

# **Is rhodopsin isomerization correlated to astronauts' phosphene perceptions in space?**

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Anomalous Phosphene Perception (APP) phenomenon may just be a first example of how microgravity and particle radiation may modify the normal behaviour of the Central Nervous System (CNS) and also is an evidence that space environment may indeed influence the correct functioning of the visual system.

The ALTEA program is going to provide i) an assesment of the CNS functional hazard due to microgravity and particle radiation during long space human permanence; ii) a definition for the needed shielding optimized for reducing these risks and iii) a survey of ISS radiation environment aimed at the validation of spacecrafts computer models.

As known, Rhodopsin is at the start of the photo-transduction cascade and its involvement in the phosphene perception would suggest a possible physiological pathway. The "bleaching" of few molecules in the retina is sufficient to start the process of vision.

A very preliminary measurements on rhodopsin irradiation has been conducted in April 2003. Irradiation of 17 vials containing a solution of suine rhodopsine has been performed with  $^{12}\text{C}$  ions at 200 MeV/n - total dose has been varied from  $10^9$  to  $10^{13}$  ions over each vial.

New and more complete data from most recent measurements are now available. Preparation and purification of bovine rhodopsin, and regenerations of "bleached" molecules was carried out, using reproducible procedures. The samples

was irradiated with controlled  $^{12}\text{C}$  ion beams and with different amount of light radi-

ation in order 1) to understand if the molecules have been “bleached” or damaged (or “denaturated”) by the irradiation in the laboratory conditions; 2) to perform quantitative comparison between light and particle irradiation; 3) to understand if heavy-ion-induced isomerization could be responsible for phosphenes sensations.

The understanding of the processes involved in the observed modifications of the spectral properties of the rhodopsin complex could be of great importance concerning the whole ALTEA-project and could clarify some aspects in order to explain how phosphenes originate.