

EIGHTH COLLEGIUM RAMAZZINI STATEMENT

CALL FOR A REDUCTION OF EXPOSURE TO BENZENE TO THE LOWEST POSSIBLE LEVEL

RICHIESTA DI UNA RIDUZIONE DELL'ESPOSIZIONE A BENZENE AL MINIMO LIVELLO POSSIBILE

The Collegium Ramazzini reaffirms its previously stated position (1993) that benzene is a human carcinogen. The Collegium Ramazzini affirms further, based on recently published evidence, that there is no reason to believe there is a threshold level of exposure below which benzene is not a carcinogen.

The Collegium Ramazzini is an international society of physicians and health scientists dedicated to occupational and environmental medicine and to protection of the health of working men and women worldwide. Periodically the Collegium Ramazzini issues position statements and advisories and holds conferences on occupational, environmental, and public health issues of pressing importance to public health. In this document, the Collegium Ramazzini expresses its deep concern about the continuing exposure of workers in developing nations as well as in industrially developed nations to benzene, a proven, potent cause of human cancer.

Occupational exposure to benzene occurs in the manufacture of benzene and related chemicals in refineries and petrochemical and coke plants; in the manufacturing, distribution and sale of gasoline; in the painting trades where benzene-contaminated solvents are used in paint products; and in the tire industry where solvents are contaminated with benzene. Some of the most hazardous exposures to benzene today involve the use of benzene-contaminated gasoline as a solvent, particularly in developing countries, and the use of benzene as a solvent in small industries such as shoe manufacturing.

Benzene is a proven human carcinogen. Its carcinogenicity has been affirmed repeatedly by the US Environmental Protection Agency (EPA), the US National Toxicology Program (NTP), the US Occupational Safety and Health Administration (OSHA), and the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO), and by similar agencies in many other nations of the world. Benzene has been associated with the induction of a range of haematopoietic and lymphoreticular malignancies including all of the major forms of acute and chronic leukaemia, non-Hodgkin's lymphoma, multiple myeloma, and the myelodysplastic syndromes (MDS).

In 1997, Hayes *et al.* reported a significant dose-response relationship between benzene exposure and all lymphohaematopoietic cancers (LHP) combined as well as for leukaemia and non-Hodgkin's lymphoma examined separately. In this analysis, a cumulative benzene exposure of 4.3 ppm-year was associated with a statistically significant, 2-fold increased risk for all LHP cancers. This effect corresponds to a time-weighted average (TWA) exposure of 0.11 ppm per year over a 45-year working lifetime. In this study, a cumulative exposure of 6.7 ppm-years was associated with a 3-fold elevation in the risk of acute non-lymphocytic leukaemia including MDS; this finding was statistically significant.

A recent study of Australian petroleum workers (Health Watch Eleventh Report, 2002) exposed to benzene has demonstrated a statistically significant 50% increase in the incidence of leukaemia. For this cohort, the average intensity of benzene exposure was 0.2 ppm, well below the standard recommended by American Conference of Governmental Industrial Hygienists (ACGIH) of 0.5 ppm in 1997 and the current OSHA 1 ppm TLV-TWA standard, - with 98% of the cohort having exposures below 1.0 ppm. The average cumulative exposure to benzene in this population was only 4.9 ppm-years. The European carcinogenesis directive (90/394/EEC amended by directives 97/42/EC and 97/38/EC) obliges the European member states to bring into force a maximum occupational exposure limit of 1 ppm. Member states are free to set a lower limit.

In summary, the elevated risks of leukaemia and lymphoma observed in these recent, carefully conducted, peer-reviewed studies are the consequence of exposures to benzene that occur at levels well below current permissible exposure limits in the USA and in other countries.

The Collegium Ramazzini states that these current data overwhelmingly support the immediate need to reduce the occupational standard exposure limit for benzene. Continued maintenance of an occupational exposure standard for benzene at a level above 40 ppb presents a serious, needless, and preventable risk of cancer to working men and women throughout the world.

The Collegium Ramazzini calls upon occupational and environmental authorities in nations around the world to take immediate action to reduce the standard for occupational exposure to benzene well below the standard recommended by ACGIH (0.5 ppm in 1997) and the current OSHA 1 ppm (TLV-TWA) standard.

The Collegium Ramazzini calls upon occupational and environmental authorities in nations around the world to take immediate action to reduce the standard for occupational exposure to benzene and, at the same time, to reduce general exposure to the lowest possible level.

Fundamental references

- Collegium Ramazzini Position Paper on Benzene. 10 September 1993.
- European Commission. EUR 15091 – Occupational exposure limits: Recommendations of the Scientific Expert Group 199-1992. Luxembourg: Office for Official Publications of the European Communities, 1994.
- Hayes RB, Yin SN, Dosemeci M, *et al.* Benzene and the dose-related incidence of hematologic neoplasms in China. For the Chinese Academy of Preventive Medicine—National Cancer Institute Benzene Study Group. *J Natl Cancer Inst* 1997; 89: 1065-71.
- Hayes RB, Yin SN, Rothman N, *et al.* Benzene and lymphohematopoietic malignancies in China. *J Toxicol Environ Health* 2000; 61: 419-32.
- Health Watch Eleventh Report. The Australian Institute of Petroleum Health Surveillance Program. The University of Adelaide Department of Public Health, Adelaide University, South Australia, 2002, 1-75.
- Huff JE, Haseman JK, De Marini DM, *et al.* Multiple site carcinogenicity of benzene in Fisher 344 rats and B6C3F1 mice. *Environ Health Perspect* 1989; 82: 125-63.
- Infante PF. Benzene and leukemia: cell types, latency and amount of exposure associated with leukemia. In Imbriani M, Ghittori S, Pezzagno G, *et al.* (eds). Update on benzene, advances in occupational medicine and rehabilitation. Fondazione Salvatore Maugeri Edizioni, Pavia, Italy, 1995, 107-20.

- Maltoni C, Ciliberti G, Cotti G, *et al.* Benzene an experimental multipotential carcinogen: results of the long-term bioassays performed at the Bologna Institute of Oncology. *Environ Health Perspect* 1989; 82: 109-24.
- Mehlman MA. Benzene health effects: unanswered questions still not addressed. *Am J Ind Med* 1991; 20: 707-11.
- Mehlman MA. Benzene – A hematopoietic and multi-organ carcinogen at any level above zero. *Eur J Oncol*, in this volume.
- Pearce NE, Howard JK. Occupation, social class and male cancer mortality in New Zealand, 1974-1978. *Int J Epidemiol* 1986; 15: 456-62.
- Raaschou-Nielsen O, Hertel O, Thomsen BL, *et al.* Air pollution from traffic at the residence of children with cancer. *Am J Epidemiol* 2001; 153: 433-43.
- Rinsky RA, Smith AB, Hornung R, *et al.* Benzene and leukemia: an epidemiologic risk assessment. *N Engl J Med* 1987; 316: 1044-50.
- Smith MT, Zhang L, Wang Y, *et al.* Increased translocations and aneusomy in chromosomes 8 and 21 among workers exposed to benzene. *Cancer Res* 1998; 58: 2176-81.
- Yin S-N, Hayes RB, Linet MS, *et al.* An expanded cohort study of cancer among benzene-exposed workers in China. *Environ Health Perspect* 1996; 104: 1339-41.