

Radiation-associated brain-ophthalmic effects in long-duration space missions

Efeitos cerebro-oculares associados à radiação em missões espaciais de longa duração

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Dear Editors:

We read with interest the paper entitled "Space travel: A challenge from the point of view of ophthalmology" by Cunha *et al.*,⁽¹⁾ recently published at *Revista Brasileira de Oftalmologia*. The authors stressed that currently, with the emergence of new technologies promoting novel and even more ambitious space programs, aerospace medicine has increasingly gained prominence in the scientific community. Hence, there is an urgent need for specific studies exploring changes in human physiology during space missions, with the aim to maintain proper health conditions of astronauts.

We totally agree with the authors that the eye is one of the most sensitive structures to cosmic radiation and microgravity, and is associated to major issues especially during long-duration space missions. Indeed, our research group has already underlined the sensitivity of the eye to radiation in humans, while suggesting the brain and visual organ as potential targets for ionizing radiation (IR) exposure.⁽²⁻⁴⁾ Our observations led us to the proposal that eye changes can cause or be associated with brain dysfunction, and *vice versa*, and we labeled these relations as the "eye-brain axis".⁽²⁻⁴⁾

Available data would indicate that astronauts who carry out long-duration space missions, outside the protection of the Earth's magnetosphere, will be exposed to galactic cosmic radiation (heavy ions, protons), that might lead to what we defined "cerebro-ophthalmic disorders", including cognitive/behavioral disorders, phosphenes and cataracts (besides psychological and psychopathological disorders).^(5,6) Interestingly, Cunha *et al.*⁽¹⁾ underlined the likelihood of developing cataract was positively related to the dose of radiation, as noted by us.⁽³⁾

With no doubt, exploring space is one of the most attractive goals that humanity has ever set; notwithstanding, the detrimental effects and risks on crews' health should be carefully considered and possibly prevented.

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