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Human Physiology in Space (2)

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PECULIARITIES OF PATHOLOGICAL PROCESSES UNDER SIMULATED MICROGRAVITY (SPACE PATHOPHYSIOLOGY)

Abstract

Introduction: It is widely known and proven that weightlessness causes serious physiological changes in virtually all systems and tissues of the human body. These include: decreased blood volume (BV), heart rhythm disturbances, changes in the ventilation-perfusion ratio in the lungs, increased calcium excretion from the body, muscle atrophy, changes in the gastrointestinal tract and urinary system. The changes listed above, including changes in the sensitivity of the respiratory center and hypoxemia, not only can exacerbate the clinical picture of classic pathological process, but also can affect pathogenesis of the disease and change its course and prognosis. The basic goal of medical doctors was to prevent diseases in space. New promising plans for exploring the Moon and Mars, the transition to mass flights into space requires clinical medicine which would include not only prevention but also diagnostics and treatment of diseases under microgravity. The first step to this should be studying pathological processes under the state of weightlessness. Results: We studied some pathological processes under microgravity simulation. *Pain sensitivity:* Microgravitaty causes changes in the daily dynamics of pain sensitivity in humans; besides, a possible cortisol effect and the degree of fluids shift in the cranial direction are also important. *Inflammation of the abdominal cavity and retroperitoneal space (peritonitis and pancreatitis)*: Model microgravity leads to significant changes in the liver and pancreas which are manifested with the dynamics of biochemical blood parameters. When peritonitis is combined with microgravity, hypoproteinemia and hypoalbuminemia as well as maximal levels of transaminases, urea and total bilirubin are more pronounced what indicates more severe course of inflammation. Excretory function disorders and excessive accumulation of zymogen in acinar cells what causes more massive pancreatocyte cytolysis are indicative of circulatory disorders in the pancreas, specific for microgravitaty. *Stroke (ischemic and hemorrhagic).* Model microgravity lasting 48 hours and preceding the stroke has a positive effect at functional recovery and at the morphological picture of regeneration. However, a lasting antiorthostatic effect after experimental stroke worsens restoration and regeneration; it also increases a necrotic zone and mortality rate. Conclusion: Peculiarities of pathological processes associated with microgravitaty (redistribution of blood, changes in respiratory center sensitivity, hypoxemia, etc.) require special researches not only on the Earth, but also in flight. Space pathophysiology is the most important step in the development of clinical medicine in space.