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MICROBIOMICS AND AEROSPACE MEDICINE

MÉDECINE MICROBIOMIQUE ET AÉROSPATIALE

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Introduction: The human microbiome is the population of microorganisms throughout the human body including the mouth, gastrointestinal (GI) tract, pharynx, respiratory system, middle ear, external ear canal, urogenital tract and skin. The human body has 10 times as many microorganisms as human cells. While the human genome has about 23,000 genes the human microbiome contains more than 1 million genes. The composition and functional impact of the microbiome in the human body jointly develops from birth and is affected by the person's nutrition, genetic composition, general lifestyle, self-imposed stress and exposure to environmental stress factors.

Background: The interaction of the GI microbiome with human cells influences the regulation of some metabolic pathways and immune-inflammatory pathways impacting the intestines, liver, muscle, and brain. A decrease in the desirable GI microbiome can lead to deterioration in GI, endocrine, neurologic or immune functions, and could lead to diseases. Probiotics are types of living friendly bacteria similar to those that inhabit the GI tract used to adjust the microbiome to protect the individual. Prebiotics are nutrients that feed the good bacteria.

Summary: Practical implications of the human microbiome on aerospace personnel health and safety involve: 1) Nutrition/Diet (pre/probiotics as alternatives to antibiotics, food-borne pathogens, bacteria and dietary-derived metabolites, role of plant/soil microbiome, microbiome-directed foods), 2) Diseases (inhibition of disease vectors, traveler's diarrhea, respiratory infections, asthma, drug metabolism, multidrug resistance, impaired immunity, irritable bowel syndrome, inflammatory bowel disease, multiple sclerosis, acute mountain sickness), 3) Injury (PTSD, TBI, wound infections, wound healing), 4) Environmental Exposure (chemicals, heavy metals, hypoxia, hypobaria, microgravity), 5) Neurological (neuronal activity, stress-performance, cognition, anxiety-fear, sleep/circadian rhythm disruption, neurochemical-neurotransmitter, microbiome gut-brain axis), 6) Other (microbiome biosensors for health/disease, microbiome forensic identity markers, antibiotics, chemotherapy effects on microbiome, role of pre-probiotics against foodborne pathogens, pre-probiotics and improved immune function, lung microbiome and health risks of particulate matter-emissions, human effects of indoor microbiomes).