healing was faster in experimental groups in comparison with control rats.

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EFFECT LONG-TERM SPACE FLIGHT ON CONTRACNILE PROPERTIES HUMAN SKELETAL MUSCLE

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It is known that inactivity results in deconditioning and physiological deconditioning induced by inactivity affects important system of the body including musculoskelatal. Skeletal muscle deconditioning is associated with adaptation to a microgravity environment. These physiological changes may result in altered muscle function and motor control [Jaweed et al., 1995]. Decrements in motor performance could have negative implications for effective completion of mission-critical operational tasks. Up to now, owing to methodological difficulties, the property contractile properties of human skeletal muscles in a true weightless environment [Tschan et al., 1994; Day et al., 1995] or during its simulation [Grigorieva, Kozlovskaya, 1987; Sugajima et al., 1996] were beyond the field of vision of the scientists who in the main have concentrated on examining the mechanical features of the voluntary muscular contractions. This is the first study to make quantitative measurement of the functional properties of a single muscle in a man exposed to the long-term space mission. The investigation was concerned with the parameters of mechanical responses of the triceps surae muscle, which has been shown to be a postural antigravity muscle [Campbell et al., 1973]. The purpose of study were to analyze the effects of spaceflight the MIR-18 and MIR-22 mission on the mechanical changes of the triceps surae muscle. The methods for measuring electrically evoked and voluntary forces have been described in detail elsewhere [Koryak, 1997]. Briefly, the mechanical responses of the triceps surae muscle were recorded by tendometry, which made it possible to measure single muscle contraction force by the degree of tension change in muscle distal tendon [Koryak, 1995]. Maximal voluntary contraction (MVC), maximal twitch (P_t), tetanic forces (P_o) of isometric contraction elicited by electrical stimulation of tibialis nerve with a supramaximal rectangular pulses of 1 ms at a frequency of 150 Hz [Koryak, 1978], time-to-peak tension (TPT), a half-relaxation (1/2HR), and time of force development both during voluntary and evoked contractions to 25%, 50%, 75% of the MVC and P_o, respectively, before (60-d) and after (6-d) the MIR mission were evaluated as well. The difference between P_o and MVC expressed as a percentage of P_o and referred to as force deficiency has also been calculated. The surface EMG during contractile were recorded a one crewman with bipolar electrodes from the gastrocnemius and soleus muscles. EMG integral (IEMG) was calculated for gastrocnemius and soleus, but were than averaged. The IEMG/MVC ratio was also determined. After spaceflight, the TPT increased by 9%, but 1/2HR and P_t decreased by 18% and 14%., respectively. MVC and P_o decreased by 23% and 11%, respectively. Force deficiency increased by 36%. The value P_o/P_t ratio increased by 6%. The rate of rise a voluntary tension development decreased by 19%, 45%, and 20%, respectively. However, electrical evoked tetanic development not differ substantially from the initial data. The value EMG and IEMF/MVC ratio increased by 55%, and 71%, respectively. These findings indicate thus the alterations of contractile properties induced by spaceflight, were found to be booth of periferal and central nature but more central. However, relative less functional alterations of the triceps surae muscle compared to those observed after a 120-days bed-rest [Koryak, 1995] that may be related to countermeasure compliance.

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