TESTIMONY BEFORE THE EPA
HEARINGS ON PARTICULATE MATTER REGULATORY STANDARDS
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The Clean Air Act legislates primary consideration for public health, and secondary standards for aesthetics, haze, and smog. In respiratory school I studied pharmacology and modes of aerosol deposition: inertial impaction, gravitational settling, and Brownian diffusion; and I learned that it is affected by temperature and humidity. As a licensed respiratory care practitioner, I apply aerosol medications therapeutically to the functional tissues, the parenchyma, of the lungs of my patients. From the environmental air we breathe, these membranous pulmonary tissues are exposed to airborne toxic pollutants. Mother Nature does not distinguish between medical drugs and airborne pollutants. Below 10-15 microns, they all get to the lungs and a lot get directly deposited into the tissues, are absorbed by the body, and course through the bloodstream.

Consider the aerosol delivery of therapeutic respiratory medications. Therapeutic, effective inhaled doses are smaller than systemic doses (roughly one to ten ratio); they have a rapid onset; their delivery is directly targeted to lung parenchyma. Yet, due to variability in environmental conditions and modes of deposition, precise aerosol doses can be difficult to reproduce and estimate, which confounds clinicians and researchers. And the range of particle size is vast: 0.001 (one-one-thousandth) to 100 micrometers. The range for pulmonary diagnostic and therapeutic applications is 1-10 micrometers, which coincides with the EPA's range of concerns. Therapeutics and environmental risk intersect.

The average person breathes in 13 cubic meters of air per day. The EPA fine Particulate Matter standards allow 15 micrograms/cubic meter of air. The agency's coarse PM standards

allow as much as 150 micrograms/cubic meter of air. That permits a 195 to 1,950 mcg toxic load per day. An albuterol rescue inhaler puts out 90 mcg/puff, and typical use is 1-2 puffs per use. The anticholinergic bronchodilator ipratropium is effective at 1-3 puffs with 18 mcg/puff. Long-acting salmeterol is usually prescribed for 1-2 puffs at 21 mcg/puff. Please note that the EPA's proposed toxic load exceeds that of therapeutic dosing recommendations. We're breathing more poison than medicine.

Still, studies abound with convincing, empirical evidence that PM pollutants contribute to chronic cardiopulmonary diseases in all populations. "Very fine and ultrafine iron, nickel, copper, and zinc were identified as vehicular, with the most probable sources being brake drums and pads and the lubrication oil additive zinc thiophosphate. High correlations, many with r^2 >0.9, were found between these vehicular metals and IHD mortality, enhanced by the meteorology, terrain, and traffic patterns of the southern Central Valley. The braking systems of cars and trucks must now be considered along with direct exhaust emissions in estimating the health impacts from traffic.." From: *Very Fine and Ultrafine Metals and Ischemic Heart Disease in the California Central Valley 1: 2003–2007* [available at: http://www.tandfonline.com/doi/pdf/10.1080/02786826.2011.582194].

Furthermore: "Soot from diesels trucks and trains is almost all < 0.25 microns, 10 x smaller than the $PM_{2.5}$ cut. Much is ultra fine, < 0.1 micrometer. Brake debris is almost all < 0.25 microns, also. The fine iron, < 1 micron, is implicated in the loss of lung function in LA [Los Angeles] children living within 1 mile of freeways. Simply lowering the $PM_{2.5}$ mass standard is a classic case of looking for your [car] keys under a convenient street light when they were lost down a dark ally..[W]hat we really need is a revision of the Clean Air Act that directly addresses those parts of the PM aerosol that are harmful most of which are much finer than 2.5

micrometers – carcinogenics from diesel, heart disease from brake pads, drums and lube oil metals, children's lung capacity from sub micron iron and copper, asthma for coarser particles – none of which are separated out in a $PM_{2.5}$ mass standard. If you are going to continue to use mass as an antiquated and inefficient surrogate [standard/regulation] for the health effects of aerosols, then one should craft a new mass standard $PM_{0.25}$, since almost everything below 0.25 micrometers in diameter deposits deep in the lung and is most often toxic."--Dr. Tom Cahill, UC Davis physicist (personal correspondence July 19, 2012).

In the US Supreme Court decision *Whitman v American Trucking Associations*, cost analysis is not permitted consideration in establishment of Clear Air Act regulatory standards: "Section 109(b) does not permit the Administrator to consider implementation costs in setting NAAQS [National Ambient Air Quality Standards]." Despite this, the EPA's Confidential Business Information (CBI) accommodation allows those illegal considerations to be made. And yet, front-end public health preventatives are far more successful, and so much more cost-effective, than back-end curatives (from my professional experience, most of which fail). As the joke about the EPA goes, a life is worth about $1M less now than it was in 2001. Full funding of front-end public health efforts is the solution to the conundrum of cost.

http://www.msnbc.msn.com/id/25626294/ns/us_news-environment/t/how-value-life-epa-devalues-its-estimate/#.UAcmB_UvvEI

Why is there an emphasis on protection of trade secrets and CBI in this information-gathering process? The Declaration of Independence wasn't signed by Anonymous. Transparency in our economy and in our science is critical to successfully tackling human health problems associated with inhaled airborne pollutants. It should start with protection of public health through our own EPA.