

### HPA response to the British Society for Ecological Medicine report

The Chemical Hazards and Poisons Division of the Health Protection Agency (HPA) has considered the report entitled "The Health Effects of Waste Incinerators" published by the British Society for Ecological Medicine (BSEM)<sup>1</sup>.

#### General comments

The BSEM report is not a systematic review of the literature and there is no critical assessment of the quality of the included studies. Consequently the report presents a selective and limited use of the scientific literature. For example the report has not considered important reviews such as the Defra review of environmental and health effects of waste management<sup>2</sup>, the Committee on Carcinogenicity (COC) statement on cancer incidence near municipal solid waste incinerators in Great Britain<sup>3</sup> or the Royal Society critique of the Defra review<sup>4</sup>. In addition, several of the claims regarding health risks are not supported by appropriate scientific references, for examples see page 7 '*...increased ischaemic heart disease has been reported in incinerator workers*' and page 35 regarding cement kilns '*They are therefore capable of extremely serious health consequences*'.

The authors have also failed to acknowledge the impact of the current legislative regime which minimises the potential for public *exposure* to emissions. The Waste Incineration Directive<sup>5</sup> (WID) for example has strengthened the regulatory regime and provides for strict operating conditions and robust monitoring programmes. Current planning and regulatory regimes provide a comprehensive mechanism for consideration of health impacts through Environmental Impact Assessment (EIA), Integrated Pollution Prevention and Control (IPPC) and more recently the implementation of Strategic Environmental Assessment (SEA).

There are misleading statements on health issues such as carcinogenicity and the report misinterprets the 'precautionary principle'. The precautionary principle should be invoked when there is good reason to believe that harmful effects may occur and the level of scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision making<sup>6</sup>. As there is a body of scientific evidence strongly indicating that contemporary waste management practices including incineration, have at most, a minor effect on human health and the environment, there are no grounds for adopting the 'precautionary principle' to restrict the introduction of new incinerators.

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<sup>1</sup> The Health Effects of Waste Incinerators, 4<sup>th</sup> Report of the British Society for Ecological Medicine, December 2005. (<http://www.ecomed.org.uk/content/IncineratorReport.pdf>).

<sup>2</sup> Defra, Review of environmental and health effects of waste management: municipal solid waste and similar wastes, May 2004. (<http://www.defra.gov.uk/environment/waste/research/health/pdf/health-report.pdf>)

<sup>3</sup> COC statement COC/00/S1. Cancer incidence near municipal solid waste incinerators in Great Britain. March 2000. (<http://www.advisorybodies.doh.gov.uk/coc/munipwst.htm>)

<sup>4</sup> Royal Society review of DEFRA's health and environmental effects of waste management options report, March 2004. (<http://www.royalsoc.ac.uk/displaypagedoc.asp?id=11459>)

<sup>5</sup> [http://europa.eu.int/comm/environment/wasteinc/newdir/2000-76\\_en.pdf](http://europa.eu.int/comm/environment/wasteinc/newdir/2000-76_en.pdf)

<sup>6</sup> The United Kingdom Interdepartmental Liaison Group on Risk Assessment, The Precautionary Principle: Policy and Application. November 2005. (<http://www.hse.gov.uk/aboutus/meetings/ilgra/pppa.htm>)

## Hazard and risk

The report does not distinguish adequately between hazard and risk i.e. the intrinsic hazard associated with a chemical/s as opposed to the likelihood of health impacts (which is dependent on exposure). The report also fails to apportion impact to source which is highly misleading e.g. where the authors make a calculation of impact for heavy metals, nitrogen oxides, ozone and organic pollutants, this relates to *total* impact with no attempt to identify the contribution of incineration. The High Risk Groups chapter provides no data as to the contribution incineration makes to exposure/body burden of the chemicals discussed.

The report makes unsubstantiated claims regarding ultrafine particles (mistakenly described as being < 1 µm diameter. The UK independent advisory Air Quality Expert Group defines ultrafines as < 0.1 µm<sup>7</sup>). No data on likely respiratory filtration factors are presented and assertions that these particles are especially damaging to health are accepted uncritically. HPA advice is that exposure to particulates will increase the risk of adverse health effects. However modern, well managed incinerators are a minor source of such exposures.

Assertions regarding the effects of metals are also presented without question. It is well understood that at some dose levels metals can produce a range of toxic effects. However, in this context, the key question is whether health effects will occur at dose levels likely to be produced by incinerator emissions. This is not considered by the authors, nor the difficulties involved in making such an assessment.

The Risk Assessment chapter does not reflect the general consensus amongst toxicologists regarding the risk assessment paradigm and subsequent risk management. For example, if the authors' views that some pollutants are more dangerous at low concentrations than high are accepted, risk assessment (including those on which the authors rely) would have to be regarded as pointless ; no alternative strategy is offered.

The section on cement kilns makes no reference to the evidence that the use of substitute fuels can actually reduce pollutant emissions or that such processes are insignificant sources of either metals or dioxins. The statement '*They are therefore capable of extremely serious health consequences*' is not qualified by an acknowledgement that there is no evidence that the use of substitute fuels in cement kilns has measurable impact on public health.

The statement that pollution controls for cement kilns are significantly weaker than hazardous waste incinerators is incorrect. When burning wastes, both are covered by the same EC Directives controlling maximum concentrations of prescribed substances. WID specifically addresses the recovery of energy from waste derived fuels and sets emission limits accordingly.

## Carcinogenicity

The section on effects on genetic material is unnecessarily alarmist. Chemicals that produce DNA adducts are of course a concern. However, to then refer to the 'horrifying scenario' of carcinogenesis passed through several generations, stating that incinerator emissions would greatly increase this risk without providing any documentation to support this, is misleading. The International Agency for Research on Cancer (IARC) reference to effects occurring over several generations in animals in fact refers to transplacental carcinogenesis i.e. *in utero* exposure resulting in cancer in the offspring. The relevance of these data to actual emissions from incinerators is not addressed.

The authors' statement that cancer incidence rates have shown a steady increase paralleling the rise in synthetic chemicals is incorrect. For example, in the period 1992-2001 the overall age standardised incidence rates for cancer have remained fairly constant for men and have only slightly increased in women<sup>8</sup>. However, it should be recognised that there are many different types of

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<sup>7</sup> Air Quality Expert Group Report on Particulate Matter in the United Kingdom, June 2005.

(<http://www.defra.gov.uk/environment/airquality/ageg/particulate-matter/index.htm>)

<sup>8</sup> CancerStats Incidence UK, Cancer Research UK, March 2005.

(<http://info.cancerresearchuk.org/cancerstats/incidence/trends/>)

cancer, the causes of which are multi-factorial rather than there being a single cause for any particular type of cancer. It is therefore inappropriate to consider all cancers together. The overall constant incidence of cancer masks a large decrease in some types e.g. stomach, lung in men but not women (mirroring closely cigarette smoking habits), and an increase in others, e.g. malignant melanoma in men and women (probably related to UV exposure patterns) and cancer of the uterus and testes.

The authors estimate that 5-10% of all chemicals are carcinogenic since this was the value reported by the National Toxicity Program (NTP)<sup>9</sup>. This ignores the fact that to be selected for this carcinogenicity testing programme there had to be concerns regarding the toxicity of the compounds<sup>10</sup>. The statement that the IARC tested 1000 chemicals is incorrect. The IARC evaluated about this number on the basis of the available data and found that about 10% were probable carcinogens. However, again compounds were selected because of concerns in this regard. It is misleading to extrapolate from these very selective groups to the universe of chemicals where the overall proportion of chemicals that are carcinogenic is likely to be very much smaller.

The largest study of cancer and proximity to municipal solid waste incinerators (MSWIs) is that of the Small Area Health Statistics Unit (SAHSU)<sup>11</sup>. While the reviewers disagreed with the SAHSU conclusions that the very slight increase in cancer incidence was due to confounding factors such as lifestyle they make no mention of the conclusions of the Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (COC) on this issue. The overall conclusion of the COC was “any risk of cancer due to residency near to MSWIs was exceedingly low and probably not measurable by the most modern epidemiology techniques. The Committee agreed that at the present time there was no need for any further epidemiological investigations of cancer incidence near MSWIs”.

### **Other health effects**

The section on birth defects considers five reports of which only three actually relate to incinerators and are in peer reviewed journals. These all have limitations and preclude any definite conclusions being drawn. The 2004 Defra review comprehensively reviewed the literature and concluded ‘*we found that health effects in people living near waste management facilities were either generally not apparent, or the evidence was not consistent or convincing*’.

There is no convincing data to indicate that Parkinson’s disease, Alzheimer’s disease, other mental disorders, or violent crime is linked with exposure to chemicals in the environment.

### **Synergistic effects**

This section makes no reference to the recent report of the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) on Risk Assessment of Mixtures of Pesticides and similar Substances.<sup>12</sup> This report comprehensively reviews the available evidence (not only limited to pesticides) of the different types of interaction. The COT report stated that ‘*several studies had claimed to have identified toxicological interaction in some mixtures. However for the most part, these studies have been inadequately designed and based on an incomplete understanding of the concepts involved. A few well defined studies have demonstrated the occurrence of both synergistic and antagonistic interactions, as well as additive effects in mixtures,*

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<sup>9</sup> <http://ntp-server.niehs.nih.gov/ntpweb/index.cfm?objectid=25BC6AF8-BDB7-CEBA-F18554656CC4FCD9>

<sup>10</sup> <http://ntp-server.niehs.nih.gov/ntpweb/index.cfm?objectid=25BC6AF8-BDB7-CEBA-F18554656CC4FCD9>

<sup>11</sup> Elliott P, Eaton N, Shaddick G and Carter R (2000). Cancer Incidence near Municipal Solid Waste Incinerators in Great Britain 2 : Histopathological and Case Note Review of primary liver cancer cases. British Journal of Cancer, 82, 1103-1106.

<sup>12</sup> COT. Risk Assessment of Mixtures of Pesticides and Similar Substances. September 2002 (<http://www.food.gov.uk/science/ouradvisors/toxicity/COTwg/wigramp/>)

*usually at high concentration or high exposure levels which are probably unrepresented of exposure doses'. Thus, although a few examples of a real synergistic effect, involving relative high exposures, are well understood e.g. asbestos and smoking, there are essentially no convincing data of such effects at low exposure levels such as those arising from exposure via environmental pathways.*

## **Monitoring**

Much of the section discussing monitoring concerns toxic effects rather than monitoring, and much is questionable. For example it is not true to say that effects on the foetus or infant are not taken into account when setting safety limits. Information from reproductive/developmental toxicity studies are needed in order to set tolerable daily intakes (TDI).

The data quoted for bisphenol A apparently showing effects at very low dose levels are contentious. The widely held view, including the expert advice from the COT, is that these data should not be used when deriving health based standards.

In addition, the authors do not acknowledge that incinerator operators are required by law to monitor their process and make available monitoring data to the regulator.

The authors criticise the use of modelling without offering alternative strategies. Statements such as *'Modelling produces the illusion of a scientific knowledge and a certainty that is entirely unjustified as modeling itself is imprecise and it is based on substantial scientific uncertainty and limited scientific data'* fail to acknowledge that modelling is only one of a number of tools and resources including monitoring data used in the management and regulation of incinerators. Interestingly the authors earlier cite a US modeling study as providing evidence of incinerators contributing to Inuit mother's dioxin levels

## **Conclusion**

Having considered the BSEM report the HPA maintains its position that contemporary and effectively managed and regulated waste incineration processes contribute little to the concentrations of monitored pollutants in ambient air and that the emissions from such plants have little effect on health.

[http://www.hpa.org.uk/chemicals/ipcc/incineration\\_posn\\_statement.pdf](http://www.hpa.org.uk/chemicals/ipcc/incineration_posn_statement.pdf)

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