

PILOT STUDY ON THE INVESTIGATION OF TEAR FLUID BIOMARKERS AS AN INDICATOR OF OCULAR, NEUROLOGICAL, AND IMMUNOLOGICAL HEALTH IN ASTRONAUTS

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Abstract

The purpose of this pilot study is to investigate the collection, preparation, and analysis of tear biomarkers as a means of assessing ocular, neurological, and immunological health. At present, no published data exists on the cytokine profiles of tears from astronauts exposed to long periods of microgravity and space irradiations. In addition, no published data exist on cytokine (biomarker) profiles of tears that have been collected from irradiated non-human biological systems (primates and other animal models).

A goal for the proposed pilot study is to discover *novel tear biomarkers* which can help inform researchers, clinicians, epidemiologist and healthcare providers about the health status of a living biological system, as well as informing them when a disease state is triggered. This would be done via analysis of the onset of expression of pro-inflammatory cytokines, leading up to the full progression of a disease (i.e. cancer, loss of vision, radiation-induced oxidative stress, cardiovascular disorders, fibrosis in major organs, bone loss). Another goal of this pilot study is to investigate the state of disease against proposed medical countermeasures, in order to determine whether the countermeasures are efficacious in preventing or mitigating these injuries.

An example of an up and coming tear biomarker technology, Ascendant Dx, a clinical stage diagnostic company, is developing a screening test to detect breast cancer using proteins from tears. The team utilized Liquid Chromatography –Mass Spectrometry with Mass analysis (LC MS/MS) as a discovery platform followed by validation with ELISA to come up with a panel of protein biomarkers that can differentiate breast cancer samples from control (“cancer free”) samples with results far surpassing the results of imaging techniques in use today. Continued research into additional proteins is underway to increase the sensitivity and specificity of the test and development efforts are on the way to transfer the test onto a fast, accurate and inexpensive point of care platform.

In conclusion, the expected results from this proposed pilot study are to:

- a) establish an SOP for retrieving/storing/transporting tear fluid samples from multicentre sites
- b) establish a normal range for relevant biomarkers in tears; and
- c) establish a database (biobank) of tears of space naïve versus veteran astronauts, to establish a personal baseline for long-term ocular health monitoring.

References

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