THE RELATIONSHIP BETWEEN CO_2 LEVELS AND CO_2 RELATED SYMPTOMS REPORTED ON THE ISS

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INTRODUCTION

Medical Operations, Toxicology, and the Lifetime Surveillance of Astronaut Health collaborated to assess the association of CO2 levels on board the International Space Station and USOS crew reported symptoms inflight, i.e. headache and vision changes.

METHODS

Private Medical Conference (PMC) documents and the weekly Space Medicine Operations Team (SMOT) Notes were used to provide a robust data set of inflight medical events. All events and non-events were documented independent of CO2 levels and other potential contributors. Average (arithmetic mean) and single point maximum ppCO2 was calculated for the 24 hours and 7 days prior to the PMC or SMOT date and time provided by LSAH.

RESULTS

Observations falling within the first 7 days of flight (147) were removed from the datasets analyzed to avoid confounding with Space Adaptation Syndrome. The final analysis was based on 1716 observations. For headache, 46 headaches were observed. CO2 level, age at launch, time inflight, and data source were all significantly associated with headache. In particular, for each 1 mmHg increase in CO2, the odds of a crewmember reporting a headache doubled. For vision changes, 29 reports of vision changes were observed. These observations were not found to be statistically associated with CO_2 levels as analyzed.

DISCUSSION

While the incidence of headache has was not high (~3%), headaches may be an indicator of underlying increases in intracranial pressure, which may result likely from the synergy between CO2-induced cerebral vasodilatation and decreased venous drainage in microgravity. Vision changes were inconsistently reported and as a result did not align appropriately with the CO_2 levels. Further analysis is needed. Our results support ongoing efforts to lower the CO2 exposure limits in spacecraft.