PostScript

LETTERS

Occupational exposure to mercury from amalgams during pregnancy

In their investigation of chemical exposure in dental personnel, Lindbohm *et al*¹ conclude by saying that there is a weak association between exposure to chemical agents and an increased frequency of spontaneous abortion. Based on their data, the authors propose in the Policy implications section that “In general, there is no need to restrict work in dental clinics during pregnancy”. We would like to express our concerns about their statement before these results reach public health policy.

In this survey, the most important methodological limitation was the complete absence of measures of exposure to chemical agents in the dental office. For example, there were neither environmental nor biological monitoring data to show the level of exposure to mercury vapor, to estimate the risk for dental staff.

Furthermore, the number of total dental amalgams was determined by a self-report questionnaire. It seems highly unlikely that all participants were able to report their exact number of mercury fillings. Self-report can lead to flawed data. We believe that the self-reported figure of amalgams cannot be considered a reliable measure of exposure to non-occupational mercury vapor.

Most unexpectedly, in their discussion, the authors did not take into account the very high concentrations of mercury vapor in the air in the breathing zone of the dental team, especially during amalgam removal.

These concentrations are often higher (10 times) than the short-term threshold limit (STEL) of 150 µg/m³, with levels peaking around 1.5 mg/m³.^{2,3} Consistent with this finding, dental workers show elevated placenta concentrations of mercury as well as in fetal membrane.⁴ Also, results from animal models suggest that chronic mercury exposure causes fetal resorption in pregnant rats.⁴

Surprisingly, the authors do not mention that the fetus is exposed through the placenta to mercury vapor inhaled in the operator's breathing zone. As estimated from previous studies, the developing brain has a critical sensitivity to mercury vapor, which may cause an accumulation in fetal brain.^{4–7} In addition, there is evidence that a fetus exposed to chemicals may experience adverse health effects that continue into old age.⁸

It has been shown in experimental study in non-human primates and humans that urine may not reflect the levels of mercury body burden.^{9,10} Notably, the frequency of symptoms associated with mercury vapor exposure was also increased in subjects who had low mercury concentrations compared with subjects with higher urine mercury levels.⁹ Our ongoing study seems to confirm this findings.¹⁰ Because of these limitations, we believe that this work is incomplete at the least.

Given that during amalgam removal dental personnel may be exposed to very high levels of mercury vapor, these unsafe procedures that put dental personnel at risk should be avoided during pregnancy.

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Occupational exposure in dentistry and miscarriage: authors' reply

We would like to address the comments made by Dr Guzzi and Dr Pigatto, in their letter regarding our paper “Occupational exposure in dentistry and miscarriage”.¹ They were concerned about our exposure assessment and policy implications, and pointed out that no monitoring data were used in the assessment of exposure to mercury. In a retrospective case-control study such as ours, it is next to impossible to find environmental or biological monitoring data to cover relevant time windows for all the study subjects and for all the exposures. Therefore we assessed exposure to mercury based on the self-reported number of

amalgam fillings made over a one-week time period. We also took into account exposure to mercury during removal of old amalgam fillings by determining their frequency. The number of amalgam fillings placed per week has been shown to be associated with urinary mercury concentration in dental personnel.²

There is also monitoring data available on mercury exposure among Finnish dental workers, as indicated in the discussion of our paper. The concentrations of inorganic mercury in blood measured during the study period remained below the reference value for the unexposed (25 nmol/l). The median concentration among the dental nurses was 6.0 nmol/l (range 1.8–17.4, n = 26) and among dentists 6.9 nmol/l (range 4.0–20.2, n = 23). All the concentrations of mercury vapour in the air of dental offices in 1994–2004 (range 3.0–5.9 µg/m³, n = 10) were also far below the current occupational exposure limit (50 µg/m³) in Finland.³ Thus both environmental and biological measurements indicate a low level of exposure in Finnish dental offices.

In addition, we feel that dental personnel are quite capable of correctly reporting the number of their amalgam fillings, although it may be more difficult for the pharmacists and health-care secretaries. We believe that we have successfully been able to separate those with no fillings from those with a high number of fillings.

Drs Guzzi and Pigatto consider it surprising that we do not mention that the fetus may be exposed to mercury vapour. However, the potential exposure of the worker and the fetus was in fact our main reason for examining the association between mercury exposure and spontaneous abortion. The writers seem to have missed the part in our introduction saying “it has been shown that inorganic mercury accumulates in the placenta and a substantial fraction of maternal blood mercury reaches the foetus”.⁴

Consistent with our findings, most earlier studies among dentists and dental nurses have shown no clear association between mercury exposure and reproductive disorders.^{5–9} In addition, a recent study by Hujoel *et al* showed no evidence that mercury-containing dental fillings placed during pregnancy increased low birth weight risk.¹⁰ Occupational studies have been carried out in the Nordic countries (Denmark, Finland, Norway and Sweden) and the US. Thus, their results cannot necessarily be generalised to working conditions in countries where exposure levels are clearly higher.

Based on our findings and other available evidence, we stand by our policy implication: in general, there is no need to restrict work in dental clinics during pregnancy. If the exposure level exceeds the reference limit for non-exposed (inorganic mercury in blood 25 nmol/l or in urine 50 nmol/l in Finland), exposure of a pregnant worker should be prevented. We would also like to emphasise our second policy implication: it is important to conform to good occupational hygiene in dental work during pregnancy.

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