Microgravity

Microgravity refers to the condition where the force of gravity experienced by an object is very small, usually less than one-thousandth (1/1000) of the gravity experienced on Earth's surface. This condition can be experienced by objects or organisms in orbit around the Earth or other celestial bodies, as well as in certain aircraft or drop towers that simulate weightlessness for short periods of time.

In microgravity, objects and organisms float freely and appear weightless, but they are still subject to other physical laws such as inertia and momentum. This unique environment has been used for scientific research in fields such as physics, materials science, biology, and medicine, as it allows scientists to study the effects of gravity on different processes and phenomena in a controlled setting.

However, microgravity can also have negative effects on human health, including muscle and bone loss, cardiovascular changes, and fluid shifts in the body. Therefore, researchers continue to study the effects of microgravity and develop countermeasures to mitigate its impact on astronauts during long-duration space missions.

The environmental conditions to which astronauts and other military pilots are subjected represent a unique example for understanding and studying the biomechanical events that regulate the functioning of the human body. In particular, microgravity has shown a significant impact on various biological systems, such as the cardiovascular system, immune system, endocrine system, and, last but not least, musculoskeletal system. Among the potential risks of flying, low back pain (LBP) has a high incidence among astronauts and military pilots, and it is often associated with intervertebral disc degeneration events. The mechanisms of degeneration determine the loss of structural and functional integrity and are accompanied by the aberrant production of pro-inflammatory mediators that exacerbate the degenerative environment, contributing to the onset of pain. In the present work, the mechanisms of disc degeneration, the conditions of microgravity, and their association have been discussed in order to identify possible molecular mechanisms underlying disc degeneration and the related clinical manifestations in order to develop a model of prevention to maintain health and performance of air- and space-travelers. The focus on microgravity also allows the development of new proofs of concept with potential therapeutic implications [1)]

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