

EXECUTIVE SUMMARY OF RICHARDSON REPORT

ASSESSMENT OF MERCURY EXPOSURE AND RISKS FROM DENTAL AMALGAM by G. Mark Richardson, PhD., Medical Devices Bureau, Environmental Health Directorate, Health Canada, August 18, 1995, Final Report (released November 27, 1995, in Toronto, at the stakeholders' meeting)

Executive Summary For Canadians with amalgam-filled teeth, it was estimated that total mercury (Hg) exposure averages: 3.3 ug Hg/day in toddlers (aged 3 to 4 years); 5.6 ug Hg/day in children (aged 5 to 11 years); 6.7 ug Hg/day in teens (aged 12 to 19 years); 9.4 ug Hg/day adults (aged 20 to 59 years; and 6.8 ug Hg/day in seniors (aged 60+ years). Of this exposure, amalgam was estimated to contribute 50% to total Hg exposure in adults, and 32 to 42% for other age groups. Estimates, based on two independent models, of exposure from amalgam alone were: 0.8 - 1.4 ug Hg/day in toddlers; 1.1 - 1.7 ug Hg/day in children; 1.9 -2.5 ug Hg/day in teens; 3.4- 3.7 ug Hg/day in adults and 2.1 - 2.8 ug Hg/day in seniors.

There are insufficient published data on the potential health effects of dental amalgam specifically to support or refute the diverse variety of health effects attributed to it. Numerous studies constantly report effects on the central nervous system (CNS) in persons occupationally exposed to Hg. Virtually all studies failed to detect a threshold for the effects CNS measured. A tolerable daily intake (TDI) of 0.014 ug Hg/kg body weight/day was proposed for mercury vapour, the principal form of mercury to which bearers of amalgam fillings are exposed. This TDI was based on a published account of sub-clinical (i.e. not resulting in overt symptoms or medical care) CNS effects in occupationally exposed men, expressed as a slight tremor of the forearm. An uncertainty factor of 100 was applied to these data, to derive a reference dose (TDI) which should, in all probability, prevent the occurrence of CNS effects in non-occupationally- exposed individuals bearing amalgam fillings.

The number of amalgam-filled teeth, for each age group, estimated to cause exposure equivalent to the TDI were: 1 filling in toddlers; 1 filling in children; 3 fillings in teens; and 4 fillings in adults and seniors. It was recognized that filling size and location (occlusal versus lingual or buccal) may also contribute to exposure. However, data suggest that no improvement in prediction of exposure is offered by any particular measure of amalgam load. Therefore, the estimates of exposure derived from the number of filled teeth were considered as reliable as those that might be based on size and position of amalgam fillings, were such data available for the Canadian population.

Effects caused by allergic hypersensitivity to amalgam or mercury, including possible auto- immune reactions, can not be adequately addressed by any proposed tolerable daily intake. Individuals suspecting possible allergic or auto-immune reactions should avoid the use of amalgam selecting suitable alternate materials in consultation with dental care (and possibly health care) professionals.

Preface This report has been prepared in response to concerns that exposure to mercury from dental amalgam may adversely impact on health. Recent reviews (USDHHS 1993, Swedish National Board of Health, 1994) have concluded that there is no evidence to suggest that dental amalgam, specifically, is injurious to health. However, the data base relating health impacts in humans or animals to amalgam specifically is small and weak. This suggests that indirect evidence relating mercury vapour exposure (the predominant form of mercury released by dental amalgam) to human health effects (for which a large data base exists) is a necessary basis for an evaluation of the possible health risks of dental amalgam. In the reports previously mentioned, exposure to mercury arising from amalgam was not adequately quantified, and a level of mercury vapour exposure which is, in all probability, tolerable to the vast majority of persons bearing amalgam fillings, was not defined. This report attempts to address these previous deficiencies.

This report is not exhaustive. Recent reviews on mercury (WHO 1990, 1991; IARC 1993; ATSDR 1994) adequately review many aspects of mercury toxicity and exposure. Instead, this report focuses on studies which report on health effects in dental care practitioners and other occupational groups exposed to relatively low levels of mercury. This report also examines recent research which hypothesizes a link between mercury exposure, and thereby dental amalgam, and Alzheimers' Disease. This report concentrates on effects associated with long term mercury vapour exposure (via inhalation) in humans. Other reviews (WHO 1990, 1991; IARC 1993; ATSDR 1994) examined acute and sub-chronic exposure in animals, and all aspects of the toxicology of exposure to other forms of mercury via other routes of exposure (ingestion, dermal absorption), in extensive and adequate detail such that this is not repeated here.

Any medical or dental material, such as amalgam, will have associated with it some degree of health risk. The purpose of this report is to attempt some determination of what that risk is (i.e. what effect(s) it may cause), how significant it is (i.e. what level of exposure should be free from effect), and what proportion of the population might be at some degree of risk (i.e. how many exceed the level considered to be free from effect)