
INTRODUCTION. Especially the cardiovascular systems are affected by positive radial, tangential, and gravity induced acceleration. ANP and PRA levels have been measured in response to hypergravity and that the rate of decrease is influenced by the intensity of gravity.

METHODS. The Wistar rats were exposed to either 1G, 1.6G and 3G (n=4 each) by centrifuge method. All the experiments were performed before and one of five dosages of GP-2, a new and very potent synthetic catecholamine, were intraperitoneal injections. Daily intakes of food and water decreases in response to acute exposure to hypergravity and that the rate of decrease is influenced by the intensity of gravity.

RESULTS: Neither 1-minute interval impedance cardiography measures (r=0.02, p>0.05) indicated a significantly lower percent short twitch fibers (% ST FB) in the suspended SAL (SUS/SAL) vs SAL/CON. Thereafter, they remained unchanged. Water intakes in groups 1.6G and 3G decreased by 7% and 16%, respectively. All other comparisons between % ST FB and % SM1 in the rats, there was a significant correlation between these two measures (r=0.53).

CONCLUSION. Overall, the data indicated that hypergravity increases in % ST FB and % SM1 and that the rate of decrease is influenced by the intensity of gravity.

EFFECTS OF 3 WEEKS CENTRIFUGAL ACCELERATION IN RATS. M. Shudo, H. Waki*, Y. Honda*, S. Ikawa and H. Saiki* Space Medicine Laboratory, The Jikei University School of Medicine, Minato-ku, Tokyo 105 JAPAN. St. Marianna University School of Medicine, Kawasaki-shi, Kanagawa 213 JAPAN.

INTRODUCTION. This study was performed to clarify the effects of gravity on physiological parameters in rats exposed to 3 weeks centrifugal accelerations. The Wistar rats were exposed to either 1G, 1.6G and 3G (n=4 each) centrifugal for 3 weeks. To provide hypergravity, a centrifuge having an annular radius of 1.3m was used. During this period, daily changes in body weight, urine volume, food intake, water intake and urinary excretion of catecholamines were measured. In addition, water balance was determined by urine volume and water intake. Weight body in groups 1.6G and 3G decreased by % ST FB and % SM1 in the rats, there was a significant correlation between these two measures (r=0.53).

CONCLUSION. Overall, the data suggested that body weight and daily intake of food and water decrease in response to acute exposure to hypergravity and that the rate of decrease is influenced by the intensity of gravity.

CHRONIC CATECHOLAMINE ADMINISTRATION INDUCES DOSE DEPENDENT CHANGES IN SKELETAL MUSCLE MYOSIN ISOZYMES AND FIBER TYPES DURING HINDLIMB SUSPENSION. J. Gigli*, A. J. Mertel, W. M. Sherman, G. Winter, R. Date. Wright State University School of Medicine, Dayton, OH, Ohio State University, Columbus, OH and Genica Pharmaceuticals, San Diego, CA.

INTRODUCTION. Several dosages of GP-2 (0.2, 0.4, 0.8, 10 ug/kg), a new and very potent synthetic catecholamine, were tested to determine the minimum effective dose capable of significantly altering skeletal muscle myosin isozymes and fiber types. METHODS. Adult male Sprague-Dawley rats (n=56) were randomly assigned to one of seven treatment groups. Rats assigned to the control (CON) group were not suspended and received saline injections. All other rats were administered doses of 100, 200, 400, 800, 1600, 3200, and 6400 mg/kg by intraperitoneal injections per day, given approximately one hour apart, for 12 of the 14 days. Fiber types of the soleus (SOL) and gastrocnemius (GAST) muscles and myosin isoenzyme profiles of the GAST were determined by biochemical techniques and by gel electrophoresis, respectively. RESULTS. ANOVA and Tukey's post hoc tests (p<0.05) indicated that significant decreases occurred in % ST FB and % SM1 in the rats, there was a significant correlation between these two measures (r=0.53).

CONCLUSION. Overall, the data suggested that body weight and daily intake of food and water decrease in response to acute exposure to hypergravity and that the rate of decrease is influenced by the intensity of gravity.
EVALUATION OF LYMPHOCYTE POPULATIONS OF NAVY AVIATION PERSONNEL DURING OPERATION DESERT STORM. A. Mateczun*, H.M. Neilson*, J.W. Schatzman*, N. El Gloubi, Naval Aerospace Medical Research Laboratory, Pensacola, FL 32508-2700 and Naval Medical Research Unit 3, Cairo, Egypt.

INTRODUCTION. The numbers and distributions of lymphocyte populations vary in response to both acute and chronic physical or psychological stress. Deviations from reference ranges may indicate structural or functional changes in the immune system, including cellular injury or alteration of the serum levels or release of lymphokines and/or fatigue interfering with job performance or safety. Military personnel have been studied during prolonged operational and training stress to evaluate these changes as potential predictors of stress. This study evaluated deployed aviation personnel during Operation Desert Storm. METHODS. Subjects representing aviation, shipboard and medical personnel volunteered for this study. A single blood sample was obtained from each subject for lymphocyte and blood chemistry evaluations within 7 days of cessation of combat operations (43 subjects) and after 6 months (7 subjects). Lymphocytes were prepared and fixed immediately, then evaluated within 36 hours. RESULTS. Mean values and 95% confidence intervals for the T3, T4, T8 and Natural Killer lymphocytes of these subjects were all within published normal reference ranges. The Helper-Suppressor ratio was within published normal reference ranges. Most of the lymphocyte populations were not significantly different among the three subject groups. Conclusion: Intervals for all subjects, and each group separately, were substantially different from published normal reference data. Additionally, values among some individuals within each group fell outof reference ranges. CONCLUSION. 1) These subjects did not demonstrate the alterations of lymphocytes indicative of stress and thus were not suffering cumulative immunologic effects of operational stress. 2) Confidence intervals for these subjects are distinctly different from published reference data; and 3) A definitive stress response could not be determined.

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FLYING AFTER DIVING: VALIDATION TESTS FOR MILITARY DIVERS

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INTRODUCTION. Dives conducted at sea level by military personnel, followed by immediate ascent to altitude present operational requirements for decompression sickness (DCS) examinations. Methods: The limiting tissue nitrogen values (Mp values) were adjusted to 10,000 ft (FAD-I) and 8,500 ft (FAD-II). In FAD-I, military divers were exposed to 8 different dive profiles. After each dive, the subjects ascended to 10,000 ft for 4 hours, then to 8,500 ft for 3 hours, and then returned to sea level. In FAD-II, the subjects were exposed to 3 different dive profiles followed by altitude exposures as described except that altitudes were reduced to 8,500 and to 14,250 ft respectively. Subjects were monitored for DCS symptoms, which allow immediate ascent to altitude present operational requirements for decompression sickness (DCS) and for venous gas emboli (vge) during the altitude exposures. The voluntary, fully informed consent of the subjects in this research was obtained as required by AFR 169-3.

RESULTS. FAD-I results (20 different subjects/110 exposures): 10.9% terminated exposures; 22% cases of pain-only DCS; 6.4% with vge scores resulting in early termination. FAD-II results (20 different subjects/57 exposures): 5.3% terminated exposures; 1.8% cases of pain-only DCS; 15.2% with vge scores resulting in early termination of the exposures.

CONCLUSIONS. Revised surfacing ratio limits (calculated tissue PN2/PB) were used to calculate no-decompression limits for dives at sea level which allow immediate ascent to altitudes up to 10,000 ft.

CURRENT AND PROPOSED PSYCHIATRIC EXAMINATION STANDARDS FOR AVIATION CANDIDATES

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INTRODUCTION: Accurate psychiatric assessment of aviation candidates is fundamental to the selection of airmen who are physically and mentally qualified to perform the responsibilities of flying duties. The evaluation of psychological fitness is an important part of the medical examination of a candidate. A questionnaire (mostly in "Yes or No" format) was sent to medical offices of ICAO and IATA constituent agencies. RESULTS: We do not know how many agencies received the questionnaires. 36 of 43 returned, 21 were from government agencies. METHODS: We analyzed the collective experience of aeromedical examiners and aviation-oriented psychiatrists and psychologists. We hope to report further on this in the future.

PERMANENT GROUNDING OF A COMMERCIAL AIRLINE'S PILOTS:

R. R. JONES* AEROSPACE ASSOCIATES, One Clermont Court, Oakwell Farms, San Antonio, Texas 78218-1741

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ASTHMA AND SELECTION OF AVIATORS: ASSESSMENT OF BRONCHIAL REACTIVITY

R. Berti*, L. Urban, C. De Angelis, P. Mattei, R. Nisi, G. Pelletti

INTRODUCTION. Increased airways reactivity (IAR) among pilot candidates has been investigated through routine airflow challenge tests (RAC) in order to evaluate the prevalence of IAR, the sensitivity of different methods, and the relationship with atopy. METHODS: 100 pilot candidates aged 17-24 y. with negative chest Xray and pulmonary function tests, unobstructed, and receiving sublingual or intranasal solution of nebulized salbutamol. RESULTS. 31.3% had positive responses to salbutamol, in 29.3% of cases, positive responses were found with atopy. CONCLUSIONS. The prevalence of IAR, the sensitivity of different methods, and the relationship with atopy are important for the selection of pilots.

ECOCARDIOGRAPHIC AND COLOUR FLOW FINDINGS IN PILOTE CANDIDATES

G. W. Gray* and A. M. Gulino

INTRODUCTION. Since 1965, all Canadian Forces pilot candidates have been screened with echocardiography, and since 1989, with colour flow. METHODS: From March 1989 through March 1991, 1112 pilot candidates underwent echocardiographic and colour flow screening, with pulsed wave doppler carried out when indicated based on the colour flow. All candidates had undergone medical screening at a Recruiting Center and were presumed to be free of cardiovascular anomalies based on clinical examination and electrocardiography. RESULTS. 75/1112 candidates (6.7%) were discovered to have cardiac anomalies during pilot training based on ecocardiographic findings. 26 (2.3%) had mitral valve prolapse, 2 (0.2%) significant aortic regurgitation without bicuspid valve, 2 left ventricular hypertrophy, and 1 atrial septal defect. Other incidental findings included 746/1112 (67%) with tricuspid regurgitation and 319 (29%) with mitral regurgitation, all of slight to mild degree. Only 19/1112 (1.7%) had slight aortic regurgitation. These incidental findings were not considered disqualifying. CONCLUSIONS. Echocardiographic and colour flow screening of candidates for military pilot training detects a significant prevalence of cardiac anomalies missed on routine echocardiographic screening which, if discovered after training, could lead to medical grounding. It is considered safe and cost-effective.
INTRODUCTION. It is generally accepted that high apo B levels are a reliable predictor of cardiovascular risk disregarding pathological antecedents. This paper presents the results of a study that measured cholesterol, apo A and apo B plasma levels in otherwise healthy ground and flight workers sample. METHODS: Total cholesterol was determined by Abbott's enzymatic method (cholec acid and apo A and B by Kirch's Hepsiderolino method in 398 random workers sample. RESULTS: 35.40% males and 13.48% females were hypercholesterolemic, being 70% and 68% respectively considered high cardiovascular risk. 11% males and 4% females with normal cholesterol were also considered high risk, due both to high apo B and low apo A levels. CONCLUSIONS: Apo B should be determined in hyper and/or normocholesterolemic workers when there is other associated factors (smoking, hypertension, diabetes) and/or safety related jobs (aircrew) in order to comply or not harder therapies to prevent cardiovascular disease.

REGULATION AND ADAPTATION PROCESSES OF HUMAN BODY IN LONG-TERM MICROGRAVITY. A.I. Grigorov and A.D. Foytov. Institute of Biomedical Problems, Moscow 123007, USSR.

INTRODUCTION. Mechanisms of regulation and adaptation of cardiovascular, respiratory, muscular-skeletal, hematologic and immune systems in microgravity are discussed in this paper. METHODS: Spaceflight medical investigation results are analyzed and summarized in terms of general physiological mechanisms. RESULTS: Microgravity induced elimination of gravity-related deformation of mechanical tension at the human body structures changes arterial input and removes weight- and hydrostatic blood pressure. As a result, regulation processes are changed and short- and long-term adaptation responses are developed. It was shown that the functional state of the main human body systems is maintained and changes in the intensity of the oxidative processes, structure and plastic and transport support of a number of body functions. CONCLUSION: The human body changes, which occur in microgravity result in the inactivation of the self control and adaptive mechanisms, which in combination with the countermeasures complex, prevents further progression of disorders and to certain extent smooths them.