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The physiological endurance of skeletal muscles increases in the case of water-soluble C_{60} fullerene nanoparticles administration before physical activity

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Skeletal muscles are able to perform contractions only for a certain period of time, the duration of which is inversely proportional to the load. After that there is a gradual reduction of the maximum level of generated force, which skeletal muscles can maintain over the time. The relevance of studying the problem of muscle fatigue and ways for its correction is caused by restrictions, which it imposes on human for prolonged physical activity in various fields.

Reactive oxygen species (ROS) including superoxide anions, hydrogen peroxide and hydroxyl radicals are generated in muscles during their contraction. The concentration of ROS increases with the duration of load. The fact that one of the major factors which causes the development of muscle fatigue are free radicals was confirmed in rabbit muscles using EPR method (free radicals registration was performed before and after the exhausting exercises). Later the impact of free radicals on muscle fatigue development was demonstrated in human limbs. Biocompatible C_{60} fullerene nanoparticles can be used for muscle fatigue correction as powerful antioxidants. C_{60} fullerene characterized by a high regenerative ability - it can capture up to six electrons simultaneously.

Purpose of this work was to study mechano-kinetic and related biochemical changes *in vivo* for stimuli preceding intramuscular injection of pristine C_{60} fullerene aqueous colloid solution (C_{60}FAS) and its dose-dependent effects.

The ability of C_{60}FAS to increase muscle fatigue threshold for single stimulus signal with 1 Hz to over 4 times and significantly improve the muscle response to monotonously repeated tetanic stimulations within 6 s was demonstrated in experiments on the muscles of hindlimbs of male rats of the 'Wistar' line. Significant positive mechano-kinetic changes in the development of muscle fatigue, which were caused by C_{60}FAS administration, are strongly correlated with changes in blood biochemical markers of muscle fatigue (such as CPK (creatine phosphokinase), LDH (lactate dehydrogenase), general bilirubin, ALT (alaninaminotransferase), AST (aspartate aminotransferase) and creatinine). As a result, therapeutic usage of C_{60}FAS contributed to the effective recovery of investigated contraction-relaxation parameters of skeletal muscles almost to baseline. The most effective dosage of C_{60}FAS administration was 1 ml/kg.

Thus, the obtained results clear show a promising biomedical C_{60}FAS application for muscle fatigue correction and improvement of functional capacity of skeletal muscles.