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APOPROTEIN B AS A USEFUL TOOL TO FORTELL CARDIO-VASCULAR RISK IN NORMAL OR HYPERCHOLESTEROLEMIC SUBJECTS. F.Blanco Rojo, J.M.Pèrez * Sastre. Occupational Medicine Service of IBERIA airline company of Spain. Madrid

INTRODUCTION. It is generally acepted high apo B levels as a reliable predictor of cardio-vascular 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 enzimatic technic and apo A and B by Behring's Nefelometer inmunological method in 398 random workers sample. RESULTS 35.40% males and 13.48% females were hypercholesterolemic, being 75% and 68% respectively considered high cardio-vascular 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 are other associated factors (smoking, hypertension, diabetes) and/or safety related jobs (aircrews) in order to comply or not harsher therapies to - prevent cardio-vascular disease.

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REGULATION AND ADAPTATION PROCESSES OF HUMAN BODY IN LONG-TERM MICROGRAVITY. A.I. Grigoriev and A.D. Egorov. 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. Space flight medical investigation results are analyzed and summarized in terms of general physiological mechanisms. RESULTS. Microgravity induced elimination of gravity-related deformation and mechanical tension of the human body structures changes afferent input and removes weight-load and hydrostatic blood pressure. As a result, regulation processes are changed and short- and long-term adaptation responses are developed. It was shown, that afferent input changes result in adaptive rearrangement of the functional state of the main human body systems. The fluid shifts are accompanied by reflex changes in regulation of circulation, water-salt metabolism and other systems. The reduction of load upon the human body weight-bearing structures results in partial loss of properties and qualities, acquired by man under influence of the Earth's gravity, and causes changes in the intensity of the oxidative processes, structure-plastic and transport support of a number of body functions. CONCULSIONS. The human body changes, which occur in microgravity result in the involving of the self control and adaptive mechanisms, which in, combination with the countermeasures complex, prevents further progress of disorders and to certain extent smooths them.

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INITIAL RESPONSE OF THE CALCIUM HOMEOSTATIC SYSTEM TO SPACEFLIGHT. C.E. Cann*, C.D. Arnaud, B.P. Halloran, M.E. Hammond, D. Matsumoto, S. Sanchez. University of California, San Francisco, CA 94143

INTRODUCTION Bone loss following spaceflight is well documented, and if left untreated by rational countermeasures could limit manned space exploration. Many consider the loss of bone to occur over long periods, months to years, but the relationship between bone and blood calcium homeostasis allows us to study this problem within the first 48 hours of spaceflight. We hypothesized that the initial response of bone to unloading will be a release of calcium, through increased bone resorption, into the extracellular calcium fluid compartment including blood. If this is correct, the serum parathyroid hormone (PTH) level will decrease in an adaptive response, leading to other observed effects such as increased urinary calcium. We tested this hypothesis in the payload crew of the SLS-1mission. METHODS Serum samples were obtained from four crew (2 male, 2 female) on days L-15,7, 2,FD2,FD6,R+1 and R+6. We measured serum ionized calcium (Ca^{++}, magnesium, phosphorus, intact PTH (IRMA, with measurement of PTH in > 95% of normal subjects) and 1,25 dihydroxyvitamin D using microtechniques developed in our laboratory. RESULTS Serum Ca^{++} showed the expected negative correlation with PTH for all samples, confirming biological validity of our data. An unexpected finding was a much stronger correlation for the male crew ($r=-0.8$, $p<0.001$) than for the female crew ($r= 0.3$, N.S.). Ca^{++}increased markedly (26%) by FD2 and remained elevated (19%) through FD6, with recovery by R+6. PTH decreased by FD2, was low through FD6, and also recovered by R+6. Mg and P did not change. CONCLUSION The hypercalcemia is clinically significant, and could be responsible for some symptoms of space adaptation syndrome. The early Ca homeostatic response to spaceflight is consistent with increased bone resorption, but this is not proved. Antiresorptive drugs such as those in research trials in osteoporosis and metastatic bone disease may be useful in preventing bone loss in spaceflight.

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MAGNETIC RESONANCE IMAGING (MRI) OF SKELETAL MUSCLES IN ASTRONAUTS AFTER 9 DAYS OF SPACE FLIGHT. M. Jaweed[1]*, P. Narayana[2], J. Slopis[2], I. Butler[2], V. Schneider[1], A. LeBlanc[3], L. Fotedar[4] and D. Bacon[5]. [1]NASA Johnson Space Center, [2]Univ. of Texas Health Science Center, [3]Baylor College of Medicine, [4]KRUG Life Sciences, [5]Humana Hospital, Houston, TX.

INTRODUCTION: Skylab data indicated that prolonged exposure of human subjects to microgravity environment causes significant muscle atrophy accompanied by reduced muscle strength and fatigue resistance. The objective of this study was to determine decrements in muscle size, if any, in the soleus and gastrocnemius muscles of male and female astronauts after 9 days of space flights. METHODS: Eight astronauts, one female and seven male, between the ages of 31 and 59 years, 59-84 Kg in body weight were examined by MRI 2-3 times preflight within 16 days before launch; and 2 days (n=8) and seven days (n=3) after landing. The right leg muscles (gastroc-soleus) were imaged with a lower extremity coil in magnets operating at 1.0 or 1.5 Telsa. The imaging protocol consisted of spin echo with a Tr of 0.70 - 1.5 sec. Thirty to forty 3-5 mm thick slices were acquired in 256 x 128 or 256 x 256 matrices. Acquisition time lasted 20-40 minutes. Multiple slices were measured by computerized planimetry. RESULTS: Compared to the preflight, the cross-sectional areas (CSA) of the soleus, gastrocnemius and the leg, at 2 days after landing were reduced (at least $P<0.05$) 8.9 percent, 13.2 percent and 9.5 percent, respectively. The soleus and the leg of three astronauts evaluated at 7 days postflight, did not show full recovery compared to the preflight values. CONCLUSIONS: It is concluded that 9-days of space flight may cause significant decrease in CSA of the leg muscles. The factors responsible for this loss need further delineation.

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THE METHODOLOGICAL PRINCIPLES OF MEDICAL CONTROL SYSTEMS (MCS) DESIGN FOR LONG DURATION SPACE FLIGHTS (LDSF).

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INTRODUCTION. The USSR experience, having been accumulated in LDSF medical support, has shown the necessity of the definite correction and specification of methodology of MCS design. METHODS. By use of systemic analysis, the generalized estimation of the results of MC in space has been performed. There have been analyzed the results of examination of 19 Soviet cosmonauts, who performed LDSF, lasting from 2 to 12 months, in 1980-90. Moreover the analogous estimation has been carried out in 556 experiments with volunteers during the modelling of zero-gravity environment. Results. The systemic analysis has shown, that in addition to 3 well-known methodological principles (i.e. pathogenesis, "MC by stages" and succession's ones), 4 new principles must be formulated and taken into account. They are the systemic-structural approach, the determinism of the infrastructure of the basic physiologic methods, the notion of the total "image" of MCS, the search of "organ-targets". CONCLUSION. The realization of all the above-named methodological principles leads to the significant improvement of the informative and diagnostic possibilities of on-board MCS in LDSF.

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RESULTS OF AN INTERNATIONAL SPACE CREW DEBRIEF. P.A. Santy*, A.W. Holland*, L. Looper, and R. Marcondes-North*. UTMB, Galveston, TX 77550; and Johnson Space Center Biobehavioral Laboratory, Houston, TX 77058.

INTRODUCTION. In order to identify potential multicultural and multinational problems for future International Space Station Freedom crew, a crew debrief questionnaire (called an "International Crew Debrief") was developed for U.S. astronauts who flew on Shuttle missions with one or more crewmembers from other countries. METHODS. From 1981-90, a total of 20 U.S. astronauts flew on International space missions. Debriefs were mailed to all twenty with instructions not to identify themselves or their specific mission. The debrief focused primarily on preflight training; and postflight incidents of misunderstanding, miscommunication and interpersonal friction among crewmembers. Astronauts were also asked to rate the impact of the incident to the mission (low, medium or high). RESULTS. Ten astronauts responded, but only nine responses were able to be scored; for a return rate of 45%. 42 incidents were reported: 9 in the preflight period; 26 inflight; and 7 in the postflight period. Most of these incidents were rated at a low or medium impact, but 5 of the inflight incidents were rated at a "high" mission impact. A number of causes for the problems were listed, and are discussed. CONCLUSIONS. The Debrief respondents provide useful and timely recommendations on preflight training which might help facilitate the integration of multinational crews and prevent multicultural or multinational factors from interfering with mission operations.