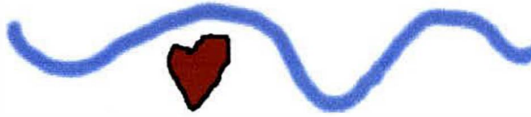


## Contribution of space related research to advances in the field of medicine

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**Study 1:** The neurological alterations secondary to a 72 hours exposure to Dry Water Immersion (DWI) vs. Bed Rest (BR) with a recompensation time of 96 hours between the two experiments were investigated in ten healthy volunteers (V1-10 ; mean age 27.9 SD 6.3). Six volunteers (V11-16; mean age 23.3 SD 5.3) were exposed to 72 hours of DWI only. The main findings of this study involved a change in reflex amplitude, exteroceptive and proprioceptive afferences (afferent input), signs of disintegrated cerebellar function, frontal signs and a decrease in muscle tone. The decrease in reflex amplitude was discussed to represent a change of afferent inputs, thus influencing the control loop of the motor system. **Study 2:** A 120 hour exposure to DWI leads to a diffuse lesioning mainly of slow twitch fibers in antigravitational muscles, documented by an increase of muscle enzymes such as serum creatine kinase activity (CK activity) and mass (CK mass), myoglobin and myosin heavy chain fragments (MHC). An eccentric lengthening exercise immediately after DWI exposure causes a large delayed increase in CK activity and mass as well as MHC, not seen in volunteers unexposed to DWI. The increase of MHC suggests that total immobilisation leads to a temporary hidden and diffuse lesions of slow twitch fibers, which are found predominantly in antigravitational muscles. The changes reported may be the consequence of a functional adaptation process indicating regeneration rather than permanent damage of slow twitch skeletal muscle fibers. **Study 3:** Basing on the data obtained in the prior experiments, a boot was developed in order to stimulate plantar mechanoreceptors as countermeasure to deafferentiation. To investigate the influence of receptor stimulation by simulating standing we investigated the effect of 72 hours of DWI exposure on muscle enzymes in four healthy volunteers in whom this boot (SUC - support unloading compensator) simulated standing (A), vs. a group of four volunteers without this device (B). During the 72 hours of DWI exposure plantar stimulation was applicated six times per 24 hours, each stimulation lasting for 30 minutes with alternating right / left pressure application. Muscle enzyme measurement was identical to 3rd experiment. Reduced levels of serum CK activity, mass and MHC in group A, as compared with group B, indicated a less diffuse lesioning of mainly antigravitational muscles. **Discussion:** Of the many disturbances induced by a decrease in gravitational load, the disorders and effects on the function of the musculoskeletal and motor regulatory systems are of major significance. These resemble the symptoms of posterior funiculus pathologies, hereditary spinocerebellar degenerations or those of the Bed Rest Syndrome (BRS). **Conclusion:** Thus, the understanding of the neurophysiological facts may help to understand the pathology, a predisposition for therapeutic consequences. The equipment and technology developed for microgravity experiments may be utilized as diagnostic as well as therapeutic tools in patients.



The 4th International  
**Head-Out Water Immersion Symposium**

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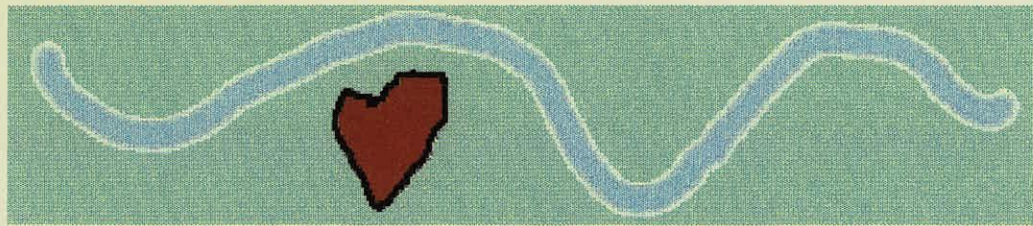
Graz, Austria

**SCIENTIFIC PROGRAM**

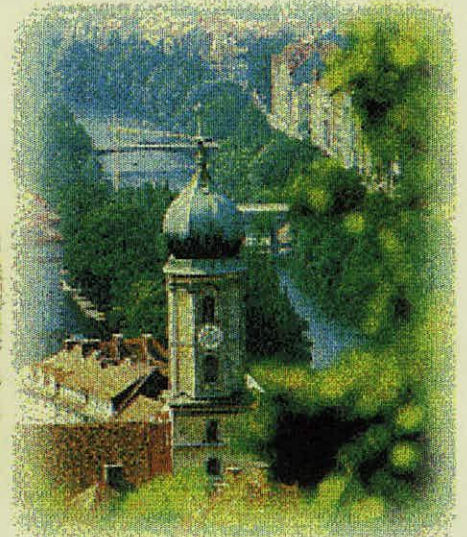
Session 4: Clinical aspects

Chair: P. O'Hare, T. Mano

- Evans P.M.S., Broughton-Pipkin F., Lightman S.L., O'Hare J.P. (**Cardiff / Bristol / Warwick / Nottingham**): Role of the renin-aldosterone axis in the circadian sodium homeostasis of diabetic patients with autonomic neuropathy
- Gabrielsen A., Sorensen V.B., Pump B., Galatius S., Videbaek R., Bie P., Warberg J., Christensen N.J., Wroblewski H., Kastrup J., Norsk P. (**Copenhagen**): Blunted peripheral but preserved central cardiovascular and neuroendocrine responsiveness to water immersion in heart failure
- Evans P.M.S., Taylor A., Macdonald I.A., Lightman S.L., O'Hare J.P. (**Cardiff / Bristol / Warwick / Bath / Nottingham**): Do catecholamines have a role in the impaired sodium homeostasis of IDDM patients?
- Marosi M., Gerstenbrand F., Kozlovskaya I.B. (**Innsbruck / Vienna / Moscow**): Contribution of space related research to advances in the field of medicine



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