Adaptation of humans to new environments - from space to the patient

Translation of knowledge and technology from a clinical scientists’ perspective:

*the Stress-responses and Immune Network*

To contact, mail to achouker@med-uni-muenchen.de

By Alexander Choukèr
Hospital of the University of Munich, Germany

Chairman ESA Topical Team „Stress and Immunology
Chairman ESA Life Sciences Working Group (LSWG)

Mail
Immunity and Health

Cause of death

- Wound healing - trauma
- Host defense - infections
- Malignancies
- Degenerative diseases

Lifetime

Reproduction
On Earth

Increase of Immune-associated disease
-> „Worldwide, the rise in prevalence of **allergic diseases** has continued in the industrialized world for more than 50 years (AAAAI)”
-> „**Autoimmune disease** prevalence is rising (NIH)”
-> “The **incidence of sepsis is increasing** in all areas of the world where epidemiology studies have been conducted” (GS Martin)

Changes of immune competence by mobility, new environmental and social stresses?

In Space

Imbalance of immune functions
-> ca. 50 % of space crew (Apollo) and 40 % of long duration crew (MIR/ISS) showed significant immune changes
-> Astronauts are subjected to very new environmental stressor

Need to understand **changes in a few** to enable safe Space Exploration
AND
To understand stress associated immune **adaptation of many**
Environmental challenges

World Migrations

World Migrations Since 1500
- Europeans
- Africans
- South Asians
- Chinese
- European Jews
- Americans and Canadians
- Russians
- Mexicans and Central Americans
- Caribbeans (Cubans, Haitians, Puerto Ricans)
- Southeast Asians


Translation of knowledge and technology from a clinical scientists’ perspective
- MONITORING ACQUIRED IMMUNE DEFICIENCY -

**HIV**
- monitoring of disease states and therapy in HIV positive patients (a pilot study)

**HoSPACE**
- was part of a prospective, randomized, multicentric clinical trial in patients suffering from severe inflammation (SISPCT full trial)
- using a battery of immunology assays
  Evolved from ESA/IBMP, ESA/NASA and NASA projects to monitor immune-dys function in 76 sepsis patients
  Registered with [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT00832039)
Propionaldehyde:
- Healthy volunteer during parabolic flight (blue boxes, n=6)
- Healthy volunteers (dark grey boxes, n=17)
- Intensive care unit population (light grey boxes, n=12)
- Patients after lung/heart–lung transplantation (white boxes, n=7)

Kruskal-Wallis ranksum test with post hoc Nemenyi test; #P<.001

Embedding research for space into research on Earth
The Immun system of tomorrow?
- Looking beyond the borders-

Interdisciplinary & International network for space and Earth benefits and progress in applied (bio-)technologies