The Health Effects of Fine, Ultrafine and Nanoscale Particulate Emissions from Incinerators

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January 23, 2008

"Particulates are tiny particles in air that are classified by size. PM10s have a diameter of less than 10 microns whereas fine particulates (PM2.5s) are less than 2.5 microns and ultrafine particulates (PM1s) are less than 1 micron" (1). Research indicates that incineration creates many more PM2.5 and smaller particles than PM10 particles. This is true for both primary and secondary particulates (secondary particulates are formed beyond pollution controls in the incinerator stack and are "emitted unabated" (1).

(1) The Health Effects of Waste Incinerators: 4th Report of the British Society for Ecological Medicine (see especially p. 9) 12/05
http://www.ecomed.org.uk/pub_waste.php

The evidence on the damaging health effects of particulates is clear. As the levels of PM10 and smaller particulates increase, respiratory (e.g., asthma, bronchitis, emphysema) and other illnesses increase, and premature death from heart disease and lung cancer increases. PM2.5, PM1, and smaller (i.e., nano) particles impair health and cause premature death even more than PM10 particles (2-6).

(2) British Society for Ecological Medicine - Reply to Enviros Communication of September 2006 (see especially pp. 1 & 3)
http://www.ecomed.org.uk/content/IncineratorSurreyResponse2.pdf

(3) Clean Air Advocates Challenge EPA's Lax Rule for State Plans to Clean Up Fine Particle Pollution: Exemptions for power plants and industrial agriculture opposed 6/25/07
http://www.lungusa.org/site/apps/nl/content3.asp?c=dvLUK9O0E&b=40404&ct=4026367

(4) Health, Environmental Groups File Court Challenge to EPA Particulate Matter Pollution Standard: EPA maintains nearly decade old annual pollution levels that has been linked to thousands of deaths annually 12/15/06
http://www.lungusa.org/site/apps/nl/content3.asp?c=dvLUK9O0E&b=40404&ct=3307385

(5) The Revolution, Part 3: Ultrafines 7/24/03
http://www.rachel.org/bulletin/index.cfm?issue_ID=2371

(6) Invisible Killers: Fine Particles 1/20/94
http://www.rachel.org/bulletin/index.cfm?issue_ID=755

PM2.5, PM1, and nano particles travel to the deepest parts of our lungs, and are very

difficult for our lungs to remove. PM.2.5, PM1, and nano particles are also particularly threatening because toxic metals and toxic and carcinogenic polycyclic aromatic hydrocarbons (PAHs) cling to them, further exacerbating their health impairing effects (7, 1).

(7) Incineration and Human Health: State of Knowledge of the Impacts of Waste Incinerators on Human Health (see especially pp. 70-72) 3/01
Michelle Allsopp, Pat Costner and Paul Johnston
Greenpeace Research Laboratories, University of Exeter, UK
http://www.no-burn.org/resources/library/gphealth&incin.pdf

Particulates created by incineration are likely to become even more of an environmental and health hazard in the future, because municipal wastes (aka refuse derived fuel), industrial wastes, treated wood wastes, and agricultural wastes will contain more and more nanoscale materials.

Nanoscale materials "have at least one dimension that is 100 nanometers or less. A nanometer is one billionth of a meter – approximately 1/100,000 of a human hair" (8). For a quick two page introduction to how nanoscale materials differ, the potential problems they pose, and why there is an urgent need for precaution, research and regulation, see "Sweating the Small Stuff" (8).

(8) Sweating the Small Stuff - Nanotechnology Needs Research and Regulation 1/07
http://www.foodandwaterwatch.org/food/food-technologies/nanotechnology

Sweating the Small Stuff (8) notes, for instance, that "nanoscale materials are very different than their larger counterparts, with distinct electronic, magnetic, chemical and mechanical properties," and that "nanoparticles have the potential to bypass the blood-brain barrier" ... "the potential to pass the placental barrier" ... [and that] "once in the bloodstream, nanomaterials can circulate throughout the body and be taken up by organs and tissues."

"Sweating..." also notes that "the European Commission Scientific Committee on Emerging and Newly Identified Health Risks reported [3/10/06] that 'experts are of the unanimous opinion that the adverse effects of nanoparticles cannot be predicted (or derived) from the known toxicity of material of macroscopic size, which obeys the laws of classical physics.' "

More than 500 consumer products already contain nanoscale materials, and hundreds of additional nanomaterials are used at various stages of manufacturing. In addition to concern about potential environmental and health risks created by the use of nanoscale materials, there is also extensive concern about the potential health and environmental risks and liabilities that will be created when the materials reach the end of their lifecycle and are disposed of via landfills or incineration (9, 10).

(9) Project on Emerging Nanotechnologies: Where Does the Nano Go? New Report on

End-of-Life Regulation of Nanotechnologies 7/26/07
http://www.nanotechproject.org/news/archive/where_does_nano_go_new/

(10) Nanowaste Needs Attention of EPA, Industry and Investors 7/26/07
http://www.eurekalert.org/pub_releases/2007-07/poen-nna072507.php

For more on the urgent need for precaution, research and regulation of nanotechnology, and why we don't want to burn municipal wastes, industrial wastes, treated wood wastes, and agricultural wastes containing nanoscale materials, see the resources below (11-21).

(11) Project on Emerging Nanotechnologies (Woodrow Wilson International Center for Scholars and the Pew Charitable Trusts)
http://www.nanotechproject.org/

(12) ETC Group: Organic Pioneer Says No to Nano 1/14/08
http://www.etcgroup.org/en/materials/publications.html?pub_id=669

(13) The Economist: The risk in nanotechnology - A little risky business 11/22/07
http://www.economist.com/displaystory.cfm?story_id=10171212

(14) Collaborative on Health and the Environment: The Impacts of Nanotechnology 10/11/07
http://www.healthandenvironment.org/articles/partnership_calls/1894
http://www.healthandenvironment.org/articles/call_resources/1898

(15) Environmental Working Group: Comments to FDA on Nano-Scale Ingredients in Cosmetics 10/9/06
http://www.ewg.org/node/21738

(16) ETC Group: Broad International Coalition Issues Urgent Call for Strong Oversight of Nanotechnology 7/31/07
http://www.etcgroup.org/en/materials/publications.html?pub_id=651

(17) Nanotechnology Showdown 5/18/06
http://www.precaution.org/lib/06/prn_dhn_nano.060518.htm

(18) NRDC: Tiny Particles Promise Much, But Could Pose Big Risk 3/20/2006
http://www.precaution.org/lib/06/prn_nano_backgrounder_nrdc.060320.htm

(19) Michigan State research sheds new light on health dangers of nanoparticles 2/17/06
http://www.eurekalert.org/pub_releases/2006-02/msu-msr021306.php

(20) Nel et al.: Toxic Potential of Materials at the Nanolevel 2/3/06
http://www.sciencemag.org/cgi/content/abstract/311/5761/622

(21) Nanotoxicology: An Emerging Discipline Evolving from Studies of Ultrafine Particles 7/05
http://www.ehponline.org/members/2005/7339/7339.html

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