

Lead exposure may be an important unrecognised risk factor for cataract

Devon Schuyler

CUMULATIVE exposure to lead may be an important risk factor for age-related cataract, a new epidemiological study reveals. The study was among the first to examine the relationship between bone lead levels and cataracts in humans.

“One of the well-known biological effects of lead in the body is to increase oxidative damage. And cataract is one of the quintessential age-related diseases associated with oxidative damage,” said Debra A Schaumberg ScD, of Boston’s Brigham and Women’s Hospital, Division of Preventive Medicine, in an interview with *EuroTimes*.

These two pieces of information led her and colleagues at the Harvard School for Public Health to investigate the relationship between lead and cataract. The study involved 642 men aged 60 years and older (average age 69 years) from the Normative Aging

Study, a longitudinal study of veterans based in Boston.

The researchers used x-ray fluorescence to measure levels of lead in the participants’ tibia and patellae between 1991 and 1999. Each participant had at least one eye examination between 1990 and 2002.

Cataract was diagnosed in 122 men during the course of the study. Men with the highest levels of lead in the tibia were more than three times as likely to develop cataracts as those with the lowest levels, after adjusting for various potential confounding factors. The concentration of tibial lead was a marker for cumulative lead exposure. Overall, lead was a contributing factor to cataract in 42% of cases, she said.

The concentration of lead in participants ranged from 0 to 126 mcg/g in the tibia (median, 20 mcg/g) and 0 to 165 mcg/g in the patella (median, 29 mcg/g), with a correlation of 0.68 between lead levels in the tibia and patella. These

amounts were in line with what the researchers expected to find.

Men in the highest quintile of tibia lead levels had an age-adjusted odds ratio for cataract of 2.68 compared with those in the lowest quintile. After further adjustment for cigarette smoking, diabetes, blood levels of lead, and intake of vitamin C, vitamin E, and carotenoids, the odds ratio was 3.19.

As for patellar lead levels, men in the highest quintile appeared to be increased risk of cataract compared with those in the lowest quintile, but the trend was not considered to be statistically significant.

Blood levels of lead were also measured, but these indicate only recent lead exposure—about 95% of the body’s lead is stored in the skeleton. The tibia provides an especially good measurement of long-term lead exposure because it has a relatively low turnover rate; the half-life of lead is more than 10 years in the tibia, versus

one to five years in the patella, Dr Schaumberg noted.

Cataract-associated lead levels within normal range

She said that the levels of lead found in the study were not unusually high; in fact they were quite reflective of the general population. Current U.S. limits for occupational lead exposure can produce bone lead levels about three times higher than those found in upper group in this study, she added.

Lead appears to contribute to cataract in several ways. First, it can disrupt normal oxidation in the lens. Second, lead inhibits the metabolism of glutathione in the lens, increasing the amount of glutathione and cysteine bound to protein. Third, lead exposure increases the amount of malondialdehyde, a by-product of lipid metabolism, in the lens. Finally, lead can interfere with calcium homeostasis. All of these processes can interfere with lens clarity.

The main sources of environmental lead are leaded gasoline and paint. Leaded gasoline is dangerous because it can be inhaled; it also contaminates soil. When lead-based paint peels or chips, it creates dust that can get

in the body when people inhale or put their hands or contaminated objects in their mouth. Other sources of lead include water from plumbing with lead solder, foods and liquids stored in leaded crystal or pottery, employment as a lead smelter, and some old-fashioned or ethnic cosmetics.

Most American adults have substantial amounts of lead in their bodies, and there’s “no reason to think that the problem is any different in Europe,” said Dr Schaumberg.

The United States phased out leaded gasoline and paint in the 1970s and 1980s; most European countries banned these substances slightly later.

Recent studies have linked lead exposure to other age-related disorders associated with oxidative stress, namely hypertension and cognitive decline.

The study, ‘Accumulated Lead Exposure and Risk of Age-Related Cataract in Men’, appeared in the *Journal of the American Medical Association* (December 2004 292:2750-2754).

Debra A. Schaumberg ScD
dschaumberg@rics.bwh.harvard.edu