



Association of Doctors for the Environment – ISDE Italy ([www.isde.it](http://www.isde.it))  
Affiliate of the International Society of Doctors for the Environment

## WASTE INCINERATION (2007)

The Association of Doctors for the Environment (ISDE Italy) expresses its profound concern about the increase in municipal solid waste (MSW) disposal through incineration, a practice which is being promoted both by building new facilities and by enlarging existing ones.

In the first place, waste disposal requires adhesion to the “R” policies: “R” like Rationalization, Reduction in waste production, Resort to waste separation, Recycling, Reuse, Repair and Recovery. Only when all the preceding points have been put into practice, we will eventually be able to correctly assess the best technical system to dispose of the residual fraction, choosing among those which best guarantee human health and the environment (think about incineration with energy recovery for the small residual fraction). This is the only policy which, besides reducing economic costs, gives environmental and health impacts lower than those produced by incinerators and landfills.

MSW incineration is, among all technologies, the one which has least respect for the environment and health. The production of ashes is unavoidable (they represent about 1/3 in weight of the initial waste and they must be disposed of in special landfills), as is the systematic and continuous emission in the atmosphere for each incinerator (of millions of cubic meters every day) of polluting fumes containing coarse (PM<sub>10</sub>), fine (PM<sub>2.5</sub> with diameters less than 2.5 μ) nanoparticles, with at least one dimension less than 100 nm. (0.1 μm), and ultrafine particles, the most dangerous of them – both medically and environmentally – owing to the high surface to volume ratio, which makes these particles very reactive or catalytic.

Ultrafine and nanoparticles are formed largely by combustion sources as primary PM emissions or as secondary particles formed by atmospheric chemical reactions of combustion emissions of sulphur and nitrogen oxides (1) (2); they are not efficiently captured by air pollution control devices, are transported over long distances, and penetrate deep into the respiratory system (3) (4). Owing to their microscopic size ultrafine particles are also able to penetrate organs and tissues, causing biochemical damage, passing easily through cell walls and/or interacting with cell receptors, proteins and Dna. Persistent free radicals - present in combustion generated fine and ultrafine PM - induce DNA damage (5) (6)

Exposure to ultrafine particles has been shown to elicit an acute inflammatory response and release of proinflammatory cytokines in the lung (7) (8) (9): the chemokines and cytokines released during this inflammatory response travel through the blood, causing myocardial dysfunction and/or infarction, atherosclerosis (10) (11) (12) and proliferative responses of bone marrow leukocytes.

These particles are then translocated by the circulation to other organs including the liver, the spleen, the kidneys, the heart and the brain, where they may be deposited. Histological evidence of neurodegeneration has been reported in both canine and human brains exposed to high ambient PM levels, suggesting the potential for neurotoxic consequences of PM-CNS entry. (13) (14)

Nanoparticles can also vehicle into living organisms many toxic chemicals (heavy metals,



polycyclic hydrocarbons, polychlorinated biphenyls, benzene dioxins and furans etc.) that can persist and accumulate in tissues, organs and cells.

And this without taking into account the contribution to the greenhouse effect.

In fact combustion transforms even relatively harmless garbage items such as packaging and food scraps into toxic and hazardous compounds released as gases, fine particles, fly ash and bottom ash which require expensive neutralization and storage systems

We, Doctors for the Environment, believe that the effects on the frailest, such as those who are already ill, or on the most susceptible such as children, pregnant women, the elderly should be taken into account as a top priority. The risk does not only consist of an increased incidence of cancer (which has already been reported), but also of other health problems such as: increases in hospital admissions and in mortality due to respiratory and cardiovascular diseases, endocrine, immune system and neurological disorders.

We reaffirm that for such important and complex problems, choices based on the “precautionary” principle and on the protection and safeguard of the environment should always be favoured, as we are aware that our health, and that of future generations is indissolubly bound to this (as the dramatic experiences with asbestos, benzene, lead and fine particles should have taught us).

**The Association of Doctors for the Environment advances the following requests:**

- 1) All current plans to build incinerators, or waste – to – energy incinerators, should immediately be suspended;
- 2) The “R” policies should receive economic incentives;
- 3) The competent Authorities should put into practice efficient and effective inspections and continuous controls, of possible pollutants (at the stack, in the air, soil and ground water) at working plants and these controls should be accompanied by rigorous monitoring of the health of the already potentially exposed populations;
- 4) Population Guarantors should be established; they should get to know the results of the environmental and health assessments and the trends in the measurements of all possible emissions caused by the operative disposal system in real time, so as to be able to suggest timely solutions.

All human beings are responsible for the environment; doctors are twice responsible!

- (1) Cormier SA, Lomnicki S, Backes W, Dellinger B. **Origin and health impacts of emissions of toxic by-products and fine particles from combustion and thermal treatment of hazardous wastes and materials.** *Environ Health Perspect.* 2006 Jun;114(6):810-7.
- (2) Donaldson K, Li XY, MacNee W. 1998. **Ultrafine (nanometre) particle mediated lung injury.** *J Aerosol Sci* 29:553–560.
- (3) D’Alesio A, D’Anna A, Gambi G, Minutolo P, Sgro LA, Violi A. 1999. **Combustion generated nanoparticles.** *Chim Ind* 81:1001–1006.
- (4) Kauppinen EI, Pakkanen TA. 1990. **Coal combustion aerosols—a field-study.** *Environ Sci Technol* 24:1811–1818
- (5) Dellinger B, Pryor WA, Cueto R, Squadrito GL, Hedge V, Deutsch WA. 2001. **Role of free radicals in the toxicity of airborne fine particulate matter.** *Chem Res Toxicol* 14:1371–1377.

**Associazione Medici per l’Ambiente – ISDE Italia**

**Via della Fioraia, 17/19 – 52100 Arezzo – Tel. 0575/22256 – Fax. 0575/28676**

**E-mail: [isde@ats.it](mailto:isde@ats.it) - <http://www.isde.it>**



- (6) Dellinger B. 2003. **The origin and nature of toxic combustion byproducts.** In: *Challenges for the Chemical Sciences in the 21st Century. The Environment.* Washington, DC:National Academies Press, 97–102
- (7) Carter JD, Ghio AJ, Samet JM, Devlin RB. 1997. **Cytokine production by human airway epithelial cells after exposure to an air pollution particle is metal-dependent.** *Toxicol Appl Pharmacol* 146:180–188
- (8) Fujii T, Hayashi S, Hogg JC, Vincent R, Van Eeden SF. 2001. **Particulate matter induces cytokine expression in human bronchial epithelial cells.** *Am J Respir Cell Mol Biol* 25:265–271
- (9) van Eeden SF. 2002. **Systemic inflammatory response induced by particulate matter air pollution: the importance of bone-marrow stimulation.** *J Toxicol Environ Health* 65:1597–1613.
- (10) Abe Y, Kawakami M, Kuroki M, Yamamoto T, Fujii M, Kobayashi H, et al. 1993. **Transient rise in serum interleukin-8 concentration during acute myocardial infarction.** *Br Heart J* 70:132–134.
- (11) DeMeules JE, Pigula FA, Mueller M, Raymond SJ, Gamelli RL. 1992. **Tumor necrosis factor and cardiac function.** *J Trauma* 32:686–692
- (12) Mann DL, Young JB. 1994. **Basic mechanisms in congestive heart failure. Recognizing the role of proinflammatory cytokines.** *Chest* 105:897–904.
- (13) Oberdorster G, Sharp Z, Atudorei V, Elder A, Gelein R, Kreyling W, Cox C. **Translocation of inhaled ultrafine particles to the brain.** *Inhal Toxicol.* 2004 Jun;16(6-7):437-45.
- (14) Peters A, Veronesi B, Calderon-Garciduenas L, Gehr P, Chen LC, Geiser M, Reed W, Rothen-Rutishauser B, Schurch S, Schulz H. **Translocation and potential neurological effects of fine and ultrafine particles a critical update.** *Part Fibre Toxicol.* 2006 Sep 8;3:13.

Post-Script:

Proximity to municipal waste incinerators was positively related to both childhood and adult cancer in Great Britain

Elliott P, Shaddick G, Kleinschmidt I, et al. **Cancer incidence near municipal solid waste incinerators in Great Britain.** *Br J Cancer* 1996; 73: 702–710.

Elliott P, Eaton N, Shaddick G, et al. **Cancer incidence near municipal solid waste incinerators in Great Britain. Part 2: histopathological and case-note review of primary liver cancer cases.** *Br J Cancer* 2000; 82: 1103–1106.

Knox EG. **Childhood cancers, birthplaces, incinerators and landfill sites.** *Int J Epidemiol* 2000; 29: 391–397.