

# Astronauts at risk of cortical cataracts



Eleanor Blakely



Leo T Chylack

Pippa Wyszog  
in Fort Lauderdale, Florida

RADIATION exposure from space flights is associated with cortical cataracts, and diet may affect the risk, according to a study that looked at the eyes of all American astronauts.

These findings come from the NASA Study of Cataract in Astronauts (NASCA), which was presented at the annual meeting of the Association for Research in Vision and Ophthalmology, by Leo T Chylack, Jr, MD, professor and vice-chairman (research) in the Department of Ophthalmology at Harvard Medical School. NASCA, a five-year study, is intended to clarify the risk of cataract from space radiation in astronauts and the factors associated with cataract incidence and progression. Dr Chylack presented data from the first year.

The study was open to all American astronauts; 215 participated. Astronauts' exposure to space radiation varied with the length of service and the nature of the mission. Some astronauts have flown only in low-inclination flights (meaning they were still partially shielded by the Earth's atmosphere); some have been around since the start of the programme in the 1960s, and some walked on the moon. The study excluded eight

astronauts who have had lens replacement surgery, as well as 12 others known to have cataracts.

Researchers used two sets of controls: 90 military pilots and 90 ground-crew workers. Pilots are known to have an increased risk of cataract. Also, because many of the astronauts had been pilots, pilots were included to help researchers separate cataract risks related to flying aircraft from those related to flying spacecraft.

Data from the first year suggests exposure to radiation in space "is related only to cortical cataract... but it does not appear to be related to nuclear cataract", Dr Chylack told *EuroTimes* in an interview.

He pointed out that there are many components to the radiation in space including heavy ions, protons, X-rays and cosmic rays.

The study of cataract in astronauts is of interest largely because they are exposed to higher doses and different patterns of radiation than other more Earth-bound populations. Increased radiation exposure has been linked to increased cataract risk. With the increasing probability that people will travel some day on deep space missions to other planets, it will be vital to know how

exposure to the space environment affects astronauts' health.

The Harvard Food Frequency Questionnaire was administered to all subjects. Levels of annual solar UV and space radiation exposure were also calculated. The severity of lens opacities in study participants was measured objectively from digital images. The colour of the lens was ranked according to the Lens Opacities Classification System, Version III (LOCS III) by study optometrists. Dr Chylack developed LOCS III, a quantitative measure of lens opacification that indicates the type and severity of each opacity.

Data was obtained for a total of 105 nutritional variables, and analysis showed a correlation between specific nutrients and risk for cortical opacity. Intake of omega-3 fatty acids appeared associated with increased risk of cortical opacity, the study indicated. That finding was statistically significant.

The study also found that risk of cortical opacity "tends to be lowered by intake of the A vitamins and pro-vitamins"; this finding was also statistically significant. A vitamins and pro-vitamins included dietary forms such as alpha- and beta-carotenes.

The data concurs with other studies in that it found increasing age is related to an

increased risk for cataract formation.

Findings from the study are of interest, because the research quantifies the types and severities of cataracts in astronauts. They also add to the knowledge base of what types of risks astronauts may face in deep space missions where ambient radiation levels are higher, said Eleanor Blakely PhD, a biophysicist at the Lawrence Berkeley National Laboratory.

Dr Blakely was not directly involved in the study, but studies the effects of radiation on tissue. Cancer risk from exposure to galactic cosmic rays and its implication for space exploration by human beings has been a long-addressed concern in planning space missions and is the topic of a recent article published in *The Lancet Oncology* (Cucinotta and Durante, May 2006).

The importance of this work is that radiation cataracts have always been associated with the posterior subcapsular region, she said. This study shows that space flight may also be associated with cortical cataracts. In addition, the findings suggest that diet can play a role in ameliorating that risk, she said.

lchylack@rics.bwh.harvard.edu  
eablakely@lbl.gov