



BIOMARKER RESEARCH FOR Aero Toxic Syndrome DIAGNOSTICS

Dear Participants,

Medical conditions caused by **toxic chemical exposure** impose a large burden on many EU citizens, especially to those who are exposed to such substances chronically. The International Labour Organization of the United Nations stated in 2018 that globally, nearly 2M workers per year die prematurely from non-communicable diseases related to toxic exposure in the workplace.

1 In the case of airline personnel, different reports indicate up to 10-15% of workers to suffer from health complaints after employment on aircrafts

2. This is presumably related to chronic exposure to chemicals present in cabin air combined with occasional exposure to so-called “fume events” where oil from the engine contaminates the air. This medical condition, named the Aero-Toxic Syndrome (ATS), is **under-researched** for a number of reasons: 1) workers are often exposed to a mix of different toxins and concentrations that each have differential effects on health, making it hard to pinpoint causal effects) slow accumulation of health complaints due to long-term exposure to hazardous substances further blur cause and effect) symptoms vary and often depend on the susceptibility or metabolism of the individual person, resulting in controversy surrounding these health complaints) exposure frequently occurs in the workplace where admission could result in litigation, therefore, allegedly, employers try to cover up anecdotal evidence⁵.

The lack of recognition and diagnoses of ATS results in a **high burden** on those afflicted, suffering from a diffuse set of acute and chronic symptoms, including neurological, neurobehavioral, respiratory, cardiovascular, and gastrointestinal symptoms, without adequate treatment.

Overall, there is a lack of solid and causal research into the micro-biological mechanisms underlying different health complaints that ATS patients experience. Also insights on possible biomarkers and genetic predisposition effects are currently not available.

Therefore, the **multidisciplinary BMR-ATS consortium** will investigate biomarkers and resulting health effects of ATS symptoms by researching the following objectives in the Pre-Protocol Phase before the Official Protocol regime can be formulated.

It is our intention during this **Pre-Protocol Phase** to apply below formulated tests during Pre and Post flights:

1. To **identify proteins (DNA and RNA) and toxic components (Organophosphates)** as putative biomarkers in blood of male and female airline personnel that do not have signs of ATS and that are exposed to 5-6 flights or more in a row during 3-5 days schedule/program (**multiple take offs and landings**)
2. To **identify specific organelles within the muscle cell (ribosomes and energy supplier-ATP)** through a **muscle biopsy** (sedated) taken from the outer portion of the thigh muscle (vastus lateralis).

Currently, research into ATS is very fragmented. There is research into the origins of the toxic exposures by determining constellations of toxins in aircraft engines, cabins, and potable water. Additionally, there is research focusing on health effects following exposure of specific toxins, through questionnaire surveys, neuropsychological studies and studies at cellular levels. Yet, as there are



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many toxic substances in cabin air that each have differential effects on health and a wide array of symptoms, there is currently little consensus in the literature on health effects of chronic exposure to these substances. For this reason it is imperative to emphasize on these blood markers (**proteins-toxins**) and intracellular changes (**ribosomes and energy supplier-ATP**) to assess the direct responsible link to this possible, non-official at present, occupational Aero Toxic Syndrome.

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