

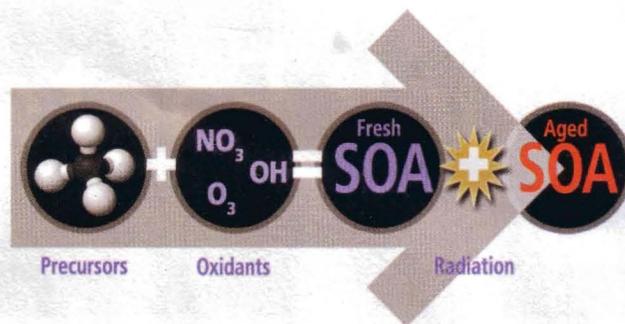
PARTICULATE MATTER

New Chapter on the Next Generation of Aerosols

Scientists have known for decades that carbonaceous molecules emitted by cars, factories, and ships can react chemically to form new pollutants called secondary organic aerosols (SOA). Until recently they thought these offspring constituted only a small part of the pollution plume [see “Ship Sulfate an Unexpected Heavy-weight,” *EHP* 116:A475 (2008)]. So when researcher Jose-Luis Jimenez of the University of Colorado at Boulder and colleagues analyzed the particle content of the air of Riverside, California, about 50 miles east of Los Angeles, they were surprised to find that only 10–30% came from smokestacks and tailpipes—the rest was SOA generated in the atmosphere. The findings, reported 15 October 2008 in *Environmental Science & Technology*, add to growing suspicions that people may be exposed to substantial levels of unregulated health-threatening pollutants.

Organic aerosols are formed from burning coal, gasoline, and other fossil fuels. Emissions of some primary organic aerosols are regulated by the Environmental Protection Agency (EPA). SOA forms when hydrocarbons (including toluene and xylene from fuel combustion) and other lesser volatile precursors oxidize and condense onto particles in the atmosphere. SOA also forms from terpenes and sesquiterpenes emitted by vegetation. Because SOA forms more readily in sunlight, it is more prevalent during the summer and in warmer climates. SOA disperses over wide areas, often far downwind of the cities where its precursors were emitted.

Particles contribute to preterm birth, low birth weight, asthma, and cardiovascular disease, among other health effects. Researchers think SOA may also threaten human health, but they're just starting to gather evidence to back that hypothesis. “We know a lot about what particles do, but we don't know a lot about the role of SOA in that,” says environmental epidemiologist Joel Schwartz of the



Harvard University School of Public Health. However, one clue lies in the size of SOA. “Smaller particles are more aggressive in finding their way into the lungs and crossing the blood barrier,” says atmospheric researcher Rainer Volkamer of the University of Colorado at Boulder. With a diameter of less than 1 μm , SOA is among the smaller particles in an ambient distribution.

A study in the October 2003 issue of *Inhalation Toxicology* showed a decrease in respiratory frequency in rodents exposed to ozone- and terpene-based SOA. First author Annette Rohr, senior technical manager of the Electric Power Research Institute in Palo Alto, California, says, “We had evidence of airway irritation as well as airflow limitation. There's no reason to think humans wouldn't have the same effect.” She notes, however, that the concentrations used in her studies were many times higher than likely human exposures.

EPA-funded studies under way in Los Angeles, Fresno, Pittsburgh, St. Louis, Boulder, Mexico City, and Chebogue Point (Canada) are looking at how emissions, temperature, wind, and other factors influence SOA formation and movement. Dan Costa, national program director for air research at the EPA, hopes that information eventually can be used to predict air quality. “We're trying to get fundamental information we can plug into models to project the air quality in a community,” he says. “But we're a ways away from being able to regulate these things.” —Cynthia Washam

Joseph Tarr/EHP



President-elect Mohamed Nasheed of the Maldives has taken that warning to heart. On 10 November 2008 he announced plans to create a “sovereign wealth fund” from tourism revenue to purchase land for relocation in the event the Maldivian homeland succumbs to rising sea levels. In an April 2008 book on the threat posed to his country by global warming, outgoing president Maumoon Abdul Gayoom wrote that the alternative to relocation—building protective walls around the 193 inhabited islands—was prohibitively expensive.

Left to right: Craig Grobler, istockphoto

Pregnancy Hypertension Risks Higher for Rural Women

There are several well-known risk factors for preeclampsia, in which pregnant women experience high blood pressure and proteinuria. At the November 2008 annual meeting of the American Society of Nephrology, researchers announced one more. In a study of 362,000 women, they found that living in a rural county carried a 56% increased risk. This increase in risk, which the researchers believe may be linked to maternal poverty or social isolation, was independent of other risk factors including poor prenatal care.

Open Invitation to Oysters

Oysters purify water as they filter it through their bodies to obtain nutrition, with a single adult oyster filtering up to 60 gallons per day. Before the growth of the commercial shellfish industry in the last century, oyster beds along the Atlantic coast sometimes covered several square miles. Now oyster populations have been ravaged by overharvesting, pollution, and dredging. Environmental advocacy groups and

government entities have teamed up to create an artificial reef in Wellfleet Harbor, Cape Cod, in an effort to improve water quality, strengthen the local marine ecosystem, and form a natural breakwater to protect the shoreline. The reef is composed of two 100-foot lengths of “cultch,” or crushed shells, banked by mesh bags loaded with shells. In a second phase of the project, concrete structures will be added to serve as habitat for juvenile oysters. As of November 2008, hundreds of oysters had begun populating the reef.

