

Incineration and health: critical observations on a WHO Workshop

There is an ongoing lively debate and great interest in the relationship between human health and waste management in the European medical community, as shown for instance by the following documents:

http://portale.fnomceo.it/Jcmsfnomceo/cmsfile/attach_6121.pdf,

<http://www.artac.info/static/telechargement/RapportIncineration.pdf>

http://www.ecomed.org.uk/content/IncineratorReport_v2.pdf-

This topic was also the subject of a recent report by WHO/Europe: “**Population health and waste management: scientific data and policy options**”, the result of a workshop held in Rome on 29th and 30th March 2007 (<http://www.euro.who.int/document/E91021.pdf>). We find this report perplexing for the reasons discussed below and we believe it is worthwhile commenting on it, both for the consequences its assessments can have on the debate and for the implications it can have on public health.

- A) In our opinion, given the title of the WHO report on the health effects of waste management, we would have expected a systemic approach, one in which all the hierarchical options available, starting from waste reduction, recovery, recycling, re-use and any other approach which produces secondary raw materials should have been taken into account. Instead the WHO workshop focussed entirely on incineration and landfills, i.e. the final and residual steps in waste management. A correct assessment of the health effects of the waste cycle should compare the impacts of all the systems, otherwise, it ends up approving solutions which are thought to be less negative, but which however are chosen from the less virtuous ones from the point of view of their health impact. This is particularly important because with more suitable waste collection systems (e.g. door to door), direct and indirect benefits can be obtained (such as reduction of waste production) to the point that waste disposal through incineration is no longer profitable. The fact that recycling of materials, after appropriate source separation, produces a lower environmental impact than incineration was shown in a 2004 study (<http://www.cewep.com>) commissioned by incinerator plant managers themselves
- B) Another important aspect of the WHO workshop was the composition of the group of participants: these included representatives of the following: companies which manage incinerators, Federambiente (an association of companies directly involved in building and managing incinerators and landfills in Italy), Legambiente, an Italian environmental association which is favourable to incineration and also an Italian member of Greenpeace, who was present as an observer just for one day. Instead there were no members of other, more representative business associations (such as Zero Waste Alliance), nor those of waste recovery/recycling companies, or of the international associations for the protection of citizens (e.g. Global Alliance for Incinerator Alternatives). There weren't even any representatives of accredited international environmental associations such as WWF
- C) In the WHO report it seems that the “technological adequacy” of the “new generation of incineration plants” obtained using the “best available technologies” (B.A.T.) was taken for granted (see 3.1) without considering that even when the “best available technologies” are used, there are still several aspects which make emission control difficult such as the characteristics of the abatement devices, the fact that the overall mass of pollutants emitted into the atmosphere by new incinerators is greater than that of the older ones because of the much bigger size of the former, the critical start-up and shut-down stages during which combustion processes and therefore emissions are very difficult to control, as shown in the recent BSEM report http://www.ecomed.org.uk/content/IncineratorReport_v2.pdf-
- D) The WHO report purports to assess scientific evidence on the health effects of waste treatment, but neglects the health impacts produced before and after the incineration stage, in particular it does not take into account the fact that the abatement of emissions to the atmosphere shifts pollutants to incinerator derived waste, therefore simply relocates the health and environmental impact in time and place. In particular the bottom and fly ashes produced by incinerators, which overall amount to about 30% in weight of the incinerated waste, especially the fly ashes, require specific treatment systems which do not have a zero impact
- E) In the WHO report the emission limits established by European Directives are considered satisfactory, even from the point of view of their consequences for health, though this could be questioned. For instance, in the case of dioxins, European Directive 2000/76/CE sets emission

limits into the atmosphere which do not take into account the more precautionary revisions proposed by WHO in 1998 and 2005. We must moreover point out that there is no mention of the Stockholm Treaty which would require a drastic reduction of persistent organic pollutants, such as dioxins and their elimination whenever technically feasible

- F) The authors of the WHO report conclude that reports on the health effects of incinerators have studied incinerators belonging to the older generation and that there are few surveys on new plants; they believe that implementation of the best available technologies will make the occurrence of measurable effects “less likely”. The WHO report goes even further and in paragraph 4.2 it contradicts the uncertainty it had previously written about, by giving policymakers reassurances which cannot be inferred from the data analysed, stating that it is unlikely that in the future it will be possible to prove effects on population, health and waste management. To draw this conclusion the authors emphasize epidemiological evidence, considering it the “ideal way” to assess health effects, and though its limits are pointed out, this conclusion is unacceptable or, to say the least, partial. In our opinion this is a typical case in which one should resort to the Prevention Principle.
- G) In a European perspective, the WHO report foresees that by 2020 waste incineration will increase to 25% (82 million tonnes). Without implementation of alternative policies, this means that 1 billion tonnes of waste will have been burned by that date. If we now consider some specific pollutants, taking into account the emission factors with which they are emitted into the atmosphere in the best possible working conditions of the plants, <http://reports.eea.europa.eu/EMEP CORIN AIR5/en/page002.html> , (see Tab.8.1) and the above reported estimates of waste production, we may assess the amounts that will be released into the atmosphere in the period 2004-2020 (see. Table A)

8 EMISSION FACTORS

Table 8.1 Default Emission Factors For Use With Simpler Methodology

Compound	Emission factor	Abatement type
SO ₂	1.7 kg/tonne of MSW	Baseline emission factor (no acid gas abatement)
SO ₂	0.4 kg/tonne of MSW	Acid gas abatement
NO _x	1.8 kg/tonne of MSW	Baseline emission factor (no NO _x abatement)
NM VOC	0.02 kg/tonne of MSW	Baseline emission factor (uncontrolled)
CO	0.7 kg/tonne of MSW	Baseline emission factor
N ₂ O	0.1 kg/tonne of MSW	No NO _x abatement
HCl	2.3 kg/tonne of MSW	Baseline emission factor (no acid gas abatement)
HCl	0.5 kg/tonne of MSW ^{2,3}	Acid gas abatement
TSP	18.3 kg/tonne of MSW	Baseline emission factor (no particle abatement)
TSP	0.3 kg/tonne of MSW	Particle abatement only
TSP	0.05 kg/tonne of MSW	WID compliant plant (<10 mg.m ⁻³)
Pb	104 g/tonne of MSW	Baseline emission factor (no particle or acid gas abatement)
Pb	0.8 g/tonne of MSW	Particle and acid gas abatement
Cd	3.4 g/tonne of MSW	Baseline emission factor No Particle and acid gas abatement
Cd	0.1 g/tonne of MSW	Particle and acid gas abatement
Hg	2.8 g/tonne of MSW	Baseline emission factor (no particle or acid gas abatement)
Hg	1.1 g/tonne of MSW	Particle and acid gas abatement
PCDD/Fs	25-1000 µg I-TEQ/tonne of MSW	No PCDD/F abatement
PCDD/Fs	0.5 µg I-TEQ/tonne of MSW	Particle abatement plus acid gas abatement with carbon injection
PCB		
IUPAC No. 77	1.6 µg /tonne of MSW	Particle and acid gas abatement

TABLE A

ESTIMATE OF OVERALL AMOUNTS OF POLLUTANTS EMITTED IN EUROPE IN THE PERIOD 2004 - 2020 WITH THE USE OF BEST AVAILABLE ABATEMENT TECHNIQUES, CONSIDERING A 25% INCREASE IN WASTE INCINERATION

Compound	Emission factor	Unit / Abatement type	Mean year 2004-2020	Total 2004-2020	
Pb	0,80	g/tonne of MSW Particle and acid gas abatement	50000	800000	Kg
Cd	0,10	g/tonne of MSW Particle and acid gas abatement	6250	100000	Kg
Hg	1,10	g/tonne of MSW Particle and acid gas abatement	68750	1100000	Kg
PCDD/Fs	0,50	µg I-TEQ/tonne of MSW Particle abatement plus acid gas abatement with carbon injection	31,25	500	g.
PCBIUPAC No. 77	1,60	µg /tonne of MSW Particle and acid gas abatement	100	1600	g.
PCBIUPAC No. 77	1,60	µg /tonne of MSW Particle and acid gas abatement	30,0	480,0	g.
IUPAC No. 126	1.07	µg /tonne of MSW Particle and acid gas abatement	0,9	14,0	g.
IUPAC No. 169	1.02	µg /tonne of MSW Particle and acid gas abatement	0,8	12,9	g.
Benz[a]anthracene Benzo[b]fluoranthene Benzo[a]pyrene Dibenzo[ah]anthracene	13.17	Mg/tonne of MSW Particle and acid gas abatement	2729	43666	Kg

Furthermore, Table B shows concentration ranges found at several European MSW incinerators following analyses of several types of residues; results are considerably variable (Table B), but the ensuing health impact has been totally neglected by the authors of the WHO report

TABLE B**CONCENTRATION RANGES OF SOME POLLUTANTS IN INCINERATOR DERIVED WASTE**

Compound	Bottom ashes	Fly ashes	Residues from stack gas abatement systems
PCDD/PCDF TEQ (1)	4-25 nanog/kg	100-1.000 nanog/kg	100-10.000 nanog/kg
PCDD/PCDF TEQ (2)	15-300 nanog/kg	n.r.	680-4.500 nanog/kg

Table 5. PCDD-PCDF concentrations in solid residues from European MSW incinerators
Sources:
1) European Environmental Agency "Dangerous Substances in Waste", elaborated by J. Schimd, A. Eisler, R. Strobel, ABAG_Itm, M. Crowe, 2000, p. 29.
2) European Commission "Releases of Dioxins and Furans to Land and Water in Europe- Final Report", September 1999.

H) The WHO report notes that there are considerable difficulties in characterizing exposures due to incinerators and landfills. In spite of these problems, the review of the epidemiological studies which the report refers to, indicates, in our opinion, that there is evidence suggestive of a causal association between incinerators and several health end-points, which have also been confirmed in more recent studies (Miyake Y et al 2005; Enhance Health (EH) study www.arpa.emr.it/moniter ; Etude d'incidence des cancer à proximité des usines d' incineration d'ordures ménagères- Syntesis Saint-Maurice (Fr) Institut de Ville Sanitarie 2008, pag. 25 www.invssantè). Instead the authors of the WHO report stated, drawing the conclusions from the reviews mentioned, that there is some evidence of an increased risk of soft tissue sarcoma (STS) and of Non Hodgkin Lymphoma (NHL) with a *possible* aetiological role for dioxin (carcinogenic compound belonging to Group 1 IARC emitted by incinerators) and they concluded that the scientific evidence for health effects is insufficient, in other words, on the basis of the scientific evidence one cannot conclude that incinerators cause health effects, nor can this be excluded, therefore the results are inconclusive but overall they imply that incinerators can cause serious health effects (10 separate studies have shown increases in cancer around incinerators), and these facts should not be denied by the authors of the WHO report.; instead in the following paragraphs, they reassure policymakers, telling them that it is "unlikely" that in the future it will be possible to prove the occurrence of effects on the population residing near incinerators.

Conclusions

In our opinion, the limited availability of scientific data and of epidemiological evidence on the health impact of modern waste incineration plants does not justify the conclusions drawn by the WHO report. A much more cautious approach should have been taken, especially considering the fact that epidemiology consists in a retrospective observation, therefore it is intrinsically limited in making valid predictions for new incinerators. On the other hand well-established experimental and toxicological evidence on pollutants known to be emitted by incinerators does not allow any derogation of the precautionary principle; and we must not forget that the production of high amounts of fine and above all ultrafine particulates, whose hazards for health have been widely investigated in the most recent literature, can only increase our fears.

Last, but certainly not least we wish to express our great concern about the health of children in Europe and especially in Italy, now that evidence is accumulating that shows just how crucial the stage of foetal

development is, not only for the risk of cancer, but also in conditioning the overall state of health in adult life.

With regard to cancer, the most recent data (AIRTUM Report 2008) shows that Italy is already first in the European continent for cancer incidence in infancy, as the cases have passed from 146.9 per million children a year in the period 1988 -92 to 176.0 cases between 1998 and 2002, with a 2% increase per year, compared to the already alarming +1.1% increase per year which is the European average. In Italy there is a 3.2% increase in the first year of life and we wonder what the future holds for European and especially Italian children as a consequence of the massive spread of the practice of waste incineration. In the light of the above-mentioned considerations, as well as of the intrinsic limits in epidemiological studies which must always lead to caution before “dismissing” a study as “negative” and therefore equating inadequate evidence to a lack of evidence (as tirelessly recommended by Lorenzo Tomatis) and of the positions which have emerged in the area of health at the international level (FNOMCeO, Conseil National de l’Ordre des Medecins, British Society for Ecological Medicine), of the results obtained with systems using good practices such as re-use, recycling, reduction, separate collection of waste and also considering the new and recent techniques of treatment and recovery with extrusion even of “non-recyclable dry waste,” it seems appropriate to advise those in charge of WHO, to hold a further workshop on the problem of waste management. We sincerely hope that all the interested parties will be included and be able to participate in this controversial and complex project, with its clash of interests, to guarantee public debate and greater transparency and credibility in policymaking.

Dr. Michelangiolo Bolognini, Pistoia

Dr. Gianluca Garetto, Firenze

Dr. Patrizia Gentilini, Forlì

Dr. Giovanni Ghirga, Civitavecchia

Dr. Paolo Franceschi, Savona

Dr. Ferdinando Laghi, Castrovillari

Dr. Mauro Mocchi, Roma

Dr. Vincenzo Migaleddu, Sassari

Dr. Celestino Panizza, Brescia

Dr. Ruggero Ridolfi, Forlì

Dr. Jeremy Thompson, UK

Dr. Giovanni Vantaggi, Gubbio