Support for research into space medicine

Space exploration requires advances in science and medicine to develop countermeasures to mitigate the effects of the space environment.

In this field, MEDES works principally with an experimental model for simulating microgravity, anti-orthostatic bed-rest.

Context

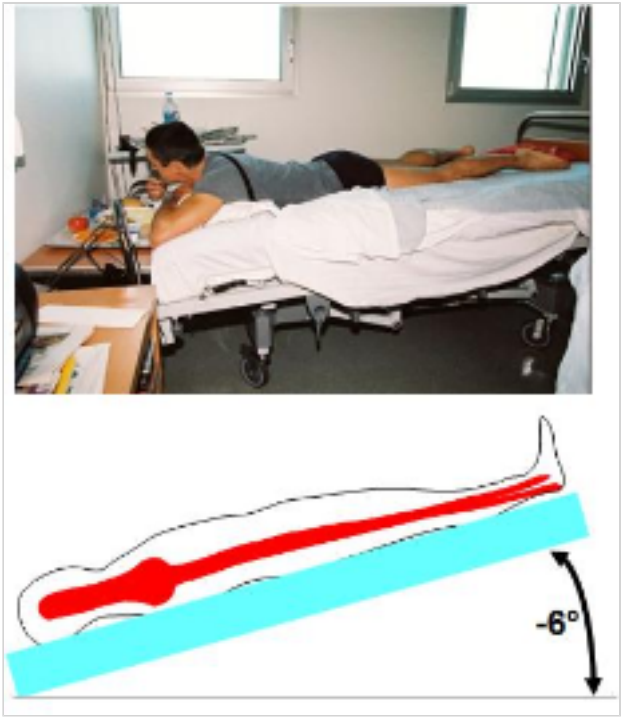
The principal characteristics of the space environment are microgravity, radiation and confinement. Research in the human life sciences concern the effects of these different factors on the physiological systems and the psychology of astronauts.

Research in space itself is often preceded by preparatory experiments on the ground. The advantage of these experiments is that they enable the testing of scientific hypotheses on larger cohorts, and in more controlled conditions than the circumstances of a space mission, meaning that experiments in space can be better prepared.

Earth-bound experiments to recreate or simulate the effects of microgravity use parabolic flights or simulation models such as immersion or bed-rest. Other types of simulation for other aspects of the space environment use confined environments similar to space conditions, such as the Concordia base in Antarctica.

Advances in science and medicine are necessary to design and implement methods for mitigating the effects of the space environment, known as countermeasures. These can be physical, pharmacological or nutritional. To perfect these countermeasures it is first necessary to understand the physiological effects of the space environment. Physiological research and the validation of the countermeasures are often carried out in simulation studies on the ground.

MEDES activities in support of research into space medicine



These principally concern the use of the anti-orthostatic bed-rest model to simulate the effects of microgravity.

This experimental model faithfully replicates the absence of hydrostatic pressure and of stress on the musculoskeletal system. It also reproduces the lack of physical activity of astronauts in the course of space flights.

These activities are carried out at the MEDES Space Clinic, where more than 20 simulation studies of this type have been carried out since it was created.

In particular, the Space Clinic hosted two of the most ambitious international studies of this type:

* The first, which lasted for 3 months in 2000-2001 and involved 25 male volunteers, was financed jointly by CNES, the European Space Agency (ESA) and the Japanese Space Agency (JAXA).
* The second, WISE (for Women International Space simulation for Exploration), which lasted for 2 months in 2005 and involved 24 female volunteers, was financed jointly by CNES, ESA, NASA and the Canadian Space Agency (CSA).

A dozen international research teams made up of about 50 scientists participated in each of these studies.

Moreover, since 2007, MEDES has been able to use a short-arm human centrifuge developed by ESA with which to assess the effects of artificial gravity. In 2010, MEDES carried out the first European study to assess artificial gravity as a countermeasure.

The MEDES Space Clinic

MEDES activities in support of research into space medicine, which can be compared to clinical research, benefit from a unique facility in this field, the Space Clinic. It is located on the Rangueil site of the Toulouse University Hospital (CHU), covers a surface area of 1500 m_2, has its own specialist personnel, access to the biomedical facilities of a University Hospital (NMR, scanner , biomedical analyses, etc.), and the necessary equipment and infrastructures for carrying out research in a fully-controlled environment.

It is the world's leading clinical research centre in the field of space located on the site of a University Hospital. The Space Clinic has thus naturally become one of the world's reference centres for simulating the effects of the space environment using the bed-rest model.

To find out more about the Space Clinic, click here.