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FITNESS

For Athletes, an Invisible Traffic Hazard



Richard Perry/The New York Times

SOOTY STREETS Air pollution may make a ride along the Hudson in Manhattan bad for lungs and hearts.

By GRETCHEN REYNOLDS
Published: July 12, 2007

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A Fresh New Comedy

SUSAN JAMES, a 50-year-old probation officer in Bakersfield, Calif., has been a competitive runner for almost three decades. “I’ve spent a lot of hours running through this city,” she said.

Which is beginning to worry her.

“Twenty years ago, I didn’t have asthma or allergies,” she said. Today, she has both, probably due to the same improbable cause. “My doctor told me I’m allergic to Bakersfield air,” she said. “I’m actually allergic to it.”

In May, the American Lung Association called Bakersfield the third-sootiest city in the country, behind Los Angeles and Pittsburgh.

The news didn’t surprise Ms. James. “Sometimes my chest aches” midrun, she said. To combat the pollution, she may soon join a gym for the first time. “I’ve got a lot of years to run still, and I’m not sure if I can do it outside,” she said.

Air pollution is on the minds of many athletes this summer, especially those who, in a

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Axel Koester for The New York Times

OUT OF BREATH Susan James, 50, of Bakersfield, Calif., says she has developed lung problems from years of running in polluted air.

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reverse of Ms. James's plan, have moved their workouts outside.

Fitness chat rooms resound with worried postings about air quality. As one cyclist wrote on SoCalCycling .com, "During the summer months, I have to ride in the morning and be home no later than 11, otherwise I will feel miserable and cough all day long."

Elite athletes and their retinues, meanwhile, are looking with trepidation toward Beijing, the site next year of the Summer Olympic Games and one of the most polluted cities in the world.

Concerns about air quality in Beijing, climate change, automobile emissions and other environmental issues have driven a recent boom in studies of air pollution's medical effects. Most studies haven't used exercisers as subjects. But their results have implications for exercisers, who breathe with particular vigor and oomph.

Kenneth Rundell, the director of the Human Performance Laboratory at Marywood University in Scranton, Pa., said, "Athletes typically take in 10 to 20 times as much air," and thus pollutants, with every breath as sedentary people do. He was the chairman, in May, of a scientific session on air pollution and athletes at the annual meeting of the American College of Sports Medicine.

Still, virtually every expert interviewed said that Americans should not stop exercising outdoors. Rather they suggested that exercisers should keep their distance from exhaust-spewing cars and check air-quality forecasts before venturing out.

That said, a 2004 review of pollution studies worldwide conducted by the University of Brisbane, Australia, found that during exercise, low concentrations of pollutants caused lung damage similar to that caused by high concentrations in people not working out.

Given what can be in the air, "people who exercise outdoors should probably be more worried" than many are, said Morton Lippmann, a professor of environmental medicine at the New York University School of Medicine.

And there are long-term consequences. A study that used the mass of data included in the Women's Health Initiative found that women who lived in communities with relatively high levels of air pollution in the forms of tiny particles — a k a soot — were far more likely to die because of heart attacks than women who lived in cleaner air. Results were published in February in The New England Journal of Medicine.

"Fine particulates are definitely something to worry about," said Dr. Rundell, especially for athletes, who, in the process of exerting themselves, "can take in very elevated doses."

That may go against conventional wisdom. Most people, when they think of air pollution, think first of ozone, a ground-level gas created when sunlight reacts with pollutants emitted by cars and factories. Ground-level ozone, popularly known (and loathed) as smog, has long been recognized as a threat to cardiovascular health.

"Ozone over the long term causes what is similar to a premature aging of the lungs," said Michelle Bell, an assistant professor of environmental health at the Yale School of Forestry and Environmental Studies.

But today most experts agree that, as Dr. Lippmann said, the "greatest overall public health impact" of air pollution comes from fine particulates, which can be seen only with an electron microscope.

They are ubiquitous. Cars, trucks, and diesel buses — the main culprits in the creation of

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particle pollution — spew untold millions of the microscopic pollutants into the air daily. Exercisers should take precautions against particles, experts said, by not exerting themselves near traffic, or, if they must use a path next to a highway, staying a few hundred yards away from vehicles.

Particles can sail past nasal hairs, the body's first line of defense, and settle deep in athletes' lungs. Some remain there, causing irritation and inflammation. Others, so tiny they can bypass various bodily defenses, migrate into the bloodstream. "Blood vessels do not like those particulates," said David Newby, a cardiology professor at the University of Edinburgh.

Dr. Newby has seen, in action, the effects of those particles on active people. In 2005, he and his colleagues had 30 healthy volunteers ride exercise bikes inside a laboratory for 30 minutes, while breathing piped-in diesel exhaust at levels approximately those along a city highway at rush hour.

Afterward, the researchers did a "kind of stress test of the blood vessels" in the participants' forearms, Dr. Newby said, and found that the vessels were abnormally dilated, meaning blood and oxygen could not flow easily to the muscles. At the same time, levels of tissue plasminogen activator, or tPA, a naturally-occurring protein that dissolves blood clots, had fallen.

"Those are ideal conditions for a heart attack," Dr. Newby said. A heart attack can start when arteries constrict and a clot forms. Without sufficient tPA, the clot isn't dissolved, the artery is blocked, and the heart is damaged.

Dr. Newby recently replicated the experiment with 20 volunteers who had previously had a heart attack. His group found that their electrocardiograms after they exercised in the noxious air showed a blip that indicated reduced blood flow to the heart. Results were reported in March at a meeting of the American College of Cardiology.

"They had the blip during exercise in good air, too," Dr. Newby said. "But it was much more pronounced when they exercised in the polluted air."

No one is sure yet just how the tiny particles become such a threat to the heart. Preliminary research suggests that it may be because they don't work alone.

"The particles have almost no mass but a great deal of surface area," Dr. Lippmann said. In the air, they attract chemicals and circulating heavy metals, which attach themselves to the particles, and, in effect, hitchhike a ride into the lungs and bloodstream.

It is not clear whether resulting inflammation and problems are caused by the particles themselves or their passengers or both, Dr. Lippmann said.

There seems little doubt that the particles do promote cardiac disease — in athletes and others. Dr. Lippmann has found that mice exposed to large doses of the particulates develop atherosclerosis, or narrowed, plaque-riddled arteries. Other studies have suggested similar effects probably occur in the arteries of people, although the evidence is not definitive. Based on experiments to date, though, a 2004 American Heart Association scientific statement concluded that "air pollution may accelerate the development of coronary atherosclerosis."

Dr. Lippmann is quick to point out that any health damage from air pollution depends on the size of the dose. "The risks from one run would be negligible," he said. But the cumulative risk — over months or years of panting through workouts on hazy days — "would not be."

Still, it is not wise to give up outdoor exercise, even if, as Dr. Bell put it, there is a "trade-off between physical health from exercise and damage from air pollution."

"Be sensible and try to cut back" on your exposure to particles, Dr. Rundell advised, but don't use pollution as an excuse to cut back on exercise.

In the calculus of health concerns, "Breathing air pollution is not nearly as bad as smoking," Dr. Lippmann said.

"The bottom line is that running and cycling are healthy and, over all, good for the heart," Dr. Newby said. With proper care, he said, outdoor exercise does not have to be harmful — and, done en masse, could even ease pollution.

"I ride my bike back and forth to work every day," he said. "If everyone else did that, too, we wouldn't be having this problem at all, would we?"

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