyoid bone which began after the 52nd day. In the spine, ossification of the cervical vertebrae, ribs, and lumbar vertebrae was observed on the 39th day. Other vertebrae began to develop from anterior to posterior. For the limb bones, the humeri ossified on the 34th day. The scapulae, ulnae, radii, ilium, femora, tibiae, and fibrae ossified on the 39th day. The order of skeletogeny of feet and hooves was also determined in detail. Author (NASDA)

N94-27492# Yagi Memorial Park, Mitake (Japan). Inst. of Applied Biochemistry.
DEVELOPMENT OF INBRED STRAINS FROM JAPANESE WILD RATS (RATTUS NORVEGICUS) [NIHONSAN YASEI RATTO (RATUSU NORUBEGIKUSU) KARANO KEITO IKUSEI]
KYOKO ONO, YOSHIKI NIWA, SHIZUKA KATO, SENICHI ODA (Nagoya Univ., Japan.), KYOJI KONDO, and HIDEKI YAMAMURA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 197-201 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

This report discusses the development of inbred strains of Japanese wild rats (Rattus norvegicus) and the characteristics of these strains. Twelve pairs of wild rats were bred, and inbred strains were developed by sibling mating. The gene of hair color was analyzed for each of the strains, and a biological marker gene was detected by electrophoresis. As a result, five inbred strains were developed: A, B, C, D, and E. Strain A rats were gentle, docile, and seemed most suitable for experimental rats. They have stable breeding potential. Strain B rats have the mutant gene for hair color and eye color, and their characteristics and fertility are similar to those of strain A rats. Strain C rats were undersized, and may have a maker gene--transferrin mutant. Strain D rats showed marked maternal aggression. Strain E rats were developed from a different pair of captured rats from the other four strains. They are slightly gentle and docile, and their breeding potential is unstable. Author (NASDA)

N94-27493# Academy of Sciences (USSR), Novosibirsk. Inst. of Cytology and Genetics.
ELECTRON MICROSCOPIC ANALYSIS OF MEIOTIC CHROMOSOME PAIRING IN MALE HOUSE MUSK SHREW, SUNCUS MURINUS [SUNKUSU OSU NI OKERU SENSHOKUTAI TAIGO NO DENSHI KENBIKYO NI YORU KAISEKI]
PAVEL M. BORODIN, SENICHI ODA (Nagoya Univ., Japan.), YOSHIKO TAKAGISHI (Nagoya Univ., Japan.), MINORU INOUE (Nagoya Univ., Japan.), and HIDEKI YAMAMURA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 202-204 25 Mar. 1993 In JAPANESE
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It has been reported that crossbred suncuses express a high frequency of mutation in size, shape, or number of chromosomes. Hence, they are an appropriate model for studying pairing or reconstitution of chromosomes. This study examines the chromosome pairing and shape of nucleolus from zygotene stage to diplotene stage of meiosis using spermatocyte of crossbred suncuses. The subjects were 17 mature male suncuses from eight breeding groups. The testicles were extracted, separated with a thin needle, fixed on a slide, and staind by silver staining. The spermatocyte chromosomes were observed by an electron microscopy and compared with other mammals, such as the Chinese hamster or mouse. As a result, no difference was observed between suncus and other mammals in respect to the behavior of chromosomes and shape of spermatocytes in prophase of meiosis. However, the behavior of the sex chromosome was apparently different from other mammals; i.e., the sex vesicle appeared in early prophase in the suncus, as opposed to late prophase in other mammals. Detail observation of pairing and shape of nucleolus in prophase of meiosis may be useful to study complicated meiosis in crossbreeding suncus with various number or shape of chromosomes. Author (NASDA)

N94-27494# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
EFFECT OF PGE2 RECEPTOR AGONISTS BUTAPROST, M AND B 28767 AND AN ANTAGONIST AH 6809 ON THE BK RESPONSE OF VISCERAL POLYMODAL RECEPTORS [NAIZO PORIMODARU JUYOKI NO BURAJIKININ HANNO NI TAISURU PUROSUTAGURANJIN E2 JUYOTAI NO AGONISUTO BUTAPUROSUTO, M/B 28767, OYOBI ANTAGONISUTO AH 6809 NO KOKA]
HISASHI KODA, KAZUE MIZUMURA, and TAKAO KUMAZAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 205-207 25 Mar. 1993 In JAPANESE
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The polymodal receptor is one of the noxious receptors and can respond to extensive noxious stimulation including mechanical stimulation, heat, and dolorogenic substances. An inflammatory mediator, Prostaglandin E2 (PGE2), does not stimulate the polymodal receptor by itself; however, it strengthens the effects of heat or Bradykinin (BK) on the receptor. This study examined subtypes of the PGE2 receptor that might be associated with BK responses. Author (NASDA)

N94-27495# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
EXCITATION OF CUTANEOUS POLYMODAL RECEPTOR INDUCED BY SYMPATHETIC STIMULATION IN ADJUVANT-INDUCED ARTHRITIS RATS [AJUBANTO KANSETSUEN RATTO NI MIRARETA KOKAN SHINKEI SHIGEKI NI YORU HIFU PORIMODARU JUYOKI KOFUN]
JUN SATO, SHIGEYUKI SUZUKI, TOMOKO ISEKI, and TAKAO KUMAZAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 208-210 25 Mar. 1993 In JAPANESE Sponsored by Uehara Memorial Foundation and Research Foundation for Oriental Medicine

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It was demonstrated that the polymodal receptor, one of the pain receptors, causes paralgesia via the sympathetic nerve, and that catecholamine alpha-2 receptors participate in this pain transmission. This report presents the effect of sympathetic nerves on polymodal receptors using adjuvant-induced arthritis rats.

Author (NASDA)

N94-27496# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

SELECTION OF SITE INJECTING ADJUVANT IN CHRONIC INFLAMMATION MODEL [MANSEI ENSHO MODERU NI OKERU KIENZAI TOYO BUI NO SENTAKU]

SHIGEYUKI SUZUKI, TOMOKO ISEKI, KAZUE MIZUMURA, and TAKAO KUMAZAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 211-213 25 Mar. 1993 In JAPANESE
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As an experimental model for chronic inflammation, rats with arthritis induced by adjuvant are used extensively. A phologogenic agent is usually administered to these rats at the base of the tail or the foot. A severe inflammatory response with marked swelling usually occurs at the administration site on the first day. This rapid and severe response is not suitable for experiments that measure the foot volume as an index of inflammation. Therefore, injecting the adjuvant at the one-third distal site of the tail was used in thisstudy. The purpose was to clarify whether the injection causes suitable inflammatory response as a model of chronic inflammation and to prepare control data on these rats.

Author (NASDA)

N94-27497# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

INFLUENCE OF MECHANICAL STIMULATION ON INFLAMMATORY EDEMA [UNDO SHIGEKI NO ENSHOSEI FUSHU NI TAISURU EIKYO]

SHIGEYUKI SUZUKI, TOMOKO ISEKI, KAZUE MIZUMURA, and TAKAO KUMAZAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 214-216 25 Mar. 1993 In JAPANESE
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In previous studies, it was shown that inflammatory edema could be affected by a neurogenic inflammation caused by polymodal receptor stimulation using adjuvant-induced arthritis rats. This study examined the effect of mechanical stimulus on inflammatory edema while varying the concentration of the phlogogenic agent. The subjects were 13 Lewis strain rats, to which either 0.6 (N = 3), 0.4 (N = 3), 0.2 (N = 5), or 0.1 mg (N = 2) of adjuvant was administered at the one-third distal site of the tail. Each rat was forced to move everyday after the administration, and the foot volume was measured before and after the movement and compared with non-movement group. As a result, the foot volume is not different between the movement group and non-movement group in the case of administered 0.4 mg and 0.6 mg adjuvant; however, 0.2 mg adjuvant rats revealed remarkably larger foot volume in the movement group than the non-movement group. The 0.1 mg adjuvant rats, however, showed the opposite response to 0.2 mg adjuvant rats; the foot volume was smaller in the movement group. Assuming that the greater the concentration of phlogogenic agent gets, the more severe the inflammation becomes, these results suggest that polymodal receptors may be stimulated by mechanical stimulus in a certain inflammatory state and may result in occurrence of edema by neurogenic inflammation.

Author (NASDA)

N94-27498# Nagoya Univ. (Japan). Coll. of Medical Technology.

THE EFFECT OF NALOXONE ON SLEEPING TIME IN ADJUVANT ARTHRITIC RATS [CHOKI AJUBANTO KANSETSUEN RATTO NO MASUI KOKA JIKAN NI TAISURU NAROKISON ZENTOYO NO EIKYO]

TOMOKO ISEKI, SHIGEYUKI SUZUKI, KAZUE MIZUMURA, and TAKAO KUMAZAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 217-218 25 Mar. 1993 In JAPANESE
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It was known that the narcotic effect was prolonged in adjuvant-induced arthritic rats, probably due to decrease of the liver microsome activity. Recently, a finding was obtained that opioid analgesics prolongs the narcotic effect of pentobarbital. This suggests that the opioid pathway might be related to the prolongation in adjuvant-induced arthritic rats, and this possibility was examined in this study. The subjects were six Lewis strain rats classified into the control group (N = 3) and the adjuvant-induced arthritis group (N = 3). In both subjects the narcotics were administered intraperitoneally, and the period that wink reflex disappeared was measured as the effective time of the narcotics. The same measurement was performed on subjects preadministered with naloxone. As a result, the effective time of adjuvant group was longer than that before adjuvant administration; however, in case of preadministration of naroxone, the effective time became shorter. In the control group, the effective time became slightly shorter in case of naroxone preadministration.

Author (NASDA)

N94-27499# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF CAPSAICIN ON FRESHLY DISSOCIATED RAT DORSAL ROOT GANGLION CELLS [RATTO SEKIZUI GOKON SHINKEISETSU BUNRI SAIBO NI TAISURU KAPUSAISHIN NO KOKA]

MASANORI KASAI, KAZUE MIZUMURA, and TAKAO KUMAZAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 219-220 25 Mar. 1993 In JAPANESE
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It was demonstrated that polymodal receptors responsive to noxious stimuli are sensitive to capsaicin (CAP), a phlogogenic agent, in peripheral levels. The fact that polymodal receptors present in Dorsal Root Ganglions (DRG) and the cells in DRG can bind with and be stimulated by CAP suggests that the membrane of DRG cells might respond to CAP.

Author (NASDA)

N94-27500# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

SIZE DISTRIBUTION OF RETROGRADELY LABELED DORSAL ROOT GANGLION CELLS: TEST OF NORMALITY [GYAKKOSEI TORESAHO NI YORI HYOSHIKI SARETA GOKON SHINKEISETSU SAIBO NO OKISA NO BUNPU: SEIKISEI NO KENTEI]

RYOKO TAMURA, KAZUE MIZUMURA, and TAKAO KUMAZAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 221-223 25 Mar. 1993 In JAPANESE
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In this study, the size of dosal root ganglion cells was compared with other ganglion cells using a retrograde tracer method. Fast Blue (FB) was injected to the testicle and epididymis or the left superior testicular nerve of male dogs, and the diameter of the cells in the first and second lumber vertebra (L1 and L2) was measured. In case of administering FB at the testicle, the mean diameter of labelled cells was 35.7 micrometers, whereas it was 31.7 micrometers when administered at the superior testicular nerve. The results of the normality test revealed that the cells

labelled at the testicle were intermingled with several sizes of cells. It is known that the dorsal root ganglion cells can be morphologically classified into small cell and large cell. The cells labelled at the superior testicular nerve were small cells, which implies that afferent neurons that control the testicle via superior testicular nerve may correspond to small cells. When FB was administered at the testicle, the fluorochrome may stain not only afferent neurons but also other cells. Therefore, the size of afferent neuron could be determined by the FB-labelled cells administered at the superior testicular cells. It can be concluded that the test of normality is useful to detect intermingled cells in the study using retrograde tracer method. Author (NASDA)

N94-27502# Kinjo Gakuin Univ., Nagoya (Japan). Dept. of Home Economics.

INTERACTION BETWEEN ENDOGENOUS OPIOID AND CHOLECYSTOKININ (CCK) IN MODULATING RESPIRATORY RESPONSES INDUCED BY THIN-FIBER MUSCULAR AFFERENTS [KI SAIKEI SHINKEI NYURYOKU NI YORU KOKYU HANNO NO SHUSHOKU NI OKERU NAIINSEI OPIOIDO TO KORESHISUTOKININ (CCK) NO SOGO SAYO]

EIKO TADAKI, YASUKO KOZAKI (Nagoya Univ., Japan.), and TAKAO KUMAZAWA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 227-229 25 Mar. 1993 In JAPANESE (Contract MOE-04255103)

Avail: CASI HC A01/MF A04

It was reported that Cholecystokinin (CCK) participates in tachyphylaxy of opioid analgesics. The CCK receptor is classified into two subtypes; type A and type B. The effect of a type B receptor was examined using highly selective inhibitors, L-365 and 260, because B receptors are present mainly in the brain. The thin-fiber muscular afferent nerves of cats were stimulated every 35 minutes and L-365 or 260 was injected slowly for 1 minute intravenously, while respiratory response was monitored, and respiratory output was determined as an index. The concentration of inhibitor was 0.03, 0.1, 0.2, 0.3, 1.0 mg/kg, in the order of administration, and, at the last of them, naroxone, an inhibitor of opioids, was administered. As a result, the tachyphylaxis of Aspiratory Suppression (AS) that was induced by repetitive stimulation of thin-fiber muscular afferent nerves was inhibited by CCK-B (CCK Type-B) receptor inhibitor, L-365 and 260, in dose-dependent manner. It was also revealed that there is high correlation between the degree of tachyphylaxy and degree of inhibition. Therefore, this tachyphylaxy may be mediated by CCK-B receptors. L-365 and 260 dominantly affect the respiratory rate. This suggests that tachyphylaxy of AS may not result from deletion of endogenous opioid, but from activation of CCK receptors by excitation of thin-fiber muscular afferent nerve which modulates respiratory rate. Author (NASDA)

N94-27503# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF PERFUSION OF AMIODARONE ON ELECTROPHYSIOLOGICAL PROPERTIES IN SINGLE RABBIT VENTRICULAR MYOCYTES [AMIODARONE KYUSEI TOYO GA IEUSAGI TANRI SHINSHITSUKIN SAIBO NI OYOBOSU DENKI SEIRIGAKUTEKI SAYO]

KAICHIRO KAMIYA, JIANHUA CHENG, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 230-232 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The acute administration of amiodarone, an antiarrhythmic agent, was studied and the data was compared with chronic administration. The ventricular myocytes were isolated from rabbit hearts, perfusated with perfusate containing amiodarone, and action potential was measured under steady stimulating frequency. As a result, Action Potential Duration (APD) was shortened by amiodarone acute administration, and this did not depend on the stimulating frequency. The previous study demonstrated that APD was remarkably prolonged by chronic administration of amiodarone. Therefore, electrophysiologically reverse effects were observed in rabbit ventricular myocytes by the two administration methods. In respect to ion current, amiodarone acute administration interfered Na current and Ca current, and the suppression of these inward currents may result in the shortening of APD. In addition, transient outward current induced by repetitive depolarization was not affected by amiodarone acute administration, whereas it was decreased by chronic administration. Author (NASDA)

N94-27504# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

FAST AND SLOW ONSETS OF NA CHANNEL BLOCKING ACTIONS DUE TO LIDOCAINE AND DISOPYRAMIDE USING CONCENTRATION-CLAMP METHOD [NODO KOTEIHO NI YORU ENUE NATORIUMU CHANERU YOKUSEIYAKU NO SAYO HATSUGEN KIJO NI KANSURU KENTO]

TAKAFUMI ANNO, EIICHI WATANABE, AKIHIKO TANIGUCHI, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 233-235 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The purpose was to examine the change of Na current by lidocaine and disopyramide using concentration-clamp method, and to consider how the drugs bind the channel protein. The ventricular myocytes were isolated from guinea pig hearts and the Na current was measured using whole-cell clamp method. As a result, Na current was interfered slowly, at the time constant of 10 seconds, when disopyramide was added extracellularly. In case that lidocaine was added, Na channel was blocked by two steps; one is rapid block with the time constant of less than 0.1 seconds, and another is slow block that reached steady state for 60 to 120 seconds. The concentration of both drugs were so high that the Na current suppression depended not on electric potential or stimulating rate, but on binding the drug with the channel protein. If binding site of lidocaine presents on the only outer surface of the cell membrane, the time constant can be expressed using binding constant (k) and dissociation constant (l) as the following formula; $1/(k(D) + l)$. In order to bind the channel protein, drugs must pass through a extracellular hydrophilic path as well as intermembrane hydrophobic path. This suggests that the slow time constant of disopyramide and lidocaine may correspond to the hydrophobic pathway, and the rapid time constant of lidocaine, to the hydrophilic pathway. Author (NASDA)

N94-27505# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

ELECTROPHYSIOLOGICAL EFFECTS OF MS-551, A NEW CLASS 3 ANTIARRHYTHMIC AGENT, ON ISOLATED RABBIT VENTRICULAR MUSCLES [KURASU 3 KOFUSEIMYAKUYAKU MS-551 NO IEUSAGI SHINSHITSUKIN NI TAISURU DENKI SEIRIGAKUTEKI SAYO]

RYOKO SUZUKI, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 236-238 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

MS-511, 1, 3-dimethyl 6-(2-(N-(2-hydroxethyl) 3-(4-nitrophenyl) propylamino) ethylamino) 2, 4-(1H, 3H)-pyrimidinedione hydrochloride, is a newly developed antiarrhythmic agent that can prolong the Action Potential Duration (APD) and effective refractory period mainly due to K channel blockage. The MS-551 was compared with sotalol and E-4031 in respect to prolongation of effective refractory period. Rabbit ventricular muscles were extracted, perfusated with perfusate containing MS-551, and the membrane potential was measured. As a result, MS-551 prolonged APD significantly at the concentration of 0.3 micro-M or more, without suppressing maximum upstroke velocity. The APD prolongation caused by sotalol and E-4031 showed remarkable reverse use-dependency within the range of 0.1 to 3.0 Hz of stimulus, whereas that by MS-551 showed diphasic rate-dependency. This suggests that MS-511 may suppress a different K channel from other drug suppression. Among various K channels in the myocytes, slow rectifying K channel may participate in the rate-dependent APD prolongation, and MS-551

may bind with the activated K channel because the effect emerged not at the first stimulating pulse but at the second pulse after a long pause. Author (NASDA)

N94-27506# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

COMPARATIVE INVESTIGATION OF NEW CLASS 3 ANTIARRHYTHMIC DRUGS, E-4031 AND MS-551, ON ELECTROPHYSIOLOGICAL PROPERTIES IN ISOLATED RABBIT VENTRICULAR MYOCYTES [DAI 3 GUN KOFUSEIMYAKUYAKU E-4031, MS-551 GA IEUSAGI TANRI SHINSHITSUKIN SAIBO NI OYOBOSU DENKI SEIRIGAKUTEKI SAYO NO HIKAKU KENTO]

JIANHUA CHENG, KAICHIRO KAMIYA, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 239-241 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The effect of newly developed Class 3 antiarrhythmic agents, E-4031 and MS-551 on electrophysiological property of myocytes, especially on action potential and transient outward current was examined. The ventricular myocytes were extracted from rabbit hearts, and membrane potential was measured using whole cell clamp method. As a result, Action Potential Duration (APD) was prolonged by E-4031 under low frequency stimulus in reverse use-dependent manner. On the other hand, MS-511 prolonged APD under high frequency stimulus in use dependent manner. However both drugs were similar in respect to APD prolongation without affecting maximum upstroke potential or action potential amplitude. In addition, they did not affect transient outward current that is an important factor to cause the notch in the first phase of the action potential and to regulate APD. Therefore, the APD prolongation by low frequency stimulus using E-4031 may not result from the effect on transient outward current. MS-511 prolongs APD with premature contraction which shows shorter coupling duration than E-4031, so that they may have different association and dissociation constants of drug and channel.

Author (NASDA)

N94-27507# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF CLASS 1 ANTIARRHYTHMIC DRUGS ON THE INTRAVENTRICULAR CONDUCTION: INFLUENCE OF FIBER ORIENTATION [KURASU 1 KOFUSEIMYAKUYAKU NIYORU SHINSHITSUNAI DENDO YOKUSEI TO SHINKIN SENI SOKO]

MASATO IIDA, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 242-244 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

Class 1 drugs, such as Na channel blockers, were used for ventricular arrhythmia to lower the conductivity and excitability of the ventricle. Recently, it was revealed that the inhibition of conductivity caused reentry in the ventricle. The conduction and fiber orientation of ventricular epicardium surface when lidocaine or flecainide was added, in order to clarify the mechanism of arrhythmia caused by class 1 antiarrhythmic agents was examined. The ventricle was extracted from rabbit hearts, and the extracellular potential was recorded and mapped to draw isochronic lines of conduction on the surface. These lines became stable after 2 hours of perfusion, and drew ellipses extended to the longitudinal direction of the fibers (L-direction). Lidocaine inhibited the L-direction conduction at the stimulating frequency of 2.0 Hz or more, and flecainide showed the similar inhibition within the range of 0.2 to 3.0 Hz. These inhibitions augmented with increase of stimulating frequency. This rate-dependency may result from use-dependent block of Na channel. However, both lidocaine and flecainanide did not inhibit the conduction to the transversal direction of the fibers. Author (NASDA)

N94-27508# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF CLASS 3 ANTIARRHYTHMIC AGENTS, E-4031 AND MS-551 ON VENTRICULAR REPOLARIZATION IN ISOLATED RABBIT HEARTS [IEUSAGI SHINSHITSU NO SAI BUNKYOKU NI TAISURU KURASU 3 KOFUSEIMYAKUZAI E-4031 TO MS-551 NO SAYO]

HIROKAZU IWATA, RYOKO SUZUKI, KAICHIRO KAMIYA, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 245-247 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

It is known that class 3 antiarrhythmic agents can prolong action potential duration and refractory period, however it is uncertain whether these effects are different by each ventricular site, or how these drugs modify the repolarization in the entire ventricle. The effects of newly developed class 3 drugs, E-4031 and MS-551, were examined by mapping the electric potential of the heart surface. The hearts were extracted from rabbits, and heart surface potential were recorded and conductivity was mapped using a distant bipolar electrogram. As a result, it was demonstrated that E-4031 had a different effect from E-4031 prolonged the APD (Action Potential Duration) mainly in the apex, and increased spatial inequality of repolarization, whereas MS-551 did not cause inequality of ADP and repolarization in the entire left ventricle. It is known that class 3 drugs prolong APD and refractory period by inhibiting three types of K current, i.e., slow rectifying K(+) current, inward rectifying K(+) current, and transient outward current. The channels of these current are distributed unequally on the heart surface. This may be the reason why ADP and E-4031 effect was different by the sites of ventricle. Author (NASDA)

N94-27509# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

ELECTRICAL COUPLING BETWEEN THE SINO-ATRIAL NODE AND ATRIAL MUSCLE: CELL TO CELL INTERACTION THROUGH AN EXTERNAL CIRCUIT AND ITS SIMULATION BY COMPUTER MODELING [DOBO KESSETSU TO SHINBOKAN NO DENKITEKI KETSUGO NI KANSURU KENKYU: GAIBU KAIRO O MOCHIITA SAIBO KETSUGO JIKKEN]

EIICHI WATANABE, TAKAFUMI ANNO, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 248-250 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

Electric coupling between a multicellular sample or isolated myocyte and an external circuit simulating a gap junction able to change the conductivity was examined, and the electric coupling between sinoatrial node and atrial muscle was reviewed. The external circuit was consist of a voltage converter connected with an amplifier with membrane potential to membrane current converter, which can couple certain cells with other cells or a membrane model that can change the conductance like gap junction. Using this system, two experiments were performed. In one experiment, sinoatrial node cells were connected with a membrane model, however, spontaneous exciting cycle, depolarization velocity of the fourth phase, and action potential duration were not modified by the membrane model. This is probably because of insufficient space clamp due to low input resistance of the cells. Another experiment was that a single atrial cell of a guinea pig was connected with recorded action potential of the sinoatrial node. As a result, the atrial cell was excited, and as conductance increased, the action potential became similar to action potential in the sinoatrial node. Therefore, it can be concluded that this system is useful for quantitative evaluation of the cell-to-cell interaction and cellular excitability by electric coupling between a cell and a membrane model.

Author (NASDA)

N94-27510# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
A STUDY ON TISSUE EXCITATION OF CARDIAC MUSCLE UNDER ELECTRICAL FIELD STIMULATION [FIRUDO SHIGEKIKA SHINKIN NO KATSUDO DENI SAIDAI TACHIAGARI SOKUDO]
AKIHIKO TANIGUCHI, TAKAFUMI ANNO, MASAKI SHIRAKAWA (Toyohashi Univ. of Technology, Aichi, Japan.), SHIRO USUI (Toyohashi Univ. of Technology, Aichi, Japan.), ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 251-254 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Whether action potential by electrical field stimulation is affected by intercellular electrical interaction was examined. The right ventricular papillary muscles were extracted from guinea pig hearts, to which electrical field stimulation was given, and the upstroke phase of action potential was recorded, as well as the activation time was determined as a time to reach the maximum upstroke velocity (V(sub max)) for each phase. As a result, V(sub max) was similar to that of one-point stimulation at any part of the muscle, which was about half of the V(sub max) in a single cell. The activation time was dispersed within the range of approximately 2-3 msec. In this experiment, a two-dimensional sheet model was developed to simulate cell membrane with dispersed excitation stages. Using this model, it was revealed that when electrical field stimulation was given, the cells were not excited synchronously, but the excitation was propagated among cells. The change of field stimulation may vary the direction of conduction, and cause unequal excitation, because isochronic line of conduction was obviously changed according to the change of stimulus strength, and because there were sites that V(sub max) was changed largely by abrupt change of activation time. Therefore, it can be concluded that V(sub max) was affected by various intercellular interaction when electric field stimulation was given, so that V(sub max) should not be used as an index of availability of Na channels. Author (NASDA)

N94-27511# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
BLOCK OF CARDIAC SODIUM CHANNELS BY RO 22-9194 (R), A NEW ANTIARRHYTHMIC AGENT: EFFECTS ON THE MAXIMUM UPSTROKE VELOCITY (VMAX) OF SINGLE GUINEA PIG VENTRICULAR MYOCYTES [KOFUSEIMYAKUYAKU RO 22-9194 (R) NO SHINKIN NA CHANERU YOKUSEI SAYO: MORUMOTTO TANRI SHINSHITSUKIN SAIBO NO KATSUDO DENI SAIDAI TACHIAGARI SOKUDO (VMAX) NIYORU KENTO]
KAZUYASU MARUYAMA, RYOKO SUZUKI, TAKAFUMI ANNO, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 255-258 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Ro 22-9194 (R), (2R)-2-amino N-(2, 6-dimethylphenyl) N-(3-(3-pyridyl) propyl) propionamiade D-tartrate is a newly developed antiarrhythmic agent. In previous study, it was demonstrated that the effect was dependent on blockage of Na channels of myocytes, because the drug inhibited the maximum upstroke velocity (V(sub max)) in rate-dependent manner. The membrane potential dependency of Na channel blockage by Ro 22-9194 (R) was examined. Venticular myocytes were isolated from guinea pig hearts, membrane potential was clamped by the whole cell clamp method, and the membrane potential and V(sub max) was determined. From the relation between resting potential of a single cell and V(sub max), it was revealed that the membrane potential that decreases V(sub max) by 50 percent was lowered by .0 mV by adding 30 micro-M Ro 22-9194 (R). This suggests that the drug may bind inactivated Na channels. In order to examine the participation of Na channel in detail, clamp pulses were given, which can shift the Na channel to resting state to inactivated state via activated state, and the duration of inactivated state is changeable. When a single pulse was given, V(sub max) inhibition was apparently increased by prolongation of pulse duration, so that Na block may occur both in the upstroke phase and in the plateau phase. From the experiment using train pulses, it was revealed that Ro 22-9194 blocked Na channels in use dependent manner by repetitive activation, and the drug could bind both activated and inactivated channel. Author (NASDA)

N94-27512# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
ELECTROPHYSIOLOGICAL EFFECTS OF AN ANTIARRHYTHMIC DRUG, MORICIZINE ON ISOLATED GUINEA PIG VENTRICULAR MUSCLES [KO FUSEIMYAKUYAKU MORISHIJIN NO MORUMOTTO SHINSHITSUKIN NI TAISURU DENKI SEIRIGAKUTEKI SAYO]
KAZUYASU MARUYAMA, RYOKO SUZUKI, TAKAFUMI ANNO, ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 259-261 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Moricizine is an oral antiarrhythmic agent that has an effect to block Na channel. Rate-dependent and membrane potential-dependent Na channel inhibition by moricizine using maximum upstroke velocity (V(sub max)) as an index was studied. The right papillary muscles were extracted from guinea pig hearts, and the action potential was recorded when electric stimuli were given. As a result, moricizine decreased the V(sub max) in dose-dependent manner without affecting the resting potential at the concentration of 1 micro-M or more. The concentration to inhibit the V(sub max) by 20 percent (IC(sub 20)) was 1.3 micro-M under basic stimulus of 1 Hz, and under three or more micro-M, the action potential duration was shortened significantly. These results suggest that main effect of moricizine on cardiac muscles might depend on inhibition of Na channels. In case of train stimuli, V(sub max) was inhibited use-dependently, and the inhibition was augmented as the frequency of stimulus was increased. The recovery time constant and onset rate of Use-Dependent Block (UDB) were similar to flecainide that shows slow Na channel blockage. From experiments using isolated ventricular myocytes, V(sub max) was decreased significantly when the duration of 0 mV conditioning clamp was prolonged to 400 msec or more, and the longer the duration was prolonged, the more the V(sub max) decreased. 0 mV conditioning clamp shifts Na channel from resting state to inactivating state via activating state. From these results, it can be concluded that moricizine may have high affinity to inactivated Na channel. Author (NASDA)

N94-27513# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
CORRELATION BETWEEN ELECTRICAL ACTIVITY AND THE SIZE OF SINGLE SINOATRIAL NODE CELLS [DOBO KESSETSU HOCHODORI SAIBO NO OKISA TO DENKITEKI TOKUSEI TONO KANKEI]
HARUO HONJO, M. R. BOYETT (Leeds Univ., England.), ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 262-265 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

In the sinoatrial node, various sizes of pacemaker cells are present. The purpose is to compare the cell size with spontaneous action potential pulses and ion current densities in pacemaker cells. The sinoatrial myocytes were isolated from rabbit hearts, and the cells which contract spontaneously were clamped by the whole cell clamp method. The action potential was recorded and membrane current was measured under membrane potential clamp. As a result, there was correlation between the size of these cells and spontaneous action potential; i.e., the small cells showed shallow maximum diastolic membrane potential and low maximum upstroke velocity and diastolic depolarization velocity compared by the large cells. In addition, small cells tended to be slow in spontaneous excitation. It is known that small cells present in the central part of the sinoatrial node, so that pacemaker cells in the central sinoatrial node may have shallow maximum diastolic potential, slow maximum upstroke velocity and diastolic depolarization velocity, and slow spontaneous activity. In respect

to correlation between ion current density and cell size, no significant correlation was observed between the density of L-type Ca current and cell size, however, the density of non-selective current activated by hyperpolarization tended to augment the large cells. Therefore, this current may participate in rapid spontaneous activity and diastolic depolarization velocity in larger cells.
Author (NASDA)

N94-27514# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
THE IONIC MECHANISM UNDERLYING THE NEGATIVE CHRONOTROPIC EFFECT OF ACETYLCHOLINE: EXPERIMENTAL STUDY IN RABBIT SINGLE SINOATRIAL NODE CELLS Report No. 1 [DOBO KESSETSU NI TAISURU ASECHIRUKORIN INSEI HENJI SAYO NO ION KIJO NI KANSURU KENKYU: TANRI DOBO KESSETSU SAIBOU O MOCHIITA JIKKEN]
HARUO HONJO, M. R. BOYETT (Leeds Univ., England.), ITSUO KODAMA, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 266-268 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Acetylcholine (Ach) has a negative chronotropic effect on the heart due to suppressing automatism of the pacemaker in the sinoatrial node. How selective inhibition of ion channels can influence the Ach negative chronotropic effect was examined. The sinoatrial myocytes were isolated from rabbit hearts, and spontaneous cycle length was measured. In order to distinguish Ach effects on K current and on non-selective current activated by hyperdepolarization, each current was inhibited selectively using Ba(2+) and Cs(+); 0.5 mM Ba(2+) can inhibit K current by 80 - 0 percent, and 1 mM Cs(+) can inhibit the non-selective current by 50 - 60 percent. Both inhibitors do not affect other currents. A 1 mM Cs(+) did not show any effect on spontaneous excitation rate of the sinoatrial node, and on inhibition by Ach. This suggests that the negative chronotropic effect of Ach is not related to the non-selective current. On the other hand, although 0.5 mM Ba(2+) did not affect the spontaneous excitation rate when Ach was not present, it suppressed the Ach effect on spontaneous excitation. Therefore, the K current may participate in negative chronotropic effect of Ach.
Author (NASDA)

N94-27515# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
THE IONIC MECHANISM UNDERLYING THE NEGATIVE CHRONOTROPIC EFFECT OF ACETYLCHOLINE: EXPERIMENTS USING SMALL SINOATRIAL NODE TISSUE PREPARATIONS ISOLATED FROM RABBIT HEARTS Report No. 2 [DOBO KESSETSU NI TAISURU ASECHIRUKORIN INSEI HENJI SAYO NO ION KIJO NI KANSURU KENKYU: TASAIBO BISHO HYOHON O MOCHIITA JIKKEN]
ITSUO KODAMA, M. R. BOYETT (Leeds Univ., England.), AKIKO ARAI, RYOKO SUZUKI, HARUO HONJO, and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 269-271 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

The inhibition of automatism and change of membrane potential pulses in multicellular samples under wide range of Acetylcholine (Ach) concentration using selective inhibitors of channels associated with Ach was studied. Small sinoatrial node tissues were extracted from rabbit hearts, and perfused with perfusate containing Ach, Ba(2+), or Cs(+). Ba(2+) was used as a selective inhibitor of Ach sensitive K current (I(sub k)), and Cs(+), as a inhibitor of inward current activated by hyperdepolarization (I(sub f)). As a result, 2 mM Cs(+) decreased spontaneous excitation rate by 12.8 percent, while 2 mM Cs(+) did not affect the negative chronotropic effect of Ach; i.e., the dose-response curve and IC(sub 50) (the concentration inhibiting Ach effect by 50 percent) was not changed by Cs(+) addition. This implies that I(sub f) may not play an important role in pacemaker function, and that the negative chronotropic effect by Ach may not be associated with I(sub f). 0.5mM Ba(2+) prolonged the action potential duration, and decreased the maximum diastolic potential by 8-10 mV, as well as slight promotion of spontaneous excitation was observed. This is probably because of decrease of slow rectifying K current, and partially due to decrease of I(sub f) current secondary to the depolarization. In addition, Ba(2+) shifted the dose-response curve of Ach to the right, and increase IC(sub 50) (Ach) 3.5 times, which implies that Ach effect was inhibited. Therefore, the negative chronotropic effect of Ach may be caused by the activation of K current.
Author (NASDA)

N94-27516# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
THE IONIC MECHANISM UNDERLYING THE NEGATIVE CHRONOTROPIC EFFECT OF ACETYLCHOLINE: POSTGANGLIONIC VAGAL STIMULATION IN ISOLATED RABBIT HEARTS Report No. 3 [DOBO KESSETSU NI TAISURU ASECHIRUKORIN INSEI HENJI SAYO NO ION KIJO NI KANSURU KENKYU: MEISO SHINKEISETSUGO SENI SHIGEKI NO KOKA]
ITSUO KODAMA, AKIKO ARAI, RYOKO SUZUKI, HARUO HONJO, M. R. BOYETT (Leeds Univ., England.), and JUNJI TOYAMA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 272-275 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

In a previous study, it was demonstrated that the negative chronotropic effect of Acetylcholine (Ach) on sinoatrial node was owed to activation of K current (I(sub k)) rather than inward current activated by hyperpolarization (I(sub f)). The negative chronotropic effect of Ach released from postganglionic vagal ending on the entire sinoatrial node was studied. The sample tissues extracted from rabbit hearts were stimulated by electric field stimulus, and the response disappeared when atropine was added. Therefore, this response may be caused by binding muscarinic receptor with Ach released from postganglionic vagal ending. The vagal nerves responded with three phases; early automatism inhibition, secondary post-inhibitory rebound, and late artomatism inhibition. The post-inhibitory rebound can not be explained by the shift of pace-making site to other site in the sinoatrial node, because there is a finding that the post-inhibitory rebound was observed after the pacemaker site returned to the original site. When Cs(2+), an inhibitor of I(sub f), was added, the post-inhibitory rebound disappeared or decreased, which implies that automatism may be promoted by I(sub f) activation following hyperpolarization in vagal endings. Although Cs(2+) did not change the relation between early automatism inhibition and vagal stimulus compared with control, Ba(2+) decreased the negative chronotropic effect. It can be concluded that I(sub k) may play a more important role than I(sub f) in the negative chronotropic effect by Ach.
Author (NASDA)

N94-27519# Nagoya Univ. (Japan). Dept. of Ophthalomology.
ANALYSIS OF THE ELECTRICALLY EVOKED RESPONSE (EER) OF THE CAT [NEKO EER (EREKUTORIKARI EBOKUTO RESUPONSU) NO KISOTEKI KENKYU: 17, 18 YA HISHITSU NI OKERU EER NO NYURON KIGEN NO KENKYU]
KAZUHIRO SHIMAZU, YOZO MIYAKE, YASUHIRO FUKATSU (Fukatsu Eye Clinic, Nagoya, Japan.), and SATORU WATANABE *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 282-287 25 Mar. 1993 In JAPANESE
Avail: CASI HC A02/MF A04

Phosphene is a sense obtained by electric stimulus of eyeball, and it can be applied as an evoked potential in the brain. The basic pulses of EER (Electricaly Evoked Response) and responses of a single neuron in the area 17 and 18 of the cerebral cortex were studied. The subjects were cats whose cerebral cortex was exposed, and extracellular potential was recorded. 54 units of cortex neurons were identified in the area 17, including 41 simple cells and 13 complex cells, and, 48 units, in the area 18. It is known that discharge occurs corresponding to two negative waves in Lateral Geniculate Neurons (LGN); i.e., latency ms (N1) and latency 20 ms (N2) stimulus. As a result of neuronal responses in the area 17, simple cells discharged by either N1, N2 or N1 and

N2, and the response was less periodical compared with LGN, while the complex cells tended to slightly respond to the N1 and N2 stimuli. In the area 18, a few neurons discharged by the N1 stimulus, and no neuron could respond to both N1 and N2 stimuli. However, the neurons discharging by 30 ms or more stimulus presented in the area 18. In addition, by stimuli of 20 ms or more given twice at the interval of 20 ms, the responses were inhibited, which implies that these responses may be mediated by multiple synapses in the cortex, and the responses to 20 ms of stimuli may be a single synaptic response. Author (NASDA)

N94-27530# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
THE MEASUREMENTS OF MUSCLE BLOOD FLOW BY LASER DOPPLER FLOWMETRY WITH NEEDLE TYPE PROBE [HARIGATA PUROBE O MOCHIITA REZA DOPPURA KETSURYURYOKEI NIYORU KIN SOSHIKI KETSURYURYO NO SOKUTEI]
KIYOHITO YAMAMOTO, YASUHIRO OBA, TADAAKI MANO, and SHIGEHIKO SHIONOYA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 335-339 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Laser Doppler velocimetry is an easy method to measure continuous skin blood flow. However, for muscle blood flow measurement, the probe must touch directly to the operationally exposed muscle, and the performance has not been determined yet. The newly developed needle type probe for laser Doppler velocimetry can be inserted into the target muscle without operation, so that simple and continuous measurement of muscle blood flow might be achieved. In order to examine this possibility, the laser Doppler velocimeter was compared with an ultrasonic velocimeter in respect to suitability of continuous measurement and reproducibility. The subjects were three dogs, in which an ultrasonic velocimeter was equipped to the popliteal artery, and a laser Doppler velocimeter was inserted into the musculus gastrocnemius, and blood flow was varied by papaverin and reactive hyperemia. As a result, there was a linear relationship between measurements of the two velocimeters when blood flow increased, whereas when blood flow decreased, no linear relationship was observed between the two methods. However, in short-period blood flow decrease, the two methods were correlated positively, although the incline was different between papaverin and reactive hyperemia. These results suggest that the laser Doppler velocimeter could be useful to measure muscle blood flow with high reproducibility; however the measurements should be evaluated as relative values. Author (NASDA)

N94-27537# Nagoya Univ. (Japan). Dept. of Circulation.
DESENSITIZATION TO ACETHYLCHOLINE IN PACEMAKER CELLS OF THE SINOATRIAL NODE [DOBO KESSETSU SAIBO HOCHODORI SAIBO NI OKERU ASECHIRUKORIN INSEI HENJI SAYO NO DATSU KANSA GENSHO]
HARUO HONJO, ITSUO KODAMA, and MARK R. BOYETT (Leeds Univ., England.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 367-369 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992
Avail: CASI HC A01/MF A04

The most important effect of acetylcholine (Ach) on the heart is negative chronotropic effect that decreases heart rate by inhibiting autonomic activity of sinoatrial pacemaker. This article presents experimental findings on the desensitization of negative chronotropic effect by Ach. It is reported that the negative chronotropic effect is caused by three ion currents; i.e., activation of Ach sensitive inward rectifying K current, i(sub k, Ach), inhibition of L type Ca current, i(sub Ca), and non-selective current activated by hyperdepolarization, i(sub f). Therefore, it was examined which current participates in Ach desensitization, using a single sinoatrial myocytes of rabbit hearts with clamped membrane potential. As a result, i(sub k, Ach) was activated by Ach, then decayed biphasically, while Ach inhibited i(sub Ca) and i(sub f) under stimulation of beta receptor, but this inhibition did not decay. I(sub Ca) and i(sub f) are inhibited by decrease of cAMP (adenosine 3', 5'-cyclic monophosphate) resulting from adenylate cyclase suppression via inhibitory G protein. These results suggest that adenylate cyclase inhibition by Ach may not cause desensitization of ion currents, but that the desensitization may result from change of Ach sensitive K channels. Author (NASDA)

N94-27539# Nagoya Univ. (Japan). Dept. of Neural Regulation.
THE POLYMODAL RECEPTOR [PORIMODARU RESEPUTA]
KAZUE MIZUMURA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 373-374 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992
Avail: CASI HC A01/MF A04

The polymodal receptor is a noxious receptor that not only causes the sense of pain, but also affects autonomic functions, and is sensitized by inflammatory mediators. This article presents the findings on the sensitization of polymodal receptors examined by prostaglandin E2 (PGE2). The PGE2 scarcely causes discharge on polymodal receptor; however, it augments the discharge caused by Bradykinin (BK) or caloric stimulus in different concentrations. This suggests that the polymodal receptor has at least two binding sites for prostaglandin. Therefore, antagonists of each three subtypes of PGE receptors (EP1, EP2, and EP3) were added to the polymodal receptor, and it was revealed that EP3 receptor might participate in augmentation of BK effect, and EP2 receptor may be relevant to caloric stimulus. In order to identify the second messengers of these receptors, the relation between adenosine 3', 5'-cyclic monophosphate (cAMP) concentration and responses to BK and caloric stimulus was examined. As a result, BK response was slightly suppressed by increase of intracellular cAMP, which may imply that EP3 receptor inhibited adenylate cyclase via inhibitory G protein. On the contrary, the thermoresponse was obviously increased by cAMP increase, and it was also decreased by adenylate cyclase inhibitor, which supports the idea that cAMP participates in thermoresponse via PGE2 receptor.
Author (NASDA)

N94-27743# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany). Abt. Strahlenbiologie.
CONSTRUCTION AND TEST OF EXPERIMENT HARDWARE FOR A SPACE EXPERIMENT ON SPACELAB MISSION IML-2 Ph.D. Thesis - Fachhochschule Aachen [KONSTRUKTION UND PRUEFUNG VON EXPERIMENT-HARDWARE EIN WELTRAUMEXPERIMENT AUF DER SPACELAB-MISSION IML-2]
UTE SCHLENGERMANN Mar. 1993 83 p In GERMAN
(ISSN 0939-2963)
(DLR-FB-93-23; ETN-94-95499) Avail: CASI HC A05/MF A01

The space experiment KINETICS onboard of the Spacelab mission IML-2 (International Microgravity Laboratory) deals with cellular repair processes of radiation injured DNA (Deoxyribo Nucleic Acid) in microgravity. The biological samples consist of irradiated cultures of bacteria and human cells in nine Typ-1-containers of the Biorack. They are kept frozen except for the active phase in the 37 C incubator. The experiment hardware comprises nine sample carriers and three passive thermal units to keep the samples frozen during the first 30 h of the mission. The sample carriers are constructed from rectangular aluminum profiles with holes to accommodate eighteen 200 micrometers tubes with bacteria and ten 600 micrometers tubes with cell cultures, each. The passive thermal units are stainless steel vacuum flasks. Their interior is divided into an inner part, accommodating three sample carriers, and an outer part with phase changing material. A total of 550 ml of a water salt solution as phase changing material will keep the samples frozen for 42 h. ESA

N94-27754# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne (Germany). Abt. Strahlenbiologie.
VACUUM-UV-EFFECTS ON E. COLI PLASMID PUC19: INACTIVATION, STRAND BREAK INDUCTION AND MUTATION INDUCTION Ph.D. Thesis - Bonn Univ. [VAKUUM-UV-EFFEKTE AUF DAS E. COLI PLASMID PUC19: INAKTIVIERUNG, STRANGBRUCHINDUKTION UND MUTATIONSINDUKTION]
JOERG WEHNER Jul. 1993 111 p In GERMAN
(ISSN 0939-2963)
(DLR-FB-93-26; ETN-94-95502) Avail: CASI HC A06/MF A02

On Escherichia coli plasmid pUC19 the UV action spectra of inactivation, mutation induction and strand break induction are compared between wet and dry state. The cross sections of inactivation and mutation induction show similar dependence on wavelength strand in the range 190 to 254 nm, whereas the cross sections of inactivation and break induction show similar dependence on wavelength in the range 160 to 190 nm. The mutation spectrum was detected after irradiation with V-UV (Vacuum UV) (160 nm) and V-UV (254 nm). In both cases, more than 60 of the detected mutations were transitions. After irradiation with V-UV (254 nm) a significant amount of frame-shift mutations could be detected. ESA

N94-27862# Japan Atomic Energy Research Inst., Tokyo.
NEUTRONS IN BIOLOGY
SATORU FUNAHASHI (Japan Atomic Energy Research Inst., Tokai.) and NOBUO NIIMURA (Toho Univ., Tokyo, Japan.) Jan. 1993 104 p
(DE94-701085; JAERI-M-92-213) Avail: CASI HC A06/MF A02

The start of JRR-3M in 1990 was a great epoch to the neutron scattering research in Japan. Abundant neutron beam generated by the JRR-3M made it possible to widen the research field of neutron scattering in Japan. In the early days of neutron scattering, biological materials were too difficult to be studied by neutrons not only because of their complexity but also because of the strong incoherent scattering by hydrogen. However, the remarkable development of the recent neutron scattering and its related sciences, as well as the availability of higher flux, has made biological materials one of the most attractive subjects to be studied by neutrons. In early September 1992, an intensive workshop titled 'Neutrons in Biology' was held in Hitachi City by making use of the opportunity of the 4th International Conference on Biophysics and Synchrotron Radiation (BSR92) held in Tsukuba. The workshop was organized by volunteers who are eager to develop the research in this field in Japan. Numbers of outstanding neutron scattering biologists from U.S., Europe, and Asian countries met together and enthusiastic discussions were held all day long. The editors believe that the presentations at the workshop were so invaluable that it is absolutely adequate to put them on record as an issue of JAERI-M and to make them available for scientists to refer to in order to further promote the research in the future. DOE

N94-27940*# Ohio State Univ., Columbus.
ROOT GRAVITROPISM IN MAIZE AND ARABIDOPSIS Final Report, 1 Mar. 1992 - 30 Nov. 1993
MICHAEL L. EVANS 30 Nov. 1993 4 p
(Contract NAG10-84)
(NASA-CR-195710; NAS 1.26:195710) Avail: CASI HC A01/MF A01

Research during the period 1 March 1992 to 30 November 1993 focused on improvements in a video digitizer system designed to automate the recording of surface extension in plants responding to gravistimulation. The improvements included modification of software to allow detailed analysis of localized extension patterns in roots of Arabidopsis. We used the system to analyze the role of the postmitotic isodiametric growth zone (a region between the meristem and the elongation zone) in the response of maize roots to auxin, calcium, touch and gravity. We also used the system to analyze short-term auxin and gravitropic responses in mutants of Arabidopsis with reduced auxin sensitivity. In a related project, we studied the relationship between growth rate and surface electrical currents in roots by examining the effects of gravity and thigmostimulation on surface potentials in maize roots.
Derived from text

N94-27970# National Inst. of Polar Research, Tokyo (Japan).
COUNTING ADELIE PENGUINS AT COLONIES: SEASONAL AND ANNUAL CHANGES [KORONI DENO ADERI PENGIN NO KAUNTO: KISETSU HENKA TO NEN HENKA]
In its Antarctic Record, Vol. 36, No. 2 p 279-284 30 Jul. 1992
In JAPANESE
Avail: CASI HC A02/MF A02

The number of Adelie penguin (Pygoscelis adeliae) adults at colonies around Showa Station changes seasonally. The penguins started to arrive at the colonies on October 20-25. The number of adults at each colony reached its maximum on November 10-20, decreased until late November and was stable on December 1-10. This seasonal pattern was consistent over years and colonies. Censuses in mid-November and early December are recommended since they could give reliable numbers of breeding pairs.
Author (NASDA)

N94-27971# Hiroshima Univ. (Japan). Dept. of Environmental Studies.
NOTE ON THE STRUCTURE OF MOSS COLONIES COMPOSED OF TWO SPECIES ON KING GEORGE ISLAND, THE SOUTH SHETLAND ISLANDS [KINGUJOJITO NO NI SHU YORI NARU SENRUI KORONI NO KOZO NI TSUITE]
TAKAYUKI NAKATSUBO and SHUJI OTANI (National Inst. of Polar Research, Tokyo, Japan.) *In* National Inst. of Polar Research, Antarctic Record, Vol. 36, No. 2 p 285-293 30 Jul. 1992
Sponsored by Ministry of Education, Science and Culture, Tokyo, Japan
Avail: CASI HC A02/MF A02

Moss colonies composed of two species Sanionia uncinata and Bryum pseudotriquetrum are abundant in the vicinity of Great Wall Station on King George Island. Vertical cross-sections of these colonies were examined to know the colony structure indicating the interaction between the two species. In several colonies, a layer composed of Bryum pseudotriquetrum was partially covered with shoots of Sanionia uncinata. In some other colonies, a layer composed of Sanionia uncinata was partially covered with shoots of Bryum pseudotriquetrum. For the rest of the colonies, both species coexisted without covering each other. It is concluded that the proportion of the two species in a colony has changed through the colony growth, but the direction of the change varies among the colonies at each site. Author (NASDA)

N94-28198*# Oceanographic Consultants.
SONIC BOOMS AND MARINE MAMMALS: INFORMATIONAL STATUS AND RECOMMENDATIONS
WILLIAM C. CUMMINGS *In* NASA. Ames Research Center, High-Speed Research: Sonic Boom, Volume 1 p 219-231 Feb. 1994
Avail: CASI HC A03/MF A03

The topics discussed include the following: introduction to marine mammals; marine mammal hearing; noise effects; sonic booms; sonic boom effects on marine mammals; predictions; and recommendations. CASI

N94-28304*# Princeton Univ., NJ. Dept. of Geological and Geophysical Sciences.
AN EVALUATION OF CRITERIA THAT MAY BE USED TO IDENTIFY SPECIES SURVIVING A MASS EXTINCTION
Abstract Only
N. MACLEOD *In* Houston Univ., New Developments Regarding the KT Event and Other Catastrophes in Earth History p 75-77 1994
Avail: CASI HC A01/MF A02

One of the most difficult obstacles to establishing a causal connection between mass extinctions and large body impacts is the existence of what appear to be many more KT survivor species than previously suspected. Though interpretations of 'Cretaceous' faunal elements in lowermost Danian sediments differ, this enigmatic fauna has not been recovered from every

biozone-complete boundary section, including the El Kef stratotype. In terms of their potential for providing constraints on scenarios seeking to account for the KT extinction event, the significance of such observations cannot be overstated. Owing to the consistency with which these observations have been made over the last several years, the possibility of widespread trans-KT biotic survivorship can no longer be dismissed. Rather, the survivorship hypothesis must be tested alongside its alternative (the reworking hypothesis) to determine which explains the available data in the most complete yet parsimonious manner. Moreover, valid tests for survivorship cannot be based on negative evidence' or on the assumption that only a small cohort of species could have survived the KT boundary event. Several authors have recently proposed various criteria that might be used to test alternative interpretations for this aspect lowermost Danian biotic record. Author (revised)

N94-28408 Technical Research Centre of Finland, Espoo. Biotekniikan Lab.
BARLEY CELL CULTURE AS A PRODUCER OF HETEROLOGOUS PROTEIN Ph.D. Thesis
L. MANNONEN 1993 77 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
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The purpose of the present study was to demonstrate the possibility of using the stable cell culture of barley (Hordeum vulgare var. Pokko) established in our laboratory, in the production of heterologous proteins. Production of a cellulolytic enzyme, heat stable endoglucanase EGI from the filamentous fungi Trichoderma reesei, was chosen as an example. NTIS

N94-28420# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.
THE SUPPORT OF AIR OPERATIONS UNDER EXTREME HOT AND COLD WEATHER CONDITIONS [LES OPERATIONS AERIENNES EN ENVIRONNEMENT EXTREME CHAUD/FROID]
Oct. 1993 312 p In ENGLISH and FRENCH Symposium held in Victoria, British Columbia, 17-21 May 1993
(AGARD-CP-540; ISBN-92-835-0721-5) Copyright Avail: CASI HC A14/MF A03

Extreme temperatures, both hot and cold, can severely restrict the ability of aircrew and support personnel to accomplish their missions. Under emergency conditions of bail-out, ejection, and ditching of fixed or rotary-wing aircraft on land or in water, the survival rate of aircrew and passengers is also affected by the intensity of thermal stress experienced and the duration of exposure to the thermal stress. This has all recently been borne out by the experience of intense air operations in the Gulf War. This symposium reviewed the operational conditions experienced under extreme hot and cold weather. The papers presented at this symposium highlighted recent advances in thermal physiology, clothing sciences, personal flying equipment, and microclimate cooling. Emphasis was placed on the potential applications of these advances in situations where thermal stress may confound the efficient achievement of mission objectives.

N94-28439# Erlangen-Nuremberg Univ. Childrens Hospital (Germany). Inst. of Forensic Medicine.
PHYSIOLOGICAL INVESTIGATIONS OF THE ISOLATED RAT'S LIVER IN HYPOTHERMIA AND HYPOXIA AND THEIR RELEVANCE IN AIRCRAFT INCIDENTS ABOVE THE SEA
T. DUMSER, M. KRAEMER (Institute of Aviation Medicine, Fuerstenfeldbruck, Germany.), and J. HOEPER *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 11 p Oct. 1993
Copyright Avail: CASI HC A03/MF A03

Animals have two main methods of adjusting their body temperature. Poikilothermic animals adjust it to the existing ambient temperature, temperature, whereas homoiothermic animals keep temperature at a relatively constant value which is frequently above the ambient temperature; thus, temperature; thus, they able to stay in contrast to poikilothermic animals whose metabolic processes slow down increasingly due to van't Hoff's rule when ambient temperatures are when ambient temperatures are low, rendering sometimes even resulting in low-temperature rigidity. This, however, enables them to survive for a longer period of time in case of a lack of food and/or cold spells. Hibernating animals are something in between. In times of food shortage and in the period of cold weather, they reduce their metabolic processes and lower their body temperature. Without a doubt, man is part of the group of homoiothermic organisms. However, when having a closer look at homoiothermic organisms, it becomes obvious that their body temperature is only constant as far as the body core and the vital organs are concerned - there are fluctuations in the temperature of the extremities, i.e., the outer parts of the body, which are mainly induced by the environment. Consequently, the tissue of these regions of the body is subject to changes in temperature which may be considerable without resulting in permanent damage. Findings, mainly obtained from transplantation medicine, have shown that the organs of the body core need not be damaged irreversibly either, if their temperature is lowered for several hours - on the contrary, they can even be preserved this way for a limited period. Derived from text

N94-28667 Kent State Univ., OH.
DEVELOPMENT OF NOVEL SWITCHABLE PROTEIN SURFACES Final Report, 15 Mar. 1990 - 31 Jul. 1993
ROGER K. GILPIN Dec. 1993 11 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DAAL03-90-G-0061)
(AD-A275510; ARO-27695.21-CH-SM) Avail: CASI HC A03

The objective of the proposed work was to develop a range of new separation and purification media based on ligand imprinting techniques to generate ligand binding sites on silica-immobilized proteins for specifically targeted compounds. Ligand imprinting take advantage of our ability to manipulate the dynamical properties of proteins using water as a plasticizer. DTIC

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AEROSPACE MEDICINE

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

N94-26360# Army Health Care Studies and Clinical Investigation Activity, Fort Sam Houston, TX.
PRACTICE PATTERNS OF US ARMY MEDICAL DEPARTMENT PSYCHIATRISTS AND PSYCHOLOGISTS Final Report, May 1991 - Dec. 1993
NANCY K. WILLCOCKSON and JAMES M. GEORGOULAKIS Jan. 1994 27 p
(AD-A274787; HCSCIA-HR-94-002) Avail: CASI HC A03/MF A01

The present study is an evaluation of psychiatrist and psychologist patient care services from the Army's Ambulatory Care Data Base. The data from the present study did not reveal any evidence that psychiatrists performed patient care or medical services in any manner different from psychologists, with the exception that they prescribed medication. Psychologists were found (1) to spend more time with patients, (2) to provide a wider variety of patient care services, (3) to treat more patients with concurrent medical disorders, (4) to perform nearly all psychological testing evaluations, and (5) to be the sole medical professionals performing biofeedback and behavioral assessment. Both provider groups treated all of the same patient diagnostic categories, with some variation in patient diagnostic frequency, and neither group utilized ancillary medical procedures to any significant extent in its evaluation and management of patients. This data revealed that psychologists' are the almost exclusive providers of psychological testing evaluation, which is a work intensive, lengthy, and complex diagnostic process. Four significant variations were found: (1) time

spent in evaluation, depended upon the type of assessment performed (e.g., personality, intellectual, neuropsychological, or a combination thereof; (2) the amount of direct provider time required by psychologists, which depended upon three factors--the complexity of the case, the type of assessment undertaken, and whether a psychological assistant was utilized; (3) the frequency with which types of evaluations were performed, with personality assessments accounting for almost one-half half of all psychological testing evaluations; and (4) the average number of visit days involved in an assessment, which, again, varied with the complexity of the evaluation. DTIC

N94-26377# Naval Health Research Center, San Diego, CA.
MONITORING ACTIVITY WITH A WRIST-WORN ACTIGRAPH: EFFECTS OF AMPLIFIER PASSBAND AND THRESHOLD VARIATIONS Final Report, Nov. 1990 - Oct. 1992
TIMOTHY F. ELSMORE and PAUL NAITOH Feb. 1993 63 p
(Contract MIPR-91MM1505)
(AD-A274705; NHRC-93-18) Avail: CASI HC A04/MF A01

This project investigated some properties of the AMA-32 wrist-worn activity monitor. In the first phase of this project, a software program for the analysis of activity data was developed. The program permits rapid statistical and graphical summaries of activity data. The second phase of the project investigated effects of varying the sensitivity of the actigraph. Three different frequency passbands were investigated. The ability to differentiate sleep from wake was optimized with a 2 to 3 Hz passband, particularly with a high trigger threshold. Increasing sensitivity by lowering the trigger threshold or by broadening the passband reduced sleep/wake discriminability. The optimal sleep/wake discrimination parameters for the AMA-32 approximate those of earlier generations of wrist-worn actigraphs. The work in this report suggests research to investigate the utility of other actigraph sensitivity settings for differentiating movement patterns during sleep or for assessments of daytime workload. DTIC

N94-26432# Army Aeromedical Research Lab., Fort Rucker, AL.
US ARMY AVIATION EPIDEMIOLOGY DATA REGISTRY: INCIDENCE AND OUTCOMES OF AVIATOR FLYING EVALUATION BOARDS Final Report
KEVIN T. MASON and S. G. SHANNON Oct. 1993 21 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A274711; USAARL-94-2) Avail: CASI HC A03/MF A01

The Aviation Epidemiology Data Registry (AEDR) is a family of databases storing history and physical information on Army aircrewmembers. The AEDR lacks some aviation career endpoints, one being the outcome of flying evaluation boards (FEB's) for nonmedical disqualifications. The outcomes of 170 new FEB actions from 1985 through 1992 in active duty and U.S. Army Reserve aviators were reviewed. The overall incidence was 1.13 per 1,000 aviator-years. Aviators aged 25 through 39 were twice as likely to undergo FEB actions. The likelihood of restoration to flying duties after FEB was significantly lower if the FEB was for habits, character, and motivation, than if the FEB was for poor flying proficiency or failure to follow flight rules. Many nonmedical disqualifications leading to FEB require medical evaluation to rule out underlying mental disorders. DTIC

N94-26435# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.
AEROMEDICAL ISSUES RELATED TO POSITIVE PRESSURE BREATHING FOR +GZ PROTECTION Interim Report, 1 Apr. - 31 Oct. 1992
LARRY P. KROCK Dec. 1993 13 p
(Contract AF PROJ. 7930)
(AD-A274717; AL-TP-1992-0024) Avail: CASI HC A03/MF A01

Positive pressure breathing as a method to enhance aircrew tolerance for repeated and sustained high +Gz exposures (PBG) was first considered many years ago. Use of Combined Advanced Technology Enhanced Design G Ensemble (COMBAT EDGE) as a G-protection measure increases overall tolerance to +Gz acceleration by reducing the fatigue associated with performing straining maneuvers during extended or repeated exposures to acceleration stress. Physiologically, PBG exerts its effects upon both the cardiovascular and respiratory systems. The principal benefit of PBG is the maintenance of elevated intrathoracic pressure with minimal voluntary effort on behalf of the individual. Some confusion exists with regard to the potential impact COMBAT EDGE may have on the physical health of aircrew. A certain unknown probability exists suggesting acute and/or long-term exposure to PBG may produce certain undesirable changes in the cardiopulmonary physiology of a pilot. This issue has resulted in the need to provide information regarding the current state of our understanding. Described herein are the principal physiologic issues raised concerning use of COMBAT EDGE, looking to the available literature, past experience, and current and future research answers. DTIC

N94-26549 Korean Atomic Energy Research Inst., Daeduk (Republic of Korea).
MOLECULAR BIOLOGICAL STUDIES ON THE HUMAN RADIORESISTANCE AND DRUG RESISTANCE
CHANG MIN KIM and WEON SEON HONG Apr. 1992 20 p In KOREAN Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(DE93-632682; KAERI/RR-1114/91) Avail: CASI HC A03 (US Sales Only)

We irradiated the MKN45 and PC14 cell lines with 500 rads and also established the adriamycin-resistant and cis-platinum resistant cell line. The genomic DNA and total RNA were extracted and subjected to the Southern and Northern analysis using various probes including heat shock protein 70, MDR1, fos, TGFb, etc. The mRNA transcript was increased 1 hour after the irradiation and sustained during the 48 hours and returned to the level of pre-irradiation. No significant change was observed with the drug resistant cell lines at the level of gene dosage. We suggest that the marked increase of the hsp70 transcript is a very important finding and is believed to be a good candidate for the modulation of the cellular response to irradiation and the radioresistance. DOE

N94-26748# Army Aeromedical Research Lab., Fort Rucker, AL.
A COMPARISON OF SLEEP SCORED FROM ELECTROENCEPHALOGRAPHY TO SLEEP SCORED BY WRIST ACTIGRAPHY Technical Report, Nov. 1989 - Feb. 1990
J. L. CALDWELL and JOHN A. CALDWELL, JR. Sep. 1993 33 p
(AD-A273739; USAARL-93-32) Avail: CASI HC A03/MF A01

During military operations, it has been found that soldiers often are required to work for long periods of time without rest. In order to assist commanders in determining how much rest soldiers receive, various methods of monitoring activity have been used. One unobtrusive method is to use wrist activity monitors (WAM's) to determine how long soldiers are required to work with little or no sleep. This study compared data from traditionally scored sleep using electroencephalographs (EEG's) to data from WAM's to determine the ability of WAMs to measure sleep. Based on this limited comparison study, it appears that the WAM is a good instrument to use to estimate sleep time when an EEG is not possible. The percent agreement between WAM sleep time and EEG sleep time is very high, with an average of almost 89 percent. The error tended to be in the direction of overestimation of sleep time by the WAM. Also, the current method of scoring using a set cutoff of counts is a suitable method. However, an overestimation of sleep most likely will occur when this method is used. Therefore, whenever actigraphs are used, a conservative interpretation of the data is to discuss 'rest time' instead of 'sleep time.' In addition, the quality of sleep as determined by normal EEG sleep staging cannot be assessed by the WAM. DTIC

N94-26847# Air Force Flight Test Center, Edwards AFB, CA.
THE USE OF EEG AS A WORKLOAD ASSESSMENT TOOL IN FLIGHT TEST Technical Report

BRUCE P. HUNN Oct. 1993 79 p
(AD-A274568; AFFTC-TIM-93-02) Avail: CASI HC A05/MF A01

This report examines the use of EEG (Electroencephalography) as a tool to assess aircrew mental workload in-flight. It contains a brief history of EEG methods and a detailed analysis section. It also contains a large reference section for additional research purposes. Analysis methods, both historical and current are discussed. Statistical and graphic presentation of continuous EEG data is reviewed and recommendations are made for future testing of EEG technologies. DTIC

N94-26973# Systems Research Labs., Inc., Dayton, OH.
PASSIVE AND ACTIVE BEHAVIOR OF THE CARDIOVASCULAR SYSTEM UNDER INCREASED GRAVITATIONAL LOADS IN A CHRONICALLY INSTRUMENTAL CONSCIOUS BABOON MODEL Final Report, 1 Feb. 1991 - 1 Jun. 1993
DAVID A. SELF, CURTIS D. WHITE, RICHARD W. OWENS, JOHN W. FANTON, and RICKY D. LATHAM Nov. 1993 27 p
(Contract AF PROJ. 2312)
(AD-A274344; AL/AO-TR-1993-0103) Avail: CASI HC A03/MF A01

Simultaneous recordings of right atrial, left atrial, left ventricular (LV) and aortic pressure (AOP), aortic root flow and LV dimensions were recorded in chronically instrumented baboons at rest and undergoing centrifugation that mimicked military aviation acceleration environments. We separated the early and late hemodynamic responses to increased +Gz loads during acceleration using a rapid onset-rapid return (ROR) (greater than 4.5 G/s) centrifugation protocol. +Gz onset resulted in immediate changes in vascular pressure from hydrostatic effects, followed by passive shifting of blood volume to dependent regions causing declines in systemic pressure above the hydrostatic indifference point (HIP) and in venous return. Stroke volume (SV) and mean cardiac power output fell. Distending carotid level pressure routinely fell during acceleration to levels well outside threshold values previously reported for carotid baroreflex function. Active compensation consisted of increases in heart rate, AOP and decreases in aortic flow. Previous +Gz load history had enormous impact on blood pressure regulation during increased +Gz loads and on baseline pressures existing prior to exposure to a second +Gz onset. Animals exposed to a conditioning run that saturated their short-term pressure regulatory mechanisms 5 min before a second +Gz exposure, displayed significantly higher mean aortic root pressures and consistently overshot their baseline operating points during centrifugation. We conclude that hemodynamic consequences of rapid-onset acceleration are extremely complex and may provide conflicting error signal information during compensatory adjustments. DTIC

N94-26985# Army Aeromedical Research Lab., Fort Rucker, AL.
MONOGRAPH OF THE AVIATION EPIDEMIOLOGY DATA REGISTER FOR CALENDAR YEAR 1988 Final Report
ROBERT H. SCHRIMSHER and SAMUEL G. SHANNON Aug. 1993 99 p
(Contract DAMD17-92-C-2062)
(AD-A274589) Avail: CASI HC A05/MF A02

The purpose of this monograph is to provide the reader with descriptive statistics from the Aviation Epidemiology Data Register (AEDR). Data are presented for class 2/2A Flying Duty Medical Examinations (FDMES) based on information received by the AEDR during calendar year 1988. It is our purpose to provide these data with little discussion so as to encourage comparisons with other monographs. DTIC

N94-27088# Wright State Univ., Dayton, OH.
PULSE WAVEFORM AND TRANSCRANIAL DOPPLER ANALYSIS DURING LOWER BODY NEGATIVE PRESSURE Interim Report, Jan. - Oct. 1992
RAINER K. EFFENHAUSER and LLOYD D. TRIPP, JR. Apr. 1993 83 p
(Contract AF PROJ. 7231)
(AD-A274516; AL/CF-TR-1993-0097) Avail: CASI HC A05/MF A01

The use of lower body negative pressure (LBNP) as an acceleration pre-conditioning technique for space applications was investigated. The purpose was to evaluate changes in cephalic blood flow during LBNP. The intent was to see if detection or warning of impending syncope was possible, and to simulate effects which occur under exposure to +Gz. Ten subjects underwent the following LBNP profile while in a standing position: Five minutes of baseline at ambient pressure, followed by increments of -10 mm Hg every three minutes to a minimum of -50 mm Hg. They remained at -50 mm Hg for a maximum of twenty minutes or until presyncopal symptoms occurred. An additional five minutes of post-LBNP baseline data were collected. The analog pulse waveform, obtained from a pulse oximeter sensor located approximately at eye level on the subject's ear lobe. The pulse waveform analysis included pulse area, amplitude, and duration. Other physiological variables included: middle cerebral artery blood flow velocity using transcranial Doppler (TCD) sonography, and oxygen saturation obtained from a pulse oximeter. Six of the ten subjects experienced presyncopal symptoms during the LBNP profile. Significant changes were observed in several variables at the presyncopal endpoint and included: pulse waveform area ($P=0.0048$), pulse waveform amplitude ($P=0.0236$), cerebral artery blood flow velocity ($P=0.0001$), and cerebral artery pulsatility index ($P=0.0357$). DTIC

N94-27097# Army Aeromedical Research Lab., Fort Rucker, AL.
AVIATION EPIDEMIOLOGY DATA REGISTER: INDEXING THE AEDR DOCUMENT LASER OPTIC ARCHIVE Final Report
KEVIN T. MASON, SAMUEL G. SHANNON, and ROBERT E. POST Oct. 1993 20 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A274185; USAARL-94-1) Avail: CASI HC A03/MF A01

The Aviation Epidemiology Data Register (AEDR) is a family of databases storing health and physical parameters of Army aircrew. The components are administratively linked by social security number (SSN). A new component is an upgrade of the medical document microfiche archive to laser optic CD-ROM. The U.S. Army Aeromedical Activity requested assistance in creating an indexing scheme for the new system. They wanted to use a single SSN digit, the disks to fill at a uniform rate, and to keep the same aircrew member on the same disk even if multiple entries were made for the same patient. The SSN of each case in the microfiche archive was extracted as a reference population. Analysis of the frequency distribution of decimal values for selected SSN digits showed the last SSN digit would meet the stated requirements. Any of the first five SSN digits should not be used for indexing. DTIC

N94-27130# Army Aeromedical Research Lab., Fort Rucker, AL.
MONOGRAPH OF THE AVIATION EPIDEMIOLOGY DATA REGISTER FOR CY 1992 Final Report
ROBERT H. SCHRIMSHER and SAMUEL G. SHANNON Aug. 1993 109 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A274400; USAARL-93-35) Avail: CASI HC A06/MF A02

The purpose of this monograph is to provide the reader with descriptive statistics from the Aviation Epidemiology Data Register (AEDR). Data are presented for class 2/2A flying Duty Medical Examinations (FDME) based on information received by the AEDR during calendar year 1992. It is our purpose to provide these data with little discussion so as to encourage comparisons with other monographs. DTIC

N94-27442# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
ANNALS OF THE RESEARCH INST. OF ENVIRONMENTAL MEDICINE, NAGOYA UNIV., VOLUME 44 [KANKYO IGAKU KENKYUJO NENPO]

25 Mar. 1993 401 p In JAPANESE
(ISSN 0369-3570)
(REPT-44-VOL-44; JTN-94-80524) Avail: CASI HC A18/MF A04

The following topics were discussed: space environments, microgravity, low oxygen, metabolism, posture control, space activity, eye movement, temperature effect, thermoregulation, water immersion, sensory reception, stresses, visual reception, heart, cardiac muscle, pace-maker cells, electric stimuli, gamma radiation, brain, neurons, nervous cells, nervous systems, autonomic nervous system, receptors, circulatory system, neurotransmitters, enzymes, proteins, hormones, genes, electric potential, RNA (Ribonucleic Acid), DNA (Deoxyribonucleic Acid), cultivation, cloning, electron microscopy, acetylcholine, prostaglandin, Na ion channel, K ion channel, Ca(2+), ion current, antiarrhythmic agents, blood flow, saccade system, microneurography, and hypotension.

Author (NASDA)

N94-27443# Sanwa Kagaku Kenkyusho Co. Ltd., Kasugai (Japan).

CHANGES IN CIRCADIAN VARIATIONS OF URINE EXCRETION IN TAIL-SUSPENDED RATS [RATTO BIBU KENSUI NI OKERU CHUYA NO NYO HAISETSU RIZUMU NO HENKA]

KAZUMI KANDA, SACHIKO OHMORI (Nagoya Univ., Japan.), CHIKASHI YAMAMOTO (Nagoya Univ., Japan.), SETSUKO KAWANO (Nagoya Women's Univ., Japan.), SAYOKO HAYAMIZU (Nagoya Univ., Japan.), NORIHIRO MIYAMOTO (Nagoya Univ., Japan.), YOSHIHARU MURATA (Nagoya Univ., Japan.), and HISAO SEO (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 1-4 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

In this study, urine excretion was examined using tail-suspended rats as a model of muscle and bone atrophy in a weightless state. Subjects were 30 Wistar strain rats, classified into a control group, and suspended groups. In suspended groups, rats were suspended from the ceilings of the cages with wires pierced through the coccygeal bone for seven days, and urine was collected every 12 hours, as well as the amount of diets and water ingested was measured. As a result, the amount of diet and water ingestion was significantly decreased in the tail-suspended groups. Urine excretion in day was increased in all suspended groups, while that in night was different by when the suspension started; i.e. rats suspended at 19:00 increased in urine excretion, but those suspended at 7:00 did not show remarkable change. Comparing the ratios of urine excretion in night to that in day, they were significantly decreased in the suspended groups, whereas no observable change was detected in the control group. These results suggest that the circadian change of urine excretion may result from secretion and modification of Atrial Natriuretic Polypeptide (ANP) by glucocorticoids. Author (NASDA)

N94-27445# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

CHANGES IN FLUID AND ELECTROLYTE METABOLISM DURING WATER IMMERSION AT HIGH OR THERMONEUTRAL TEMPERATURE [KOON OYOBI CHUSEION SUISHINJI NI OKERU MIZU-DENKAISHITSU TAISHA NO HENDO]

SACHIKO OMORI, KAZUMI KANDA, CHIKASHI YAMAMOTO, SAYOKO HAYAMIZU, K. A. KIRSCH (Freie Univ., Berlin, Germany.), SATOSHI IWASE, CHIHIRO MIWA, JUNICHI SUGENOYA (Aichi Medical Univ., Nagakute, Japan.), TADAAKI MANO, and YOSHIHARU MURATA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 9-17 25 Mar. 1993 In JAPANESE
Avail: CASI HC A02/MF A04

It is known that water and electrolyte metabolism changes due to movement of fluid from lower part to upper part of the body when astronauts are in a weightless state. In addition, stress might effect on astronauts' metabolism during space travel. To study metabolic changes in this condition, subjects were immersed in thermoneutral water or hot water to load stress, and blood and urine samples were collected. As a result, Ht (Hematocrit), total protein and Ca concentration was decreased by immersion in thermoneutral water bath, which suggests that blood was diluted by fluid transferred into the vessel in a weightless state. In addition, decrease of aldosterone that was also observed may cause increase of Na in urine and urine flow. Contrastingly, by immersion in high temperature water, it was revealed that blood was condensed by sweating, and aldosterone was increased. These results suggests that stress loaded by high temperature might stimulate the hypothalamus that controls the secretion of the adrenal grand. Author (NASDA)

N94-27449# Kawasaki Heavy Industries Ltd., Kobe (Japan).

TELESCIENCE TESTBEDDING FOR PHYSIOLOGICAL EXPERIMENTS UNDER HYPOBARIC HYPOXIC CONDITIONS [TEIATSU TEISANSO KANKYOKA DENO SEIRIGAKU JIKKEN ENO TERESAIENSU-SHISUTEMU NO TEKIYO]

SEIJI NISHIO, SATORU WATANABE (Nagoya Univ., Japan.), MASAMICHI YAMASHITA (Ministry of Education, Kanagawa, Japan.), SHIGEO MORI (Nagoya Univ., Japan.), SOKICHI SAKURAGI (Aichi Univ. of Education, Japan.), YOSHIRO WADA (Nagoya Univ., Japan.), HIROYUKI SUZUKI (Aichi Univ. of Education, Japan.), MITSUHIRO KOEDA (Chukyo Univ., Toyota, Japan.), and TAKATOSHI SHOJI *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 30-34 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Physiological experiments in outer space requires special knowledge and technique. However the limited number of Payload Specialists (PS) cannot cover all the special fields, so that the role of telescience has become important in order to communicate experimental sequences or manipulation with Principal Investigators (PI), especially in experiments with flexible sequences. Several preliminary studies to simulate space experiments using testbedding revealed that human factors may provide an important effect on space experiments. Therefore, this study focused on operation ability of PS's under hypobaric hypoxic conditions that was evaluated by Kraepelin census, results of a video game, brain wave and heart rate. As a result, operation ability was not decreased in this condition, which suggests effectiveness of the teletool as a means of communication with PI's on ground and PS's in space. The method that direction by PI's was given as necessary was proved to be useful to optimize the time line if PS's have enough level of skill. In addition, several PI's directed two PS's to perform two experiments parallely. This parallel system seemed to be useful to save time, but it should be prudent to introduce it, because both PI's and PS's felt anxiety in the parallel system. Author (NASDA)

N94-27450# Aichi Univ. of Education (Japan). Dept. of Nursing.

TELESCIENCE TESTBEDDING UNDER HYPOBARIC HYPOXIC CONDITIONS: EVALUATION BY OPERATION ABILITY AND RECOGNITION ABILITY [TEIATSU TEISANSO KANKYOKA DENO TERESAIENSU-TESUTOBEDDO: SAGYO NORYOKU OYOBI JOHO NINSHIKINORYOKU NI YORU HYOKA]

SOKICHI SAKURAGI, SATORU WATANABE (Nagoya Univ., Japan.), SHIGEO MORI (Nagoya Univ., Japan.), YOSHIRO WADA (Nagoya Univ., Japan.), HIROYUKI SUZUKI (Nagoya Univ., Japan.), TAKATOSHI SHOJI (Kawasaki Heavy Industries Ltd., Kobe, Japan.), and SEIJI NISHIO (Kawasaki Heavy Industries Ltd., Kobe, Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 35-37 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Telescience is a remote operation support system which enables Principal Investigators (PI) on ground to direct a Payload Specialist (PS) and to manipulate directly the experimental system in outer space through teletools. In order to complete this system, simulation tests were performed on ground using testbedding. This report concerns the 4th simulation test, that focused on human factors under a particular condition of outer space, hypobaric hypoxia. In this test, operation and recognition ability was evaluated by results of Kraepelin census, results of a video game, scoring

of subjective symptoms and measurements of brain wave and heart rate, for two subjects. As a result, no difference was observed in these abilities between normal and hypobaric hypoxic condition in one subject, probably because of experience of a decompression chamber that the subjects already had. The other subject, who had no such experience, revealed decrease in operation ability, while no or slight decrease was observed in recognition ability. These results suggests that a PS can respond to clear directions even in a particular condition that could decrease operation ability. Author (NASDA)

N94-27451# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

TELESCIENCE TESTBEDDING FOR PHYSIOLOGICAL EXPERIMENTS UNDER HYPOBARIC HYPOXIC CONDITIONS: DEVELOPMENT AND EVALUATION IN CNV MEASURING [TEIATSU TEISANSO KANKYOKA DENO SEIRIGAKU JIKKEN ENO TERESAIENSU-SHISUTEMU NO TEKIYO: CNV KEISOKU KARA MITA HYOKA]

HIROYUKI SUZUKI, SATORU WATANABE, SHIGEO MORI, YOSHIRO WADA, MASAMICHI YAMASHITA (Ministry of Education, Kanagawa, Japan.), SOKICHI SAKURAGI (Aichi Univ. of Education, Japan.), MITSUHIRO KOEDA (Chukyo Univ., Toyota, Japan.), SEIJI NISHIO (Kawasaki Heavy Industries Ltd., Kobe, Japan.), and TAKATOSHI SHOJI (Kawasaki Heavy Industries Ltd., Kobe, Japan.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 38-44 25 Mar. 1993 In JAPANESE

Avail: CASI HC A02/MF A04

Telescience is a system to achieve highly credible experiment in outer space, directed by Principal Investigators (PI) on ground through teletools, and is inevitable to perform complicated physiological experiments that require flexible experimental sequences. For development and operation of telescience, preliminary experiments were performed under the hypobaric hypoxic condition in a testbedding. In this study, Contigent Negative Variation (CNV) was used as an objective index of attentiveness to evaluate credibility and adequacy of telescience experiments. In addition, a teletool which has been developed to determine CNV, was also evaluated in respect to operational effectiveness. As a result, it was demonstrated that CNV was a useful index to evaluate operation ability. In evaluation of the teletool, the up link image was effective in presenting, directing and discussing data from ground, especially in a phase requiring sophisticated manipulation. The down link data was improved to send only status data of device and statistic data on physiological and behavior indexes, which enabled: (1) reduction of information to 1/200; (2) decrease of PI's work; and (3) visualization and facilitation of data by making a graph. On the other hand, as the system largely depends on the computer support, several problems occurred due to less communication with PS's. Author (NASDA)

N94-27452# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

THE ELECTROGASTROGRAM DURING PARABOLIC FLIGHT [PARABORIKKU FURAITO NI OKERU EGG (EREKUTOROGASUTOROGURAFI) SOKUTEI]

YOSHIRO WADA, HIROYUKI SUZUKI, SATORU WATANABE, and YOSHIKI KANEOKE *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 45-48 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

Motion sickness is a disease caused by vehicles with symptoms of digestive system, as well as pale and cold sweat. It is often observed in parabolic flight which produces microgravity and hypergravity. Recently, Electrogastrography (ECG) has been developed to record gastric electroactivity percutaneously. In order to examine whether ECG was available as an index of nausia and vomitting in motion sickness, ECG was measured during parabolic flight in this study. As a result, from scoring of motion sickness according to the diagnosis table, four in eight subjects were diagnosed as motion sickness. Although there was individual difference in amplitude and frequency of ECG, motion sickness occurred in subjects who had large amplitude before vomiting, or high frequency as nausea became worse. It was also observed that trajectory of ECG turned to the opposite direction when gravity shifted from 0 to 2 G. Therefore, ECG might be useful as an objective index of motion sickness, however, further studies with large population would be necessary in order to remove individual differences. Author (NASDA)

N94-27453# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

VERTICAL GAZE DIRECTION DURING PARABOLIC FLIGHT [PARABORIKKU FURAITO JI NO SUICHOKUSEI GANSHIN]

HIROYUKI SUZUKI, SATORU WATANABE, SHIRO USUI (Toyohashi Univ. of Technology, Aichi, Japan.), AKIRA MIYAMOTO (National Space Development Agency, Tokyo, Japan.), and SHUNJI NAGAOKA (National Space Development Agency, Tokyo, Japan.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 49-51 25 Mar. 1993 In JAPANESE Sponsored by NASDA

Avail: CASI HC A01/MF A04

There are many reports that variation of gravity causes vertical nystagmus, probably resulting from changes of vertical acceleration sensed by statoliths system. This report concerns some findings obtained from simultaneous measurement of acceleration and vertical eye movement by Electronystagmography (ENG) in the parabolic flight under the following three conditions: (1) open eyed gaze with sitting position; (2) dark field with sitting position; and (3) dark field with reclining position. As a result, under the condition (1), no eye movement was detected during vertical gravity (Gz) altered from 2.3 to 0 G, while upward shift of eye position and downward nystagmus were observed during Gz changing from hypergravity to microgravity under the condition (2). On the other hand, while the eye position was shifted upwards under the condition (3), slight downward nystagmus was observed from hypergravity to microgravity. In both sitting and reclining positions, eye position was shifted before Gz decreased below 1 G. In addition, the posture or the direction that subjects were facing may affect the eye movement in parabolic flight, so that these factors should be considered in the study concerning sense of equilibrium. Author (NASDA)

N94-27454# Aichi Univ. of Education (Japan). Dept. of Nursing.

HEART RATE CHANGE IN NORMAL AND LABYRINTHECTOMIZED HAMSTERS DURING PARABOLIC FLIGHT [HOBUTSUSEN HIKOCHU NO SEIJO OYOBI ZENTEI HAKAI HAMUSUTA NO SHINPAKUSU HENKA]

SOKICHI SAKURAGI, SATORU WATANABE (Nagoya Univ., Japan.), YOSHIRO WADA (Nagoya Univ., Japan.), and HIROYUKI SUZUKI (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 52-54 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

Usually, circulatory system is regulated under a constant gravity. However, in outer space, microgravity causes fluid to move to the upper part of the body, and the regulation of the fluid movement results in circulatory hypometabolism after returning in normal gravity. There is no effective countermeasure for this hypometabolism at present. In this study, adaptation of circulatory system under microgravity was examined by Electrogastrography (ECG) in parabolic flight using eight hamsters, including three normal, three hemilateral labyrinthectomized and two bilateral labyrinthectomized hamsters. ECG data was sent by telemetric transmitter implanted in the hamsters, with data of vertical gravity. As a result, two in three normal hamsters increased heart rate under the microgravity, while the other labyrinthectomized hamsters did not reveal any change by variation of gravity. The simultaneous human experiment demonstrated that although human heart rate was decreased under microgravity, and was increased under hypergravity in sitting position, it was not affected in supine position. This could be because in sitting position the fluid movement by change of gravity stimulates baroreceptor, leading to decrease of heart rate, while in supine position the change of gravity may not

move fluid. As hamsters' posture is considered to be similar to human supine position, the effect of fluid can be excluded, so that the change of heart rate in hamster may be caused by change of vestibular sense or somatasthenia. Author (NASDA)

N94-27457# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

THE MECHANISM OF CALORIC NYSTAGMUS UNDER MICROGRAVITY. 1: CHANGES OF ENDOLYMPHATIC PRESSURE IN THE SEMICIRCULAR CANAL OF PIGEON BY CALORIC STIMULATION [MUJURYOKU KA NI OKERU ONDOSEI GANSHIN HATSUGEN KIJO. 1: HATO NO ONDO SHIGEKI NI TAISURU SUIHEI HANKIKANNAI RINPA ATSU HENKA]

YOSHIRO WADA, HIROYUKI SUZUKI, and SATORU WATANABE *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 64-67 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The caloric nystagmus is a nystagmus caused by pouring cold or hot water in the external auditory meatus, which is extensively practiced in clinical test of equilibrium function. The cause might be change of endolymphatic pressure in the semicircular canal according to caloric stimulation. This study examined the variation of endolymphatic pressure in response to caloric stimulation in pigeons in order to verify the hypothesis. The endolymphatic pressure was measured with a thermosensor directly on the semicircular canal, around which a silicon tube was twisted to stimulate by hot or cold water flowing through it. It was observed that the endolymphatic pressure of pigeons increased when stimulated by cold water and decreased by hot water, and the pressure was varied in proportion to the change of temperature. In addition, because this change was not affected by posture of a pigeon's head which fixed to keep the semicircular canal in horizontal or 45 degree-inclining position, the effect of gravity could be excluded. Author (NASDA)

N94-27458# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

CARDIOVASCULAR FUNCTION DURING THERMONEUTRAL HEAD-OUT WATER IMMERSION IN THE ELDERLY [KOREISHA NI OKERU CHURITSUON KEIKA SUISHIN FUKAJI NO JUNKAN DOTAI]

YOSHIKI SUGIYAMA, CHIHIRO MIWA, HATSUE SUZUKI, YE-XIANG XUE, TOSHIYOSHI MATSUKAWA, SATOSHI IWASE, and TADAAKI MANO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 68-71 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

Circulation system is regulated mainly by autonomic nerve system including pressor-receptor reflex. However, in the elderly, this regulation system did not seem to function, probably because of degeneration of baroreceptor and less fluid movement which may lower the suppression of muscular intension via sympathetic nervous system. The purpose of this study is to review circulatory regulation in the elderly. For examination of circulatory function, heart rate, blood pressure, mean stroke volume and cardiac output were compared between the elderly and the youth when immersed in thermoneutral water up to the level of navel or shoulder, or in standing position before the immersion. As a result, during immersion, heart rate was significantly decreased in the youth, while no decrease was observed in the elderly. Blood pressure was significantly increased in the elderly, but stroke volume was significantly increased in the youth. Cardiac output was increased only in the youth. These results reveal that in the elderly the blood pressure was increased significantly in spite of less cardiac output, which should be suppressed by negative feedback of sympathetic nervous system stimulated by the baroreceptor. However the function of pressor-receptor reflex may degenerate in the elderly. In addition, during immersion, water pressure moves fluid toward upper part of the body, and this fluid movement may stimulate the baroreceptor. However, the mechanism might not work sufficiently in the elderly. Author (NASDA)

N94-27459# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF 40 C HOT WATER IMMERSION FOR AN HOUR ON THERMOREGULATORY FUNCTIONS IN HUMANS: COMPARISON WITH 34 C THERMONEUTRAL IMMERSION [40 C ICHI JIKANNO SUISHIN GA TAION CHOSETSU KINO NI OYOBOSU EIKYO: 34 C NO CHURITSUON SUISHIN TONO HIKAKU]

CHIHIRO MIWA, SATOSHI IWASE, TOSHIYOSHI MATSUKAWA, JUNICHI SUGENOYA (Aichi Medical Univ., Nagakute, Japan.), KOJI YAMAGUCHI (Toho Gas Co. Ltd., Nagoya, Japan.), TADAAKI MANO, YOSHIKI SUGIYAMA, YE-XIANG XUE, and KARL A. KIRSCH (Freie Univ., Berlin, Germany.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 72-75 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

This study examined the effects of temperature in water immersion by measuring skin temperature, core temperature, sweat rate, blood flow, body weight loss and urine volume, and compared the data between 34 C and 40 C water immersion. As a result, skin temperature and blood flow in forearms and precordia was increased, and blood flow in fingertips was decreased, during immersion in hot water. After immersion for 10 minutes, the core temperature and sweat rate was rapidly increased in high temperature water. During thermoneutral water immersion, skin temperature, sweat rate and blood flow did not change, and core temperature was lowered. Body weight loss in hot water immersion was larger by 300 g, while urine volume in thermoneutral water immersion was five times as much as that in hot water immersion. The sweat rate in the palm which represents psychogenic sweat was observed 20 minutes after the hot water immersion, probably because of stress by high temperatrue. In addition, in hot water, blood flow and skin temperature was increased by two steps; one is immediately after the immersion and the other is about 10 minutes after that. The first step might be the direct effect of water temperature, and the second might result from dilation of peripheral vessels by the change of core temperature that could stimulate thermoregulation system. It is suggested that the body weight loss might result from increased sweat in the case of high temperature, and from endocrine variation in the case of thermoneutral immersion. Author (NASDA)

N94-27460# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

DEVELOPMENT OF STIMULUS-SEEKING SCALE FOR EXPECTING INDIVIDUAL DIFFERENCES AGAINST CONFINEMENT STRESS [HEISA KANKYO SUTORESU NI TAISURO TAISEI YOSOKU NO TAMENO SHIGEKI KIKYU SHAKUDO NO SAKUSEI]

MITSURO KIDA, MASAFUMI TANAKA, TETSUJI ITO, and KAZUAKI KAWANO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 76-83 25 Mar. 1993 In JAPANESE

(Contract MOE-04551001)
Avail: CASI HC A02/MF A04

Confinement stress is a current issue caused by an extremely few stimuli such as life in a satellite station or polar base. There are several levels of optimal stimulus for each individual, and if the individual difference could be measured, the confinement stress will be predicted. The purpose of this study was to develop a new stimulus-seeking scale based on Zuckerman's scale. In this stimulus-seeking scale, two levels were presumed; i.e. external stimulus-seeking that seeks external or physical stimulus, and internal stimulus-seeking that seeks internal or mental stimulus. Based on the two stimulus-seeking levels, a questionnaire was prepared to verify whether this classification was appropriate or not, as well as to review this scale by comparing the established scale of anxiety and disposition. From results of about 200 subjects, each 10 items were selected for internal and external stimulus-seeking level as appropriate items to distinguish individual features. Analytical study revealed the credibility and propriety of these items. Comparing scores of characteristic anxiety scale and

disposition scale, there was correlation with external stimulus-seeking scale, while slight or no correlation was observed with internal stimulus-seeking scale. Author (NASDA)

N94-27473# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF BATHING AT 40 C ON CARDIOVASCULAR SYSTEM IN HUMANS: COMPARISON WITH 34 C THERMONEUTRAL BATHING [40 C NO NYUYOKU GA HITO NO JUNKANKIKEI NI OYOBOSU EIKYO]

TOSHIYOSHI MATSUKAWA, CHIHIRO MIWA, SATOSHI IWASE, YOSHIKI SUGIYAMA, YE-XIANG XUE, TADAAKI MANO, JUNICHI SUGENOYA (Aichi Medical Univ., Nagakute, Japan.), KOJI YAMAGUCHI (Toho Gas Co. Ltd., Nagoya, Japan.), and KARL A. KIRSCH (Freie Univ., Berlin, Germany.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 128-130 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The incidence of stroke and cardiac infarction increases during and immediately after bathing; however, it is not sufficiently understood what is the effect of bathing, especially on the circulatorysystem. In this study, the changes of core temperature, skin blood flow, blood pressure and heart rate were measured to compare the effect of bathing in 34 C water and 40 C water on healthy human subjects. As a result, in 34 C bathing, skin blood flow and systolic pressure did not change, while core temperature, diastolic pressure, mean blood pressure and heart rate were decreased. On the contrary, in 40 C bathing, core temperature, skin blood flow and heart rate were significantly increased, and systolic, diastolic and mean pressure were decreased significantly. Generally, bathing effects circulatory system by static water pressure and water temperature, but 34 C bathing receives only static water pressure. Therefore, the difference between 34 C and 40 C bathing could result from the effect of water temperature. This effect includes an increase of peripheral blood that may decrease the amount of central blood, leading to decrease of blood pressure in 40 C bathing. The reverse response of heart rate was explained as follows: in 34 C bathing, increase of central blood by static water pressure may stimulate baroreceptor to decrease heart rate, whereas, in 40 C bathing, baroreceptor was stimulated oppositely, as well as stimulation of the hypothalamus by high core temperature also functioned to increase heart rate via sympathetic nerve system. Author (NASDA)

N94-27474# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECTS OF 41 C BATHING FOR 20 MINUTES ON CARDIOVASCULAR AND THERMOREGULATORY FUNCTIONS IN HUMANS [HITO NO SHIN JUNKAN KINO TO ONDO CHOSETSU KINO NI OYOBOSU 41 C 20 PUNKAN NYUYOKU NO EIKYO]

CHIHIRO MIWA, SATOSHI IWASE, TOSHIYOSHI MATSUKAWA, YOSHIKI SUGIYAMA, TADAAKI MANO, MITSURO KIDA, HIROSHI YAMAGUCHI (Toho Gas Co. Ltd., Nagoya, Japan.), SEISHI OKUYAMA (Toho Gas Co. Ltd., Nagoya, Japan.), TOSHIYA MIZUNO, TERUYUKI SAITO et al. *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 131-134 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The Japanese prefers hot water bathing of 41 - 43 C; however, it was reported that cardiovascular and cerebrovascular diseases often occurs during hot water bathing. This study examined physiological effects of 41 C bathing for 20 minutes on healthy human subjects. As a result, heart and respiration rate, skin temperature and skin blood flow were increased, while blood pressure was decreased. When bathing, the first response could be dilation of peripheral vessels that decreases circulatory blood and cardiac output, which might result in immediate decrease of blood pressure and rise of heart and respiration rate. The second response which occurred 10 minutes after bathing was increase of heart rate and respiration rate, probably resulting from elevation of core temperature that also stores blood in peripheral vessels and decrease circulatory blood, and from stimulation of the hypothalamus by high core temperature to activate sympathetic nerve system. Sweat was observed 10 minutes after the bathing, which would be thermoregulation against core temperature elevation. Author (NASDA)

N94-27475# Nagoya Univ. (Japan). School of Engineering.

MONTHLY VARIATION OF PHYSIOLOGICAL AND PSYCHOLOGICAL RESPONSES UNDER UNSTEADY THERMAL CONDITIONS Report No. 2 [HITEIJO ONNETSU KANKYOKA DENO SEIRI-SHINRI HANNO NI OKERU NENNAI HENDO]

TERUYUKI SAITO, SATORU KUNO, MITSURO KIDA, KAZUO KOGA, HATSUE SUZUKI, TOSHIYA MIZUNO, HIDEO ONO (Sugiyama Jogakuin Univ., Nagoya, Japan.), and NOBUO NAKAHARA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 135-139 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

This study examined physiological response (mean skin temperature) and psychological response (feeling of hot and cold, cool and warm, comfort and desire for elevating or lowering room temperature) of human subjects for every month in case of changing room temperature from 18 to 26 C and from 34 to 26 C. For each response parameters, linear regression line was obtained from the relation of the response with change of room temperature. Concerning skin temperature, regression lines of each month were compared between rising and lowering temperature condition, and the inclines in the two conditions differed remarkably during June to August. This suggests that during summer sweat lowers skin temperature in 34 C condition so that the incline becomes gentler around the temperature. The incline of hot and cold feelings was not varied by seasonal changes, but generally, the inclines were steeper in rising temperature than lowering temperature. This is because at 18 C subjects complained coldness more than the degree of complain of hotness in lowering temperature. In the desire for room temperature, the Y intercepts were smaller in winter, which suggests that a man is satisfied to higher temperature during winter. Author (NASDA)

N94-27476# Sugiyama Jogakuin Univ., Nagoya (Japan). Dept. of Human Environment.

MAN'S ABILITY TO ADAPT HIMSELF FOR THE SEASONAL CLIMATIC CHANGES: FROM VIEWPOINT OF ANTICIPATION AND SEASONABLE BEHAVIOR [DOTEKI NA ONNETSU KANKYO NI TAISURU NINGEN NO TSUIJUSEI NI KANSURU KOSATSU: YOCHIKODO ANCHISHIPESHON TO KISETSU SOOSEI NO KANKEI NI TSUITE]

HIDEO ONO and MITSURO KIDA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 140-144 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The purpose of this article is to review the studies on environmental evaluation and changes of comfortability by dynamic thermal conditions, especially on a effect of seasonal changes, in order to achieve a coordinated environments not depending on large energy consumption but considering ecological system on the entire earth. From these studies, it was revealed that the change of room temperature caused physiological and psychological changes. The similar physiological changes were also observed in seasonal changes, although the peak of hot or cold temperature preceded the peak of physiological responses by about two months. The senses of warm or cool seem to largely depend on a physiological factor (hormone or metabolism), and a mental factor (scenary or color). The adaptability is a behavior to reach such warm or cool condition by anticipating the seasonal changes. There are two factors that effect thermo-comfortability: seasonal factor, such as metabolism, meteorological condition, or scenary, and seasonable factor, such as admiration of seasons. It seems to be important to consider both factors for design and management of comfortable environment. Author (NASDA)

N94-27478# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
THYROID HORMONE ACTION IN CULTURED HUMAN SKIN FIBROBLASTS: EVALUATION USING SPHEROID CULTURE [HITO HIFU SENIGA SAIBO NI OKERU KOJOSEN HORUMON SAYO: SUFEROIDO BAIYO O MOCHITA KENTO]
YOSHIHARU MURATA, MASAFUMI MENJO, TAKASHI MIYAZAKI, HISAO SEO, MANABU YAMAZAKI (Japan Research Center, Atsugi.), and YUICHI MORI (Japan Research Center, Atsugi.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 148-150 25 Mar. 1993 In JAPANESE
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Avail: CASI HC A01/MF A04

This article presents the responses of human skin fibroblasts to the stimulus of thyroid hormone. In previous studies, the mechanism was examined with monolayer culture, however, different stages of cell cycle were observed among cells. On the other hand, cells are considered to stay at G(sub 0)-stage in the spheroid culture. In this study, this spheroid culture was applied using a thermo-sensitive polymer which has a property to become insoluble above 30 C and soluble below the temperature. Human skin fibroblasts were cultured in solid medium at 37 C, and when confluent, it was cooled to 4 C to melt the polymer so that the cells were suspended in the medium and gradually formed spheroids. Triiodothyronine (T(sub 3)) was added to the culture when spheroid was formed and Fibronectin (FN) mRNA (Messenger Ribonucleic Acid) and collagenase mRNA was determined as indices of the response. As a result, FN mRNA was decreased to two-thirds by T(sub 3) addition, while collagenase mRNA was not changed by T(sub 3). There is some contradictions between these results and those from monolayer culture, because the effect of proteinkinase C cannot be excluded from the latter system due to containing cells with different cell cycles. Therefore, the spheroid culture may be superior in examining the pure effect of thyroid hormone. Author (NASDA)

N94-27481# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
EFFECT OF SERA FROM PATIENTS TREATED WITH LONG-TERM HEMODIALYSIS ON MRNA'S FOR COLLAGENASE, STROMELYSIN, AND TISSUE INHIBITOR OF METALLOPROTEASE IN CULTURED HUMAN SYNOVIAL CELLS [BAIYO HITO KATSUMAKU SAIBO NI OKERU KORAGENAZE, SUTOMERAISHIN, OYOBI SOSHIKI METAROPUROTEAZE INHIBITA NO KAKUIDENSHI HATSUGEN NI OYOBOSU TOSEKI KANJA KESSEI TENKA NO EIKYO]
TAKASH MIYAZAKI, MOTOYOSHI SATO, YOSHIHARU MURATA, KENJI MAEDA, and HISAO SEO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 158-160 25 Mar. 1993 In JAPANESE Sponsored by the Aichi Kidney Foundation and Kowa Life Science Foundation
Avail: CASI HC A01/MF A04

Long-term hemodialysis usually causes dialysis amyloid arthropathy. It was demonstrated in the previous studies that sera from long-term hemodialysis patients promoted the production of Collagenase (CS) that plays an important role in degradation of interstitial tissue in synovial cells. This study examined whether this sera varies the expression of mRNA of Stomelysin (SN) and Tissue Inhibitor of Metalloprotease (TIMP). It is known that SN promotes degradation of interstitial tissue together with CS synergistically, and TIMP inhibits such degradation by blocking both proteases to reconstitute interstitial tissue. Sera from long-term dialysis patient was added to subcultured synovial cells, and the mRNA (messenger Ribonucleic Acid) was extracted and determined. As a result, mRNA of CS and SN was increased three times as much as that of control in which sera from healthy person was added. On the contrary, at the most, only a slight difference was observed in TIMP mRNA expression between sera from patient and a healthy person. This suggests that sera from the dialysis patient change synovial cells to promote degradation of surrounding interstitial tissue. Author (NASDA)

N94-27501# Yasui Acupuncture Clinic, Nagoya (Japan).
CHANGES IN PAIN SENSATION INDUCED BY REPETITIVE APPLICATION OF NOXIOUS HEAT PULSES TO THE HUMAN SKIN [SHINGAITEKI FUKUSHANETSU SHIGEKI NO KURIKAESHI NI YORU HITO HIFU TSUKAKU NO HENKA]
HIROTAKA YASUI, KAZUHIKO KUMAZAWA (Aichi Medical Univ., Nagakute, Japan.), KAZUE MIZUMURA (Nagoya Univ., Japan.), and TAKAO KUMAZAWA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 224-226 25 Mar. 1993 In JAPANESE
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Pain can be classified into two types: primary pain, which is weakened by repetitive stimuli; and secondary pain, which is dull and strengthened by repetitive stimuli. The purpose of this study was to examine the change of primary pain sensation when repetitive stimuli of noxious heat pulses was applied to the human skin. Author (NASDA)

N94-27520# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
IMPAIRED ASSOCIATED MOVEMENT IN PARKINSON'S DISEASE: AN EVALUATION OF BELL'S PHENOMENON [PAKINSONBYO NI OKERU RENGO UNDO SHOGAI: BERU GENSHO NI TSUITE NO KENTO]
MINORU HOSHIYAMA, SATORU WATANABE, SEIJI YOSHINO (Suzuka Univ. of Medical Science and Technology, Japan.), and KANEO MORI *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 288-291 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

One of the dyskinesia in Parkinson's disease is a kinesia with impaired associated movement. This impairment includes Bell's phenomenon which is an upward movement of eye balls accompanied with eye close movement. The purpose is to observe the Bell's phenomenon in patients with Parkinson's disease. The subjects were seven patients with Parkinson's disease and eight healthy persons in the similar ages, who sat in resting position, with the head fixed, and closed the eyes while gazing at the front. Movement of eye ball and eye lid was recorded by an Electrooculogram (EOG). As a result, the Bell's phenomenon was observed in both groups. However, vertical movement of eye balls was significantly smaller in movement angle and the maximum angle in patient group, although no difference was observed in horizontal movement and distance of eye lid movement between both groups. There was a correlation between distance and velocity of eye lid movement in both groups, which implies that the duration of close eye movement was constant. In addition, duration from the beginning to the end of upward movement of eye ball was not different between two groups. Therefore, the difference of upward movement of eye balls could result from the difference of eye movement velocity. Author (NASDA)

N94-27521# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
HYPERALGESIA TO COLD IN PATIENTS WITH SUBACUTE MYELO-OPTICO-NEUROPATHY (SMON) [SUMON KANJA NO HIFU TSUKAKU KABIN: SAMO TESUTO NI YORU KENTO]
YOSHIKI SUGIYAMA, SATOSHI IWASE, TADAAKI MANO, YASUO KOIKE, KIMIYA SUGIMURA, and AKIRA TAKAHASHI *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 292-294 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

In previous studies, it was demonstrated that hyperalgesia was manifested by ischemic block in the brachium. Blocking for 2 minutes causes spontaneous discharge of myelinated thick-fibers, resulting in tingling pain, and in case of blocking more than 10 minutes, dull pain hypersensitive to coldness occurred at the level of less than the threshold stimulus probably due to excitation of unmyelinated fibers, both of which are similar to the pain in a patient with Subacute Myelo-Optico-Neuropathy (SMON). The functional disorder of myelinated thick-fibers and afferent thin-fibers

in hyperalgesia observed in SMON were examined. The subjects were 17 patients with SMON, to whom caloric stimulus and vibration were given. As a result, hyperalgesia by vibration was observed in seven cases, and thermoparesthesia was eight cases in the hand and nine cases in the thigh. What is interesting was abnormal sensitivity to coldness was observed in 11 cases. The threshold of these stimuli was within the non-pain range, and the response has a property of secondary pain with sense of ardor. These results suggest that hyperalgesia in SMON may be mediated by unmyelinated fibers. Author (NASDA)

N94-27522# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

CONTRIBUTION OF MUSCLE SPINDLE AFFERENT ACTIVITY TO TRANSIENT PAUSE IN EMG DURING VOLUNTARY TONIC CONTRACTION [JIZOKUSEI KIN SHUSHUKUCHU NI MIRARERU KIN HODEN NO KYUSHI NI KAKAWARU KIN *BOSUI KYUSHINSEI HASSHA KATSUDO*]

REIKO TSUKAHARA, HISASHI AOKI (Institute for Developmental Research, Kasugai, Japan.), KYONOSUKE YABE, and TADAAKI MANO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 295-298 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

The purpose of this study is to examine how discharge of afferent fibers contributes to the pause emerging incidently in electromyogram (EMG) during voluntary tonic contraction. The subjects were five healthy adults, who lied in the prone position with isometric plantar flexion, and EMG and electroneurogram were recorded to identify afferent discharge of muscle spindle and Golgi tendon organ. As a result, the afferent discharge of muscle spindle was paused or grouped before muscle discharge paused. The muscle spindle afferent discharge was not relevant to restart of muscle discharge, at least through spinal reflex pathway. In addition, although discharge of muscle spindle tended to group before pauses of muscle discharge, the tendency disappeared after the pauses. The EMG of Golgi tendon organ revealed that discharge was decreased during muscle discharge pause as well as before restart of muscle discharge. This suggests that decrease of inhibitory stimulus from Golgi tendon organ may contribute to muscle discharge after the restart. Author (NASDA)

N94-27524# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECT OF PROSTAGLANDIN E1 ON THE RELATIONSHIP BETWEEN SKIN SYMPATHETIC NERVE ACTIVITY AND REDUCTION IN SKIN BLOOD FLOW [PUROSUTAGURANJIN E1 GA HIFU KOKAN SHINKEI KATSUDO TO HIFU KETSURYURYO TONO KANKEI NI ATAERU EIKYO]

SATOSHI IWASE, YOSHIKI SUGIYAMA, TOSHIYOSHI MATSUKAWA, CHIHIRO MIWA, SHIGEO TAKEUCHI, and TADAAKI MANO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 304-308 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

It is known that skin sympathetic nerve activity causes vasoconstriction and decrease of skin blood flow. This study examined the effect of a peripheral vasodilator, Prostaglandin E1 (PGE1), on the skin sympathetic nerve activity. The subjects were five healthy male adults to whom skin sympathetic nerve activity burst was induced by several stimuli with or without PGE1, and the nerve activity and skin blood flow were recorded. It had been proved that there is a positive correlation between the intensity of the nerve activity and decrease of skin blood flow. In this study, it was demonstrated that PGE1 does not change the blood flow in resting condition, while it inhibites vasoconstriction in a dose-dependent manner under such stimuli as to cause burst activity in skin sympathetic nerve. These results suggest that it may be useful to test sympathetic nerve activity pharmacologically for examination of the vasoconstrictive action of drugs.
Author (NASDA)

N94-27525# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

DIFFERENCE IN SKIN BLOOD FLOW REDUCTION DEPENDING ON ACTIVATING MANEUVER OF SKIN SYMPATHETIC NERVE ACTIVITY [KAKUSHU HIFU KOKAN SHINKEI KATSUDO FUKATSUKAHO GA MASSHO HIFU KETSURYURYO GENSHO NI OYOBOS EIKYO]

SATOSHI IWASE, YOSHIKI SUGIYAMA, TOSHIYOSHI MATSUKAWA, CHIHIRO MIWA, and TADAAKI MANO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 309-313 25 Mar. 1993 In JAPANESE

Avail: CASI HC A01/MF A04

It is known that activity burst can be induced in skin sympathetic nerve by various stimuli. This study examined the change of skin blood flow during occurrence of the activity burst to reveal the participation of activity burst in vasoconstrictive and sweating effect of sympathetic nerve. The subjects were four healthy male adults, to whom activity burst was induced by mental arithmetic, acoustic stimulus, electric stimulus, and sudden and deep inspiration, while skin nerve activity, skin blood flow, and sweating were measured. As a result, linear relation was observed between skin sympathetic nerve activity and reduction of blood flow, when activity burst was induced by mental arithmetic, acoustic stimulus, electric stimulus, or in resting condition. Under activity burst by deep breathing, reduction of blood flow was larger than other stimuli. The stimuli, such as acoustic or electric stimulus, can activate the sympathetic nerve system via the cerebral cortex, while inspiratory stimulus activates afferent vagus nerve directly through Hering-Breuer reflex. These results indicate that the decrease of skin blood flow was larger when the response was mediated by afferent vagus nerve via Hering-Breuer reflex than mediated through cerebral cortex. Therefore, the activation via afferent vagus nerve may stimulate vasoconstrictive activity more vividly during skin sympathetic nerve activity. Author (NASDA)

N94-27526# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

EFFECT OF L-DOPA ON HEMODYNAMIC FUNCTIONS IN HUMANS [L-DOPA GA HITO NO JUNKAN DOTAI NI OYOBOSU EIKYO]

SHIGEO TAKEUCHI, YOSHIKI SUGIYAMA, SATOSHI IWASE, TADAAKI MANO, TOSHIYOSHI MATSUKAWA, and REIKO TSUKAHARA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 314-320 25 Mar. 1993 In JAPANESE

Avail: CASI HC A02/MF A04

L-dopa often causes orthostatic hypotension in patients with Parkinson's disease. This study examined the effect of L-dopa on human circulatory system to clarify the mechanism of this adverse reaction. The subjects were eight healthy adults, who lied in supine position on a tilting bed which was inclined 20, 40, and 60 degrees for head-up tilt before and after administration of L-dopa. To evaluate cardiovascular functions, the associated cardiovascular parameters and sympathetic nerve activity were measured. As a result, burst activity of muscle sympathetic nerve was increased significantly in every tilt by L-dopa administration, so that the effect of L-dopa may result from inhibition of sympathetic nerve activity at the peripheral level. This is supported by the fact that the increase of muscle sympathetic nerve activity was lowered by L-dopa as flow resistance in the leg was increased during tilting. Therefore, L-dopa may cause vasodilation or inhibit vasoconstriction at the peripheral level. Flow resistance was significantly decreased at 60 degrees tilt after L-dopa administration, probably because decrease of blood pressure by peripheral vasodilation surpasses central sympathetic nerve activity. Author (NASDA)

N94-27527# Toyota Coll. of Technology (Japan). Dept. of Applied Physiology.

SYMPATHETIC NERVE ACTIVITY DURING DYNAMIC LEG EXERCISE [DOTEKI KYAKU UNDOJI NO KOKAN SHINKEI KATSUDO]

MITSURU SAITO and TADAAKI MANO (Nagoya Univ., Japan.)

In Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 321-324 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

It has been suggested that sympathetic nerve activity may be affected by the muscles that participate in the motive activity and by exercise patterns. The purpose of this study is to observe sympathetic nerve activity during dynamic leg exercise that increased oxygen consumption up to 70 percent of the maximum oxygen consumption. The subjects were five healthy male adults, 22 to 27 years old, who were loaded with an ergometer by four stages; i.e., Warming-up stage (W-Up), load less than anaerobic metabolic threshold, load corresponding to anaerobic metabolic threshold, and load more than anaerobic metabolic threshold, and sympathetic nerve activity, heart rate, blood pressure, and electromyogram (EMG) of femur muscle surface were recorded. As a result, the heart rate, EMG, and blood pressure were all increased as the load increased. As an index of sympathetic nerve activity, discharge burst rate (BR) was determined by the number of peak bursts from the analysis of muscle sympathetic nerve activity, which indicated that BR was once decreased in W-Up, then increased linearly as the exercise load was increased. In other words, sympathetic nerve activity was increased in heavy exercise, although it was suppressed in light exercise.

Author (NASDA)

N94-27528# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

ANALYSIS ON ONE MINUTE WAVE IN BODY FLUID VOLUME AND MUSCLE PUMPING REFERRED TO BODY PARTS GENERATING THE ONE MINUTE WAVE DURING HUMAN ACTIVE STANDING [HITO NO NODOTEKI SEISHI RITSUI NI OKERU TAIEKIRYO HENDO ICHI FUNHA NO HASSEI BUI OYOBI SONO ICHI FUNHA TO KIN PONPU SAYO TONO KANKEI]

KINSAKU INAMURA, TADAAKI MANO, and SATOSHI IWASE *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 325-330 25 Mar. 1993 In JAPANESE
Avail: CASI HC A02/MF A04

It is known that muscle pumping and sympathetic nerve response can regulate one-minute waves that are generated by automatic vasoconstriction in venous blood congestive sites in order to circulate congestive blood. The purpose of this study is to reveal the generating site and propagation of one-minute waves in active standing by measuring body fluid volume and surface electromyography in detail, and to reveal the relationship between muscle pumping and one-minute waves in body fluid volume. The subjects were 14 healthy adults, 18 to 20 years old, who maintained active standing for 40 minutes, and circumferences of each body parts, electromyograms, and foot pressure centers were measured. As a result, it was revealed that the one-minute waves in body fluid volume were generated not only in the lower thigh but also in the abdomen and upper thigh and propagated upwards. The one-minute waves were generated at one site each in the lower thigh, upper thigh, and upper body, and they were usually observed in the soleus muscle, central calf, upper thigh, and navel and stomach level of the abdomen. In addition, as soon as muscle constriction occurred, one-minute waves were observed on this site, and the wave was coupled with one-minute wave of foot pressure center resulting from body sway in active standing. This implies that the muscle pumping caused by body sway may circulate blood by one-minute waves in body fluid volume.

Author (NASDA)

N94-27529# Aichi Medical Univ., Nagakute (Japan). Dept. of Physiology.

AN ATTEMPT OF INTRANEURAL STIMULATION BY MICROELECTRODE INSERTED IN SKIN SYMPATHETIC NERVE FASCICLE [BISHO DENKYOKU NI YORU HIFU KOKAN SHINKEINAI SHIGEKI NO KOKOROMI]

JUNICHI SUGENOYA, SATOSHI IWASE (Nagoya Univ., Japan.), YOSHIKI SUGIYAMA (Nagoya Univ., Japan.), and TADAAKI MANO (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 331-334 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Recently, microelectrode techniques have enabled selective stimulation of a nerve by inserting a stimulating electrode into the target nerve fascicle percutaneously. In this study, a new technique was attempted using a microelectrode to stimulate skin sympathetic nerve selectively. The subjects were four healthy male adults, to whom a microelectrode was inserted into the tibial nerve percutaneously, and skin sympathetic nerve activity (SSNA) was recorded. Sweating and skin blood flow were also recorded in the soles which have effecters of the tibial nerve. Before insertion, the nerve was blocked by lidocaine at 5 cm proximal from the insertion site, and stimulated with various strengths of current, duration, and stimulating patterns. Although the nerve was not blocked completely, the latency of sweating response was shortened by 1.5 seconds when stimulated, which indicates that the electrode directly stimulated the sweat controlling nerve. This response was increased by repetitive stimuli. In addition, the more the current strength was, the more the sweating responses became. Even when the stimulus was so weak that sweating response did not occur, it tended to occur by repetitive stimuli with more frequent cycle. The latency tended to be shortened when large response occurred by strong stimulus. However, no change was observed in skin blood flow.

Author (NASDA)

N94-27531# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.

MUSCLE SYMPATHETIC NERVE ACTIVITY IN PATIENTS WITH HYPER-AND HYPOTHYROIDISM: A MICRONEUROGRAPHIC STUDY [KOJOSEN KINO KOSHINSHO OYOBI TEIKASHO KANJA NI OKERU KIN KOKAN SHINKEI KATSUDO: MAIKURONYUROGURAFI O MOCHIITA KENKYU]

TOSHIYOSHI MATSUKAWA and TADAAKI MANO *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 340-342 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Clinical manifestations of hyper- and hypothyroidism are similar to those of hyper- and hypoactivity of sympathetic nerves. In order to clarify the relation between muscle sympathetic nerve activity (MSNA) and thyroid function, action potential of sympathetic nerve was measured directly using microneurography, and the data were compared with control and patients with hyper- and hypothyroidism. The subjects were eight healthy persons, six patients with hyperthyroidism, and six patients with hypothyroidism. Blood pressure, cardiac rate, and MSNA were measured and at the same time free triiodothyronine (F-T3), free thyroxine (F-T4), and thyroid-stimulating hormone (TSH) in venous blood were determined. As a result, it was revealed that sympathetic nerve was hyperactive in patients with hypothyroidism, while it was hypoactive in patients with hyperthroidism. In addition, there was a negative correlation between thyroid hormone concentration and MSNA, probably because thyrotropin releasing hormone (TRH) that can activate MSNA may be lowered in hyperthyroidism, and increased in hypothyroidism. Moreover, this negative relation may be relevant to beta-receptor which can be increased in number and affinity by thyroid hormone.

Author (NASDA)

N94-27532# Aichi Medical Univ., Nagakute (Japan).

ENHANCEMENT OF SKIN SYMPATHETIC NERVE ACTIVITY IN AMYOTROPHIC LATERAL SCLEROSIS [KIN ISHUKUSEI SOKUSAKU KOKASHO NI OKERU HIFU KOKAN SHINKEI KATSUDO NO KENTO]

KOJI YAMAMOTO, GEN SOBUE, SATOSHI IWASE (Nagoya Univ., Japan.), TETSUYA OKAMOTO (Nagoya Univ., Japan.), TADAAKI MANO (Nagoya Univ., Japan.), and TERUNORI MITSUMA *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 343-347 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Amyotrophic lateral sclerosis (ALS) is a disease that degenerates motor neurons systematically. Several studies suggest that sympathetic nerve activity may be activated in ALS patients.

The purpose of this study is to examine the skin sympathetic nerve activity (SSNA) in ALS using microneurography. The subjects were five patients with ALS and 10 healthy adults, to whom a microelectrode was inserted into the efferent sympathetic nerve, tibial nerve, and SSNA was determined using burst activity as an index. Blood flow and sweating were measured in the sole, an effector of the efferent nerve, during rest and sympathetic nerve stimulation. As a result, SSNA was higher in patients with ALS than the control group in rest. However, under stimulation, SSNA was not changed in ALS patients, whereas it was activated in the control group. This implies that the sympathetic nerve was hyperactivated in ALS patients. There were individual differences in SSNA among ALS patients. Whether these differences may be associated with individual severity or stages of the disease cannot be determined because only a few subjects participated in this study. Author (NASDA)

N94-27533# Red Cross Hospital, Nagoya (Japan).
TREATMENT OF ORTHOSTATIC HYPOTENSION BY NASAL ADMINISTRATION OF VASOPRESSIN [BASOPURESHIN SEIZAI TENBI TOYO NI YORU KIRITSUSEI TEIKETSUATSU NO CHIRYO KOKA]
SHIGETAKA HAKUSUI, YOSHIKI SUGIYAMA (Nagoya Univ., Japan.), SATOSHI IWASE (Nagoya Univ., Japan.), and TADAAKI MANO (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 348-350 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Orthostatic hypotension (OH) is an important symptom in patients with autonomic disorder; however, definitive treatment has not established yet. The purpose of this study is to examine the effect of two drugs, arginine vasopressin (AVP) and lysine vasopressin (LVP), on OH. The subject was a 41 year-old male patient with multisystemic atrophy presenting marked OH, to whom orthostatic load was applied by a tilting bed, and the blood pressure and heart rate were measured before and after the loading. The load was also applied after nasal administration of AVP and LVP. In resting, blood pressure was significantly increased by AVP and LVP. Under orthostatic load, the subject complained of the symptoms of OH at the incline of 70 degrees without AVP or LVP, whereas such symptoms did not appear after administration of AVP or LVP, and blood pressure was improved in each incline. Unpublished data revealed that AVP increased the blood pressure in patients with OH or post-prandial hypotension, although it did not affect the blood pressure of healthy subjects. These results suggest that patients with autonomic disorder may be supersensitive to vasopressin, which may be a reason for effectiveness of AVP on OH. Author (NASDA)

N94-27534# Tokyo Univ. (Japan). Inst. for Brain Research of Biochemistry.
ACTIVATION BY G PROTEIN BETA GAMMA SUBUNITS OF G PROTEIN-COUPLED RECEPTOR KINASE [G TANPAKUSHITSU KYOEKI JUYOTAI KINAZE NO G TANPAKUSHITSU BETA GANMA SABUYUNITTO NI YORU KASSEIKA]
TATSUYA HAGA, KAZUKO HAGA, KIMIHIKO KAMEYAMA, and HIROKO NAKATA *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 352-354 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992; sponsored by Research Inst. of Environmental Medicine
Avail: CASI HC A01/MF A04

This study examined the regulation of G protein-coupled receptor kinase by G protein. Musucarinic acetylcholine receptor (mAChR) kinase purified from swine brains was proved to be able to regulate phosphorylation of muscarinic receptors by G protein; i.e., the mAChR kinase was activated by alpha, beta, and gamma subunits of G protein, and inhibited by beta and gamma subunits. The beta and gamma subunits also activated the phosphorylation of rhodopsin and beta-AR (adrenergic receptor), although it did not affect the activity of rhodopsin kinase. Comparing the beta and gamma subunits of G protein with beta and gamma subunits of transducin, the former activated mAChR, rhodopsin, and beta-AR in low concentration, while the latter showed low activation in high concentration. These results suggest that beta and gamma subunits of G protein may activate phosphorylation in general. The experiment to express cDNA (complementary deoxyribonucleic acid) of beta-AR kinase support that mAChR kinase may be identical with beta-AR kinase. Comparing the amino acid sequence between beta-AR and rhodopsin kinase, beta-AR was longer in the C-terminal with which beta and gamma subunits may interact. Therefore, it can be concluded that mAChR kinase could be an effector of G protein, and be activated by beta and gamma subunits. It is also suggested that beta and gamma subunits may promote desensitization of such a receptor kinase via phosphorylation. Author (NASDA)

N94-27535# Shizuoka Saiseikai General Hospital (Japan). Dept. of Circulation.
POSTNATAL CHANGES IN THE AUTONOMIC MODULATION OF L-TYPE CA(EXP 2+) CURRENTS OF RABBIT VENTRICULAR CELLS [JIRITSU SINKEI NI YORU SHINKIN CA(2+) DENRYU SHUSHOKU KIKO NO SEIGO HENKA]
TOSHIYUKI OSAKA and RONALD W. JOYNER (Emory Univ., Atlanta, GA.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 355-361 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992; sponsored by Research Inst. of Environmental Medicine
Avail: CASI HC A02/MF A04

This article presents findings on postnatal development of autonomic modulation of L type Ca(2+) current, I(sub ca). Firstly, participation of beta-adrenergic receptor and muscarinic acetylcholine (mACh) receptor was examined in a single myocyte of adult rabbit (AD) and newborn rabbit (NB) using beta-agonist (isoproterenol (ISO)) and musucarinic agonist (carbacol (CCh)). As a result, ISO increased I(sub ca) to similar extent in AD and NB, while CCh inhibited the ISO effect more remarkably in NB than AD. Secondly, the effect of adenylate cyclase (AC) activator, forskolin (FOR), was examined in AD and NB, and it was revealed that FOR increased I(sub ca) to similar extent in AD and NB, and this increase was slightly inhibited by CCh in AD, while it was completely inhibited in NB. Thirdly, FOR effect was examined with presence of GTP (guamosine 5'-triphosphate) analog, 5'-guanulylimido diphosphate (GppNHp). As a result, FOR effect on I(sub ca) was slightly decreased by GppNHp in AD, while it was largely decreased in NB. Finally, pertussis toxin (PTX) that blocks interaction of mACh receptor and GTP binding protein, Gi, was used to examine the effect of both Gi activator, CCh and GppNHp, and Gi inactivator, PTX, on either ISO or FOR, and it was demonstrated that the effect was more remarkable in NB than AD. These results suggest that in immature hearts, AC is inhibited by parasympathetic nerve system via a tonic effect of Gi even when musucarinic agonist does not exist. Author (NASDA)

N94-27536# Yamagata Univ. (Japan). Dept. of Pharmacology.
MECHANISM FOR REGULATION OF MYOCARDIAL CONTRACTILITY BY AUTONOMIC DRUGS: PATHOPHYSIOLOGICAL RELEVANCE IN CONGESTIVE HEART FAILURE [JIRITSU SHINKEI SADO BUSSHITSU NI YORU SHINKIN SAIBO SHUSHUKU NO SEIGYO KIKO: SHINFUZEN NI OKERU BYOTAI SEIRIGAKUTEKI IGI]
MASAO ENDO *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 362-366 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992; sponsored by Research Inst. of Environmental Medicine
Avail: CASI HC A01/MF A04

This article outlines second messengers that regulates cardiac myocyte function via alpha and beta receptors, and the pathophysiological relevance to congestive heart failure. In respect to beta receptors, the mechanism to regulate cardiac function and relevance to heart failure has been considerably understood. Beta receptors which consist of beta 1 receptor and beta 2 receptor couple with G protein, Gs, and activate catalytic subunits (CS). The CS promotes cardiac function via second messenger, cAMP

(adenosine 3', 5'-cyclic monophosphate). In patients with congestive heart failure, receptor down-regulation (R-DO) occurs by exposure to high level of catecholamine in blood, and lessen the number of beta-receptors on myocyte surfaces so that cardiac function is degraded. Beta receptor blockers can recover the number of beta receptors. In addition to R-DO, heart failure results from insufficient coupling with Gs, against which phospho diesterase-3 (PDE-3) inhibitor is used to increase intracellular cAMP. However, some reports recently presented data that such inhibitors increased mortality of severe heart failure patients. In respect to alpha receptors, the mechanism to regulate cardiac function seems so complicated that the relevance to congestive heart failure has not been understood well. It was revealed that cardiac alpha receptor may increase Ca(2+)(sub i) and sensitivity to Ca(2+) by prolongation of action potential due to decrease of transient outward current and activation of Na(+)/H(+) exchangers.
Author (NASDA)

N94-27538# Nagoya Univ. (Japan). Dept. of Autonomic and Behavioral Neurosciences.
MUSCLE SYMPATHETIC NERVE ACTIVITY IN HUMANS [KIN KOKAN SHINKEI KATSUDO]
TOSHIYOSHI MATSUKAWA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 370-372 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992
Avail: CASI HC A01/MF A04

This article describes regulation of muscle sympathetic nerve activity by endogenous reflex, especially on measuring method of reflex function, and its relevance to essential hypertension. The endogenous reflex includes arterial baroreceptor reflex, cardiopulmonary baroreceptor reflex, arterial chemoreceptor reflex, and skeletal muscle chemoreceptor reflex. These reflexes sense changes of blood pressure, CO2 or O2 partial pressure, or pH by baroreceptors or chemoreceptors, and regulate them by negative feedback via sympathetic nerve activity. These reflexes are modified in patients with essential hypertension. From measurements of muscle sympathetic nerve activity (MSNA), it was revealed that occurrence and development of essential hypertension may be relevant to activation of MSNA. In young boundary hypertension patients, the arterial baroreceptor reflex was decreased, while cardiopulmonary baroreceptor reflex was increased. These contradictory results imply that the two reflexes compensate each other. In addition, arterial chemoreceptor reflex was increased probably due to decrease of arterial baroreceptor reflex.
Author (NASDA)

N94-27540# Tokyo Woman's Medical Coll. (Japan). Dept. of Internal Medicine.
AUTONOMIC NERVOUS SYSTEM AND CARDIOVASCULAR CONTROL: CLINICAL IMPLICATIONS OF THE 1/F FLUCTUATIONS OF HEART RATE [JIRITSU SHINKEI NI YORU SHINZO CHOSETSU]
KUNIAKI OTSUKA and HARUO WATANABE *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 375-379 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992; sponsored by Research Inst. of Environmental Medicine
Avail: CASI HC A01/MF A04

The 1/f fluctuation is observed extensively in nature, from the rhythm of music or vibration of vehicles to magnetic field of the galactic system. This article presents findings concerning the 1/f fluctuation of autonomic nerve activity. To examine the relation between heart rate and 1/f fluctuation, electrocardiograms were recorded and analyzed in healthy volunteers. Natural fluctuation includes 1/f fluctuation, white fluctuation, and 1/f(exp 2) fluctuation, which can be identified by incline of linear regression line of power spectral density against frequency. As a result, circadian rhythm was observed in 1/f fluctuation of healthy subjects, and the 1/f fluctuation gradually shifted to white fluctuation when subjects got older or in patients with Parkinson's disease. The same tendency was also observed in a patient with severe pseudo aldosteronism, in whom white fluctuation shifted to 1/f fluctuation as the patient recovered. These results support the notion that 1/f fluctuation may be a basic fluctuation of organisms.
Author (NASDA)

N94-27541# Osaka Univ. (Japan). Dept. of Internal Medicine.
THE ROLE OF BETA-ADRENOCEPTOR STIMULATION IN THE PROGRESSION OF CHRONIC HEART FAILURE [SHINFUZEN NO SHINTEN NI OKERU KOKAN SHINKEI BETA JUYOTAI SHIGEKI NO IGI]
MASATSUGU HORI, HIDEYUKI SATO, HIROSHI SATO, and TAKENOBU KAMADA *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 380-383 25 Mar. 1993 In JAPANESE Presented at the 13th Symposium on Environmental Medicine, Aichi, Japan, 11 Nov. 1992; sponsored by Research Inst. of Environmental Medicine
Avail: CASI HC A01/MF A04

In heart failure, sympathetic nerve activity is activated in proportion to severity of the disease. This activation may be a compensatory mechanism in order to increase blood supply to muscles in motion by stimulating cardiac muscles. Norepinephrine released in sympathetic nerve activation stimulates beta-receptors to increase heart rate, stroke volume, and cardiac output, as well as alpha-receptor to increase blood pressure and blood supply. However, alpha-receptor stimulation also decreases renal blood flow, and beta-receptor stimulation activates renin, angiotensin, and aldosterone, which contradicts with cardiac alpha-receptor response in vasoconstriction. These excess sympathetic nerve activations may exacerbate heart failure by down-regulation of beta-receptor and destruction of microtubules. For these patients, beta blocker is chronically administered to protect cardiac muscles from excess catecholamine effects. In administration, it is important to start with a low dose and increase it little by little.
Author (NASDA)

N94-27556*# National Aeronautics and Space Administration, Washington, DC.
SPACE RADIATION HEALTH RESEARCH, 1991-1992
M. H. JABLIN, comp., C. BROOKS, comp., G. FERRARO, comp., K. J. DICKSON, comp. (George Washington Univ., Washington, DC.), J. V. POWERS, comp. (George Washington Univ., Washington, DC.), J. WALLACE-ROBINSON, comp. (George Washington Univ., Washington, DC.), and B. ZAFREN, comp. (George Washington Univ., Washington, DC.) Washington Oct. 1993 149 p Prepared in cooperation with Lockheed Engineering and Sciences Co., Washington, DC
(NASA-TM-109721; NAS 1.15:109721) Avail: CASI HC A07/MF A02

The present volume is a collection of 227 abstracts of radiation research sponsored by the NASA Space Radiation Health Program for the period 1991-1992. Each abstract has been categorized within one of three discipline areas: Physics, Biology and Risk Assessment. Topic areas within each discipline have been assigned as follows: Physics - Atomic Physics, Theory, Cosmic Ray and Astrophysics, Experimental, Environments and Environmental Models, Solar Activity and Prediction, Experiments, Radiation Transport and Shielding, Theory and Model Development, Experimental Studies, and Instrumentation. Biology - Biology, Molecular Biology, Cellular Radiation Biology, Transformation, Mutation, Lethality, Survival, DNA Damage and Repair, Tissue, Organs, and Organisms, In Vivo/In Vitro Systems, Carcinogenesis and Life Shortening, Cataractogenesis, Genetics/Developmental, Radioprotectants, Plants, and Other Effects. Risk Assessment - Risk Assessment, Radiation Health and Epidemiology, Space Flight Radiation Health Physics, Inter- and Intraspecies Extrapolation and Radiation Limits and Standards. Section I contains refereed journals; Section II contains reports/meetings. Keywords and author indices are provided. A collection of abstracts spanning the period 1986-1990 was previously issued as NASA Technical Memorandum 4270.
Author

N94-27744# Los Alamos National Lab., NM.
TEMPORAL STOCHASTICITY LEADS TO NONDETERMINISTIC CHAOS IN A MODEL FOR BLOOD CELL PRODUCTION

RAMIT MEHR and ZVIA AGUR 1993 12 p Presented at the Fluctuations and Order: The New Synthesis Workshop, Los Alamos, NM, 9-12 Sep. 1993
(Contract W-7405-ENG-36)
(DE94-003943; LA-UR-93-4088; CONF-9309185-5) Avail: CASI HC A03/MF A01

All types of blood cells are formed by differentiation from a small population of pluripotent stem cells in the bone marrow. This population should maintain the balance between self-renewal and differentiation, even under severe perturbations, e.g. the massive cell death caused by chemotherapy or irradiation. The authors constructed a cellular-automata model for bone marrow dynamics, which retrieves its homeostatic capabilities even under periodic perturbations with constant or random amplitude. However, temporally stochastic perturbations result in a chaotic-like behavior. Several methods of analysis failed to distinguish between the time series in this case and a chaotic time series, although the chaotic-like behavior has no deterministic source. DOE

N94-27942# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
THE REPORTS OF AEROMEDICAL LABORATORY, VOLUME 33, NUMBER 4 [KOKU IGAKU JIKKENTAI HOKOKU, DAI 33 KAN DAI 4 GO]
AKIO NAKAMURA, MIYAKO OKAUE, HIDEO TARUI, AKIHIKO ONOZAWA, SHOICHI TACHIBANA et al. 1 Dec. 1992 73 p In JAPANESE
(ISSN 0023-2858)
(JTN-94-80586) Avail: CASI HC A04/MF A01

The following topics were discussed: aircraft pilots, pilot training, flight training, flight control, aircraft control, attitude control, pilot performance, experience, flight simulators, roll, pitch, high acceleration, acceleration effect, gravitational effect, blood flow, blood circulation, blood flow rate, hemoglobin, near infrared spectroscopy, low atmospheric pressure, high altitude pressure, low oxygen pressure, consciousness, hypoxia, symptoms, and physiological effects.
Author (NASDA)

N94-27944# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
EVALUATION OF NEAR-INFRARED SPECTROPHOTOMETRIC METHOD FOR INDIVIDUAL TOLERANCE TO +GZ ACCELERATION [KIN SEKIGAI BUNKOHO NI YORU TAI JISEI HYOKA]
YOSHINORI MIYAMOTO, CHIEKO MIZUMOTO, KEN SHIMIZU, ASAO KOBAYASHI, AKIO NAKAMURA, and SHIGEYUKI YAGURA *In its* The Reports of Aeromedical Laboratory, Volume 33, Number 4 p 103-109 1 Dec. 1992 In JAPANESE
Avail: CASI HC A02/MF A01

A technique for measurement of cerebral oxygen status was evaluated on volunteer subjects in the Aeromedical Laboratory centrifuge. Eight males were exposed to a 0.1 G sec(exp -1) onset rate profile until grayout. By using near infrared oxygenation monitor, this instrumentation is capable of measuring the concentrations in the brain of oxygenated Hemoglobin (HbO2), reduced Hemoglobin (Hb), oxidized cytochrome aa(sub 3)-reduced Cytochrome aa(sub 3) (CtO2) and total Hemoglobin (BV, HbO2+Hb). Results showed changes within the brain, as generally expected, during increased Gz with reductions in HbO2 and BV. Hb and CtO2 measurements were inconclusive. There were high correlations (R = -0.95 +/- 0.02, n = 18) between the change of the cerebral HbO2 concentration and the +Gz value. This correlation may be used as a criterion of individual subject +Gz tolerance. Author (NASDA)

N94-27945# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
SYMPTOMS OF HYPOXIA AT SIMULATED ALTITUDE OF 25,000 FEET [KODO 25,000 FITO NI OKERU TEI SANSOSHO NO SHOJO NI TSUITE]
NOBUYUKI FUJITA, HIDEKI SONODA, MAKOTO KOMIZU, KIYOAKI FUJII, SHOICHI TACHIBANA, and AKIO NAKAMURA *In its* The Reports of Aeromedical Laboratory, Volume 33, Number 4 p 111-138 1 Dec. 1992 In JAPANESE
Avail: CASI HC A03/MF A01

The signs and symptoms experienced by the 500 trainees who took the chamber flight training in 1990 at Tachikawa were reviewed. The trainees were asked to answer the questionnaire of 14 items and evaluate their hypoxic conditions into five grades of seriousness by themselves after hypoxia experience (maximum duration of 5 minutes). These data were evaluated in terms of the duties and ages of the trainees. The time during the trainee was without his oxygen mask was recorded as 'Time of Useful Consciousness (T.U.C.).' Occurrence of hypoxic signs and symptoms showed similar tendency regardless of their duties or ages. Each individual experienced more than four symptoms out of 12 items. The most common symptom was burning sensation (or hot flashes) that was complained by 85.8 percent of all trainees. This symptom is considered to be one of the important alarming signs for hypoxia since it appears in early stage. Judgment impairment was observed in 79.4 percent and visual disturbance was complained by 58.9 percent. Both of these problems are critical for controlling the aircraft. Average TUC was 2 minutes and 53 seconds. TUC of inexperienced trainees was approximately 1 minute longer than that of experienced trainees. This proves the effectiveness of repeating chamber training.
Author (NASDA)

N94-28208* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 386)
Mar. 1994 56 p
(NASA-SP-7011(386); NAS 1.21:7011(386)) Avail: CASI HC A04

This bibliography lists 117 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Mar. 1994. 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.
Derived from text

N94-28213* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 387)
Apr. 1994 33 p
(NASA-SP-7011(387); NAS 1.21:7011(387)) Avail: CASI HC A03

This bibliography lists 60 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Apr. 1994. 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.
Derived from text

N94-28219* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO A CONTINUING BIBLIOGRAPHY (SUPPLEMENT 384)
Jan. 1994 245 p
(NASA-SP-7011(384); NAS 1.21:7011(384)) Avail: CASI HC A11

This publication is a cumulative index to the abstracts contained in Supplements 372 through 383 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes seven indexes: subject, personal author, corporate source, foreign technology, contract number, report number, and accession number.
Author (revised)

N94-28361*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
WORKSHOP ON COUNTERING SPACE ADAPTATION WITH EXERCISE: CURRENT ISSUES
BERNARD A. HARRIS, ed. and STEVEN F. SICONOLFI, ed. Feb.

1994 234 p Workshop held in Houston, TX, 1989 Sponsored by NASA, Washington
(NASA-CP-3252; S-755; NAS 1.55:3252) Avail: CASI HC A11/MF A03

The proceedings represent an update to the problems associated with living and working in space and the possible impact exercise would have on helping reduce risk. The meeting provided a forum for discussions and debates on contemporary issues in exercise science and medicine as they relate to manned space flight with outside investigators. This meeting also afforded an opportunity to introduce the current status of the Exercise Countermeasures Project (ECP) science investigations and inflight hardware and software development. In addition, techniques for physiological monitoring and the development of various microgravity countermeasures were discussed.

N94-28362*# Ariel Dynamics.
MUSCULAR ACTIVITY AND ITS RELATIONSHIP TO BIOMECHANICS AND HUMAN PERFORMANCE
GIDEON ARIEL *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 1-97 Feb. 1994
Avail: CASI HC A05/MF A03

The purpose of this manuscript is to address the issue of muscular activity, human motion, fitness, and exercise. Human activity is reviewed from the historical perspective as well as from the basics of muscular contraction, nervous system controls, mechanics, and biomechanical considerations. In addition, attention has been given to some of the principles involved in developing muscular adaptations through strength development. Brief descriptions and findings from a few studies are included. These experiments were conducted in order to investigate muscular adaptation to various exercise regimens. Different theories of strength development were studied and correlated to daily human movements. All measurement tools used represent state of the art exercise equipment and movement analysis. The information presented here is only a small attempt to understand the effects of exercise and conditioning on Earth with the objective of leading to greater knowledge concerning human responses during spaceflight. What makes life from nonliving objects is movement which is generated and controlled by biochemical substances. In mammals. the controlled activators are skeletal muscles and this muscular action is an integral process composed of mechanical, chemical, and neurological processes resulting in voluntary and involuntary motions. The scope of this discussion is limited to voluntary motion. Derived from text

N94-28363*# Massachusetts Univ., Amherst. Dept. of Exercise Science.
ECCENTRIC EXERCISE TESTING AND TRAINING
PRISCILLA M. CLARKSON *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 99-110 Feb. 1994
Avail: CASI HC A03/MF A03

Some researchers and practitioners have touted the benefits of including eccentric exercise in strength training programs. However, others have challenged its use because they believe that eccentric actions are dangerous and lead to injuries. Much of the controversy may be based on a lack of understanding of the physiology of eccentric actions. This review will present data concerning eccentric exercise in strength training, the physiological characteristics of eccentric exercise, and the possible stimulus for strength development. Also a discussion of strength needs for extended exposure to microgravity will be presented. Not only is the use of eccentric exercise controversial, but the name itself is fraught with problems. The correct pronunciation is with a hard 'c' so that the word sounds like ekscentric. The confusion in pronunciation may have been prevented if the spelling that Asmussen used in 1953, excentric, had been adopted. Another problem concerns the expressions used to describe eccentric exercise. Commonly used expressions are negatives, eccentric contractions, lengthening contractions, resisted muscle lengthenings, muscle lengthening actions, and eccentric actions. Some of these terms are cumbersome (i.e., resisted muscle lengthenings), one is slang (negatives), and another is an oxymoron (lengthening contractions). Only eccentric action is appropriate and adoption of this term has been recommended by Cavanagh. Despite the controversy that surrounds eccentric exercise, it is important to note that these types of actions play an integral role in normal daily activities. Eccentric actions are used during most forms of movement, for example, in walking when the foot touches the ground and the center of mass is decelerated and in lowering objects, such as placing a bag of groceries in the car.
Author (revised)

N94-28364*# Texas Univ., Austin. Dept. of Kinesiology and Health.
EXERCISE DETRAINING: APPLICABILITY TO MICROGRAVITY
EDWARD F. COYLE *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 111-118 Feb. 1994
Avail: CASI HC A02/MF A03

Physical training exposes the various systems of the body to potent physiologic stimuli. These stimuli induce specific adaptations that enhance an individual's tolerance for the type of exercise encountered in training. The level of adaptation and the magnitude of improvement in exercise tolerance is proportional to the potency of the physical training stimuli. Likewise, our bodies are stimulated by gravity, which promotes adaptations of both the cardiovascular and skeletal muscles. Exposure to microgravity removes normal stimuli to these systems, and the body adapts to these reduced demands. In many respects the cessation of physical training in athletes and the transition from normal gravity to microgravity represent similar paradigms. Inherent to these situations is the concept of the reversibility of the adaptations induced by training or by exposure to normal gravity. The reversibility concept holds that when physical training is stopped (i.e., detraining) or reduced, or a person goes from normal gravity to microgravity, the bodily systems readjust in accordance with the diminished physiologic stimuli. The focus of this chapter is on the time course of loss of the adaptations to endurance training as well as on the possibility that certain adaptations persist, to some extent, when training is stopped. Because endurance exercise training generally improves cardiovascular function and promotes metabolic adaptations within the exercising skeletal musculature, the reversibility of these specific adaptations is considered. These observations have some applicability to the transition from normal to microgravity.
Author (revised)

N94-28365*# Medical Coll. of Wisconsin, Milwaukee. Dept. of Anesthesiology and Physiology.
AEROBIC FITNESS AND ORTHOSTATIC TOLERANCE: EVIDENCE AGAINST AN ASSOCIATION
THOMAS J. EBERT *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 121-128 Feb. 1994
Avail: CASI HC A02/MF A03

This presentation will focus on only one side of the debate as to whether high levels of aerobic fitness have a deleterious effect on tolerance to gravitational stress. This issue was raised in the early 1970's as a result of two research publications. The first work investigated the carotid sinus baroreflex of humans with an airtight chamber that surrounded the head and neck. The steady-state reflex changes in blood pressure that were recorded 3 minutes after application of the head and neck stimuli, were attenuated in an athletic group compared to a sedentary group of volunteers. A second report in the NASA literature indicated that five endurance-trained runners were less tolerant to LBNP than five nonrunners. These early research findings have stimulated a considerable amount of interest that has lead to a growing number of research efforts seeking an association between aerobic fitness and orthostatic tolerance in humans. I will briefly review some of the more pertinent published research information which suggests that there is no relationship between aerobic fitness and orthostatic tolerance in humans. Author (revised)

N94-28366*# Texas Coll. of Osteopathic Medicine, Fort Worth. Dept. of Physiology.

DOES TRAINING-INDUCED ORTHOSTATIC HYPOTENSION RESULT FROM REDUCED CAROTID BAROREFLEX RESPONSIVENESS?

JAMES A. PAWELCZYK and PETER B. RAVEN *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 129-140 Feb. 1994

Avail: CASI HC A03/MF A03

As manned space travel has steadily increased in duration and sophistication, the answer to a simple, relevant question remains elusive. Does endurance exercise training - high intensity rhythmic activity, performed regularly for extended periods of time - alter the disposition to, or severity of, postflight orthostatic hypotension? Research results continue to provide different views; however, data are difficult to compare because of the following factors that vary between investigations: the type of orthostatic stress imposed (+Gz, lower body negative pressure (LBNP), head-up tilt); pretest perturbations used (exercise, heat exposure, head-down tilting, bed rest, water immersion, hypohydration, pharmacologically-induced diuresis); the length of the training program used in longitudinal investigations (days versus weeks versus months); the criteria used to define fitness; and the criteria used to define orthostatic tolerance. Generally, research results indicate that individuals engaged in aerobic exercise activities for a period of years have been reported to have reduced orthostatic tolerance compared to untrained control subjects, while the results of shorter term longitudinal studies remain equivocal. Such conclusions suggest that chronic athletic training programs reduce orthostatic tolerance, whereas relatively brief (days to weeks) training programs do not affect orthostatic tolerance to any significant degree (increase or decrease). A primary objective was established to identify the alterations in blood pressure control that contribute to training-induced orthostatic hypotension (TIOH). Although any aspect of blood pressure regulation is suspect, current research has been focused on the baroreceptor system. Reductions in carotid baroreflex responsiveness have been documented in exercise-trained rabbits, reportedly due to an inhibitory influence from cardiac afferent, presumably vagal, nerve fibers that is abolished with intrapericardiac denervation. The purpose of this investigation was to attempt to determine if similar relationships existed in men with varied levels of fitness, using maximal aerobic power, VO2 max, as the marker of fitness. Derived from text

N94-28367*# Minnesota Univ., Minneapolis. Dept. of Physical Medicine and Rehabilitation.

CARDIAC OUTPUT AND CARDIAC CONTRACTILITY BY IMPEDANCE CARDIOGRAPHY DURING EXERCISE OF RUNNERS

W. G. KUBICEK and R. A. TRACY *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 141-149 Feb. 1994

Avail: CASI HC A02/MF A03

Most of the solid state electronic engineering of the system now generally known as the Minnesota Impedance Cardiograph was performed with the support of a five-year contract, NAS9-4500, with the NASA Lyndon B. Johnson Space Center, Houston, Texas. This contract ran from 1965 to 1970. In addition to the engineering design and development of the hardware, the contract called for testing on both animals and human subjects. This project also provided funds to construct twenty impedance cardiographs and place them in selected research and clinical facilities for further evaluation. This, then, led to the First Symposium on Impedance Cardiography, held at the NASA Lyndon B. Johnson Space Center, Houston, Texas, 2-4 June 1969. Twenty-four excellent papers were presented. Derived from text

N94-28368*# Boston Univ., MA. School of Medicine.

WEIGHTLESSNESS AND THE HUMAN SKELETON: A NEW PERSPECTIVE

MICHAEL F. HOLICK *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 153-168 Feb. 1994

Avail: CASI HC A03/MF A03

It is now clear after more than two decades of space exploration that one of the major short- and long-term effects of microgravity on the human body is the loss of bone. The purpose of this presentation will be to review the data regarding the impact of microgravity and bed rest on calcium and bone metabolism. The author takes the position in this Socratic debate that the effect of microgravity on bone metabolism can be either reversed or mitigated. As we begins to contemplate long-duration space flight and habitation of Space Station Freedom and the moon, one of the issues that needs to be addressed is whether humans need to maintain a skeleton that has been adapted for the one-g force on earth. Clearly, in the foreseeable future, a healthy and structurally sound skeleton will be required for astronauts to shuttle back and forth from earth to the moon, space station, and Mars. Based on most available data from bed-rest studies and the short- and long-duration microgravity experiences by astronauts and cosmonauts, bone loss is a fact of life in this environment. With the rapid advances in understanding of bone physiology it is now possible to contemplate measures that can prevent or mitigate microgravity-induced bone loss. Will the new therapeutic approaches for enhancing bone mineralization be useful for preventing significant bone loss during long-term space flight? Are there other approaches such as exercise and electrical stimulation that can be used to mitigate the impact of microgravity on the skeleton? A recent study that evaluated the effect of microgravity on bone modeling in developing chick embryos may perhaps provide a new perspective about the impact of microgravity on bone metabolism. Derived from text

N94-28369*# Ford (Henry) Hospital, Detroit, MI. Bone and Mineral Research Lab.

IRREVERSIBILITY OF ADVANCED OSTEOPOROSIS: LIMITED ROLE FOR PHARMACOLOGIC INTERVENTION

A. M. PARFITT *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 169-174 Feb. 1994

Avail: CASI HC A02/MF A03

Osteoporosis is of medical interest only because it increases bone fragility and risk of fracture, and except for relief of symptoms, preventing fracture is the only purpose of intervention. To prevent the first fracture, adequate bone density must be accumulated and conserved, but to prevent subsequent fracture, bone density must be augmented so that the supportive function of the skeleton can be restored. Almost 50 years after the recognition of post menopausal osteoporosis as a clinical entity, not one of the many treatments that have been used has been demonstrated to be efficacious in reducing subsequent fracture risk. My purpose is not to recite this chronicle of disappointment, but to account for it in terms of bone biology, to consider some possible exceptions, and to reiterate the importance of preventing damage to the skeleton rather than belatedly attempting its repair. Author

N94-28370*# California Univ., San Francisco. Dept. of Radiology.

EXERCISE AND OSTEOPOROSIS: METHODOLOGICAL AND PRACTICAL CONSIDERATIONS

JON E. BLOCK, ANNE L. FRIEDLANDER, PETER STEIGER, and HARRY K. GENANT *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 175-180 Feb. 1994

Avail: CASI HC A02/MF A03

Physical activity may have important implications for enhancing bone density prior to the initiation of space flight, for preserving bone density during zero gravity, and for rehabilitating the skeleton upon return to Earth. Nevertheless, the beneficial effects of exercise upon the skeleton have not been proven by controlled trials and no consensus exists regarding the type, duration, and intensity of exercise necessary to make significant alterations to the skeleton. The following sections review our current understanding of exercise and osteoporosis, examine some of the methodological

shortcomings of these investigations, and make research recommendations for future clinical trials. Author

N94-28371*# Massachusetts Univ., Amherst. Dept. of Exercise Science.

ELECTRICAL STIMULATION IN EXERCISE TRAINING

WALTER KROLL *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 183-186 Feb. 1994

Avail: CASI HC A02/MF A03

Electrical stimulation has a long history of use in medicine dating back to 46 A.D. when the Roman physician Largus found the electrical discharge of torpedo fishes useful in the treatment of pain produced by headache and gout. A rival Greek physician, Dioscorides, discounted the value of the torpedo fish for headache relief but did recommend its use in the treatment of hemorrhoids. In 1745, the Leyden jar and various sized electrostatic generators were used to treat angina pectoris, epilepsy, hemiplegia, kidney stones, and sciatica. Benjamin Franklin used an electrical device to treat successfully a young woman suffering from convulsive fits. In the late 1800's battery powered hydroelectric baths were used to treat chronic inflammation of the uterus while electrified athletic supporters were advertised for the treatment of male problems. Fortunately, such an amusing early history of the simple beginnings of electrical stimulation did not prevent eventual development of a variety of useful therapeutic and rehabilitative applications of electrical stimulation. Over the centuries electrical stimulation has survived as a modality in the treatment of various medical disorders with its primary application being in the rehabilitation area. Recently, a surge of new interest in electrical stimulation has been kindled by the work of a Russian sport scientist who reported remarkable muscle strength and endurance improvements in elite athletes. Yakov Kots reported his research on electric stimulation and strength improvements in 1977 at a Canadian-Soviet Exchange Symposium held at Concordia University in Montreal. Since then an explosion of new studies has been seen in both sport science and in medicine. Based upon the reported works of Kots and the present surge of new investigations, one could be misled as to the origin of electrical stimulation as a technique to increase muscle strength. As a matter of fact, electric stimulation has been used as a technique to improve muscle strength for over a century. Bigelow reported in 1894, for example, the use of electrical stimulation on a young man for the purpose of increasing muscle strength. Employing a rapidly alternating sinusoidal induced current and a dynamometer for strength testing, Bigelow reported that the total lifting capacity of a patient increased from 4328 pounds to 4639 pounds after only 25 minutes of stimulation. In 1965, Massey et al. reported on the use of an Isotron electrical stimulator that emitted a high frequency current. Interestingly enough, the frequencies used by Massey et al. and the frequencies used by Bigelow in 1894 were in the same range of frequencies reported by Kots as being the most effective in strength development. It would seem the Russian secret of high frequency electrical stimulation for strength development, then, is not a modern development at all. Author

N94-28372*# Kentucky Univ., Lexington. Dept. of Physical Therapy.

THE VALUE OF ELECTRICAL STIMULATION AS AN EXERCISE TRAINING MODALITY

DEAN P. CURRIER, J. MICHAEL RAY, JOHN NYLAND, and TIM NOTEBOOM *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 187-191 Feb. 1994

Avail: CASI HC A01/MF A03

Voluntary exercise is the traditional way of improving performance of the human body in both the healthy and unhealthy states. Physiological responses to voluntary exercise are well documented. It benefits the functions of bone, joints, connective tissue, and muscle. In recent years, research has shown that neuromuscular electrical stimulation (NMES) simulates voluntary exercise in many ways. Generically, NMES can perform three major functions: suppression of pain, improve healing of soft tissues, and produce muscle contractions. Low frequency NMES may gate or disrupt the sensory input to the central nervous system which results in masking or control of pain. At the same time NMES may contribute to the activation of endorphins, serotonin, vasoactive intestinal polypeptides, and ACTH which control pain and may even cause improved athletic performances. Soft tissue conditions such as wounds and inflammations have responded very favorably to NMES. NMES of various amplitudes can induce muscle contractions ranging from weak to intense levels. NMES seems to have made its greatest gains in rehabilitation where directed muscle contractions may improve joint ranges of motion correct joint contractures that result from shortening muscles; control abnormal movements through facilitating recruitment or excitation into the alpha motoneuron in orthopedically, neurologically, or healthy subjects with intense sensory, kinesthetic, and proprioceptive information; provide a conservative approach to management of spasticity in neurological patients; by stimulation of the antagonist muscle to a spastic muscle stimulation of the agonist muscle, and sensory habituation; serve as an orthotic substitute to conventional bracing used with stroke patients in lieu of dorsiflexor muscles in preventing step page gait and for shoulder muscles to maintain glenohumeral alignment to prevent subluxation; and of course NMES is used in maintaining or improving the performance or torque producing capability of muscle. NMES in exercise training is our major concern. Author (revised)

N94-28373*# California Univ., Los Angeles. Human Biomechanics Lab.

THE USE OF BIOMECHANICS IN THE STUDY OF MOVEMENT IN MICROGRAVITY

R. J. GREGOR, J. P. BROKER, and M. M. RYAN *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 195-201 Feb. 1994

Avail: CASI HC A02/MF A03

As biomechanists interested in the adaptability of the human body to microgravity conditions, it appears that our job is not only to make sure that the astronauts can function adequately in space but also that they can function upon their return to Earth. This is especially significant since many of the projects now being designed at NASA concern themselves with humans performing for up to 3 years in microgravity. While the Extended Duration Orbiter flights may last 30 to 60 days, future flights to Mars using current propulsion technology may last from 2 to 3 years. It is for this range of time that the adaptation process must be studied. Specifically, biomechanists interested in space travel realize that human performance capabilities will change as a result of exposure to microgravity. The role of the biomechanist then is to first understand the nature of the changes realized by the body. These changes include adaptation by the musculoskeletal system, the nervous system, cardiorespiratory system, and the cardiovascular system. As biomechanists, it is also our role to take part in the development of countermeasure programs that involve some form of regular exercise. Exercise countermeasure programs should include a variety of modalities with full knowledge of the loads imposed on the body by these modalities. Any exercise programs that are to be conducted by the astronauts during space travel must consider the fact that the musculoskeletal and neuromuscular systems degrade as a function of flight duration. Additionally, it must be understood that the central nervous system modifies its output in the control of the human body during space flight and most importantly, we must prepare the astronauts for their return to one g. Author (revised)

N94-28374*# North Carolina Univ., Chapel Hill. Exercise Physiology Lab.

PSYCHOPHYSIOLOGY IN MICROGRAVITY AND THE ROLE OF EXERCISE

J. M. SHAW and A. C. HACKNEY *In* NASA. Johnson Space Center, Workshop on Countering Space Adaptation with Exercise: Current Issues p 205-213 Feb. 1994

Avail: CASI HC A02/MF A03

The Space Transportation-Shuttle (STS) Program has greatly expanded our capabilities in space by allowing for missions to be

flown more frequently, less expensively, and to encompass a greater range of goals than ever before. However, the scope of the United State's role and involvement in space is currently at the edge of a new and exciting era. The National Aeronautics and Space Administration (NASA) has plans for placing an orbiting space station (Space Station Freedom) into operation before the year 2000. Space Station Freedom promises to redefine the extent of our involvement in space even further than the STS program. Space Station crewmembers will be expected to spend extended periods of time (approximately 30 to 180 days) in space exposed to an extremely diverse and adverse environment (e.g., the major adversity being the chronic microgravity condition). Consequently, the detrimental effects of exposure to the microgravity environment is of primary importance to the biomedical community responsible for the health and well-being of the crewmembers. Space flight and microgravity exposure present a unique set of stressors for the crewmember; weightlessness, danger, isolation/confinement, irregular work-rest cycles, separation from family/friends, and mission/ground crew interrelationships. A great deal is beginning to be known about the physiological changes associated with microgravity exposure, however, limited objective psychological findings exist. Examination of this latter area will become of critical concern as NASA prepares to place crewmembers on the longer space missions that will be required on Space Station Freedom. Psychological factors, such as interpersonal relations will become increasingly important issues, especially as crews become more heterogeneous in the way of experience, professional background, and assigned duties. In an attempt to minimize the detrimental physiological effects of prolonged space flight and microgravity exposure, the United States and Russian space agencies have taken steps to implement various countermeasure programs. One of the principle countermeasures used by both nations is exercise during space flight. The purpose is to present a brief overview of the major research findings examining the psychophysiological changes associated with microgravity exposure, and to address the potential role of exercise as a countermeasure in affecting these psychophysiological changes. Author (revised)

N94-28392# Research Inst. of National Defence, Stockholm (Sweden). Huvudadelning foer Maensklig Prestation och Funktion.

VISIT TO CERMA: CENTRE D'ETUDES ET DE RECHERCHES DE MEDECINE AEROSPATIALE, CENTRE FOR STUDIES AND RESEARCH IN AVIATION AND SPACE MEDICINE, BRETIGNY SUR ORGE, FRANCE, NOVEMBER 16-18, 1992 [BESOEK VID CERMA-CENTRE D'ETUDES ET DE RECHERCHES DE MEDECINE AEROSPATIALE, CENTRUM FOER STUDIER OCH FORSKNING I FLYG- OCH RYMDMEDICIN, BREGTIGNY SUR ORGE, FRANKRIKE, 1992-11-16-18]

G. DEREFELDT and B. SCHANTZ Nov. 1993 38 p In SWEDISH

(PB94-132990; FOA-A-50019-5.5) Avail: CASI HC A03/MF A01

A visit to CERMA is reported. The purpose of the journey was to visit the division for space and aviation ergonomics at CERMA to discuss cooperation between FOA and CERMA within the agreements now being established between FOA and DRET concerning co-operation within defense research. DRET is the organization for defense research in France and is the equivalent to FOA in Sweden. There are four research themes: (1) effects of variations in gravitation (acceleration, space) on the cardiovascular and musculoskeletal systems; (2) man-machine interfaces (MMI) in complex systems; (3) perturbations in vigilance; and (4) nutrition. At the division for space and aviation ergonomics, research is carried out on the following themes: (1) vision, (2) man-machine dialog, and (3) applied neurophysiology. The main result of the journey was a proposal to co-operate in visual information retrieval, color perception, and colorcoding. NTIS

N94-28421# Robert Gordon's Inst. of Tech., Aberdeen (Scotland).

MEDICAL SUPPORT FOR BRITISH OPERATIONS IN THE ANTARCTIC

S. R. K. COLESHAW and J. N. NORMAN *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 5 p Oct. 1993

Copyright Avail: CASI HC A01/MF A03

This paper presents an overview of the work undertaken and support given to members of the British Antarctic Survey, discussing some of the environmental hazards to which the personnel are exposed. Derived from text

N94-28423# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

PREDICTION OF SURVIVAL TIMES ON LAND IN A COLD CLIMATE

G. MAIDMENT *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 12 p Oct. 1993

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Eight subjects were exposed to three different combinations of air temperature and wind speed for two hours in a climatic chamber. Changes in core temperature, surface temperatures and heat flux, and metabolic rate were recorded during the exposure. The results obtained were compared with the predictions derived from a sophisticated computer model of human thermoregulation and heat exchange. Conclusions about the factors responsible for the rate of body cooling in air and the causes of the wide range of variability observed are discussed. The problems of predicting survival times on land for a diverse population are considered, and possible solutions are suggested. Author (revised)

N94-28425# Survival Systems Ltd., Dartmouth (Nova Scotia).

EFFECT OF SEASICKNESS ON AIRCREW STUDENT *SURVIVOR ABILITY AFTER DITCHING IN COLD WATER*

ALBERT BOHEMIER *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 7 p Oct. 1993

Copyright Avail: CASI HC A02/MF A03

It is suggested that immediate, effective biochemical seasickness treatment for ditched aircrew does not exist, in addition to the fact that the severity of the problem in cold water survival is not currently documented, and therefore not sufficiently recognized. Author (revised)

N94-28426# Defence and Civil Inst. of Environmental Medicine, North York (Ontario). Environmental Physiology Section.

FUELLING SHIVERING IN HUMANS DURING COLD WATER IMMERSION

I. JACOBS *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 3 p Oct. 1993

Copyright Avail: CASI HC A01/MF A03

Military cold survival research has traditionally concentrated on ways of conserving body heat. In contrast, this paper will describe recent investigations of metabolic heat production during cold exposure. In humans, increased heat production in the cold is achieved by increased shivering, i.e. involuntary intermittent skeletal muscle contractions, which must be fuelled. This research has focused on the thermoregulatory effects of manipulating the availability of specific fuel substrates to the shivering musculature. Using procedures such as muscle biopsies to quantify intramuscular substrate utilization, venous blood sampling to quantify circulating substrates, and continuous monitoring of metabolic rates and rectal temperatures during cold exposure, the importance of skeletal muscle carbohydrates stores has been demonstrated for the ability to maintain heat production and delay the onset of hypothermia during cold water immersions. Acute reductions in muscle carbohydrate stores were associated with significant reductions in heat production by the body during shivering, and a more rapid decrease in rectal temperature. In contrast, another series of studies induced acute reductions in circulating fat stores, but there was no effect on body temperature regulation. The availability of sufficient carbohydrate stores to the shivering musculature seems to be critical for the body's ability to delay hypothermia during acute cold stress. Author (revised)

N94-28427# Defence and Civil Inst. of Environmental Medicine, North York (Ontario). Environmental Physiology Section.
BIOCHEMICAL ENHANCEMENT OF COLD TOLERANCE
A. L. VALLERAND *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

It is well established that humans have a poor resistance to cold. Once the insulation provided by the microclimate and by peripheral vasoconstriction has been maximized, the last line of defense against the cold resides in an increase in metabolic heat production (M-dot). Several techniques have been used to further enhance M-dot in the cold, but it is a pharmacological approach that has received the most support. To that effect, recent experiments in cold-exposed subjects have shown that the ingestion of ephedrine (E; a decongestant) and caffeine (C; a methylxanthine) improves M-dot, heat debt (body heat deficit), and the drop in body core (rectal) temperature T(sub re), (P less than 0.05). The ingestion of an E, C, and theophylline (T; a bronchodilator) capsule produced about the same beneficial effect (P less than 0.05). Although some authors have reported that T alone reduces the drop in T(sub re) (i.e. warmer T(sub re)), these improvements require further clarification since M-dot and mean skin temperature T(sub sk)-bar practically did not change. A theobromine-based (another xanthine) Recreation and Sports bar (Cold Buster) is purported to reduce the drop in T(sub re) and thus delay the onset of hypothermia. However, such claims could not be confirmed in two different studies performed in our lab. Despite an increase in M-dot in some studies, C alone did not alter T(sub re) in the cold. It is concluded that ephedrine/xanthine mixtures represent at the moment, one of the best and safe pharmacological agents to enhance heat production and cold resistance. *Author*

N94-28428# Manitoba Univ., Winnipeg. Lab. for Exercise and Environmental Medicine.
TREATMENT OF MILD IMMERSION HYPOTHERMIA BY BODY-TO-BODY AND FORCED-AIR WARMING
GORDON G. GIESBRECHT, IGOR B. MEKJAVIC (Simon Fraser Univ., Burnaby, British Columbia.), DANIEL I. SESSLER (California Univ., San Francisco.), MARC SCHROEDER (California Univ., San Francisco.), and GERALD K. BRISTOW *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 2 p Oct. 1993
Copyright Avail: CASI HC A01/MF A03

The purpose of these studies was to test two methods (one traditional, one recent) for treating mild immersion hypothermia. Derived from text

N94-28429# Army Research Inst. of Environmental Medicine, Natick, MA. Military Health Div.
NUTRITION AND HYDRATION STATUS OF AIRCREW MEMBERS CONSUMING AN IMPROVED SURVIVAL RATION DURING A SIMULATED SURVIVAL SCENARIO
TANYA E. JONES, SUSAN H. MUTTER, JUDY M. AYLWARD, and ELDON W. ASKEW *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 14 p Oct. 1993 Prepared in cooperation with Army Natick Research and Development Command
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Adequate nutrition and hydration can be crucial to the survival of downed aircrews. To determine the nutritional adequacy and palatability of an improved, all-purpose, all-environment survival packet (GP-I) compared to the old survival packet (GP), a field test was conducted using combat survival school students. During a five day survival exercise, 41 aircrew members ate the GP-I and 57 ate the GP. Nutrition/hydration status were assessed from food/fluid intake records as well as changes in body weight. Water turnover was measured in a subset of subjects (n=30) using deuterium oxide. Pre- and post-test hemoglobin, hematocrit, plasma osmolality, urine specific gravity (SG) and ketones were also measured. Acceptability of the two rations was evaluated. Subjects eating the GP-I consumed more calories; GP-I 774 +/- 436 versus GP 642 +/- 408 kcal/d. Carbohydrate and protein consumption were similar but the GP-I group ate significantly more fat, 35 +/- 21 versus 24 +/- 18 g/d. Mean fluid intake was similar for both groups (GP-I 4.3 +/- 1.7, GP 4.4 +/- 1.9 L/d). Sodium intakes were 1.1 g/d. Weight decreased significantly for the GP-I and GP groups (2.9 +/- 1.4, 3.4 +/- 1.7 kg, respectively); changes were similar between groups. Water turnover data indicated subjects maintained adequate hydration as did hemoglobin, hematocrit, and plasma osmolality. Mean post-test urine SG was 1.024 +/- 0.007 and moderate amounts of ketones were detected in urine. Both rations received favorable ratings, but the greater variety of the GP-I ration resulted in higher acceptability ratings. Either ration is adequate; however, the GP-I is more desirable and palatable than the GP. Author

N94-28434# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DETERIORATION OF MANUAL PERFORMANCE IN COLD AND WINDY CLIMATES
H. A. M. DAANEN *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 10 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

Manual performance during work in cold and windy climates is severely hampered by decreased dexterity. In this study, the quantitative performance decrease is investigated as a function of climatic factors. The decrease in finger and hand dexterity and grip force was quantified for nine combinations of ambient temperature (-20, -10, and 0 C) and wind speeds (0.2, 4, and 8 ms(exp -1)), controlled in a climatic chamber. Finger dexterity was determined by the Purdue pegboard test, hand dexterity by the Minnesota manual dexterity test, and grip force by a hand dynamometer. Twelve subjects with average to low fat percentage were exposed to cold air for one hour with and without extra insulation by a parka. The subjects were clothed in standard work clothing of the Royal Netherlands Air Force for cold conditions. Extra insulation did affect cold sensation but not manual performance. The deterioration (in percent) in performance is strongly dependent upon Wind Chill Equivalent Temperature (C), and exposure time (min). In a computer program, the performance decreases and freezing risk is indicated for variable climatic conditions. Derived from text

N94-28438# Royal Danish Navy, Gentofte. Health Services.
THERMOREGULATION IN THE EXTREME COLD ENVIRONMENT
LEIF VANGGAARD *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 5 p Oct. 1993
Copyright Avail: CASI HC A01/MF A03

Thermoregulation is normally viewed as the physiological responses aimed towards keeping the deep body temperature constant and high. For this work, this viewpoint is changed, and the human thermoregulation is viewed as those physiological mechanisms that keep the body at an optimal functional state. Here, the extremities and their thermal state is of the highest importance. In the extremities, the arteriovenous anastomoses (AVA's) determine the local temperatures, and by their action also define the thermoregulatory state of the body. The AVA's are centrally regulated, they determine the heat exchange with the environment, and they are the main determinants of the average skin temperature. By following their reactions, man's thermoregulatory state can be ascertained. In the treatment of hyperthermia and hypothermia, these functions are highly relevant. The role of the AVA's place them as a specific thermoregulatory organ responsible for the maintenance of optimal extremity temperatures. Derived from text

N94-28440# Institute of Aviation Medicine, Fuerstenfeldbruck (Germany).
AEROPATHOLOGICAL DIAGNOSIS OF LETHAL HYPOTHERMIA

M. KRAEMER *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 6 p Oct. 1993
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The decrease of central body temperature by warmth withdrawal leads in most cases to pathological changes of signal devices as the energy metabolism. The central body temperature may be lowered to 28 to 26 C without irreversible disturbances of life functions occurring. Not earlier as below 26 C rectal temperature life sustaining becomes critical. With continued exposure to cold and missing therapy, hypothermia passes several phases. Below 26 C rectal temperature in a phase of paralysis death occurs with cardiac disturbances like cardiac oscillation and disorders of atrio-ventricular conduction. Findings on the corpses of persons dying by cold exposure are discussed. Findings of a crew member dying after ejection and immersion in cold water are demonstrated and weighted by means of differential diagnosis. Author (revised)

N94-28441# Naval Health Research Center, San Diego, CA.
REWARMING METHODOLOGIES IN THE FIELD
R. S. POZOS, R. L. HESSLINK, J. READING, P. KINCAID, and S. FEITH *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993
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Hypothermia may occur with prolonged exposure to cold air or water. Recovery from hypothermia involves removing the individual from the cold environment and utilizing a rewarming strategy. Three major rewarming strategies include the following: passive rewarming, active external heating, and active internal heating. Controversy continues regarding the best rewarming procedure for use in the field. Author (revised)

N94-28442# Royal Naval Hospital, Haslar (England). Dept. of Accident and Emergency Medicine.
A COMPARISON OF FOUR METHODS OF REWARMING INDIVIDUALS COOLED BY IMMERSION IN COLD WATER
C. J. CAHILL, P. J. BALMI (Surrey Univ., Guildford, England.), and M. J. TIPTON (Institute of Naval Medicine, Alverstoke, England.) *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993
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It has been suggested that hypothermia individuals could be actively rewarmed in the field by immersion of only the extremities (hands and feet) in hot water. If successful this technique would have enormous potential in the pre-hospital and hospital care of the victims of accidental hypothermia. The theory is that local heat to the extremities results in opening of the arteriovenous anastomoses with return of warmed blood directly to the core, via the superficial veins bypassing the intervening cold peripheral tissues. A comparison of four techniques for rewarming subjects with lowered core temperatures has been undertaken. The techniques examined were: immersion to the neck in water at 40 C; immersion of one hand in water at 40 C; immersion of two hands plus forearms in water at 42 C; and passive rewarming. During rewarming, core and skin temperatures, heart rate, blood pressure, oxygen consumption, and peripheral blood flow were measured at frequent intervals. No significant difference, in the ability to raise the core temperature, was found among the techniques. It is concluded that hand rewarming, although theoretically attractive, does not work in practice and may even be detrimental in some circumstances, by suppressing intrinsic heat production. Author (revised)

N94-28448# Naval Aerospace Medical Research Lab., Pensacola, FL. Environmental Physiology Div.
EFFECTS OF THREE HYDRATION BEVERAGES ON EXERCISE PERFORMANCE DURING 60 HOURS OF SIMULATED DESERT EXPOSURE
L. G. MEYER, D. J. HORRIGAN, JR., H. M. NEISLER, and W. G. LOTZ *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 10 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

Without adequate hydration, profound heat stress and dehydration can occur in military forces operating in hot environments. The purpose was to evaluate the effectiveness of three beverages on temperature regulation, cardiovascular response, and work performance during prolonged heat exposure. Nine male subjects, attired in standard military combat uniforms, lived in a climatic chamber for 3 days (60 h) in simulated desert conditions varying from 25 to 45 C, 20 percent relative humidity. Three submaximal treadmill exercise bouts (40 min at 4.8 km/h, 0 percent grade) were performed at 4-h intervals each day. Subjects randomly consumed three beverages: a water placebo of water, citric acid, and aspartame (WP); a 5 percent carbohydrate drink containing water, citric acid, sucrose, fructose, and electrolytes (CE); and a 4 percent carbohydrate drink containing water, citric acid, sucrose, glucose, electrolytes, pyruvate, and 1 percent glycerol (CEG). Subjects drank only one of the three beverages ad libitum during the 60 h but were encouraged to drink every 15 min during exercise. Each subject tested all three beverages in a double blind, repeated-measures experimental design. Sweat rate (SR), core (rectal) temperature (Tre), average skin temperature (Tsk), heart rate (HR), oxygen consumption (VO2), and subjective ratings of perceived exertion (RPE) were recorded during exercise. Body temperatures and metabolic parameters remained within expected physiologic limits during 60 h of simulated desert conditions. During exercise, RPE and HR were similar for all beverages, but VO2, Tre, Tsk, and SR differed among beverages. During the 3rd exercise session on all days, VO2 was higher for CE than CEG and WP; CEG tests had the lowest VO2 on the 2nd and 3rd days. Rectal temperature was lower with CE and CEG than with WP on the 2nd and 3rd exercise periods of each day. Skin temperatures were different during the second exercise period on all three days. Exercise sessions with CEG produced the highest SR. It was concluded that carbohydrate-electrolyte beverages, preferably with a small amount of glycerol, may provide beneficial physiological responses during exercise in hot-dry conditions during the first 24 h of exposure. However, water alone appears to provide adequate hydration for working in desert conditions over extended periods of time. Author (revised)

N94-28449# Defence and Civil Inst. of Environmental Medicine, North York (Ontario).
ALLEVIATION OF THERMAL STRAIN IN THE CF: KEEPING OUR COOL DURING THE GULF CONFLICT
J. FRIM, L. L. BOSSI, K. C. GLASS, and M. J. BALLANTYNE *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 10 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

Thermal stress can be a serious problem for military personnel. This is largely because the measures employed to reduce such stress under normal working conditions are impractical under operational circumstances. For example, the specialized clothing worn by soldiers cannot generally be removed to reduce insulation and facilitate cooling. Similarly, operations are often conducted in hostile environments where ambient conditions, even inside vehicles, cannot be altered substantially. While reductions in work rate are feasible during peacetime, they have little place in combat as they compromise objectives and may still not be adequate to reduce thermal strain to acceptable levels. When operationally feasible, the provision of personal cooling can assist the body with heat dissipation and thermoregulation, often to the point that work can be continued at a near-normal rate with only slight to moderate thermal strain. An overview of personal cooling technology studies conducted at DCIEM within the last decade is presented. It outlines the problems of thermal stress in operations and its effects on performance, examines various solutions to the problem, and summarizes the R&D efforts that culminated in the integration of personal cooling into the CH124 Sea King helicopters during Op Friction. This was to our knowledge the world's first use of air crew personal cooling garments during combat and it enabled the Canadian Forces (CF) to conduct their Sea King helicopter operations without being time-limited due to thermal physiological strain. Author

N94-28450# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France). Centre d'Essais en Vol.

EXPERIMENTAL EVALUATION OF TWO SYSTEMS OF INDIVIDUAL AIR-CONDITIONING [EVALUATION EXPERIMENTALE DE DEUX SYSTEMES DE CLIMATISATION INDIVIDUELLE]

D. LEJEUNE, J. M. CLERE, M. BEAUMONT, and M. LONCLE *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993 In FRENCH

Copyright Avail: CASI HC A02/MF A03

The thermal stress in military aeronautics can involve a drop in physical and psychomotor performances; in particular the tolerance for accelerations is decreased. The use of a system of individual air-conditioning is likely to decrease the storage of heat and to thus allow the prolongation of missions. Two techniques are possible: a circulation of cooled fluid in contact with the body or a ventilation of cooled air inside the suit. Two systems were tested, one using a cooled water circulation, the other a circulation of air saturated with 20 C water vapor. The fluid, air, or water circulating in contact with the body is cooled using thermoelectric modules. The tests carried out on voluntary human subjects, in a hot environment going from 40 to 50 C, made it possible to highlight a clear improvement in thermal comfort. Each system has advantages and disadvantages. They must undergo technological improvements in order to allow their use on board combat aircraft. Author

N94-28495# Japan Society of Aerospace and Environmental Medicine, Tokyo.

JAPANESE JOURNAL OF AEROSPACE AND ENVIRONMENTAL MEDICINE, VOL. 30, NO. 3 [UCHU KOKU KANKYO IGAKU DAI 30 KAN DAI 3 GO]

MAKOTO MASUDA, MASAMITSU OSHIMA, KENICHI TAKAGI, SAKAE YOKOBORI, MITSUO SASAKI, ICHIRO ASUKATA, SACHIO IKAWA, YUKIKO KAKIMOTO, HIROSHI KANSAKU, TADAAKI MANO et al. Sep. 1993 45 p In JAPANESE

(ISSN 0387-0723)

(JTN-94-80606) Avail: CASI HC A03/MF A01

The following topics were discussed: hypobaric hypoxia, electrolyte metabolism, endocrine responses, physical exercise effects, low oxygen, high altitude environments, heat rate, urination, Antidiuretic Hormone (ADH), Adrenocorticotropic Hormone (ACTH), Aldosterone (Aldo), Plasma Renin Activity (PRA), Atrial Natriuretic Peptide (ANP), space foods, space flight, feeding, eating, taste, astronauts, aerospace environment, microgravity, Head Down Tilt (HDT), gravitational effects, physiological effects, psychological effects, stress, and nutritional requirements.

Author (NASDA)

N94-28496# Tsukuba Univ., Ibaraki (Japan). Lab. of Exercise Physiology.

STUDIES ON WATER ELECTROLYTE METABOLISM AND ENDOCRINE RESPONSES AT REST AND DURING SUBMAXIMAL EXERCISE AT 6,000 M SIMULATED ALTITUDE [6,000 M SOTO KOTO NI OKERU ANSEI OYOBI SAIDAIKA UNDOJI NO MIZU/DENKAISHITSU TAISHA TO NAIBUNPI OTO]

ISAO SUGANUMA, KOH MIZUNO, YASUHITO KUMAZAKI (Tokyo Metropolitan Health Promotion Foundation, Japan.), and KATSUMI ASANO *In* Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Vol. 30, No. 3 p 109-116 Sep. 1993 In JAPANESE See also A94-12178

Avail: CASI HC A02/MF A01

Five healthy male climbers were investigated in a hypobaric simulator to elucidate the effect of hypobaric exposure on water-electrolyte metabolism and endocrine responses at rest and during exercise. After urination, the subjects drank water and rested for 30 minutes. Then blood and urine were taken and the simulator was decompressed to a simulated altitude of 6,000 m. They drank water again on arrival to 6,000 m, and blood and urine were taken after 30 minutes rest, and they conducted pedaling exercise. Heart Rate (HR) was monitored every 5 minutes during the exercise. After exercise, blood and urine were collected. Control experiment was done on another day by the same protocol at sea level. HR during exercise was about 120 beats/min at the simulated altitude, while the value at sea level was about 90 beats/min. A significant increase in blood cortisol and increasing tendencies in blood adrenocorticotropic hormone, aldosterone, etc. were observed after exercise at the simulated altitude, while blood atrial natriuretic peptide and urine volume did not show remarkable change. Because the subjects had experienced climbing above 6,000 m, it seemed that the endocrine responses of stress, sodium retention and antidiuresis were relatively mild. Urine and endocrine responses after exercise at 6,000 m became highly variant among the subjects. Endocrine responses of stress, sodium retention and antidiuresis after exercise at 6,000 m would be suggested to correlate with vulnerability to acute motion sickness during actual mountaineering. Author (NASDA)

N94-28497# Tsukuba Univ., Ibaraki (Japan). Lab. of Exercise Physiology.

EFFECTS OF TRAINING AT SIMULATED ALTITUDE OF 6,000 M ON ENDOCRINE RESPONSES AT REST AND DURING EXERCISE AT THE SAME ALTITUDE [6,000 M SOTO KOSHO JUNNO TORENINGU NO TOKOSHO NI OKERU ANSEI OYOBI UNDOJI NAIBUNPITSU OTO NI OYOBOSU EIKYO]

KOH MIZUNO, ISAO SUGANUMA, YASUHITO KUMAZAKI (Tokyo Metropolitan Health Promotion Foundation, Japan.), and KATSUMI ASANO *In* Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Vol. 30, No. 3 p 117-125 1 Sep. 1993 In JAPANESE See also A94-12179

Avail: CASI HC A02/MF A01

A study was conducted to elucidate the effect of intermittent hypobaric training on response of endocrine at rest and during exercise under hypobaric hypoxia at a simulated altitude of 6,000 m. Two male subjects; elite climber aged 35 years who had arrived over 7,000 m altitude (Testee 1), and beginner climber aged 27 years who had climbed only in comparatively low altitude mountains (Testee 2), trained in the hypobaric simulator for 8 times during 3.5 months. Simulated altitude, temperature, and relative humidity in the simulator were 6,000 m (354 Torr), 20 C, and 60 percent respectively. Training intensity was 30 minutes pedaling exercise under normoxia. At the first, fifth, and last training session, blood samples were taken before and after exercise at the 6,000 m simulated altitude. Heart Rate (HR) during exercise was monitored at all training sessions. Testee 2 showed remarkable increase of blood Adrenocorticotropic Hormone (ACTH), Antidiuresis Hormone (ADH), aldosterone, and Plasma Resin Activity (PRA) after exercise at the first training session, which tended to decrease as training progressed. Testee 1 showed almost no change of these hormones after exercise during all training sessions. Testee 2 showed about 20 to 30 beats/min decrease of HR during exercise with training progress. It might be concluded that intermittent hypobaric training cause the attenuation of stress and antidiuretic responses during exercise under hypobaric hypoxia for beginner climber and that elite climber should acquire attenuated responses of those hormones as a result of experience of severe hypoxia during actual mountaineering. Author (NASDA)

N94-28756# Naval Aerospace Medical Research Lab., Pensacola, FL.

NAVAL AVIATION VISION STANDARDS RESEARCH AT THE NAVAL AEROSPACE MEDICAL RESEARCH LABORATORY: THE LONG VIEW Special Report

LEONARD A. TEMME Apr. 1993 20 p

(AD-A275885; NAMRL-SR-93-2) Avail: CASI HC A03/MF A01

The Naval Aerospace Medical Research Laboratory (NAMRL) has been pursuing a research program to develop easily administered tests of vision skills that are valid, practical tools for the selection of personnel likely to be successful in the naval aviation arena. From 1980 to 1985, NAMRL maintained a data collection effort measuring the vision of U.S. Navy fighter pilots assigned to the air-to-air combat training range (NAS Oceana, VA). Both operational performance and vision test data were

collected from the pilots. This report presents (1) the underlying theoretical orientation that guided that research effort, (2) a summary of the research results to date, and (3) the ideas guiding the design of the research strategy projected for the future. For convenience, abstracts of the principle publications describing this work are assembled in the appendix. DTIC

N94-28757# Army Aeromedical Research Lab., Fort Rucker, AL.
AVIATION EPIDEMIOLOGY DATA REGISTER: AGE DISTRIBUTION OF U.S. ARMY AVIATORS STRATIFIED BY GENDER AND COMPONENT OF SERVICE Final Report
KEVIN T. MASON and S. G. SHANNON Jan. 1994 26 p
(Contract DA PROJ. 3M1-62787-A-879)
(AD-A275901; USAARL-94-4) Avail: CASI HC A03/MF A01

The U.S. Army Aviation Epidemiology Data Register (AEDR) contains information on the history and physical parameters of Army aircrew members. As a reference for AEDR users and customers, the age distribution of Army aviators was extracted. The data were tabulated by age, gender, and component of service for calendar years 1986 through 1992. AEDR researchers can use the tables to calculate annual incidence rates, annual period prevalence rates, and other rates based on aviator-years of occupational exposure stratified by age, gender, and/or component. Aeromedical resource, policy and standards managers can use the tables for planning and funding aviator health care programs. DTIC

N94-28797# Navy Personnel Research and Development Center, San Diego, CA.
MARKOV CHAINS FOR RANDOM URINALYSIS 3: DAILY MODEL AND DRUG KINETICS Final Report, Oct. 1992 - Sep. 1993
THEODORE J. THOMPSON and JAMES P. BOYLE Jan. 1994 20 p
(AD-A275540; NPRDC-TN-94-12) Avail: CASI HC A03/MF A01

This is the third in a series of reports on the use of Markov chains for the analysis of random urinalysis programs. A Markov model for random drug urinalysis testing that allows for daily variations in testing probabilities was developed. The formulation allows for any fixed length cycle (e.g., week, month). Drug kinetics and drug user gaming are incorporated into the Markov model via conditional probabilities. The Markov chain provides estimates of the distribution of time to detection and mean time to detection. The analyses have shown that time to detection varies dramatically with varying (observed) daily testing rates. Unequal daily testing rates provide opportunities for gaming drug users to extend the mean time to detection. Gaming is not possible with equal probabilities of testing across days. DTIC

N94-28810# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
DIGITAL TRACKING AND CONTROL OF RETINAL IMAGES M.S. Thesis
STEVEN F. BARRETT 1993 17 p
(AD-A275469; AFIT/CI/CIA-93-28D) Avail: CASI HC A03/MF A01

Laser induced retinal lesions are used to treat a variety of eye diseases such as diabetic retinopathy and retinal tears or breaks. Both the location and size of the retinal lesions are critical for effective treatment and minimal complications. Currently, once an irradiation is begun, no attempt is made to alter the laser beam location on the retina. However, adjustments are desirable to correct for patient eye movements. Lesions form in much less than one second and typical treatment for a disease such as diabetic retinopathy requires as many as 2000 lesions per eye. This type of tedious task is ideally suited for computer implementation. A system has been developed to track a specific lesion coordinate on the retinal surface and provide corrective signals to maintain laser position on the coordinate. Six distinct retinal landmarks are tracked on a high contrast retinal image using two-dimensional blood vessel templates. Use of therapeutic lesions as tracking algorithm landmarks is also investigated. An x and y laser correction signal is derived from the landmark tracking information and provided to a pair of galvanometer steered mirrors to maintain the laser on a prescribed location. Once the laser position has been corrected, a function checks the terminal laser position for minor corrections. A development speed tracking algorithm has been implemented and tested using both vessel and lesion templates. Closed loop feedback control of laser position is demonstrated with calibrated retinal velocities and in vivo testing of the development system. Trade-off analysis of parameters affecting tracking system performance is used to specify requirements and implementation details for a real time system. DTIC

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BEHAVIORAL SCIENCES

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

N94-26346# Naval Aerospace Medical Research Lab., Pensacola, FL.
A COMPARISON OF TWO HARDWARE IMPLEMENTATIONS OF A CREW SELECTION SYSTEM Special Report
T. NONTASAK and K. T. HELTON Oct. 1993 16 p
(AD-A274913; NAMRL-SR-93-3) Avail: CASI HC A03/MF A01

A number of disadvantages existed within the Apple IIe version of the Landing Craft Air Cushion vehicle Crew Selection System (LCSS). These disadvantages included slow processing speed, memory constraints, and cumbersome test administration. The system was also less conducive to future test development. The LCSS was upgraded to an IBM PC compatible Zenith 248 system. A comparison of 48 single and composite subtest scores between like measures of the two systems yielded significant positive correlations (p less than .0001). The majority of the correlations ranged from .60 to .89. A small percentage of the associations were less robust. Overall, however, the Apple IIe and Zenith 248 versions of the LCSS proved to be comparable testing systems. DTIC

N94-26430# Naval Health Research Center, San Diego, CA.
PERFORMANCE ASSESSMENT IN SUSTAINED OPERATIONS USING A COMPUTER-BASED SYNTHETIC WORK TASK
TIMOTHY F. ELSMORE, PAUL NAITOH, and STEVEN LINNVILLE 1993 32 p
(Contract DA PROJ. M00-96; DA PROJ. MM3-P-30)
(AD-A274707; NHRC-92-30) Avail: CASI HC A03/MF A01

Prediction of the effects of stressors on military performance from laboratory tests frequently involves use of procedures simulating critical functional aspects of military jobs. This paper presents a computerized 'Synthetic Work' test, SYNWORKI, as a prototypical alternative to traditional Performance Assessment Batteries. This test simulates complex operational environments by requiring subjects to work on four simultaneous tasks, and assigns explicit consequences for work on each component task. As illustrations of the utility of this technique, data are presented from three applications of SYNWORK1, a laboratory study of sleep deprivation, a test of extended exposure to a simulated sonar 'ping', and the use of the same task during army operations in Operation Desert Storm. DTIC

N94-26600# Federal Aviation Administration, Oklahoma City, OK. Civil Aeromedical Inst.
VALIDATION OF THE FEDERAL AVIATION ADMINISTRATION AIR TRAFFIC CONTROL SPECIALIST PRE-TRAINING SCREEN Final Report
DANA BROACH and JAN BRECHT-CLARK (Federal Aviation Administration, Washington, DC.) Feb. 1994 15 p
(DOT/FAA/AM-94/4) Avail: CASI HC A03/MF A01

Two formal validation studies of the Air Traffic Control Specialist

Pre-Training Screen (ATCS/PTS), a 5-day computer-administered test battery, are described. The ATCS/PTS was designed to replace the 9-week U.S. Federal Aviation Administration (FAA) Academy ATCS Nonradar Screen program that served as the second major test in the ATCS selection system. Review of ATCS job analyses suggested that predictor tests should assess cognitive constructs such as spatial reasoning and short-term memory, and require dynamic, concurrent performance. A proposed test battery was developed, consisting of 2 computer-administered information processing tests and a simplified radar-based air traffic control work sample. In study 1, predictive, criterion-related validation (N = 438) found that the proposed test battery explained additional variability in scores earned in the 9-week FAA Academy program, after taking into account student aptitude. In study 2, criterion-related validation (N = 297) demonstrated that the proposed test battery was as valid as the 9-week FAA Academy ATCS Nonradar Screen for predicting progress in field training. Preliminary data from a third study conducted after validation of the ATCS/PTS seem to suggest that the abilities assessed by the new computerized tests reflect the abilities required on the job. However, implementation of the ATCS/PTS for actual employment decision-making in June 1992 was based on results obtained in the second concurrent, criterion-related validation study. The U.S. controller selection system since June 1992 consisted of the 4-hour written ATCS aptitude test battery followed by, for those applicants earning a qualifying score and dependent upon agency manpower requirements, second-level screening on the ATCS/PTS. Additional research requirements as part of an aviation program are described. Author (revised)

N94-26683# Medical Research Council, Cambridge (England). Applied Psychology Unit.

THE CENTRAL EXECUTIVE COMPONENT OF WORKING MEMORY Final Report, 1 Sep. 1990 - 31 Aug. 1993

A. BADDELEY, J. DUNCAN, and H. EMSLIE 31 Oct. 1993 47 p

(Contract AF-AFOSR-0343-90)

(AD-A274295; AFOSR-93-0896TR) Avail: CASI HC A03/MF A01

A distinction between voluntary/controlled and stimulus-driven/automatic behavior has been separately applied to the effects of frontal lobe lesions, individual differences in general intelligence or Spearman's g, and interference between dissimilar, concurrent tasks. We suggest that these three problems are indeed closely linked, all concerning a process of selection between alternative goals or abstract requirements on behavior, especially under conditions of novelty and /or weak environmental cues to action. Among our findings are: (1) Executive deficits following frontal lesions are specifically associated with losses in fluid intelligence; (2) Conventional frontal tests have little in common besides g. (3) Across a wide range of spatial and verbal tasks, dual task interference is closely related to both g correlations and frontal lobe involvement. This may only be true, however, when the secondary task is random sequence generation, designed to avoid stereotype. (4) Frontal patients and people from the lower part of the g distribution share a tendency to goal neglect, or disregard of a task requirement even though that requirement has been understood. Neglect is confined to novel behavior, eliminated by verbal prompts, and sensitive to the number of concurrent goals. (5) In speeded stimulus classification, switching classification rules produces high g correlations. Correlations rapidly decrease, however, with practice on a fixed rule. The results begin to clarify the role of executive control in the organization of behavior. DTIC

N94-26749# Army Command and General Staff Coll., Fort Leavenworth, KS.

FEMALE COMBAT HELICOPTER PILOT SELECTION CRITERIA M.S. Thesis

WENDY R. MULLINS 4 Jun. 1993 112 p

(AD-A273935) Avail: CASI HC A06/MF A02

This study investigates selection criteria for selecting female aviators for training in combat helicopters (AH-64, AH-1, OH-58D, and RAH-66). Selection for such training would occur as either a part of the multitrack program of instruction used in the current Initial Entry Rotary Wing flight training course, or as transition training for already qualified aviators. Analysis included a review of: current Army regulations governing prerequisites for combat helicopter training and combat helicopter maintenance test pilot training; Initial Entry Rotary Wing selection criteria for combat helicopter tracks (AH-1 and OH-58); Aviation Branch personnel manager interviews; combat helicopter manprint/anthropometric restrictions; standards of medical fitness; anthropometric standards; and previous reports on female performance in Initial Entry Rotary Wing training. Conclusion supports selecting females for combat helicopter training using the same selection criteria currently used for choosing males for such training. Study recommends additional research in aircraft accommodation measurements, social-psychological aspects, and physical body strength requirements. DTIC

N94-26873 Groningen Rijksuniv. (Netherlands). Dept. of Computing Science.

INTERACTING CORTICAL FILTERS FOR OBJECT RECOGNITION

N. PETKOV and T. LOURENS 1994 19 p See also PB94-125366 Sponsored by Nederlandse Organisatie voor Wetenschappelijk Onderzoek, The Hague Limited Reproducibility: More than 20% of this document may be affected by microfiche quality

(PB94-125374; CS-9303) Avail: Issuing Activity (National Technical Information Service (NTIS))

It is shown how cortical filters can be used for image analysis and object recognition. Similarly to previous work in this area, we compute functional inner products of a two-dimensional input signal (image) with a set of two-dimensional Gabor functions which fit the receptive fields of simple cells in the primary visual cortex of mammals. We propose a method in which these inner products become the subject of thresholding, orientation competition and lateral inhibition. Each of the resulting cortical images contains only edge lines of a particular orientation and a particular light-to-dark transition direction. In this way, the information which is present in the original image is split in different channels and we show how this splitting can be used for object recognition. Each cortical image is reduced to a single number so that a set of cortical images that emanate from the same input image is reduced to a set of descriptors of the input image which are robust for translations of an object in the visual field. Multi-scale resolution and dynamic programming are used to compensate for size variations, rotations and non-topologic form differences. The method discriminates between simple geometrical figures, e.g. polygons with different numbers of edges, with reliability of 100% and a recognition rate of 99% has been achieved when the method was applied to a large database of face images. NTIS

N94-26882# Arizona State Univ., Tempe. Dept. of Industrial Management Systems Engineering.

BENEFITS ESTIMATION FOR SIMULATION SYSTEMS USED FOR AIRCREW TRAINING IN A MULTISHIP ENVIRONMENT Final Report, Jul. - Oct. 1992

WILLIAM C. MOOR and DEE H. ANDREWS Nov. 1993 44 p

(AD-A274313; AL/HR-TR-1993-0158) Avail: CASI HC A03/MF A01

A general model for the benefit evaluation of multiship training simulation systems is presented. The benefit measures derived are oriented toward allowing benefit-cost evaluations of proposed alternative simulation systems. The model is based on empirical data drawn from evaluation studies of simulators as well as analytical approaches. The focus of the approach using this model is selecting the most appropriate and economic simulators for use at the operational level. The model does not attempt to compare, or justify the comparison of, the training value of a specific simulator versus a specific aircraft. The model allows for full sensitivity analysis and variation of all important parameters. A set of LOTUS 1-2-3 spreadsheets are presented which facilitate the use of the model. The model is demonstrated by means of an application which is based on actual data. DTIC

N94-27001# Groningen Rijksuniv. (Netherlands). Dept. of Computing Science.
ORIENTATION COMPETITION IN CORTICAL FILTERS
N. PETKOV, T. LOURENS, and P. KRUIZINGA 1994 15 p See also PB94-125374
(PB94-125366; CS-9302) Avail: CASI HC A03/MF A01

This work presents explorations in the microstructure of natural vision systems based on large scale computer simulations. Similarly to previous work in this area, we compute the functional inner products of a two-dimensional input signal (image) with a set of two-dimensional Gabor functions which have been shown to fit the receptive fields of simple cells in the primary visual cortex of mammals. These inner products are then considered as net inputs to the cortical cells and used to compute the cell activations as non-linear functions. A previously used model is extended with a pixel-wise winner-takes-all competition between different Gabor filters which is introduced in order to increase the orientation sensitivity of computed cortical cell responses. The effect of this competition is qualitatively estimated by visualization of computed cortical images and quantitatively evaluated by applying the model to a face recognition problem. Recognition rate of 97% was achieved on a database of 205 face images of 30 persons vs 94% achieved with a previously used model. NTIS

N94-27012# Stanford Univ., CA. Dept. of Psychology.
INDUCED PICTORIAL REPRESENTATIONS Final Technical Report, 1 Nov. 1988 - 30 Nov. 1993
BARBARA G. TVERSKY 30 Nov. 1993 31 p
(Contract AF-AFOSR-0076-89)
(AD-A274251; AFOSR-93-0887TR) Avail: CASI HC A03/MF A01

Language is often used to describe environments or to give directions. This project investigated how spatial language describing large and small scale environments is comprehended and produced. The research on large scale environments, such as a town, has shown that in descriptions, people adopt either a route or a survey perspective or a mixture of both. In comprehension of such descriptions, people form spatial mental models that are more abstract than either perspective. The research on small scale environments investigated people's mental models of the objects surrounding them. People are faster to access objects at some directions from their bodies than others. Accessibility depends on enduring characteristics of the perceptual world and the relation of the body to it. Several variations and extensions of each project are described. The research has implications for spatial cognition as well as language comprehension and production. DTIC

N94-27056# Walter Reed Army Inst. of Research, Washington, DC.
HUMAN DIMENSIONS RESEARCH TEAM, OPERATION RESTORE HOPE Report, 26 Jan. - 5 Mar. 1993
ROBERT K. GIFFORD, JAMES N. JACKSON, and KATHLEEN B. DESHAZO 5 Mar. 1993 14 p
(AD-A274340) Avail: CASI HC A03/MF A01

The purpose of this investigation was to assess soldier coping and adaptation to the stresses of operation Restore Hope. Interviews, observations, and command consultation generated the data necessary to delineate key themes. Perhaps the most important of the investigation's findings was that current Army doctrine and practices provided the support necessary for the deployed force to successfully adapt to the unique challenges of operation Restore Hope. The Human Dimensions Research Team detected no problems that were severe enough to threaten/comprise the Army's ability to perform its mission, or that would portend significant future mental health problems (e.g., post-traumatic stress disorder). While there were numerous, identifiable stressors (e.g., redeployment uncertainty, mission ambiguity, restrictive rules of engagement, slow mail, limited phone access), none were unexcepted, and more importantly, none were beyond the soldiers' or units' capacity to cope. DTIC

N94-27072# Massachusetts Inst. of Tech., Cambridge. Dept. of Brain and Cognitive Sciences.
TOP DOWN INFLUENCES ON BOTTOM-UP PROCESSING Final Report, Sep. 1989 - Sep. 1993
WHITMAN RICHARDS 27 Oct. 1993 34 p
(Contract AF-AFOSR-0504-89)
(AD-A274220; AFOSR-93-0893TR) Avail: CASI HC A03/MF A01

Although integrated computational and psychophysical studies have considerably advanced our understanding of early visual processing (up to Marr's 2 1/2 D Sketch), much less research, by comparison, is being conducted on intermediate and higher-level vision. One reason for the scarcity is that high-level vision includes goal-directed, context-sensitive, top-down knowledge. However, little is known about these aspects of vision and how they are organized in the visual knowledge base (for example, how default preferences and categorical states are organized and related). Hence, plausible, detailed computational models can't be formulated. These studies begin to reveal the structure of some aspects of cognitive visual knowledge. DTIC

N94-27094# State Univ. of New York, Stony Brook. Dept. of Psychology.
SIGNAL- AND LISTENER-BASED FACTORS IN COMPLEX AUDITORY PATTERN PERCEPTION Annual Technical Report, 15 Sep. 1992 - 15 Sep. 1993
ARTHUR G. SAMUEL 9 Nov. 1993 13 p
(Contract AF-AFOSR-0378-91)
(AD-A274148; AFOSR-93-0906TR) Avail: CASI HC A03/MF A01

The research conducted during the second year of AFOSR grant 91-0378 investigated fundamental issues in the early processing of speech and similarly complex acoustic signals. The research pursued the information processing goal of specifying the levels of analysis that occur between the initial sensory coding of the signal and the recognition of the phonetic sequence it conveys. Five experiments provided evidence for the existence of at least three qualitatively different levels of perceptual analysis. The data help to specify the properties of each level, including a locus (peripheral versus central), a stimulus domain, and the mechanisms affected by repeated stimulation. The convergence across several different approaches used to determine levels of analysis supports the three-level model. DTIC

N94-27138 Institute for Perception RVO-TNO, Soesterberg (Netherlands).
ON THE DEVELOPMENT OF MOTOR CHUNKS AND CONCURRENT PROCESSING IN A STRUCTURED CONTINUOUS KEYPRESSING TASK Final Report
W. B. VERWEY and Y. DRONKERT Jun. 1993 26 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A274153; IZF-1993-B-6; TDCK-93-1348) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

This report describes an experiment designed to assess the effects of practice in performing a structured sequence of keypresses. The task consisted of pressing a sequence of nine keys with nine fingers, each in response to a corresponding stimulus. Each response was followed by a response-stimulus interval (RSI), which sometimes was zero ms, before the next stimulus was presented. Upon completion of one sequence, production of the identical sequence was immediately repeated. One group of 18 subjects - the 333 group - practiced with three regularly spaced, non-negligible RSI's while the remaining RSI's were zero. This divided the sequence into three groups of three keypresses each. Another group of 18 subjects - the 45 group - practiced with two non-negligible RSI's partitioning the sequence into a four- and a five-key group. These conditions were coined structured conditions. On occasion all subjects carried out a condition in which all RSI's were zero. This was the unstructured condition. The results show that interkey times in this condition clearly reflected the position of the long RSI's in the structured condition. This suggests that motor chunks had developed in the structured condition which were also used in the unstructured condition. More detailed analyses suggest that preparing one chunk

concurred with execution of the preceding chunk in the unstructured and probably also in the structured condition. Concurrent preparation of the next chunk slowed down execution of the preceding chunk in the unstructured condition. In the structured condition it concealed effects of chunk-size on initiating each chunk (i.e. the complexity effect). DTIC

N94-27141# Hahnemann Medical Coll. and Hospital, Philadelphia, PA. Dept. of Physiology and Biophysics.
CORTICAL MECHANISMS OF ATTENTION, DISCRIMINATION, AND MOTOR RESPONSE TO SOMESTHETIC STIMULI Final Report, 1 Apr. 1990 - 31 Mar. 1993
JOHN K. CHAPIN 31 Mar. 1993 9 p
(Contract AF-AFOSR-0266-90)
(AD-A274163; AFOSR-93-0897TR) Avail: CASI HC A02/MF A01

Work carried out on AFOSR 90-0266 made major progress in several areas: (1) development of technology for recording large numbers of single neurons (up to 64) simultaneously through microwires implanted at multiple levels of the somatosensory system in awake rats; (2) utilization of an operant conditioning paradigm for investigating the detection and processing of sensory cues which trigger an active motor response; (3) demonstration that neuronal responses in the SI and MI cortices to such sensory cues are increased when they are used to trigger a conditioned motor response; (4) demonstration that this conditioning increases the prevalence of functional connections between neurons in the SI and MI cortices; (5) used quantitative techniques to defined dynamic and distributed properties of receptive fields in the somatosensory cortex and thalamus; (6) developed the use of multivariate statistical techniques to define population coding within ensembles of recorded neurons; and (7) continued to define neuroanatomical substrates for processing within this system. DTIC

N94-27517# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
A STUDY OF PSYCHOLOGICAL FACTORS AFFECTING AN EXTREMELY ISOLATED ENVIRONMENT [HEISA KAKURI KANKYOKA NI OKERU SHINRI YOSO NO KENKYU]
MASAFUMI TANAKA *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 276-278 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

This study was performed as a part of a three-year project of international comparison of human behavior and psychology under extremely isolated environment, advocated by the Scientific Committee on Antarctic Research (SCAR) to Canada, Italy, Australia, France, and Japan. The subjects were 31 Japanese male members of the 32nd Antarctic wintering party, consisting of 16 observation members and 15 construction members. The age was ranging from 25 to 45, and the average age was 33.9. The duration was from November 1990 to March 1992. This test can be divided into two phases. The first phase was the test using questionnaires that was delivered to each members who were told to answer it within one week. Although this test was not compulsive, the recovery rate was as high as 1.3 percent. Another test was observation of particular members in some opportunities where every member was present at one time, such as meetings or dinner. In this test, the behavior, conversation, and others were recorded. These data are being analyzed now, and are scheduled to be compared at the international working group next year. What was interesting in this test was apparent contrast between observation members and construction members. Construction members answered to try external self-control rather than internal self-control when self-control was required, and included many inadaptable members. Author (NASDA)

N94-27518# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
INTERHEMISPHERIC PHASE RELATIONSHIP OF ALPHA WAVES AND CEREBRAL DOMINANCE [ARUFAHA NO HANKYUKAN ISO RENKAN TO HANKYU YUISEI]
TAKAKO KAWAGUCHI, HIROYASU JIJIWA (Institute for Developmental Research, Kasugai, Japan.), and SATORU WATANABE *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 279-281 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

In previous studies, phase of alpha wave was compared between the right and left hemispheres during loading mental work. Whether the interhemispheric difference could be changed by linguistic load and acoustic load was examined. The subjects were healthy 20 students. They sat relaxed with closed eyes, and brain waves were recorded, during the following two mental loadings; one is 10 questions on proverbs previously recorded by a cassette tape recorder, and another was to sing or follow seven musics in mind. The music included three children's songs with words and four melodies without words. As a result, the phase of alpha waves were significantly increased in temporal and frontal regions under linguistic loads and in temporal regions under acoustic loads, compared with those during closed-eyed relaxation. The time ratio of preceding phase in the left hemisphere to the right hemisphere was significantly larger in the temporal, frontal and central regions under linguistic loading, whereas it was not changed during acoustic loading and relaxation. This suggests that the left hemisphere of the brain may have a function of the linguistic process. No significant interhemispheric difference was observed between the music with and without words. Author (NASDA)

N94-27523# Tokyo Univ. (Japan). Dept. of Psychology.
FUNCTION OF SELECTIVE ATTENTION INTRINSIC TO THE SACCADE SYSTEM: DOES THE VOLUNTARY CONTROL OVERRIDE THE STIMULUS DRIVEN CONTROL? [SAKKADO SHISUTEMU NI NAIZAISURU SENTAKUTEKI CHUI KINO: ZUIITEKI SEIGYO WA SHIGEKI KUDO SEIGYO OSEISURUKA]
HIROMI IMAI and KAZUO KOGA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 299-303 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

From many studies on spatial attention, it was revealed that subjects can maintain selective attention to a particular target with ignoring distractors. However, the mechanism of this selective attention is not understood. The purpose of this study is to examine which is the dominant control, voluntary control or stimulus driven control, and, in the case that one control was dominant, whether the other control could affect the control or not. Three subjects were told to gaze at a target dot on a display and to ignore a distractor that appeared after a short interval, and the horizontal movement of the left eye was recorded. As a result, saccade to the targets was mainly observed, and the distractor scarcely caused saccade even in emergence immediately after the emergence of the target. This suggests that voluntary control may override stimulus driven control. However, because duration from emergence of target to occurrence of saccade was prolonged by a distractor, the presence of a distractor may interfere with saccade programming to some extent. Author (NASDA)

N94-27584# National Aerospace Lab., Tokyo (Japan). Computational Sciences Div.
AN ALGORITHM FOR STEREO CORRESPONDENCE PROBLEMS ON THE ANALOGY OF HUMAN VISION [HITO NO SHIKAKU NI MANANDA BIDEO KAMERA NO SHISEN SEIGYO NIYORU TAIOTEN TANSAKU]
HIROMI GOMI Nov. 1992 32 p In JAPANESE
(ISSN 0389-4010)
(NAL-TR-1185; JTN-94-80614) Avail: CASI HC A03/MF A01

An approach for solving stereo correspondence problems that imitates human vision is proposed and verified by directing two cameras to the same point in experiments. The algorithm is based on the fact that the illuminance difference between images on left and right human retinal foveae is minimized when both eyes look at the same point. This is due to the fact that the difference between the images is smaller than the resolution. The algorithm is robust against camera discrepancies and has an operating range similar to that of human vision. The algorithm is an area-based

method using 256 x 256 picture elements, which is greater than ordinary template matchings, and is not affected by the relative illuminance of the lens because of convergence control of the cameras. Author (NASDA)

N94-27901*# Old Dominion Univ., Norfolk, VA. Dept. of Psychology.
BRAIN WAVE CORRELATES OF ATTENTIONAL STATES: EVENT RELATED POTENTIALS AND QUANTITATIVE EEG ANALYSIS DURING PERFORMANCE OF COGNITIVE AND PERCEPTUAL TASKS
FREDERICK G. FREEMAN *In its* The 1993 NASA-ODU American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program p 85-88 Dec. 1993
Avail: CASI HC A01/MF A03

The increased use of automation in the cockpits of commercial planes has dramatically decreased the workload requirements of pilots, enabling them to function more efficiently and with a higher degree of safety. Unfortunately, advances in technology have led to an unexpected problem: the decreased demands on pilots have increased the probability of inducing 'hazardous states of awareness.' A hazardous state of awareness is defined as a decreased level of alertness or arousal which makes an individual less capable of reacting to unique or emergency types of situations. These states tend to be induced when an individual is not actively processing information. Under such conditions a person is likely to let his/her mind wander, either to internal states or to irrelevant external conditions. As a result, they are less capable of reacting quickly to emergency situations. Since emergencies are relatively rare, and since the high automated cockpit requires progressively decreasing levels of engagement, the probability of being seduced into a lowered state of awareness is increasing. This further decreases the readiness of the pilot to react to unique circumstances such as system failures. The HEM Lab at NASA-Langley Research Center has been studying how these states of awareness are induced and what the physiological correlates of these different states are. Specifically, they have been interested in studying electroencephalographic (EEG) measures of different states of alertness to determine if such states can be identified and, hopefully, avoided. The project worked on this summer involved analyzing the EEG and the event related potentials (ERP) data collected while subjects performed under two conditions. Each condition required subjects to perform a relatively boring vigilance task. The purpose of using these tasks was to induce a decreased state of awareness while still requiring the subject to process information. Each task involved identifying an infrequently presented target stimulus. In addition to the task requirements, irrelevant tones were presented in the background. Research has shown that even though these stimuli are not attended, ERP's to them can still be elicited. The amplitude of the ERP waves has been shown to change as a function of a person's level of alertness. ERP's were also collected and analyzed for the target stimuli for each task. Brain maps were produced based on the ERP voltages for the different stimuli. In addition to the ERP's, a quantitative EEG (QEEG) was performed on the data using a fast Fourier technique to produce a power spectral analysis of the EEG. This analysis was conducted on the continuous EEG while the subjects were performing the tasks. Finally, a QEEG was performed on periods during the task when subjects indicated that they were in an altered state of awareness. During the tasks, subjects were asked to indicate by pressing a button when they realized their level of task awareness had changed. EEG epochs were collected for times just before and just after subjects made this reponse. The purpose of this final analysis was to determine whether or not subjective indices of level of awareness could be correlated with different patterns of EEG. Derived from text

N94-28754# Naval Aerospace Medical Research Lab., Pensacola, FL.
AN EVALUATION OF PERSONALITY TESTING AND THE FIVE-FACTOR MODEL IN THE SELECTION OF LANDING CRAFT AIR CUSHION VEHICLE CREW MEMBERS
D. R. STREET, JR., K. T. HELTON, and T. NONTASAK 30 Jul. 1993 21 p
(AD-A275869; NAMRL-1385) Avail: CASI HC A03/MF A01

The purpose of our investigation was to determine if personality testing and a five-factor model could improve the selection of Landing Craft Air Cushion (LCAC) vehicle crew members. Vehicle crew members for the LCAC are currently selected on the basis of their performance on a computer-based psychomotor selection system. The various psychomotor tests in the selection system have demonstrated predictive validity in LCAC crew training. Certain personality characteristics may also be involved in the LCAC vehicle crew training success. In fact, various researchers have found that personality testing may improve the selection of Navy/Marine Corps aviators. There is increasing evidence that a five-factor model may be useful in describing the personality characteristics involved in training success. We believe that a five-factor model may improve the selection system used for LCAC vehicle crew members. A principal component analysis with varimax rotation was conducted to determine the underlying structure of the Adult Personality Inventory (API) with 168 LCAC crew candidates. The resulting factor scores were then analyzed using advanced statistical techniques to determine the relation of the personality factor scores and the performance-based test to an underway grade in training criterion. The results indicated that one personality factor, openness, significantly improved predictions of the criterion (p less than 0.05). Based on these results, we believe that personality testing would improve the selection of LCAC vehicle crew members. DTIC

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

N94-26339# Naval Air Warfare Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.
A CRITICAL ANALYSIS OF WORKLOAD PREDICTIONS GENERATED BY MULTIPLE RESOURCE THEORY DURING EARLY CREWSTATION DESIGN Final Report
DAVID COHEN, ROBERT J. WHERRY, JR., and FLOYD GLENN 1 Jun. 1993 35 p
(AD-A274804; NAWCADWAR-TN-93043-60) Avail: CASI HC A03/MF A01

Subjective workload ratings based on multiple resource theory were independently collected from two highly experienced pilots for 225 different tasks of an anticipated mission for a future advanced strike aircraft. Factor analysis of their responses suggest that while such ratings could have little actual validity in and even high inter-rater reliabilities, the ratings have high face validity and even high inter-rater reliabilities, the ratings could have little actual validity in terms of efforts required to utilize the seven postulated resource channels (visual or auditory input, spatial, verbal, or analytical cognition, and manual or speech output). Ratings of efforts required for various postulated cognitive resource channels were particularly suspect. Four independent factors were identified for each pilot which accounted for virtually all of the intercorrelations among the seven resource channels. Three factors (visual-spatial, verbal communications, and manual and speech output) were identical for both pilots and accounted for most of their explainable variance. DTIC

N94-26555# Pacific Northwest Lab., Richland, WA.
EMERGING HUMAN-COMPUTER INTERFACE (HCI) DESIGN GUIDELINES FOR GRAPHICAL USER INTERFACE (GUI)
S. E. BOWSER and S. M. ADAMS Oct. 1993 8 p Presented at the Human Factors and Ergonomics Society Meeting, Seattle, WA, 11-15 Oct. 1993

(Contract DE-AC06-76RL-01830)
(DE94-004293; PNL-SA-22009; CONF-9310100-7) Avail: CASI HC A02/MF A01

The requirement to establish baseline style references for Graphical User Interfaces (GUI's) is recognized. The ability to obtain consensus among user communities was limited to nonexistent. The authors are part of a team that developed a generic baseline human-computer interface (HCI) style guide for the U.S. Department of Defense (DoD). The DoD HCI Style Guide has its origin in a style guide developed by the intelligence community and in human factors design guidelines developed for Army tactical command and control systems. The DoD HCI Style Guide is intended to be a baseline style reference for the design of HCI's within DoD. The needs of specific user communities were addressed by including addenda that expand on the baseline and address focus areas of interest. The conclusion is that an overall or general style guide should be adopted for GUI's with allowance for specialized user group requirements and additions. The anticipated results would be higher productivity and reduced training and development time. DOE

N94-26788*# Boeing Defense and Space Group, Huntsville, AL.
SPACE STATION EVOLUTION STUDY OXYGEN LOOP CLOSURE Final Report
M. G. WOOD and D. DELONG 17 Nov. 1993 40 p
(Contract NAS8-38783)
(NASA-CR-193938; NAS 1.26:193938) Avail: CASI HC A03/MF A01

In the current Space Station Freedom (SSF) Permanently Manned Configuration (PMC), physical scars for closing the oxygen loop by the addition of oxygen generation and carbon dioxide reduction hardware are not included. During station restructuring, the capability for oxygen loop closure was deferred to the B-modules. As such, the ability to close the oxygen loop in the U.S. Laboratory module (LAB A) and the Habitation A module (HAB A) is contingent on the presence of the B modules. To base oxygen loop closure of SSF on the funding of the B-modules may not be desirable. Therefore, this study was requested to evaluate the necessary hooks and scars in the A-modules to facilitate closure of the oxygen loop at or subsequent to PMC. The study defines the scars for oxygen loop closure with impacts to cost, weight and volume and assesses the effects of byproduct venting. In addition, the recommended scenarios for closure with regard to topology and packaging are presented. Author (revised)

N94-26964 National Academy of Sciences - National Research Council, Washington, DC. Committee on Human Factors.
WORKLOAD TRANSITION: IMPLICATIONS FOR INDIVIDUAL AND TEAM PERFORMANCE
BEVERLY M. HUEY and CHRISTOPHER D. WICKENS 1993 301 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A274538) Avail: Issuing Activity (Defense Technical Information Center (DTIC))

The work of this study was performed by a small group of experts from key areas in workload, training, vigilance, circadian rhythms and performance effects of sleep loss and fatigue, cognitive switching, situation awareness, and crew communication and coordination. DTIC

N94-26984# Kent State Univ., OH.
A MULTIVARIATE ANTHROPOMETRIC METHOD FOR CREW STATION DESIGN: ABRIDGED Interim Report, Jan. 1989 - Dec. 1992
GREGORY F. ZEHNER, RICHARD S. MEINDL, and JEFFREY A. HUDSON Apr. 1993 30 p
(Contract F33615-85-C-0541)
(AD-A274588; AL-TR-1992-0164) Avail: CASI HC A03/MF A01

Body size accommodation in USAF cockpits is still a significant problem despite all the years of experience and the many aircraft designs that have been developed. Adequate reach to controls, body clearances (particularly during escape) and vision (internal and external), are all functions of pilot body size and position in the cockpit. One of the roots of this problem is the way cockpit accommodation is specified and tested. For many years the percentile pilot has been used. This paper describes the errors inherent in the 'percentile man' approach, and presents a multivariate alternative for describing the body size variability existing in a given flying population. A number of body size representative cases are calculated which, when used properly in specifying, designing, and testing new aircraft, should ensure the desired level of accommodation. The approach can be adapted to provide anthropometric descriptions of body size variability for a great many designs or for computer models of the human body by altering the measurements of interest and/or selecting different data sets describing the anthropometry of a user population. DTIC

N94-27089# South Dakota Univ., Vermillion. Human Factors Lab.
CONTROL PANEL DIMENSIONS FOR GLOVED OPERATION STUDY 2: TOGGLE SWITCHES MINIMUM SPACING REQUIRED BETWEEN TOGGLE Final Report
MICHELLE MCCLEEREY, JAN BERKHOUT, GLEN ANDERSON, and MICHAEL GRANAAS Oct. 1993 102 p
(Contract DAAA15-90-C-1025; DA PROJ. 1L1-62716-AH-70)
(AD-A274518; ARL-CR-122) Avail: CASI HC A06/MF A02

This study was to confirm the military specification of toggle switch spacing for gloved operators. An examination of toggle switch operations with five different glove types was conducted: a butyl and cotton glove assembly, a butyl and nomex glove assembly, a leather and wool glove assembly, a fire-fighting glove, and a vinyl glove. Subjects were required to operate a sequence of four switches in a 3 by 3 array. Three switch spacings were investigated: 15 mm, 20 mm, and 25 mm. Half the subjects operated toggle switches located directly in front of them, and the other half operated switches located behind them, in a position where the switches could not be seen. Subjects were required to activate the toggle switches in specific sequences as quickly and as accurately as possible. The task was machine-paced, and the time allowed for operation of a sequence of switches became progressively shorter as the subject was able to continue correct operation. Each subject performed the task both gloved and bare-handed. DTIC

N94-27114# Department of the Navy, Washington, DC.
HELMET HEAD TRACKING MOUNTING DEVICE Patent Application
CHRISTINE HORVAT, inventor (to Navy), GARY F. BRADLEY, inventor (to Navy), and CARROLL L. RHODES, inventor (to Navy) 23 Feb. 1993 14 p
(AD-D016048; US-PATENT-APPL-SN-021388) Avail: CASI HC A03/MF A01

A unified, low-profile, lightweight, and strong component mounting system for an aircrew member's helmet is disclosed. The system includes a substantially rectangular mounting bracket that carries necessary power, communications, and optical inputs to the components, mounting hardware and specially designed interface pieces for each component. The system is designed to securely and easily snap-lock onto the helmet and is positioned to stay balanced while attached to eliminate crewmember discomfort. DTIC

N94-27155 National Defence Research Establishment, Stockholm (Sweden).
TASK DEMAND, WORKLOAD, AND PERFORMANCE
B. BERGSTROEM Jul. 1993 31 p
(PB94-123627; FOA-A-50016-5.2) Avail: Issuing Activity (National Technical Information Service (NTIS))

The measurement of mental workload has become increasingly important as systems have become more complex and sophisticated. In this report workload and related concepts are discussed. Three dimensions of workload are recognized: task demand, operator workload (OWL), and performance. In order to measure OWL, the concepts capacity, resource, and effort must

be defined and also related to a cognitive model of the brain. Four regions of workload operation are described: underload, resource dependent, maximum capacity, and overload. Satisfactory system function can only take place in the underload and resource dependent regions. It is finally concluded that to yield meaningful workload results the experimenter must control and measure task demand, OWL, and performance at the same time. NTIS

N94-27320# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Logistics and Acquisition Management.
AN INVESTIGATION OF INTEGRATED PRODUCT DEVELOPMENT IMPLEMENTATION ISSUES: A CASE STUDY OF BOSMA MACHINE AND TOOL CORP. M.S. Thesis
F. P. KHURI and HOWARD M. PLEVYAK, JR. Sep. 1993 108 p
(AD-A273917; AFIT/GSM/LAS/93S-11) Avail: CASI HC A06/MF A02

This thesis investigated integrated product development (IPD) implementation issues. Research emphasis focused on teams used in IPD, particularly self-directed work teams (SDWT's). The areas addressed in the study were: work environment, team organization, training and education, group dynamics and communication, motivation, rewards and incentives, measurements, and contracts. Data was collected using interviews and presented as a case study. The most significant findings on work environment were that the organization's leadership should commit to the teaming idea and sell it to the organization's members. Teams should be organized by choosing members carefully and defining all roles. Personnel should be trained in technical skills and human relations. Group interaction should be ensured by establishing open communication in a non-attribution setting. The greatest motivator of personnel is pride of ownership. A measurement baseline should be established at the outset against which productivity, efficiency, and morale may be measured. Finally, team members should be allowed to provide inputs to any contract which involves them.
Author (revised)

N94-27374*# Brubaker Group, Los Angeles, CA.
A WIDELY ADAPTABLE HABITAT CONSTRUCTION SYSTEM UTILIZING SPACE RESOURCES
HARRY B. WYKES *In* NASA. Lewis Research Center, Vision 21: Interdisciplinary Science and Engineering in the Era of Cyberspace p 231-240 Dec. 1993
Avail: CASI HC A02/MF A03

This study suggests that the cost of providing accommodations for various manned activities in space may be reduced by the extensive use of resources that are commonly found throughout the solar system. Several concepts are proposed for converting these resources into simple products with many uses. Concrete is already being considered as a possible moonbase material. Manufacturing equipment should be as small and simple as possible, which leads to the idea of molding it into miniature modules that can be produced and assembled in large numbers to create any conceivable shape. Automated equipment could build up complex structures by laying down layer after layer in a process resembling stereolithography. These tiny concrete blocks handle compression loads and provide a barrier to harmful radiation. They are joined by a web of tension members that could be made of wire or fiber-reinforced plastic. The finished structure becomes air-tight with the addition of a flexible liner. Wire can be made from the iron modules found in lunar soil. In addition to its structural role, a relatively simple apparatus can bend and weld it into countless products like chairs and shelving that would otherwise need to be supplied from Earth. Wire woven into a loose blanket could be an effective micrometeoroid shield, tiny wire compression beams could be assembled into larger beams which in turn form larger beams to create very large space-frame structures. A technology developed with lunar materials could be applied to the moons of Mars or the asteroids. To illustrate its usefulness several designs for free-flying habitats are presented. They begin with a minimal self-contained living unit called the Cubicle. It may be multiplied into clusters called Condos. These are shown in a rotating tether configuration that provides a substitute for gravity. The miniature block proposal is compared with an alternate design based on larger triangular components and a tetrahedral geometry. The overall concept may be expanded to envision city-sized self-sufficient environments where humans could confortably live their entire lives. One such proposal is the Hive. It is configured around a unique sunlight collection system that could provide all its energy needs and that could be scaled up to compensate for the reduced solar intensity at greater distances from the sun. Its outer perimeter consists of a cylindrical section mated to two conical end walls that taper inwards toward a small aperture at the center of rotation. Light collected by two huge mirrors of unusual design enters the aperture and is redirected to the inside of the cylinder. The conical end walls are shielded from direct sunlight and are designed to radiate heat into space. They are lined with air ducts that passively recirculate the atmosphere while extracting moisture by condensation. Although there is no immediate demand for spacecraft on this scale, their consideration can influence even the earliest stages of the development process. Author

N94-27376*# Carnegie-Mellon Univ., Pittsburgh, PA. Robotics Inst.
PIGS IN CYBERSPACE
HANS MORAVEC *In* NASA. Lewis Research Center, Vision 21: Interdisciplinary Science and Engineering in the Era of Cyberspace p 259-264 Dec. 1993
Avail: CASI HC A02/MF A03

Exploration and colonization of the universe awaits, but Earth-adapted biological humans are ill-equipped to respond to the challenge. Machines have gone farther and seen more, limited though they presently are by insect-like behavior inflexibility. As they become smarter over the coming decades, space will be theirs. Organizations of robots of ever increasing intelligence and sensory and motor ability will expand and transform what they occupy, working with matter, space and time. As they grow, a smaller and smaller fraction of their territory will be undeveloped frontier. Competitive success will depend more and more on using already available matter and space in ever more refined and useful forms. The process, analogous to the miniaturization that makes today's computers a trillion times more powerful than the mechanical calculators of the past, will gradually transform all activity from grossly physical homesteading of raw nature, to minimum-energy quantum transactions of computation. The final frontier will be urbanized, ultimately into an arena where every bit of activity is a meaningful computation: the inhabited portion of the universe will be transformed into a cyberspace. Because it will use resources more efficiently, a mature cyberspace of the distant future will be effectively much bigger than the present physical universe. While only an infinitesimal fraction of existing matter and space is doing interesting work, in a well developed cyberspace every bit will be part of a relevant computation or storing a useful datum. Over time, more compact and faster ways of using space and matter will be invented, and used to restructure the cyberspace, effectively increasing the amount of computational spacetime per unit of physical spacetime. Computational speed-ups will affect the subjective experience of entities in the cyberspace in a paradoxical way. At first glimpse, there is no subjective effect, because everything, inside and outside the individual, speeds up equally. But, more subtly, speed-up produces an expansion of the cyber universe, because, as thought accelerates, more subjective time passes during the fixed (probably lightspeed) physical transit time of a message between a given pair of locations - so those fixed locations seem to grow farther apart. Also, as information storage is made continually more efficient through both denser utilization of matter and more efficient encodings, there will be increasingly more cyber-stuff between any two points. The effect may somewhat resemble the continuous-creation process in the old steady-state theory of the physical universe of Hoyle, Bondi and Gold, where hydrogen atoms appear just fast enough throughout the expanding cosmos to maintain a constant density.
Author

N94-27410*# Texas Univ., Dallas. Southwestern Medical Center.
SPACELAB LIFE SCIENCES 2 POST MISSION REPORT Final Report, 16 Jan. - 30 Nov. 1993
JAY C. BUCKEY 14 Jan. 1994 10 p
(Contract NAS9-18736)
(NASA-CR-195544; NAS 1.26:195544; REPT-1) Avail: CASI HC A02/MF A01

Jay C. Buckey, M.D., Assistant Professor of Medicine at The University of Texas Southwestern Medical Center at Dallas served as an alternate payload specialist astronaut for the Spacelab Life Sciences 2 Space Shuttle Mission from January 1992 through December 1993. This report summarizes his opinions on the mission and offers suggestions in the areas of selection, training, simulations, baseline data collection and mission operations. The report recognizes the contributions of the commander, payload commander and mission management team to the success of the mission. Dr. Buckey's main accomplishments during the mission are listed. Author

N94-27437*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
DESIGNING FOR HUMAN PRESENCE IN SPACE: AN INTRODUCTION TO ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS
PAUL WIELAND Jan. 1994 355 p Sponsored by NASA, Washington
(NASA-RP-1324; M-735; NAS 1.61:1324) Avail: CASI HC A15/MF A03

Human exploration and utilization of space requires habitats to provide appropriate conditions for working and living. These conditions are provided by environmental control and life support systems (ECLSS) that ensure appropriate atmosphere composition, pressure, and temperature; manage and distribute water, process waste matter, provide fire detection and suppression; and other functions as necessary. The functions that are performed by ECLSS are described and basic information necessary to design an ECLSS is provided. Technical and programmatic aspects of designing and developing ECLSS for space habitats are described including descriptions of technologies, analysis methods, test requirements, program organization, documentation requirements, and the requirements imposed by medical, mission, safety, and system needs. The design and development process is described from initial trade studies through system-level analyses to support operation. ECLSS needs for future space habitats are also described. Extensive listings of references and related works provide sources for more detailed information on each aspect of ECLSS design and development. Author

N94-27446# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
STUDY ON POSTURE CONTROL AND ADAPTION MECHANISM UNDER WEIGHTLESSNESS: RESULTS OF SECOND REHEARSAL FOR SPACE EXPERIMENT USING CARP Progress Report No. 45 [MUJURYOKU KANKYO KA NO UNDO SEIGYO TO SONO JUNNO NI KANSURU KENKYU: KOI NO UCHU JIKKEN, DAINIKAI RIHASARU SEIKA HOKOKU]
SHIGEO MORI, SADAHARU TAKAGI, SATORU WATANABE, AKIRA TAKABAYASHI (Fujita Health Univ., Toyohashi, Japan.), and SHIRO USUI *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 18-21 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

The 2nd rehearsal of the space experiment on posture control and adaption mechanism under weightless condition using carp was performed in April to May 1992, in order to simulate and practice the ground operation of the experiment. This rehearsal included transportation and breeding of carp in the pool of Kennedy Space Center (KSC) and examination of conductivity of implanted electrodes for brain wave. As a result, many carp died from encephalic infection after implantation of the electrode in KSC, especially in carp that had undergone statolithis extirpation in Japan. For this reason, several countermeasures were proposed, such as improvement of statolithis extirpation, prompt transportation system, suitable breeding procedure in KSC, selection of adaptable carp to a experimental unit, preparation for carp implantation, and supply system of carp. Above all, sufficient duration seems to be important for carp to recover from stress of operation or transportation. Therefore, a time table was prepared on the basis of these findings. Author (NASDA)

N94-27447# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
STUDY ON POSTURE CONTROL AND ADAPTATION MECHANISM UNDER WEIGHTLESSNESS: SUMMARY REPORT OF GROUND OPERATIONS PERFORMED FOR CARP EXPERIMENT (FMPT/L-2) IN SPACE SHUTTLE MISSION Report No. 46 [MUJURYOKU KANKYO KA NO UNDO SEIGYO TO SONO JUNNO NI KANSURU KENKYU: SUPESUSHATORU RIYO NI YORU KOI NO UCHU JIKKEN (FMPT/L-2) JISSHI KEIKA HOKOKU]
SHIGEO MORI, SADAHARU TAKAGI, SATORU WATANABE, AKIRA TAKABAYASHI (Fujita Health Univ., Toyohashi, Japan.), SHIRO USUI (Toyohashi Univ. of Technology, Aichi, Japan.), and GENYO MITARAI (Chukyo Univ., Toyota, Japan.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 22-26 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

An experiment on posture control and adaptation mechanism under weightless condition using carp was performed in Space Shuttle, Endeavor, in aviation of September 12-20, 1992 (FMPT (First Material Processing Test)/L-2). Although unexpected troubles occurred in ground operation, preparation could be completed thanks to the support system organized for this mission and the time schedule based on the results of two rehearsals that suggested importance of time margin for rest and adaption of carp. During aviation, there were several accidents such as entanglement of cables, but the experiment was completed and brain wave of carp could be recorded. The post-aviation test was also performed on the carp used in the space experiment that seemed healthy when returned from space travel, but at the end of all these experiments, the carp were demonstrated to be anoxia from analysis of water in the tank. As the data recorded during aviation were not obtained at this time, this report describes mainly preparation and process of experiment performed in the Space Shuttle and post-aviation. Author (NASDA)

N94-27448# Fujita Health Univ., Toyohashi (Japan). School of Hygiene.
STUDY ON POSTURE CONTROL AND ADAPTION MECHANISM UNDER WEIGHTLESSNESS: DIFFERENCES IN WEIGHT AND SHAPE OF UTRICULAR OTOLITH OF CARP Report No. 47 [MUJURYOKU KANKYO KA NO UNDO SEIGYO TO SONO JUNNO NI KANSURU KENKYU: KOI NO RANKEINO JISEKI NO JURYO TO KEITAI NI OKERU SA NI TSUITE]
AKIRA TAKABAYASHI, SADAHARU TAKAGI (Nagoya Univ., Japan.), SHIGEO MORI (Nagoya Univ., Japan.), and SATORU WATANABE (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 27-29 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

The Space Adaptation Syndrome (SAS) is one functional abnormality in a weightless state which leads to autonomic disorder. The cause of SAS is considered to be disorder of sensory coordination. Not only human beings but also other animals show abnormal behavior in a weightless state. Both of them can control movement and posture by three senses; i.e. sight, vestibule and somatesthesia. Among these senses, vestibule seems to be most affected under weightless condition, especially by disappearance of stimulation of statoliths. Therefore, it can be considered that SAS may result from sensory disorder by unbalance between the right and left vestibule senses. To review this possibility, right and left statolithses extirpated from carp in preparation of the Space Shuttle experiment were compared in respect to the shape and weight. As a result, right and left statoliths was similar in shape

and weight, so that sensory disorder might not be caused by the difference between the weight of right and left statoliths.
Author (NASDA)

N94-27455# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
FREQUENCY ANALYSIS OF BODY SWAY INDUCED BY OPTOKINETIC STIMULATION [SHIUNDO SHIGEKI YUHATSUSEI SHINTAI DOYO NO SHUHASU KAISEKI]
MASUMI ICHIKAWA, HIROYASU JIJIWA (Institute for Developmental Research, Kasugai, Japan.), TAKAKO KAWAGUCHI, and SATORU WATANABE *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 55-58 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

It is known that optokinetic stimulation of extensive field causes body sway and inclination, probably because regulatory system works for the change of posture. In this study, body sway caused by optokinetic stimulation and inclining board was examined using frequency analysis. For optokinetic stimulation, random dot patterns was projected on the screen, moving downwards, and the body sway was recorded as the displacement of the center of the gravity. The locus of longitudal sway was analyzed by frequency analysis. As a result, power spectrum during the optokinetic stimulation was increased in the frequency from 0.2 to 0.7 Hz, while power spectrum variation was not varied markedly in this range by intentional inclining on the tilt board. Because previous studies revealed that the displacement of center of gravity was increased in the frequency of less than 0.1 Hz when eyes closed, the increase of frequency in 0.2 to 0.7 Hz may reflect the direct intervention of sight into the regulation of orthostatic position. In addition, it was suggested that the increase of power spectrum in the frequency of 3 to 4 Hz was in response to the posture regulation mainly caused by stretch reflex of the crural muscles. Author (NASDA)

N94-27456# Nagoya City Univ. (Japan). Dept. of Othorhinolaryngology.
EFFECTS OF IMAGINARY TARGET ON INDUCED EYE MOVEMENTS BY LINEAR ACCELERATION [CHOKUSEN KASOKUDO NI YORI YUHATSU SARERU GANKYU UNDO NI TAISURU KASO KOSHITEN NO EIKYO]
MOTOYUKI HASHIBA, HIROTAKA WATABE, TORU MATSUOKA, SHUNKICHI BABA, SATORU WATANABE (Nagoya Univ., Japan.), YOSHIRO WADA (Nagoya Univ., Japan.), HIROYUKI SUZUKI (Nagoya Univ., Japan.), CHIHARU SEKIGUCHI (National Space Development Agency, Tokyo, Japan.), SEI YUMIKURA (National Space Development Agency, Tokyo, Japan.), and K. HOFSTETTER-DEGEN (Mainz Univ., Germany.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 59-63 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

Under microgravity, the gravity does not effect on the vestibular organ, especially on vestibulo-ocular reflex that senses the change of acceleration, which could be a dominant cause of space sickness. In vestibulo-ocular reflex system, the vertical acceleration (Y-axis) can elicit eye movement most effectively, while head position also plays an important role; i.e. prone position induces eye movement more than supine position. This can be explained by the effect of gazing at an imaginary target, because it has been reported that an imaginary target near to the head increased the reflex. In this report, the effect of imaginary fixed targets on vestibulo-ocular reflex was examined using a linear accelerator. Subjects imagined either body fixed target or space fixed target in prone position or supine position. The results revealed that imaginary target had remarkable effect on vestibulo-ocular reflex system. Especially, space fixed targets increased the reflex largely, probably because of non-visual smooth eye movement by senses other than sight, that is, acceleration or sound by the accelerator. Therefore, the body fixed target seems more appropriate to evaluate vestibulo-ocular reflex. Author (NASDA)

N94-27461# Osaka Prefecture Univ., Sakai (Japan). Coll. of Integrated Arts and Sciences.
THE EFFECT OF BODY ORIENTATION ON THE PERCEPTION OF VERTICAL AND HORIZONTAL DISTANCE IN AN OUTDOOR SETTING [HIKENSHA NO SHISEI TO YAGAI NI OKERU SUICHOKU-SUIHEI KYORI NO CHIKAKU]
ATSUKI HIGASHIYAMA and KAZUO KOGA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 84-87 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

It is known that vertical distance appears longer than horizontal distance although they are the same length. The purpose of this study was to examine whether this effect depends on a subject's postures. 28 subjects were classified into upright-position group and lie-down position group, and three-story white building was used as a vertical scale. Subjects were told to move where they thought the distance from the building to the subject (horizontal distance) matched that from a mark on the side of the building to the ground (vertical distance). As a result, the longer the actual distance was, the longer the visual vertical distance appeared. Generally, vertical distance appeared longer in upright-position, whereas difference between visual vertical and horizontal distance was not observed in lie-down position as far as the actual distance was less than 6 m, and, even in the case that the actual distance is longer than 6 m, the differences between visual vertical and horizontal distance was not so much as those of upright-position. The most important finding was that the posture of subjects affected only the sense of vertical distance, rather than that of horizontal distance. Author (NASDA)

N94-27462# Kanazawa Univ. (Japan). Dept. of Psychology.
EYE-HEAD COORDINATION AND SWINGING OF THE VISUAL SCENE WHEN WEARING VISUALLY UP-DOWN REVERSING MIRROR FOR 14 DAYS [JOGEHANTENKYO CHAKUYOCHU NO GANKYU-TOBU UNDO TO SHIYA NO DOYO]
HIROKAZU YOSHIMURA and KAZUO KOGA (Nagoya Univ., Japan.) *In* Nagoya Univ., Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 88-92 25 Mar. 1993 In JAPANESE
(Contract NOE-03551003)
Avail: CASI HC A01/MF A04

In this study, one subject wore a visually up-down reversing mirror for 14 days and recorded the subjective impression. During the period, eye-head movement and swinging of the visual scene were measured every three days. For eye-head movement, eye position and head position were recorded while the subject shook the head every one second. This experiment was performed in a dark room under the following two conditions: one is not to intend to fix the head or eyes in a particular position, the other is to intend to fix eyes at an imaginary point. As a result, on the second day, the eye movement traced in a reverse phase with the head movement, probably due to compensating the head movement, in both conditions. However, this tendency became decreased, and spikes of saccade began to be observed in the trace of eye movement. On the 15th day, the decrease of amplitude was obvious even in a trace under the condition of no intention, and, in condition of intention to fixate an imaginary point, the eye movement that showed saccade instead of pursuit movement coordinated with the phase of the head movement. For the swinging of the scene, critical fusion frequency of on-and-off light was measured under head-fixed condition and head-movement condition that shook the head every one second. As a result, the critical frequency did not change remarkably under the head-fixed condition, whereas it was increased once, then, after the 12th day, decreased under the head-movement condition. Author (NASDA)

N94-27463# Nagoya Univ. (Japan). Research Inst. of Environmental Medicine.
COMPARATIVE MEASUREMENT OF VISUAL STABILITY IN COSMIC SPACE: ONBOARD EXPERIMENT AND PRE-FLIGHT ACTIVITIES Quick Report [UCHU KUKAN NI OKERU SHIKAKU ANTEISEI NO KENKYU: JIKKEN UNYO TO UNYO NI ITARU SHOKATEI]
KAZUO KOGA, TADAAKI MANO, MITSURO KIDA, YOSHIHIRO OTA, KEIICHIRO TSUJI, TAKUO GOTO, and RYOJI OSAKA (Aichigakuin Univ., Nisshin, Japan.) *In its* Annals of the Research Inst. of Environmental Medicine, Nagoya Univ., Volume 44 p 93-96 25 Mar. 1993 In JAPANESE
Avail: CASI HC A01/MF A04

It is expected that visual recognition and coordination of eye-hand or eye-head movement would be somewhat different in cosmic space. To examine the human behavior in space, a study was planned and operated as a part of the First Material Processing Test (FMPT) in the Space Shuttle Endeavor. In this study, saccadic eye movement and anti-gravity muscle activity of a Payload Specialist (PS) was recorded. This article reports the process and operation of this experiment. For the mission operation, staff training was started in 1991, in order to master general operation of the control facilities, technical terms used in flight control, and the downlink display, etc. In 1992, several simulation training were performed using the facilities of NASA. During the flight, three experiments were scheduled to operate, with support of downlink image data. Communication with PS was also capable; however, the number of circuit was limited so that it was permitted only when necessary. The experiment was completed almost as scheduled, although several changes were added.
Author (NASDA)

N94-27683 Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Human Factors Div.
ONE FROM MANY: SELECTING AN APPROPRIATE HUMAN PERFORMANCE MODEL
MARY MARGARET SCHUCK 1993 8 p
(DCIEM-93-25; DSIS-94-00071; CTN-94-61117) Avail: CASI HC A02/MF A01

A wide variety of approaches exist for representing human behavior within an overall model of system performance. In modelling human performance, a model must be selected which not only answers the human performance problem identified, but which is also compatible with the overall system model. Blanchard and Fabrycky have suggested a six-step framework for selecting models for systems engineering studies. The first four steps of this framework are critical, and modifications are suggested to make them appropriate for models of human performance which are incorporated into an overall systems model. These steps are problem definition, identification of alternatives, selection of evaluation criteria, and application of modelling techniques. It is proposed to classify models according to their complexity, flexibility and generality, and to whether they have been validated successfully. This classification relies on a tradeoff between complexity and the model's ability to be generalized into any system. This classification system, and the other modifications proposed, allow designers of human performance models to apply an existing engineering framework to the unique problems inherent in selecting human performance models. Author (CISTI)

N94-27934*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LUNAR BASE HABITAT DESIGNS: CHARACTERIZING THE ENVIRONMENT, AND SELECTING HABITAT DESIGNS FOR FUTURE TRADE-OFFS
GANI B. GANAPATHI, JOSEPH FERRALL, and P. K. SESHAN May 1993 78 p
(Contract NAS7-918; RTOP 506-49-21-00)
(NASA-CR-195687; JPL-PUBL-93-20; NAS 1.26:195687) Avail: CASI HC A05/MF A01

A survey of distinct conceptual lunar habitat designs covering the pre- and post-Apollo era is presented. The impact of the significant lunar environmental challenges such as temperature, atmosphere, radiation, soil properties, meteorites, and seismic activity on the habitat design parameters are outlined. Over twenty habitat designs were identified and classified according to mission type, crew size; total duration of stay, modularity, environmental protection measures, and emplacement. Simple selection criteria of (1) post-Apollo design, (2) uniqueness of the habitat design, (3) level of thoroughness in design layout, (4) habitat dimensions are provided, and (5) materials of construction for the habitat shell are specified, are used to select five habitats for future trade studies. Habitat emplacement scenarios are created to examine the possible impact of emplacement of the habitat in different locations, such as lunar poles vs. equatorial, above ground vs. below ground, etc. Author (revised)

N94-27943# Japanese Air Self-Defense Force, Tokyo. Aeromedical Lab.
COMPARISON OF PERFORMANCE IN SIMULATOR FLIGHT AMONG SUBJECTS WITH DIFFERENT SIMULATOR EXPERIENCES [FURAITO SHIMYURETA SOJU NI OKERU MIKEIKENSHA TO KEIKENSHA NO SOI NI TSUITE]
MIYAKO OKAUE, ATSUSHI KADOO, SYUJI NISHI, KYOUICHI NAGATSUKA, and ZOUJIROU KATOH *In its* The Reports of Aeromedical Laboratory, Volume 33, Number 4 p 87-101 1 Dec. 1992 In JAPANESE
Avail: CASI HC A03/MF A01

A comparison of flight simulator control was made among three subject groups: Japan Air Self Defence Force (JASDF) personnel in their 20's, who had not applied to become pilots and are currently engaged in non-flight duties (Group 1); flight students (in their 20's) with only 4 hours of flight experience (Group 2); and non-pilots ranging in age from 28 to 48 (mean age, 38) (Group 3). The data-gathering flight patterns included seven segments. Each segment began from straight and level flight, proceeded to the aircraft maneuver in question, and ended in straight and level flight. The aircraft maneuvers were as follows: straight climb and descend for segment 1; right and left level turn for segment 2; left climbing turn for segment 3; right climbing turn for segment 4; left descending turn for Segment 5; right descending turn for Segment 6; and landing for Segment 7. As was expected, Group 3 performed the best overall. Author (NASDA)

N94-27952*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
EXTRA-VEHICULAR ACTIVITY (EVA) GLOVE EVALUATION TEST PROTOCOL
E. M. HINMAN-SWEENEY Mar. 1994 153 p
(NASA-TM-108442; NAS 1.15:108442) Avail: CASI HC A08/MF A02

One of the most critical components of a space suit is the gloves, yet gloves have traditionally presented significant design challenges. With continued efforts at glove development, a method for evaluating glove performance is needed. This paper presents a pressure-glove evaluation protocol. A description of this evaluation protocol, and its development is provided. The protocol allows comparison of one glove design to another, or any one design to bare-handed performance. Gloves for higher pressure suits may be evaluated at current and future design pressures to drive out differences in performance due to pressure effects. Using this protocol, gloves may be evaluated during design to drive out design problems and determine areas for improvement, or fully mature designs may be evaluated with respect to mission requirements. Several different test configurations are presented to handle these cases. This protocol was run on a prototype glove. The prototype was evaluated at two operating pressures and in the unpressurized state, with results compared to bare-handed performance. Results and analysis from this test series are provided, as is a description of the configuration used for this test. Author (revised)

N94-28406# Technical Research Centre of Finland, Tampere. Regional Inst. of Occupational Health.
SIMULATION OF THE EFFECT OF WIND ON CLOTHING BY MEASUREMENTS AND CALCULATIONS

HANNU ANTTONEN, ESA HILTUNEN, and RALF OESTERLUND 1993 49 p
(ISSN 1235-0621)
(PB94-132289; VTT/PUB-133; ISBN-951-38-4251-7) Copyright Avail: CASI HC A03/MF A01

The conventional measuring methods of thermal resistance R(ct) and water vapor resistance R(et), do not give enough information about the function of winter clothing in different conditions. In the study, two self-constructed cylinders were used, with diameters of 300 and 200 mm, both 500 mm in height. The cylinder was placed in a wind-tunnel in the climatic chamber where ambient temperature (-15 to +5 C) and wind velocity (1 to 8 m/s) were adjustable. Skin temperature and sweating level of the cylinder were controlled by a computer. The development of measuring method, the theory, and the clothing models are under progress, but *is is obvious that cylinder measurements are* suitable especially in windy conditions. NTIS

N94-28422# Norwegian Transarctic Expedition, His.
EVALUATION OF LIFE SUPPORT EQUIPMENT DURING AN UNSUPPORTED NORTH POLE EXPEDITION
W. GAUTVIK, J. O. OWE (Institute of Aviation Medicine, Oslo, Norway.), and T. A. OFTEDAL (Norwegian Defence Research Establishment, Kjeller.) *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 6 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

This paper presents practical experience with the following life support equipment used during an unsupported North Pole expedition in 1992: clothing, sleeping bag with vapor barrier inner liner, a high efficiency cooking gear for melting water, and freeze dried food with 70 percent of the energy from fat.
Derived from text

N94-28430# Guelph Univ. (Ontario). School of Engineering.
THE POTENTIAL OF NEW TEXTILES IN IMPROVING SURVIVAL PROSPECTS
K. SLATER *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 13 p Oct. 1993
Copyright Avail: CASI HC A03/MF A03

The paper surveys briefly the role of textile materials in enhancing comfort and survival prospects, in both cold and hot climates, identifying the fiber, fabric and textile construction factors of critical importance. An examination of the interaction between these factors, showing how they enhance or interfere with one another, is also carried out in outline. Selected new textile fibers and fabric construction or finishing techniques are then analyzed to determine how their novel characteristics can improve their cold- or hot-weather performance, with a prediction in each case of how the advantages derived from their incorporation may potentially be of use in improving aircrew or ground support staff clothing applications. Derived from text

N94-28431# META Research, Inc., Richmond (British Columbia).
FIRE-RESISTANT WATER VAPOUR PERMEABLE BUOYANT INSULATION
WENDELL UGLENE and BRIAN FARNWORTH *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993 Sponsored by Mustang Survival and British Columbia Research Council
Copyright Avail: CASI HC A02/MF A03

Compared to closed cell foam, constant wear garments designed with this material provide added comfort due to increased heat losses during sweating, shortened drying times after sweating, and added flexibility. Although introducing water vapor permeability causes a degradation to the material's cold water immersion protection, the integrity of its fire protection and buoyancy remains unaltered. Author

N94-28432# Gore (W. L.) and Associates, Inc., Elkton, MD.
DEVELOPMENT OF A NEW CHEMICAL WARFARE AGENT PROTECTIVE MATERIAL
S. NICHOLAS ALLEN, ROBERT J. BENDER, and TERRI L. KELLY *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

In 1976 W. L. Gore & Associates, Inc. invented GORE-TEX *fabric utilizing expanded polytetra-fluoroethylene* (ePTFE). This was the first truly waterproof and moisture vapor permeable fabric laminate. In 1980 the company began to develop products for military applications. Since that time, Gore has supplied GORE-TEX fabric for, and assisted in the development of, some of the military's most technically sophisticated apparel: the U. S. Army's Extended Cold Weather Clothing System (ECWCS), the U. S. Navy's Over Water Flight Suit (OWFS), and the U. S. Air Force's Security Police Jacket being but a few examples. All of these garments provide the user with increased levels of protection from harsh environments and have proved themselves to be very durable. GORE-TEX fabric laminate has consistently proven itself to be technically superior to any other material. This paper details the development by Gore of a new chemical warfare protective material based on proven ePTFE technology combined with a new highly activated polymer system (APS). Author

N94-28433# Alberta Univ., Edmonton. Dept. of Human Ecology.
THERMAL PROTECTIVE PERFORMANCE AND INSTRUMENTED MANNEQUIN EVALUATION OF MULTI-LAYER GARMENT SYSTEMS
E. M. CROWN, M. Y. ACKERMAN, J. D. DALE, and K. B. RIGAKIS *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993 Sponsored by Canadian Petroleum Association and Defence Research Establishment
Copyright Avail: CASI HC A02/MF A03

The purpose of this research was to evaluate the relative effectiveness of different clothing systems in their contribution to protection against exposure to high heat flux flash fires. All systems were exposed to controlled simulated flash fires (80 or 84 kW/sq m) on a thermally instrumented mannequin. The percentage of the mannequin surface reaching second and third degree burn criteria was recorded. In addition, the multiple layers of fabrics which were used together in each of the garment systems were tested according to a standard thermal protective performance (TPP) test. The protection provided by multiple layered garment systems was significantly greater than would be expected from the additive effects of the layers used singly. The outer layer of a garment system must be flame retardant, however; wearing a flammable garment over a flame retardant one clearly negates the benefits of the FR layer. While it cannot be concluded for certain that undergarments must also be flame retardant, results demonstrate that FR undergarments offer more protection than non-FR ones, especially when worn under the relatively light-weight fabrics which may be used for military flightsuits. Only in one experiment with garment systems comprising all-FR layers did small-scale TPP tests indicate the relative protection provided by the systems. The TPP test did not indicate the potential hazard of systems in which the outer layer is non-FR. Nor did it differentiate among the three different flight suit fabrics or demonstrate the relative protective performance of different underwear materials.
Author (revised)

N94-28435# German Air Force, Fuerstenfeldbruk (Germany). Inst. of Aviation Medicine.
EFFECTIVENESS OF PROTECTION CLOTHING FOR COLD WEATHER CONDITIONS AFTER EJECTION OVER SEA: A CASE REPORT
B. MAYR and M. KRAEMER *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993
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During a night formation mission including an approach without establishing a connection to the tanker aircraft a collision of both aircrafts, Typ PA 200 Tornado occurred. The four aircrew members performed an ejection. The site of the accident is located over

the baltic sea in the Skagerrak region. At the time of accident, the air temperature was noted with 6 C, the water temperature with 11 C, and the sea with waves of 4 to 4.5 m height with a frequency of 8 waves per minute. The time of rescue ranged from 1 hour 28 minutes to 2 hours 14 minutes. This document reports on clothing and personal equipment, on the clinical findings, and on statements of the crew members. The crew member who was recovered after 2 hours and 14 minutes did not survive. This accident shows that with the ordered clothing, a survival under these conditions is supported, yet with incomplete equipment, it must be reckoned with a fatal outcome. Further details are discussed. Derived from text

N94-28436# Shark Group of Companies, Morpeth (England).
ADVANCED INTEGRATED COLD PROTECTION FOR AIRCREW
E. BRAMHAM and M. J. TIPTON (Surrey Univ., Guildford, England.) *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

In this paper, the concept of an Advanced Integrated Survival System is introduced and discussed in relation to the Helicopter Crew Member and Passengers, although the principles are equally applicable to many other types of user and circumstances requiring specialized protective clothing. The fundamental principles behind the concept are firstly that the wearer should be given protection against all of the hazardous responses associated with immersion in cold water and secondly, that the individual components which make up the integrated survival system (ISS) must be compatible and complementary. They may also be interdependent. Derived from text

N94-28437# Surrey Univ., Guildford (England).
EMERGENCY UNDERWATER BREATHING AIDS FOR HELICOPTER PASSENGERS AND CREW
M. J. TIPTON (Institute of Naval Medicine, Alverstoke, England.), E. BRAMHAM (Shark Group of Companies, Morpeth, England.), and D. H. ELLIOTT *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993 Sponsored by Shell Research Ltd. and Esso Research Center
Copyright Avail: CASI HC A02/MF A03

In this paper, the rationale for the provision of some form of helicopter emergency underwater breathing aid (HEUBA) for helicopter passengers and crew is briefly discussed and the thoughts and work which resulted in the production of a new aid, 'Air Pocket', is reviewed. Derived from text

N94-28443# Aerospace Medical Research Labs., Brooks AFB, TX.
AEROMEDICAL SUPPORT FOR CASUALTIES IN EXTREMELY HOT CLIMATES
S. A. NUNNELEY and R. U. BISSON *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 7 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

Aeromedical support for operations in hot climates involves exposure to acute heat injury and chronic heat stress which are unfamiliar to many medical personnel in NATO nations. Preparation for deployment to a hot climate should include review of climatic data for the site, appropriate adjustment to supplies and equipment needed to handle predicted numbers of heat casualties, and education of all air base personnel regarding methods of preventing heat illness. Medical facilities at the remote site may include local buildings or air transportable units. Special care is required with respect to housekeeping and provision of safe food and water in hot climates. Casualties arriving from remote sites should be assumed to suffer from heat stress and dehydration; those with elevated temperatures or disturbed consciousness must be treated as heat stroke cases until proven otherwise. Oral rehydration mixtures should be used whenever possible, reserving intravenous fluids for severe cases. Plans for air evacuation of all patients should attempt to minimize heat stress during loading and allow for continued rehydration in flight. Author

N94-28444# Spanish Air Force, Talavera AFB.
WORK CONDITIONS ASSESSMENT IN PILOTS AND GROUND PERSONNEL UNDER HIGH WEATHER TEMPERATURES
J. L. GARCIAALCON and J. M. MORENOVAZQUEZ (Extremadura Univ., Badajoz, Spain.) *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 9 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

Humans and animals often exhibit a remarkable ability to adapt to harsh or rapidly changing environmental conditions. One obvious means of adaptation is to move to where the environmental stresses are less severe. The body also has a great physiological capacity for adaptation. There exists ample literature on adaptative mechanisms and processes. When a person becomes acclimatized, the hypothalamus and other body control organs and systems settle into cooperative equilibrium, with certain chemical or hormonal levels that are appropriate for that particular season. The present study, describes how simple dietary rules can prevent involuntary dehydration brought about by sweating. Author (revised)

N94-28445# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
THERMAL STRAIN GENERATED BY AN ENHANCED ANTI-G PROTECTION SYSTEM IN A HOT CLIMATE
P. J. SOWOOD and E. M. OCONNOR *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 13 p Oct. 1993
Copyright Avail: CASI HC A03/MF A03

A flight trial was conducted at RAF Akrotiri to assess the level of thermal strain associated with, and the G protection provided by, the prototype European Fighter Aircraft (EFA) interim aircrew equipment assembly (AEA) in a warm climate. Six subjects flew a standardized sortie four times in the RAF IAM Hawk aircraft: two while wearing the EFA AEA, and two wearing standard Hawk Summer AEA. The sortie profile included simulated air combat and four high G turns. Cockpit temperatures, rectal and skin temperatures, heart rate, and sweat rate were recorded. Subjective thermal comfort, fatigue, and G tolerance were also assessed. Skin temperatures at the chest, back, and upper thigh sites and mean skin temperatures were greater in flight, and sweat rate was increased when the EFA AEA was worn. However, rectal temperature and heart rate did not differ significantly when the EFA AEA was worn indicating that homeostasis was maintained by thermoregulatory mechanisms. Superior G protection was provided by the EFA AEA. Taken as 8 whole, these findings suggest that wearing the EFA AEA in a warm climate is associated with an increased but not unacceptable level of thermal stress while offering greater G protection. These results may not generalize to conditions where ambient temperatures are higher or where more insulative protective clothing is required. Author (revised)

N94-28446# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
IMPLICATIONS OF CLIMATIC EXTREMES IN AIRCREW NBC OPERATIONS
A. J. F. MACMILLAN *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 6 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

The NBC protective equipment and facilities in service with UK forces must be used when an appropriate threat exists irrespective of climate. Modifications to the individual assemblies, including provision of heated ventilating air to the aircrew respirator and additional insulation in cold conditions together with means to increase loss of body heat in hot climates and combined with changes to procedures and adaptation of concepts of use, can minimize the impedance to effective air operations which may occur from the additive effects of wearing NBC protective equipment in climatic extremes. Author (revised)

N94-28447# Army Research Inst. of Environmental Medicine, Natick, MA. Military Performance and Neuroscience Div.
THE ENVIRONMENTAL SYMPTOMS QUESTIONNAIRE: ASSESSING REACTIONS TO ENVIRONMENTAL EXTREMES IN MILITARY OPERATIONS
JOHN L. KOBRICK, JAMES B. SAMPSON (Army Natick Research and Development Command, MA.), and RICHARD F. JOHNSON *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 8 p Oct. 1993
Copyright Avail: CASI HC A02/MF A03

The environmental symptoms questionnaire (ESQ) was developed to aid in the standardized assessment of symptoms experienced by individuals exposed to environmental extremes. It was used initially to delineate the symptoms of acute mountain sickness, but has since evolved into a more comprehensive tool for assessing subjective reactions to ambient heat and cold, to diet, physical exercise, and medications. The ESQ has also been made more reliable and user friendly by revision, addition and removal of certain items, and by compression of the initial scale values. Factor analysis of responses has identified several meaningful symptom clusters, and has provided a useful technique for scoring those clusters under both laboratory and field conditions. Studies utilizing the ESQ under various environmental extremes are summarized and reviewed. Current administration and scoring methods are presented. Author (revised)

N94-28451# Exotemp Systems, Inc., Stittsville (Ontario).
RECENT CANADIAN ADVANCES IN ACTIVE THERMAL PROTECTION
P. A. BROWNE *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 9 p Oct. 1993
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The Gulf war created an unusual incentive to the rapid development and deployment of active cooling systems for defense personnel. One of the most successful efforts in this respect concerned a liquid-circulating system which departed from prior art in a number of significant ways. The system was deployed first by Canadian aircrew, and then by their British counterparts in the later stages of the conflict. The systems used by these forces are described, with an account of their physical and thermal characteristics, and an account of their performance in the field. Very recent developments in electrically powered cooling units for microclimate use are also described. These new devices offer very real advantages in terms of power and space consumption. The impact they will have on air operations in extreme heat is discussed. Author

N94-28452# Institute of Aviation Medicine, Manching (Germany).
TEST OF A NEW PROTECTION SUIT IN A CLIMATIC CHAMBER
H. PONGRATZ, M. HARRE, B. KARMANN, A. RIECK, and H. VAIC *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 4 p Oct. 1993
Copyright Avail: CASI HC A01/MF A03

Within the framework of the research and technology program, a whole-body protection suit with integrated helmet was developed by the Dornier Company. The thermophysiological capabilities of this suit were tested by Division IV Ergonomics of the German Air Force Institute of Aviation Medicine. Ambient temperatures higher than those normally to be expected in the cockpit were chosen intentionally. In spite of this fact, pulse rates remained below the limiting value and the average rise in core temperature was insignificant. Loss of weight through sweating amounted to approximately 1% of body weight. It proved possible to remove 82% of this sweat by means of ventilation. Based on the results of the questionnaires on subjective sensibility, no prejudice to well-being and no negative effects in respect of the capability to act were established with regard to the testing of the whole-body protection suit under laboratory conditions. Author (revised)

N94-28453# Army Aeromedical Research Lab., Fort Rucker, AL.
THE USE OF LIQUID AND AIR MICROCLIMATE CONDITIONING SYSTEMS TO ALLEVIATE HEAT STRESS IN HELICOPTER NBC OPERATIONS
ROBERT THORNTON, J. LYNN CALDWELL, and FRANK GUARDIANI *In* AGARD, The Support of Air Operations under Extreme Hot and Cold Weather Conditions 23 p Oct. 1993
Copyright Avail: CASI HC A03/MF A03

The effects of microclimate cooling on aviator performance and physiology in Nuclear, Biological, and Chemical (NBC) Individual Protective Equipment (IPE) were evaluated in the USAARL UH-60 research flight simulator. Sixteen male aviators flew the simulator in two temperature conditions, 35 C and 41 C, both at 50% relative humidity (RH). Two thermoelectric conditioning units were used, one providing cooled blown air, the other cooled water to the aviators. At each temperature they flew for up to six hours in NBC IPE with no cooling, air cooling, and liquid cooling. Author (revised)

N94-28498# Kawasaki Heavy Industries Ltd., Tokyo (Japan).
SOME ISSUES ON JAPAN'S SPACE FOOD DEVELOPMENT AND RELATING PRELIMINARY EXPERIMENTAL STUDY [WAGAKUNI NO UCHUSHOKU KAIHATSU NI OKERU KADAI TO KISOTEKI JIKKEN]
SHUJI KANDA, SHIZUKO YAMAGUCHI (Ajinomoto Co., Inc., Kawasaki, Japan.), CHIHARU SEKIGUCHI, SEI YUMIKURA, MAKOTO DOI, MASAO ITO, AKIRA MIYAMOTO, and KAZUYOSHI YAJIMA *In* Japan Society of Aerospace and Environmental Medicine, Japanese Journal of Aerospace and Environmental Medicine, Vol. 30, No. 3 p 127-133 1 Sep. 1993 In JAPANESE See also A94-12180
Avail: CASI HC A02/MF A01

Space food is an important subject of the manned space technology and some kinds of space food have been developed in USA and Russia. Although they meet the basic requirements, such as nutrition and preservation, some problems still remain from the viewpoint of crew comfort like hedonic acceptability. In this report, some investigations are made on the necessity of Japan's space food concerning physiological and psychological issues. These investigations are based on the hypothesis that the food having good acceptability on the ground (1 G) might have also good acceptability under the microgravity condition of space. As the first step to verify the hypothesis, a taste sensitivity test was carried out under the bed rest condition of HDT (Head Down Tilt), as a simulated microgravity condition. From the test results, no significant change of taste sensitivity is found between upright and HDT conditions. Therefore, the aforementioned hypothesis is supported on the universality of the food acceptance of humans under 1 G gravity and microgravity conditions. Author (NASDA)

N94-28649# Federal Aviation Administration, Cambridge, MA. National Transportation Systems Center.
KEY COGNITIVE ISSUES IN THE DESIGN OF ELECTRONIC DISPLAYS OF INSTRUMENT APPROACH PROCEDURE CHARTS Final Report, Nov. 1992 - Jul. 1993
MELANIE C. CLAY Nov. 1993 111 p
(AD-A275647; DOT-VNTSC-FAA-93-18; DOT/FAA/RD-93/39)
Avail: CASI HC A06/MF A02

This report provides a general introduction to the field of cognitive psychology and the application of well researched cognitive issues to the design of electronic instrument approach procedures (EIAP) displays. It presents 46 cognitive issues and 108 design principles. Its basic premise is a recognition of the need for the pilot to get unambiguous information as quickly and easily as possible in such a way that it can be remembered until the time that it must be used. Recognition and discriminability of patterns, stress resulting from heavy workload, the effects of divided attention, and the need to take account of the pilot's expectations are discussed. The merits of color and size, paper and electronic display, and temporary removal of nonessential information are examined. Among the conclusions made by the report are recommendations for more investigation in the following areas:

symbol design, grouping and coding of information, orientation and scaling of information, control of clutter, and ways of overcoming the harmful effect of interruptions to attention or to performance of sequential actions. DTIC

N94-28766# Krug Life Sciences, Inc., San Antonio, TX.
A RELIABLE AND REPEATABLE METHOD FOR VOLUME CALCULATION OF PRESSURIZED GARMENTS Interim Report, May - Nov. 1993
RICARDO PEREZ, III, JOHN H. OHLHAUSEN, and PHILIP J. PREEN Nov. 1993 5 p
(Contract F33615-92-C-0018)
(AD-A275600; AL/CF-PC-1993-0051) Avail: CASI HC A01/MF A01

A rapid, accurate and efficient method to conduct inflation, volume and leak tests on pressure containing personal protective garments was developed and validated. The new system consists of a computer data acquisition and process control system that integrates flow rate over time to calculate volume. Validation of the new test system was accomplished by comparing the volumes calculated by the computer with volumes actually measured via a wet spirometer. Results from the validation study showed that the computerized system was highly accurate. In addition, the computerized system allows suits to be rapidly and effectively evaluated. DTIC

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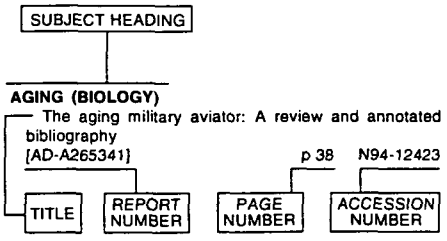
SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

N94-27370*# Sverdrup Technology, Inc., Cleveland, OH.
THE FERMI PARADOX: AN APPROACH BASED ON PERCOLATION THEORY
GEOFFREY A. LANDIS *In* NASA. Lewis Research Center, Vision 21: Interdisciplinary Science and Engineering in the Era of Cyberspace p 163-167 Dec. 1993
Avail: CASI HC A01/MF A03

If even a very small fraction of the hundred billion stars in the galaxy are home to technological civilizations which colonize over interstellar distances, the entire galaxy could be completely colonized in a few million years. The absence of such extraterrestrial civilizations visiting Earth is the Fermi paradox. A model for interstellar colonization is proposed using the assumption that there is a maximum distance over which direct interstellar colonization is feasible. Due to the time lag involved in interstellar communications, it is assumed that an interstellar colony will rapidly develop a culture independent of the civilization that originally settled it. Any given colony will have a probability P of developing a colonizing civilization, and a probability (1-P) that it will develop a non-colonizing civilization. These assumptions lead to the colonization of the galaxy occuring as a percolation problem. In a percolation problem, there will be a critical value of percolation probability, P(sub c). For P less than P(sub c), colonization will always terminate after a finite number of colonies. Growth will occur in 'clusters', with the outside of each cluster consisting of non-colonizing civilizations. For P greater than P(sub c), small uncolonized voids will exist, bounded by non-colonizing civilizations. For P approximately = to P(sub c), arbitrarily large filled regions exist, and also arbitrarily large empty regions. Author

Typical Subject Index Listing



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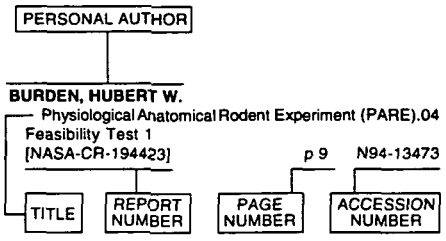

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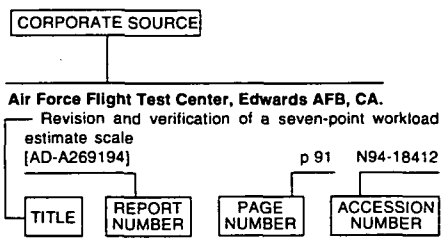

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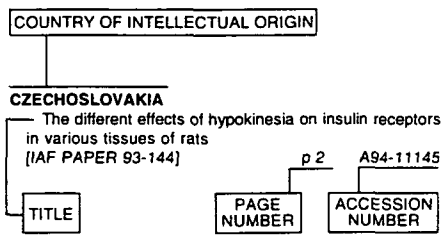

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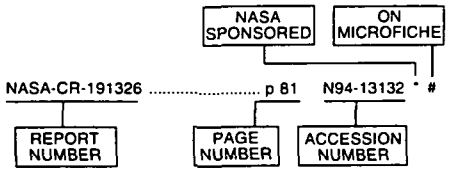

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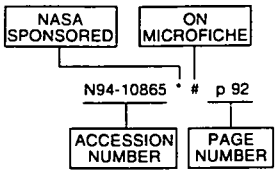

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