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Letter to the Editor

Mercury in dental amalgams: A great concern for clinical toxicology in developing countries?

Amalgam as a dental filling material contains approximately 50% mercury (Hg) by weight, as well as other metals, including silver (Ag), tin (Sn), copper (Cu), and zinc (Zn) [1]. In Norway and Sweden, this type of dental filling material is banned [2,3]. In many other European countries, the current use of dental amalgam is less than 5% of dental restorations [4]. From 1 July 2018, new rules from the European Union restrict the use of dental amalgam in children under 15, and in pregnant or breast-feeding women [5]. However, the international market for dental amalgam is "still going strong". By the end of 2023, this market is expected to reach USD 500 million dollars. During 2018–2023, the market for dental amalgam is estimated to grow at around 5% annually [6].

The potential adverse human health consequences of using dental amalgams appear to be a concern for human and environmental health, particularly in many developing countries [7–9]. Fig. 1 shows the distribution of dental amalgams in the world based on recent data. The American Dental Association (ADA) has opposed a complete ban on dental amalgams [10]. The US Food and Drug Administration (FDA) has also considered the question of banning the use of Hg-containing dental materials [11,12]. Despite this, many environmental toxicology researchers still question whether the adverse human health effects of dental amalgams have fully been considered and appropriately addressed by dentists, dental laboratories and government.

The global distribution reported in Fig. 1 concludes that many developing countries still use dental amalgam. From an epidemiological point of view, many developed countries such as Japan, the United States, and Scandinavia have vastly reduced human Hg exposure over the last several decades. Unfortunately, many people in developing nations continue to experience ongoing large-scale human exposure to Hg-containing products [13].

The adverse human impacts of Hg used in dental amalgams, vaccines, eye drops, traditional (folk) medicines, etc. may be difficult to assess because Hg toxicity usually arises many months or even years following low or moderate exposure because it is stored and accumulates in the body [14–16]. At present, research is being undertaken to evaluate the potential correlation between Hg release from dental amalgams, and a number of chronic and degenerative human diseases [17,18]. Dental amalgam emits Hg vapor, which upon inhalation is rapidly absorbed into the blood, and a fraction of the absorbed Hg°-amount also penetrates into the brain [16,19]. Some investigators have failed to find a link between Hg exposure from dental amalgams and adverse human health consequences [20,21]. Indirect evidence for a link between Hg exposures from dental amalgams has been reported [22–24]. However new evidence has revealed significant increased Hg blood levels in patients receiving amalgam fillings [25]. A recent report from Turkey showing increased Hg release from dental amalgams after high-powered MRI [26]. From a biochemical point of view, Hg is known to significantly affect human biochemical processes by interfering with complex cellular redox machinery used by cells to regulate cell survival and mitochondrial function [27,28]. The production of superoxide anions in the mitochondrial matrix might promote demethylation of methyl-Hg, causing an increase of inorganic Hg inside the cells [29]. Cells with increased oxidative stress, for instance during an inflammatory immune reaction or upon toxic chemical challenge, may be more susceptible to Hg toxicity than in healthy highly controlled conditions.

As a consequence, individuals living in developing countries who have frequent chronic health conditions resulting from immune and toxic stressors may be much more susceptible to the adverse consequences of Hg exposure than those with similar health problems living in developed countries [30,31].

Oral hygiene may also exacerbate the adverse consequences of Hg exposure [32,33]. Therefore, Hg toxicology should be reviewed in countries where dental amalgam is more frequently used than in other parts of the world, and hygiene and environmental conditions should also be considered.

In conclusion, both epidemiological research and scientific reviews about the potential human adverse consequences of Hg exposure from dental amalgams should take into account socioeconomic and environmental conditions. We hope such efforts will help to reduce and prevent toxic Hg effects in human communities.

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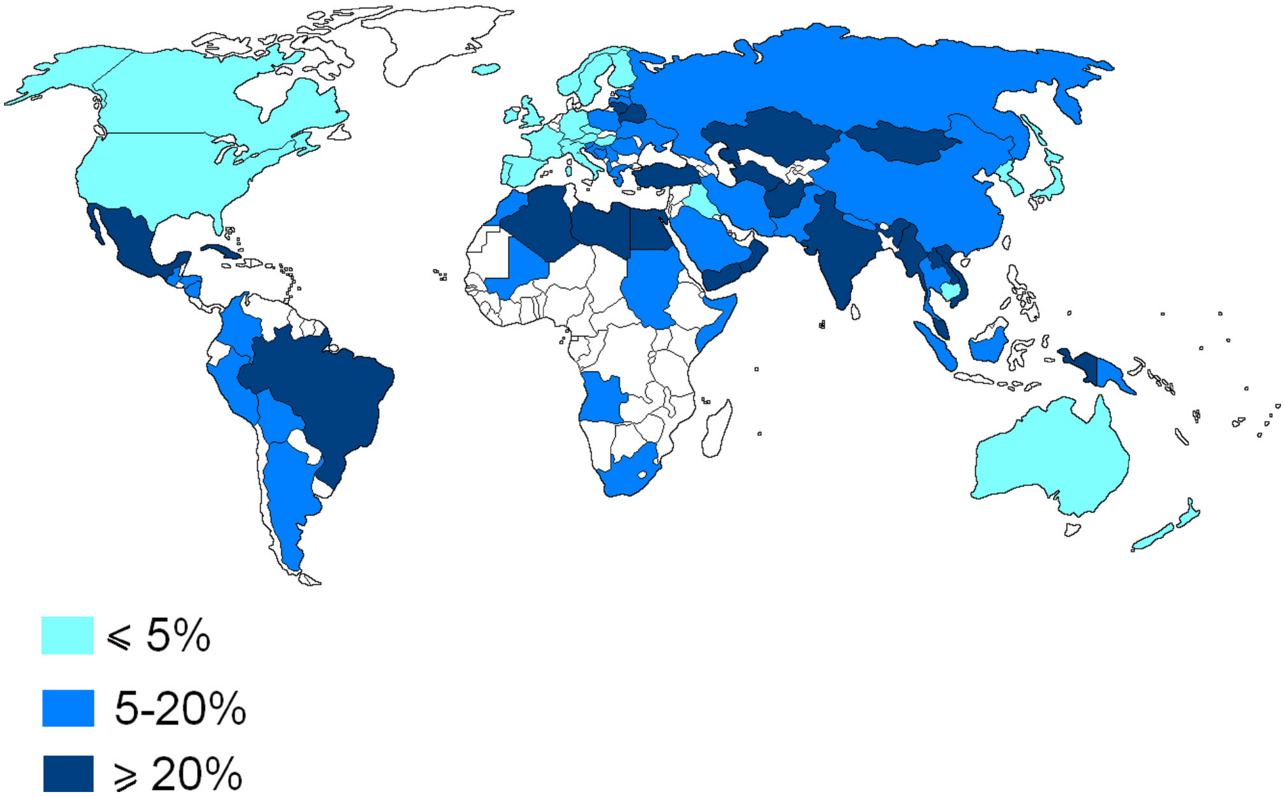

Fig. 1. Distribution of dental amalgams worldwide (sources Pubmed, FDI World Dental Federation, ADA documents, EC medical observational panel on Hg-pollution No 8765/R, 2016, surveys on years 2014, 2016 and 2017. (Data was unavailable for blank areas).

Conflict of interest

The authors declare no conflict of interest.

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