Consultation Response Form SCHER preliminary report on "The environmental risks and indirect health effects of mercury in dental amalgam"

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Consultation Response Form SCHER preliminary report on "The environmental risks and indirect health effects of mercury in dental amalgam"

Do you agree with the observations made by the SCHER?	Disagree
If you chose the option 'mostly disagree' or 'disagree', explain why:	Unsatisfactory conclusion from the scientific point of view Relevant information missing from the analysis of the situation

Please provide the scientific/technical evidence to improve the overall assessment (with complete references)
max. 4.000 characters with spaces included (approximately 1 page)

The SCHER has failed to consider all pathways of mercury releases, emissions and exposures due to dental amalgam. The SCHER has underestimated dental mercury conversion to methylmercury. The SCHER has discounted or ignored large amounts of relevant data and information that indicate a significant risk. The SCHER has used an inadequate risk assessment methodology. The SCHER has largely ignored highly relevant and peer-reviewed information and analysis on the basis that it has not been published in a scientific journal. If the SCHER properly addresses all of these issues and consults the attached references, the following conclusions are inescapable: 1.Considering the whole life cycle (municipal waste incineration and landfill, medical waste disposal, wastewater treatment sludge incineration/disposal, cremation, etc.), dental amalgam is a significant

continuous contributor to anthropogenic atmospheric mercury emissions in the EU – in the range of 15-20%, corresponding to an estimated 23 tonnes of mercury annually; For example, when amalgam waste is discarded in municipal waste, some mercury will be released into the atmosphere from landfill vapours or leachate, or the mercury will vaporize if the waste is incinerated. 2.Via another pathway to the environment, dental amalgam is also an important contributor to the mercury concentration in municipal wastewater, where the mercury originates from dental clinics as well as (large quantities of) human wastes carrying (low concentrations of) mercury released by normal wear of amalgam fillings; 3.The studies used related to the occurrence of mercury in wastewater from dental clinics are very few and not representative for the whole of the EU. The occurrence of mercury in the wastewater stream of dental clinics is a particularly sporadic and discontinuous event. The SCHER should be relying on the many studies that demonstrate that dental clinics are the origin of typically 40-50% of all Hg in the wastewater going to wastewater treatment plants, since the majority of EU member states have not yet installed and properly maintain separators, and amalgam waste is not fully treated as hazardous waste. 4.In general terms, atmospheric mercury emissions are directly linked to subsequent mercury deposition and runoff; 5.The mercury carried by deposition and runoff is directly reflected in increased concentrations of mercury in surface waters; 6.The total mercury burden in surface waters, including not only dental mercury via the pathways described above, but also contributions from dental mercury accumulated in the environment (in sediments, wastewater piping systems, leaching from landfills, etc.) during previous years, is directly reflected in the methylmercury burden in surface waters; 7.Since not all pathways above were taken into account, the amount of mercury and therefore methylmercury in the environment is underestimated, considering that to the direct methylmercury emissions we need to add the methylmercury from transformation. 8.The main source of methylmercury exposure to wildlife is fish and other aquatic organisms, whose uptake of methylmercury is proportional to the methylmercury burden in surface waters; 9.There is ample and accumulating evidence that the methylmercury burden in surface waters is directly responsible for excessive methylmercury exposure of wildlife, and is causing significant harmful effects to a range of species; 10.Therefore, as long as dental amalgam remains a significant contributor to anthropogenic mercury emissions and, in turn, to the methylmercury burden in surface waters, then dental amalgam is also heavily implicated in environmental risks.

References

References referred to in your comments should be sent as PDF-Files to the following mailbox: Sanco-Sc8-Secretariat@ec.europa.eu. Please indicate the name of contributor in your email and use the following structure for the filenames of documents: Last name of first author_publication year_name of journal (short Medline name)_topic (optional).pdf Please ensure that the maximum length of filenames is 40 characters.

AMSA (2002) – AMSA Review of American Dental Association (ADA) Scientific Assessment, "Evaluation of Mercury in Dental Facility Wastewater," October 2002.; http://www.amsa-cleanwater.org/pubs/mercury Arenholt-Bindslev and Larsen (1996) – D Arenholt-Bindslev and AH Larsen, "Mercury Levels and Discharge in Waste Water from Dental Clinics," Water Air Soil Pollution, 86(1-4):93-9. Ackerman et al. (2008) – JT Ackerman, JY Takekawa, CA Eagles-Smith and SA Iverson, Mercury contamination and effects on survival of American avocet and black-necked stilt chicks in San Francisco Bay. Ecotoxicology 17(2):103-116. Brasso and Cristol (2008) – RL Brasso and DA Cristol, Effects of mercury exposure on the reproductive success of tree swallows (Tachycineta bicolor). Ecotoxicology 17(2):133-141. Burgess and Meyer (2008) – NM Burgess and MW Meyer, Methylmercury exposure associated with reduced productivity in common loons. Ecotoxicology 17(2): 83-91. DG ENV (2007) – "Analysis of Member States replies to a letter of DG Environment concerning the environmentally sound management of dental

amalgam waste." EEB (2007) – "Mercury in dental use: environmental implications for the European Union," European Environmental Bureau (EEB), Brussels. Evers et al. (2008) – DC Evers, LJ Savoy, CR DeSorbo, DE Yates, W Hanson, KM Taylor, LS Siegel, JH Cooley, MS Bank, A Major, K Munney, BF Mower, HS Vogel, N Schoch, M Pokras, MW Goodale and J Fair, Adverse effects from environmental mercury loads on breeding common loons. Ecotoxicology 17(2):69-81. Hill et al. (2008) – EF Hill, CJ Henny and RA Grove, Mercury and drought along the lower Carson River, Nevada: II. Snowy egret and black-crowned night-heron reproduction on Lahontan Reservoir, 1997–2006. Ecotoxicology 17(2):117-131. Lindqvist et al. (1991). O Lindqvist, "Mercury in the Swedish environment – recent research on causes, consequences and corrective methods." Water, Air and Soil Pollution, 55:23–32. Scheuhammer and Sandheinrich (2008) – AM Scheuhammer and MB Sandheinrich, Recent advances in the toxicology of methylmercury in wildlife. Ecotoxicology 17(2): 67-68. Scheuhammer et al. (2007) – AM Scheuhammer, MW Meyer, MB Sandheinrich and MW Murray, "Effects of environmental methylmercury on the health of wild birds, mammals, and fish." Ambio 36, 12-18. Scheuhammer et al. (2008) – AM Scheuhammer, N Basu, NM Burgess, JE Elliott, GD Campbell, M Wayland, L Champoux and J Rodrigue, Relationships among mercury, selenium, and neurochemical parameters in common loons (Gavia immer) and bald eagles (Haliaeetus leucocephalus). Ecotoxicology 17(2): 93-101.

Question 2: Is it scientifically justified to conclude that mercury in dental amalgam could cause serious effects on human health due to mercury releases into the environment?

Do you agree with the response given?	Disagree
If you chose the option 'mostly disagree' or 'disagree', explain why:	Unsatisfactory conclusion from the scientific point of view Relevant information missing from the analysis of the situation

Please provide the scientific/technical evidence to improve the overall assessment (with complete references)

max. 4.000 characters with spaces included (approximately 1 page)

The SCHER has failed to consider all pathways of mercury releases, emissions and exposures due to dental amalgam. The SCHER has underestimated dental mercury conversion to methylmercury. The SCHER has discounted or ignored large amounts of relevant data and information that indicate a significant risk. The SCHER has used an inadequate risk assessment methodology. The SCHER has largely ignored highly relevant and peer-reviewed information and analysis on the basis that it has not been published in a scientific journal. If the SCHER properly addresses all of these issues and consults the attached references, the following conclusions are inescapable: 1.Considering the whole life cycle (municipal waste incineration and landfill, medical waste disposal, wastewater treatment sludge incineration/disposal, cremation, etc.), dental amalgam is a significant continuous contributor to anthropogenic atmospheric mercury emissions in the EU – in the range of 15-20%, corresponding to an estimated 23 tonnes of mercury annually; 2.Via another pathway to the environment, dental amalgam is also an important contributor to the mercury concentration in municipal wastewater, where the mercury originates from dental clinics as well as (large quantities of) human wastes carrying (low concentrations of) mercury released by normal wear of amalgam fillings; 3.In general terms, atmospheric mercury emissions are directly linked to subsequent The studies used related to the occurrence of mercury in wastewater from dental clinics are very few and not representative for the whole of the EU. The SCHER should be relying on many studies which demonstrate that dental clinics are the origin of typically 40-50% of all Hg in the

wastewater going to wastewater treatment plants, since the majority of EU Member States have not yet installed and properly maintain separators, and amalgam waste is not fully treated as hazardous waste.mercury deposition and runoff; 4.The mercury carried by deposition and runoff is directly reflected in increased concentrations of mercury in surface waters; 5.The total mercury burden in surface waters, including not only dental mercury via the pathways described above, but also contributions from dental mercury accumulated in the environment (in sediments, wastewater piping systems, leaching from landfills, etc.) during previous years, is directly reflected in the methylmercury burden in surface waters; 6.Since not all pathways above were taken into account, the amount of mercury and therefore methylmercury in the environment is underestimated, considering that to the direct methylmercury emissions we need to add the methylmercury from transformation. 7.The main source of methylmercury exposure to humans is fish and other aquatic organisms, whose uptake of methylmercury is proportional to the methylmercury burden in surface waters; 8.It has been well established that as dental mercury releases increase the load of mercury to both the local and global environment, such releases also increase human exposures to methylmercury through the fish that people eat. 9.Fish consumption advisories are pervasive (and increasing, as seen in EEB/ZMWG comments to the SCHER report February 2008) in order to reduce scientifically proven health risks. 10.There is a broad scientific consensus that anthropogenic mercury emissions need to be drastically reduced (e.g. calculations from Sweden call for a reduction of 80% in some areas and close to 100% in others; similarly, the Northeast region of the US has set targets of 86-98% reduction) in order to reduce the food-chain related methylmercury risks to a level where there would be little or no concern for effects on humans; 11.Therefore, as long as dental amalgam remains a significant contributor to anthropogenic mercury emissions and, in turn, to the methylmercury burden in surface waters, then dental amalgam is also heavily implicated in health risks.

References

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AMSA (2002) –"Evaluation of Mercury in Dental Facility Wastewater," October 2002.; Arenholt-Bindslev and Larsen (1996) – "Mercury Levels and Discharge in Waste Water from Dental Clinics," Aydin et al. (2003) –Neuropsychological effects of low mercury exposure in dental staff in Erzurum,. Bittner et al. (1998) –. Behavioral effects of low-level exposure to Hg° among dental professionals: a cross-study evaluation of psychomotor effects. Björnberg et al. (2005) –Methyl mercury exposure in Swedish women with high fish consumption. Cohen et al. (2005) –A quantitative risk– benefit analysis of changes in population fish consumption.. DG ENV (2007) – "Analysis of Member States replies to a letter of DG Environment concerning the environmentally sound management of dental amalgam waste." Echeverria et al. (1995) –Behavioral effects of low-level exposure to Hg° among dentists.. Echeverria et al. (1998) – Neurobehavioral effects from exposure to dental amalgam Hg°: new distinctions between recent exposure and Hg body burden. Echeverria et al. (2005) –Chronic low-level mercury exposure, BDNF polymorphism and associations with cognitive and motor function. Echeverria et al. (2006) –The association between a genetic polymorphism of coproporphyrinogen oxidase, dental mercury exposure and neurobehavioral response in humans. EEB (2007) – "Mercury in dental use: environmental implications for the European Union," Ekroth (1978) –"Anrikning i fisk av kvicksilver från tandamalgam" (Concentration of Mercury from Tooth Amalgam in Fish), Swedish National Environmental Protection Board Grandjean and Choi (2008) – "The Delayed Appearance of a Mercurial Warning [Commentary: Toxic Metals]," Harakeh et al.

(2003) –Mercury and arsenic levels among Lebanese dentists: a call for action. Heyer et al. (2006) –A cascade analysis of the interaction of mercury and coproporphyrinogen-oxidase (CPOX) polymorphism on the heme biosynthetic pathway and porphyrin production. JECFA (2004). Evaluation of certain food additives and contaminants. Sixty-first report of the Joint FAO/WHO Expert Committee on Food Additives. Mergler et al. (2007) –, "Methylmercury exposure and health effects in humans: A worldwide concern." Meyer-Baron et al. (2002) –A meta-analysis for neurobehavioral results due to occupational mercury exposure. Nadorfy-Lopez et al. (2000) –Skeletal muscle abnormalities associated with occupational exposure to mercury vapors. Ngim et al. (1992) –Chronic neurobehavioral effects of elemental mercury in dentists. NYS-DEC (2008) – NYS Department of Environmental Conservation, New York Calls on EPA to Implement New Pollution Controls, Continues In-State Efforts Nylander and Weiner (1991) –Mercury and selenium concentrations and their interrelations in organs from dental staff and the general population. Ponce et al. (2000) –Use of quality-adjusted life year weights with dose-response models for public health decisions: A case study of the risks and benefits of fish consumption. Ritchie et al. (2002) –McGowan, IM Dale, R Hammersley, RM Hamilton, V Binnie and D Collington. Health and neuropsychological functioning of dentists exposed to mercury. Occup. Tezel et al. (2001) Blood mercury levels of dental students and dentists at a dental school. Urban et al. (1999) –. Neurological and electrophysiological examinations on three groups of workers with different levels of exposure to mercury vapors. Urban et al. (2003) – . Color discrimination impairment in workers exposed to mercury vapor. WHO (2007) – Health risks of heavy metals from long-range transboundary air pollution, World Health Organization, ISBN 978 92 890 7179 6, Geneva. Yoshida et al. (2004) –Susceptibility of Metallothionein-Null Mice to the Behavioural Alterations Caused by Exposure to Mercury Vapour at Human-Relevant Concentration.

Question 3: Comparison of environmental risks from use of mercury in dental amalgam and use of alternatives without mercury

Do you agree with the general observations made by the SCENIHR? Mostly agree

Please provide the scientific/technical evidence to improve the overall assessment (with complete references)

max. 4.000 characters with spaces included (approximately 1 page)

However, there is no need to make a comparison of environmental risks from the use of mercury in dental amalgam and the use of mercury-free alternatives, since there is ample evidence that the former should be phased out for (indirect and direct) health reasons. (Please see also IAOMT comments to SCENIHR concerning direct health effects of dental amalgams vs. mercury-free alternatives.) Just as the direct health effects of dental amalgams are significantly higher than those of mercury-free alternatives, it may also be assumed that the environmental risks of amalgam releases are far higher than any releases related to mercury-free alternatives. Finally, and importantly, it has been demonstrated that it is far more cost effective to reduce mercury emissions related to dental amalgam use (in particular, shifting to mercury-free alternatives, installing and maintaining amalgam traps and separators, and improving amalgam recycling and disposal practices) than it is to pursue other opportunities for significantly reducing mercury emissions (Hylander and Goodsite 2006). Major reduction of amalgam related releases may be achieved in the near term by greatly expanding the use of separators, and in the near to medium term by phasing out amalgams, for which there are economically viable alternatives (Kemi 2005).

References

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Hylander and Goodsite (2006) – LD Hylander and ME Goodsite, Environmental costs of mercury pollution, Science of the Total Environment, Elsevier. KemI (2005) – Mercury-free Dental Fillings: Phase-out of amalgam in Sweden, prepared by the Swedish Chemicals Inspectorate KemI & Miljö Konsulterna AB, Sundbyberg, Sweden, December 2005. See also the references attached to the comments on Question 1. See also the references submitted with IAOMT comments to SCENIHR. References for Question 4. AMSA (2002a) – "Mercury Source Control & Pollution Prevention Program Evaluation, Final Report," Association of Metropolitan Sewerage Agencies, July 2002. AMSA (2002b) – AMSA Review of American Dental Association (ADA) Scientific Assessment, "Evaluation of Mercury in Dental Facility Wastewater," October 2002.; Andersson and Lundberg (1995) – Geografisk bild av kvicksilverhalten i gädda 1984–1993 (Swedish). Arenholt-Bindslev and Larsen (1996) – "Mercury Levels and Discharge in Waste Water from Dental Clinics," Bender (2007) –, "Environmental Risks of Mercury Dental Fillings," Testimony to the U.S. House Subcommittee on Domestic Policy of the Committee on Oversight and Government Reform, Mercury Policy Project/Tides Center, 14 November 2007. Cain et al. (2007) "Substance Flow Analysis of Mercury Intentionally Used in Products in the United States Carpi et al. (1997) –Methyl Mercury Contamination and Emission to the Atmosphere from Soil Amended with Municipal DG ENV (2007) – "Analysis of Member States replies to a letter of DG Environment concerning the environmentally sound management of dental amalgam waste." Drummond et al. (2003) –Mercury generation potential from dental waste amalgam. Edwards and McBride (1975) –Biosynthesis and degradation of methylmercury in human faeces. EEA (2001) – Late lessons from early warnings: the precautionary principle 1896–2000, Environmental issues report no. 22, EEB (2007) – "Mercury in dental use: environmental implications for the European Union,". Floyd et al. (2002) – Risks to health and the environment related to the use of mercury products. Håkanson L et al. (1990). Mercury in fish in Swedish lakes – linkages to domestic and European sources of emission.

Question 4: If the Committee under its work finds out that more information is needed, for one or more questions, the Committee is asked to provide a detailed list on what this kind of information is needed to carry out the tasks.

Do you agree with the general observations made by the SCENIHR?	Mostly disagree

If you chose the option 'mostly disagree' or 'disagree', explain why:	Unsatisfactory conclusion from the scientific point of view Relevant information missing from the analysis of the situation

Please provide the scientific/technical evidence to improve the overall assessment (with complete references)

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More information could be considered always useful. However, this is not a risk assessment that lends itself to a precise response, no matter how much information is provided. It is not clear which pieces of information SCHER has used. When the call for

information was made in spring 2007, the information sent by the public was not made publicly available, nor it was clarified which of these documents were accepted by the SCHER. The available information is perfectly adequate to determine that health and environmental risks from amalgam releases to the environment in the EU are significant. The SCHER should consult the following documents, among others:

References

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AMSA (2002a) – "Mercury Source Control & Pollution Prevention Program Evaluation, Final Report," Association of Metropolitan Sewerage Agencies, July 2002. Andersson and Lundberg (1995) – Geografisk bild av kvicksilverhalten i gädda 1984–1993 (Swedish). Bender (2007) –, "Environmental Risks of Mercury Dental Fillings," Testimony to the U.S. House Subcommittee on Domestic Policy of the Committee on Oversight and Government Reform, Mercury Policy Project/Tides Center, 14 November 2007. Cain et al. (2007) "Substance Flow Analysis of Mercury Intentionally Used in Products in the United States Carpi et al. (1997) –Methyl Mercury Contamination and Emission to the Atmosphere from Soil Amended with Municipal Drummond et al. (2003) –Mercury generation potential from dental waste amalgam. Edwards and McBride (1975) –Biosynthesis and degradation of methylmercury in human faeces. EEA (2001) – Late lessons from early warnings: the precautionary principle 1896–2000, Environmental issues report no. 22, Floyd et al. (2002) – Risks to health and the environment related to the use of mercury products. Håkanson L et al. (1990). Mercury in fish in Swedish lakes – linkages to domestic and European sources of emission. Heintze et al. (1983) –Methylation of mercury from dental amalgam and mercuric chloride by oral streptococci in vitro. Hylander et al. (2006a) – High mercury emissions from dental clinics despite amalgam separators. Hylander et al. (2006b) –Mercury recovery in situ of four different dental amalgam separators. Sci. Total Environ. 366:320– 336. ICMGP (2006) – 8th International Conference on Mercury as a Global Pollutant, "Societal consequences of mercury pollution," see JADA (2003) – "Dental mercury hygiene recommendations," ADA Council on Scientific Affairs, Keml (2005) – Mercury-free Dental Fillings: Phase-out of amalgam in Sweden, Leistevuo et al. (2001) –Dental amalgam fillings and the amount of organic mercury in human saliva. Leistevuo et al. (2002) –Mercury in saliva and the risk of exceeding limits for sewage in relation to exposure to amalgam fillings. Liang and Brooks (1995) –Mercury reactions in the mouth with dental amalgams. Lindberg et al. (2007) – "A synthesis of progress and uncertainties in attributing the sources of mercury in deposition." Håkanson L et al. (1988). Mercury in fish in Swedish lakes. Kennedy (2003) –Uptake and accumulation of mercury from dental amalgam in the common goldfish, Carassius auratus. Meili et al. (2003a). Critical levels of atmospheric pollution: criteria and concepts for operational modelling of mercury in forest and lake ecosystems. Meili et al. (2003b). Critical loads and limits of heavy metals in ecosystems: some Swedish contributions to European modelling efforts. Munthe et al. (2007a) – "Recovery of mercury-contaminated fisheries." Munthe et al. (2007b) –Mobilization of mercury and methylmercury from forest soils after a severe storm-fell event. Pacyna et al. (2006) –Mercury emissions to the atmosphere from anthropogenic sources in Europe in 2000 and their scenarios until 2020, Reindl (2007) – Summary of References on Mercury Emissions from Crematoria (draft), Dane County Department of Public Works, Madison, Wisconsin, 27 August 2007. Rowland et al. (1975) –The methylation of mercuric chloride by human intestinal bacteria. Rudd et al. (1980) –Mercury methylation by fish intestinal contents. Stone et al. (2003) – Determination of methyl mercury in dental-unit wastewater, Swain et al. (2007) – "Socioeconomic consequences of mercury use and pollution." Ambio 36, 45-61. UNECE

(2004). Manual on methodologies and criteria for modelling and mapping of critical loads and levels and air pollution effects, risks and trends. US EPA (1997) – Mercury Study Report to Congress. US EPA (2001) – Mercury update: impact on fish advisories Vonk and Sijpesteijn (1973) –Studies on the methylation of mercuric chloride by pure cultures of bacteria and fungi.

Contact details

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Do you write as an individual or on behalf of an organisation ? Organisation

Name of the organisation
European Environmental Bureau / Zero Mercury Working Group

If you write on behalf of an organisation, please specify the following NGO

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Privacy statement