European Environmental Bureau comments on the draft final report (5 March 2012) on the Study on the potential for reducing mercury pollution from dental amalgam and batteries, carried out by BIO Intelligence Service for the European Commission

10 April 2012

The European Environmental Bureau (EEB) appreciates the opportunity to comment on the draft final report (5 March 2012) on the Study on the potential for reducing mercury pollution from dental amalgam and batteries, carried out by BIO Intelligence Service for the European Commission.

With our comments, EEB would like to underline the importance of a continuously robust EU Mercury policy. We welcome the study carried out from the consultants and call upon the European Commission, as a follow up, to propose draft legislation, towards a swift phase out of mercury use in dentistry as relevant. On button cell batteries, legislative change needs to take place immediately to phase out mercury use from this product category; therefore if this is to happen by revising the Battery Directive we would urge the EC that it does not await 2016 for the full foreseen review of the directive, but that relevant measures are taken as soon as possible.

While the overall conclusions of the report on dental amalgam are welcome we are generally concerned on the data reporting and analysis. In some cases as it will be explained further down they seem to be rather underestimated and as a result emissions to the environment caused by the use of dental amalgam are most likely higher than reported. On this point, we would also like to express our regret that a few big Member States also with high consumption on mercury in this sector, did not provide more recent data - and we hope that new data have now been sent to the consultant.

EEB believes that the policy options proposed will indeed get us down the road to fulfilling the mandate of the EU strategy to eliminate mercury. Furthermore, if such policy options are pursued, the EU could be seen as regaining its leadership position on a key and most necessary mercury reduction activity.

In particular, we generally support the idea of adding option 1 together with option 3, recognizing that an emphasis of adhering to a clear timeline with option 3 will have the greatest rewards in reducing mercury exposure in the long run. Yet in option 1, the primary assumption appears to be that requiring more and better maintained amalgam separators in dental clinics by itself can solve the mercury crisis and, as a critical deficiency, leaves out the need for regulatory action to reduce emissions from cremation, consistent with the polluter pays principle. Yet we really question, especially at this time of austere budgets, how the member states will be able to manage enforcement to ensure that separators are installed and properly maintained, given the additional staffing and costs involved with this. In addition, we would not want however to see the implementation for a ban to slip beyond 5 years, because in the end the most cost effective way to eliminate these and related sources (discussed in more detail below) is to phase out amalgam.

Beyond the two proposed measures however we remain concerned about the emissions from *crematoria* although these appear (on the basis of the report) that at the best case, will remain stable in the future—even though the rate of cremations is steadily increasing[1] and the average number of amalgams in the deceased is also on the rise.[2] Controlling emissions from crematoria should be seen as an action complementary to controlling the waste from dental clinics (policy option 1 proposed), given that both of these represent measures to control 'historical' pollution. Yet OSPAR

recommendation on crematoria, given previous experiences from recommendations on mercury use in the chlorine sector, does not appear strong enough to ensure that Member States will consider taking measures on their own and in any case OSPAR does not cover all EU Member States. The additional weaknesses of the OSPAR 2011 reports, also generally mentioned in the BIOS report, (i.e. the uncertainties and questionable reliability of figures reported, and the fact that a uniform reporting standard is missing), further make us question the effectiveness of such a recommendation for the EU level.

We need to underline again, the importance of this issue which is further highlighted by the BIOS draft report estimate that 1000 tonnes of dental mercury in Europeans right now. A large percentage of that mercury will get disposed of with the deceased, either through burial, or increasingly through cremation. In the latter case, the EEB dental report by Concorde (2007) projected that roughly 80% of the mercury would release to air, with the other 20% getting taken up in soil. However, if the use of amalgam were banned, then in the long-term mercury emissions from crematoria would eventually cease.

To that end we would call on the EC and the consultant to further analyse the potential for taking EU measures to further control emissions, at least, from crematoria.

We further believe that the importance of the BIOS report and the measures proposed have to be put in the right context by well presenting the extend of the mercury problem; therefore the *executive summary* should include a few additional key points. It should be noted that in countries where amalgam use has been prevalent, it is the largest source of mercury in sewage treatment plants and an increasing source of mercury air pollution from crematoria, due both to the increase in cremation and percentage of the deceased with amalgam. Amalgam is one of the largest reservoirs of mercury that perpetuates the pollution problem for years even after it's banned, such as in Sweden where the amount of mercury contaminating the sludge is still estimated at 90%[3]). In addition, the experience in Sweden shows that legislation not only catalyzed the process, but can also lead to faster phase out, with the positive beneficial effects and with no long-term negative economic impacts (KEMI 2011).

Finally, we would appreciate that the cost issue and respective economic analysis of the options in the BIOS report is reanalyzed based upon the extensive, comprehensive and methodical research carried out by Concorde East/West for EEB/CDD/MPP in the new report, *"The Real Cost of Dental Mercury".*[4]The report confirms that amalgam is by no means the least expensive filling material when the external costs are taken into account. Clearly, adverse effects on the environment and society over the whole life cycle of dental amalgam –mercury production, preparation of filling materials, removal of old fillings and placement of new ones, environmental and health impacts from mercury recycling, discharges to wastewater, solid waste disposal, emissions from crematoria and releases from cemeteries – can only be sustainably avoided by phasing out amalgam as a dental restorative material and switching to mercury-free alternatives. Since high quality and cost-effective alternatives – including composites, glass ionomers and "compomers" – are readily available, Therefore, we would recommend that our new and directly applicable mass balance - cost analysis of using amalgam be incorporated into the final report.

More detailed comments are presented below following the report structure - on Part A-Dental amalgam and relevant annexes (pages 3-8), and on Part B- Batteries (page 9).

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Detailed comments

Chapter 1 - Introduction

- p.15 and 30- link also to page 45 and 50- We find rather unacceptable that not all Member States have provided information to the consultant- namely , FR, IT, ES, PT, NL, GR and especially countries like FR and PL (it is not clear if PL has submitted fresh data) who represent well over 50% of the EU population.
- p. 37 – Please state in which Member states the limit values in sewage sludge for agricultural purposes are more stringent.

PART A - Dental amalgam

Chapter 2 – Problem definition and objectives

p. 39, 40 and elsewhere as relevant – We believe that the reported overall emissions due to dental amalgam may be significantly underestimated. We question the estimate on the number of dental offices/clinics which have installed separators as well as on the estimated emissions from crematoria. It's important to bear in mind that there are over 1000 tonnes in people's mouths currently and therefore this reservoir is likely to be released in the environment in the future.

On separators:
We are really surprised with the figures reported that more than half of the MS have almost 100% installed separators in the clinics, with the general estimate arriving to 75%. Yet if one reviews the reported data by member states in annex H it is rather clear that in some cases figures reported as for separators are confused with chair side traps. Also as mentioned in the report, without proper and on-going maintenance the performance and effectiveness of these separators is highly questionable. Therefore, given that most Member States did not really report on this, we question the report findings of the separators' current ability at removing the larges quantities reported, and we would surmise that the mercury releases from clinics to wastewater/waste is probably much higher

Despite the apparently advanced level of legislation, regulations and guidance implementing the Hazardous Waste Directive, many questions still need to be raised addressing:

- the level of compliance on the ground: the number of clinics that have actually installed separators;
- confusion among definitions of traps, filters, separators, etc., in assessing compliance;
- inspection of dental clinics to ascertain the level of compliance;
- procedures or penalties to deal with non-compliance;
- the theoretical efficiency of amalgam separation equipment vs. actual practice;
- the difference between installing separation equipment and operating it properly;
- the need for routine and competent maintenance in order for separation equipment to achieve a high level of efficiency, etc.,
- not to mention the difference between rated efficiency and actual efficiency; and
- last but not least, the actual disposition of mercury amalgams once they have been collected/separated by filtering and separation devices.

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We would appreciate it if figures in the report are revised accordingly.

Concerning the issues above- policy wise this would translate that it would be a lot more difficult to succeed in eliminating mercury in a reasonable timeframe if only option 1 was to be followed - and probably timeframe is longer than estimated in the report.

On cremation:

The report mentions that 40% of crematoria are equipped with abatement devices – however given the uncertainties on what can be considered 'abatement control' this appears rather high. For example, for FR it is reported that 10% of crematoria have abatement devices, however from 2011 data, only seven (7) out of hundred fourty three (143) are reported to have – which means that the percentage is 5%[5]. If such errors have occurred for the other countries, it can be easily concluded that emissions from cremation are a lot less controlled than thought.

In terms of the reported emissions – BIOS reports generally the uncertainties and questionable reliability of figures reported from the OSPAR reports. To those please also consider the following:

- At the 2011 OSPAR report[6] section on overall effectiveness of the section on calculated loads of mercury emitted to the environment , it states that the: "Some Contracting Parties gave very clear figures for loads, whereas others were less precise. Therefore *on the basis of the information provided it is not possible to provide a reliable figure for the total load of mercury" .*
- From reviewing the 2011 OSPAR report, one can see, that reporting varies widely and there is no uniform reporting standard or even definition as to what constitutes mercury abatement. For example, in the OSPAR report Norway reports that "Knowledge on emissions is uncertain because of lack of reporting from crematories. Under this section, Spain report states that: Measures of mercury emissions from crematories are not included under the E-PRTR register and so, it is difficult to get information on this activity." In another example, its reported that Swedish federation of crematorium considers selenium capsules placed in the burn oven as mercury abatement.

At the end, the uncertainties above, do not seem to have really been considered in the estimate of the actual figure of emissions in the BIOS report.

Furthermore the UK had estimated that the amount of mercury from cremations will increase in the UK by two-thirds between 2000 and 2020, accounting for between 11% and 35% of all mercury emissions to the air in 2020, if measures are not taken These conclusions, among others, reinforced those of Tauw Milieu (Coenen 1997, as cited by Defra 2003) that predicted for the Netherlands a doubling of mercury emissions from crematoria between 1995 and 2020, and a 68% increase for the period 2000 to 2020[7].

The importance of the issue of cremation, is further highlighted by the BIOS draft report estimate that 1000 tonnes of dental mercury in Europeans right now. A large percentage of that mercury will get disposed of with the deceased, either through burial, or increasingly through cremation. In the latter case, the EEB dental report by Concorde (2007) projected that roughly 80% of the mercury would release to air, with the other 20% getting taken up in soil. However, if the use of amalgam were banned, then in the long-term mercury emissions from crematoria would eventually cease.

Therefore emissions of 2.8 tonnes are likely underestimated given, as discussed above, the percentage of cremations continues to rise steadily each year in most member states and the percentage of amalgam in the deceased is also projected to continuing rising until 2025. We would therefore appreciate if relevant sections can be revised and emissions re-estimated.

On air releases, generally

Mercury from dental amalgams is also a significant source of airborne emissions and as discussed these can be released from different media. As explained below, however, we fear that that the BIOS draft figure of dental mercury emissions to air is underestimated, and should be revised.

We have already discussed our strong reservations regarding mercury emissions from cremation. Yet there are other sources that may have either been underestimated or overlooked, as described below, including: dental clinics; dental mercury sludge incineration; dental mercury sludge spread on land or landfilled; dental mercury mixed with municipal solid waste and incinerated; dental mercury mixed with infectious and hazardous waste; and human respiration.

For example, despite regulations regarding the characterization and disposal of mercury bearing wastes, many solid dental wastes still follow the low-cost route of disposal as municipal solid waste and are subsequently disposed of in landfills or by municipal incineration. Depending on the characteristics of the landfill, dental amalgam may decompose over time and the mercury may enter the leachate (which may itself be disposed of in a manner that permits the mercury to be released), groundwater, soils, or volatilize into the atmosphere. Studies have documented methylmercury in gases emitted from landfills[8]

With something less than twice the population of the U.S., the EU use of mercury in dentistry is somewhat more than twice than this of the U.S. consumption.[9] Given that, it seems reasonable to assume that air release of dental mercury could be twice those estimated in the U.S., or over 12 tons (our low estimate) emitted into the air each year in the EU presented in the following table[10].

Atmospheric emissions of dental mercury (tons)[10]

Pathway	EPA National Emissions Inventory 2002	This report 2005 (low estimate)	This report 2005 (high estimate)	European Union (low estimate)
Human cremation	0.3	3.0	3.5	4.5*
Dental clinics	0.6	0.9	1.3	1.8
Dental Hg sludge incineration	0.6	1.5	2.0	3.0
Dental Hg sludge spread on land and landfilled	n.a.	0.8	1.2	1.6
Dental Hg MSW incineration and landfill	n.a.	0.2	0.5	0.4
Dental Hg infectious and hazardous waste	n.a.	0.5	0.7	1.0
Human respiration	n.a.	0.2	0.2	0.4
TOTAL	**1.5**	**7.1**	**9.4**	**12.7**

*Our best professional estimate, given that unlike the US some countries have installed pollution abatement equipment on crematoria, which is also consistent with the Concorde 2007 report for EEB, p.15)

p. 51 Please see additional information in *Appendix I*, on the safety of composite and other alternatives to dental mercury. We would appreciate that these are considered in the report, as relevant.

p. 52 Please see A*ppendix II* containing more clarifications on the Atraumatic Restorative Treatment (ART). We would appreciate that these are considered in the report, as relevant.

p. 57- Please clarify what is meant by UK and HU – 'modern dental equipment tends to include dental amalgam separators' – do you rather mean dental practices overall? That all new dental clinics would most probably include dental separators when setting up their systems?

p. 58-71- section 2.6.3 on costs of materials- Please now consider our newly released study 'The real cost of dental mercury'[11], to indicate that the current costs of amalgam may not include the external costs as the study has estimated – those would show that the real cost of dental amalgam is much higher than that of composite.

p.64 – Please delete reference to the EEB since the actual reference on the price of amalgam restorations in the USA is referenced directly.

p.71- the fact that the general trend of more crematoria having abatement system in future is rather an assumption since OSPAR is a recommendation and there is no EU legislation foreseen for now, so cost on that would be much lower.

p. 73- On occupational health please consider also the presentation and relevant studies by Bjorn Hilt, St Olav's University hospital and Norwegian University of Science and Technology Trondheim, Norway – Exposure to metallic mercury and cognitive effects in dental personnel in central Norway presented at the EEB/HEAL/ZMWG conference in 2007, 'Dental Sector as a Source of Mercury contamination' [12]provide studies from NO – on dental workers – see 2007 EEB conference (p.29)

Chapter 3: Policy Options

p. 79- second para. During a mercury phase out in dentistry, some exemptions to use dental amalgam for strictly medical conditions could be generally accepted. However, we think that the third criterion from Sweden – allowing mercury use in dentistry if 'the clinic has adequate equipment and routines with regard to the environmental impact of dental amalgam ' should not be an option at EU level since it would create a loophole at the legislative measures. The same applies to a lesser extend for the second criteria- given that currently alternative techniques do indeed provide for adequate restorations as widely discussed in the report.

p. 79- on 5 years application – Please explain briefly, if this is the case, that the 5 years delay for a phase out to enter into force via the REACH regulation, is due to the procedural requirements of the regulation.

Chapter 4 analysis of impacts and Chapter 5 comparison of policy options

All relevant comments from previous sections mainly on estimates of emissions from dental clinics and crematoria, as well as our newly released study 'The real cost of dental mercury' need to be considered here and relevant figures need to be updated as relevant.

Annex B- Overview of policy measures concerning dental amalgam

- On sewage sludge- please name the countries this applies to and include relevant legislation/limits

  Further experiences could also be included as below:

- Austria: An expert group on dental materials established by Austria's Federal Ministry of Health and Consumer Protection has recommended against the use of amalgam to treat deciduous teeth in children and use of amalgam restorations in pregnant and lactating women.[13]
- In 2009, the *Consejo General de Colegios Oficiales de Químicos de España* sent a letter to the Spain's Health Authorities saying that, for health and environmental reasons, dental amalgams should be substituted by other less toxic dental materials (http://www.mercuriados.org/files/upload/4040.doc);
- The first mercury filter in a crematory in Spain was installed in Montjuïc (Barcelona, Catalonia) on June 8th 2010 (http://www.quimics.cat/wp-content/uploads/2012/02/NPQ-454.pdf).
- Also in 2010, it was officially recommended (letter sent by Dr. Antonio Plasència, General Director of Public Health in the Catalonia Health Department, to the firms that buy/distribute medical products) that don't buy or distribute dental amalgams because of health and environmental reasons (http://www.quimics.cat/wp-content/uploads/2012/02/NPQ-454.pdf).

Please also consider *Appendix III*, on Worldwide Progress in Phasing Out and Restricting Dental Amalgam

Annex C - Life cycle of dental amalgam

- p.144 (Figure 11) (says "Additional mercury releases to the wastewater occur as a result of amalgam deterioration due to chewing and ingestion of hot beverages, although quantities are much smaller than those emitted by dental practices."). : It is not clear that the mercury from amalgam in human waste that ends up in wastewater treatment plants is included. Does "amalgam deterioration from chewing and hot beverages" refer to human waste? Could you elaborate further on human waste as a major environment pathway? See also study by Skare, already provided.
- p.144 3rd para: how is it proven that an increasing number of clinics are equipped with separators? Please include references as relevant.
- p.148 – we heavily question the fact that MS have almost 100% installed separators.We really question the fact that CED data are not provided by MS…. – the fact that dental chairs may have chairtraps installed does not mean that mercury is collected and disposed of separately. Please check if there is no confusion of chairtraps vs. separators in text before figure 4.
- p. 149-150 table 15- it is not clear where data come from. It also seems surpising that most MS have all of their dental facilities equipped with separators. We would prefer that analytic data and references are included here to show how these figures have been calculated, since the review from the EC (2005) showed a very different picture. Please consider earlier comments on separators as well.
- p.155, C.8.1 references to PRTR data should also be handled carefully since most of the times this is not complete.
- p.161 – figure of 40% of crematoria being equipped with mercury control devices seems high if 15 out of 19 submitted MS questionnaires provided data and when major MS did not answer to the questionnaires..
- p.161- also the effectiveness of the abatement devices and control is not discussed and it can be very important
- p.161 FR 10 % of crematoria have abatement devices, however from 2011 data, only seven (7) out of hundred forty three (143) are reported to have – which means that the percentage is 5%[14]. Therefore overall figure may be overestimated.
- p.163. Attention should be paid on estimates of emissions since it may be underestimated. Estimates and assumptions used should be discussed in more detail. Also- from the chlor-alkali reports under OSPAR we have seen that these are at the end data coming straight from industry and not necessarily having been independently verified by the state – therefore they should be used with caution. Considering that most of deceased people have amalgam in their mouths and the fact that cremations have been increasing in many countries, the conclusion for the EU is that emissions in the future will be stable, is questionable.

Annex E: Market review of dental amalgam and mercury-free alternatives

Please see also our comments sent separately on longevity of the tooth, relevant text should be included in the study. Small reference is only made on page 57

> *The report understates the importance of longevity of the* tooth *– now considered the best practice. Researchers explained in a 2011 article in the Journal of the American Dental Association, "Until recently, practitioners and researchers have judged the suitability of a restorative material according to its mechanical properties and its likely longevity compared with those of another restorative material. Within the past several years, it has become more important to select a restorative material on the basis of the likely life span of the restored tooth, rather than to focus on the potential performance of the restorative material itself. Such an approach is in keeping with a biological, rather than a surgical-mechanical, approach to operative dentistry."*[15] *The recent WHO report confirmed this view, adding "It may be more important to examine tooth survival and to preserve tooth structure than filling survival…Preservation of the tooth in a functional state should be taken into consideration rather than retention of the material used for restoration; this is in line with goals for oral health suggested by WHO."*[16] *Materials like composite can accomplish this goal according to the WHO report: "Adhesive resin materials allow for less tooth destruction and, as a result, a longer survival of the tooth itself. Funding agencies should take the initiative and encourage the replacement of amalgam as the material of choice for posterior teeth with adhesive systems."*[17]

A major indirect cost of amalgam is the irreversible damage it can do to teeth, shortening their life and/or requiring expensive care later. Amalgam requires removal of substantial good tooth matter to create a "bowl" shaped cavity. Removal of good tooth matter weakens overall tooth structure which increases the need for future dental work.[18] On top of that, amalgam fillings, which expand and contract over time, crack teeth and create the need for still more dental work.[19]

Furthermore we would consider this section on indirect costs incomplete since there is no reference to the environmental cost of amalgam. See the study of Hylander, Goodsite - Environmental costs of mercury pollution . Generally those costs are being borne by governments and society, not the dentists who place the amalgam. But they are real; they are significant; and they are the primary reason the world is negotiating a treaty on mercury – including amalgam in dentistry.

- E-5 Key actors involved [page 57-58]

From this section we think that also Consumers and Governments should be mentioned. ; for consumers, polls show they prefer mercury-free dentistry, overwhelmingly. Governments continue to play a key role, such as in structuring insurance and reimbursement. Please consider the following:

Consumers: Every dentist has an ethical obligation to inform patients about the mercury in amalgam and the other treatment options. The Council of European Dentists has acknowledged the right of patients -- not dentists -- to make their own decisions about treatment, such as amalgam placement. According to its Code of Ethics for Dentists of the European Union*, "The dentist must enable the patient, or the legal representative of the patient, to give informed consent for the treatment that is to be carried out, and must provide information about the proposed treatment, other treatment options, relevant risks, as well as costs, so as to enable the patient to make an informed choice.".*[20]*. Clearly dental consumers -- as the ultimate decision-makers when it comes to amalgam use -- should play an important role in deciding whether amalgam is used in their bodies*

What is unchallenged is that consumers, when made aware that amalgam is half mercury, want an alternative – for themselves and for their children. A Zogby poll concludes: Once aware that amalgam is mercury, over three-fourths of dental patients polled said that they would choose the mercury-free alternatives regardless of cost. http://www.toxicteeth.org/Zogby%20Poll--Results%202006.pdf

Governments: Insurance rules, exclusion of amalgam for children and pregnant women, environmental enforcement -- all of these policies affect the transition away from amalgam.

PART B - Batteries

Chapter 6 - Problem definition and objectives

p. 106 - reference to the China guidelines does not mention the fact that the battery sector is committing to phasing out mercury use in alkaline button cells by 2015, we would think that this would be useful to be included in the report.

p. 110 Mercuric oxide batteries are only reference under the baseline scenario. However , through a simple search in Comtrade - data on EU 27 trade in mercuric oxide batteries from 2007-2010 a list of data comes out - showing that millions of batteries have been imported in the EU27 during this period. Batteries reported include cylinder and button cells. See *Appendix IV.*

- We are not sure how accurate the data is but data exist so it would be good that these are also considered in the report
- It is also worthy to note that main big imports come from China, feeding into the argument that indeed if EU switches, countries from where EU imports such products, may shift as well. (p.113)

We would appreciate that the data and comments above are considered in the report where relevant.

-End-

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[1] International Cremation Statistics 2008,
http://www.srgw.demon.co.uk/CremSoc5/Stats/Interntl/2008/StatsIF.html
International Cremation Statistics 2010 (partial)
http://www.srgw.demon.co.uk/CremSoc5/Stats/Interntl/2010/StatsIF.html

[2] Mercury in Dental Use: Environmental Implications for the European Union, Concorde2007 report for EEB, p.17

[3] M*ercury Phase Out, A Study of the Experience of Swedish Companies,* KEMI, October 2011
http://www.kemi.se/Documents/Publikationer/Trycksaker/PM/PM2-11-Phase-out-of-mercury.pdf

[4]Concorde E/W for EEB/MPP/CDD 'The real cost of dental mercury' , March 2012
http://www.zeromercury.org/index.php?option=com_phocadownload&view=file&id=158:the-real-cost-of-dental-mercury&Itemid=70

[5] Michel Kawnik, président de l'Afif (Association française d'information funéraire), in *Marie Grosman et Roger Lenglet, "Menace sur nos Neurones. Alzheimer, Parkinson... et ceux qui en profitent". Editions Actes Sud, septembre 2011, p.154*

[6] Overview assessment of implementation reports on OSPAR Recommendation 2003/4 on controlling the dispersal of mercury from crematoria http://www.ospar.org/documents/dbase/publications/p00532_rec_2003-4_overview_report.pdf

[7] Defra 2003 in Concorde E/W report for EEB, Mercury in dental use: environmental implications for the European Union', p. 16.May 2007

[8] Lindberg *et al.* (2001) – SE Lindberg, D Wallschlager, EM Prestbo, NS Bloom, J Price and D Reinhart. "Methylated mercury species in municipal waste landfill gas sampled in Florida, USA." *Atmospheric Environment, 35:*23(4011-4015).).

[9] (Concorde E/W for EEB/MPP/CDD 'The real cost of dental mercury' , March 2012

[10]*Concorde East/West: Facing Up to the Hazards of Mercury Tooth Fillings/A Report to US House of Representatives, Government Oversight Subcommittee on Domestic Policy*; Mercury Policy Project, July 2008, Last column of this present table added to the original table found on page 4 of the referenced report;
http://mpp.cclearn.org/wp-content/uploads/2008/08/finalreportfrommpptestimony0707081.pdf

[11] Concorde E/W for EEB/MPP/CDD 'The real cost of dental mercury' , March 2012 http://tinyurl.com/Concorde-Report

[12] http://www.zeromercury.org/index.php?option=com_phocadownload&view=file&id=16%3Areport-from-the-conference-dental-sector-as-a-source-of-mercury-contamination-brussels-25-may-2007&Itemid=70 and http://www.zeromercury.org/index.php?option=com_simplecalendar&view=detail&id=59%3Aeeb-heal-zmwg-conference-qdental-sector-as-a-source-of-mercury-c&Itemid=13

[13] http://www.health.gov/environment/amalgam2/National.html, Health and Environment Alliance. *Mercury and Dental Amalgams.* (Brussels, Belgium: fact sheet, May 2007): 3. http:// www.env-health.org/IMG/pdf/HEA_009-07.pdf

[14] Michel Kawnik, président de l'Afif (Association française d'information funéraire), in *Marie Grosman et Roger Lenglet, "Menace sur nos Neurones. Alzheimer, Parkinson... et ceux qui en profitent". Editions Actes Sud, septembre 2011, p.154*

[15] Christopher D. Lynch, Kevin B. Frazier, Robert J. McConnell, Igor R. Blum and Nairn H.F. Wilson, *Minimally invasive management of dental caries: Contemporary teaching of posterior resin-based composite placement in U.S. and Canadian dental schools*, J AM DENTA ASSOC 2011; 142; 612-620, http://jada.ada.org/content/142/6/612.abstract

[16] World Health Organization, FUTURE USE OF MATERIALS FOR DENTAL RESTORATION (2011), http://www.who.int/oral_health/publications/dental_material_2011.pdf, p.27, 29

[17] World Health Organization, FUTURE USE OF MATERIALS FOR DENTAL RESTORATION (2011), http://www.who.int/oral_health/publications/dental_material_2011.pdf, p.16

[18] Terry L. Meyers, *When less is more -- Technology increases minimally invasive procedures*, DENTAL ECONOMICS, http://www.dentaleconomics.com/index/display/article-display/6295266301/articles/dental-economics/volume-100/issue-5/columns/when-less_is_more.html (explaining that "with the resins and composites developed over the past 30 years, we don't have to remove nearly as much tooth structure as we did when using amalgam. Before these new materials with their bonding capacity came along, in some cases dentists had to take out the whole back side of the tooth to get enough amalgam in there to work.").

[19] Davis MW, Nesbitt WE. *The wedge effect: structural design weakness of Class II amalgam*. AACD J 1997;13(3):62-8, http://www.smilesofsantafe.com/pdfs/WedgeEffect.pdf.

[20] http://www.eudental.eu/index.php?ID=2745