WG 7 (Naval and Undersea Medicine))

Seasickness and Female Hormonal Cascades

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Ancient and ubiquitous in seafaring, coping with the natural phenomenon known as seasickness is an ongoing challenge. Over the past decade, women are increasingly filling the ranks in the IDF Navy fleet. Women are commonly conceived as more susceptible to seasickness than men, with studies looking to the plainest factor: hormones. Though estrogens and their ever-fluctuating levels play an integral role in almost all human physiology, their contribution to seasickness and motion sickness is not definitively understood. Recent and not-so-recent studies reveal possible mechanisms that could uphold a non-traditional view on the effect of estrogen on seasickness. Neurophysiological in-vitro studies have shown interesting evidence of the effects estrogens may have on the vestibular system. Additionally, mono- and multi-phasic formulations of combined oral contraceptives have developed over the years. By taking this into account and analyzing the current state of knowledge, new possibilities for leveraging the female hormonal system are identified.

WG 7 (Naval and Undersea Medicine)

Lung and Gut Microbiome in Combat Divers

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The gut microbiome is composed of bacteria, archaea, fungi, protozoa, and viruses that colonize the intestines of all mammals. Studies in humans suggest microbiome involvement in a variety of physiological processes including energy homeostasis, metabolism, immune activity, neuro-behavioral development and diseases. Recent studies have demonstrated that microbiota transplantation is a beneficial treatment for epilepsy in mice, by inducing changes in gene expression in the hippocampus, which appears to protect mice from seizures. In humans this treatment has also been established for Clostridium difficile infection and fibromyalgia. In the current research, we aim to characterize the modulations in the microbiome and epigenome following repetitive hyperbaric oxygen exposures, in order to lay the foundations for harnessing these changes to enhance oxidative stress endurance in combat divers.

Stool, saliva, buccal epithelia and blood samples were collected from participants during consecutive weeks of oxygen dives. DNA was extracted from stool and saliva samples and sequenced to identify the bacterial composition of the gut and lungs, respectively. Epithelia and blood data is lacking due to Iron Swords operation and other training stand down.

We observed changes in bacterial composition and a decrease in species diversity, as well as 16/220 species in stool samples and 100/230 species in saliva samples with significant average abundance changes following repetitive oxygen dives.

These findings suggest that exposure to hyperbaric oxygen a few times a week during several consecutive weeks, leads to modulations in gut and lung bacterial microbiome composition, some of these changes returned to baseline non-diving activity, while others remained unchanged. Further samples collection and analysis are required to validate these results and to identify pertinent bacteria that could potentially enhance endurance to oxidative stress.