Big dam project in China may warm Japan

The link between widespread industrial activity and global warming has long been on the world's list of worries, but now there's concern that a single construction project—the Three Gorges Dam in China—could cause regional warming hundreds of miles away in Japan.

The 610-foot-high dam, scheduled for completion later this decade, would stretch more than 1.3 miles across the Yangtze River and create a reservoir the length of North America's Lake Superior. Although primarily built to generate hydroelectric power, to extend navigation upstream, and to provide flood control downstream, the project would impound more than 10 trillion gallons of water that could be used for irrigation.

If such agricultural use significantly diminishes the Yangtze River's flow, it could instigate convection in the Japan Sea, argues Doron Nof, an oceanographer at Florida State University in Tallahassee. That process could bring relatively warm water to the sea's surface and raise temperatures over Japan. Nof presents his analysis in the April BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY.

China's Yangtze River, the third longest river in the world, currently dumps up to 8 million gallons of fresh water into the Yellow Sea each second. This fresh water, along with flow from the Yellow River, mixes with ocean currents and sweeps northward into the Japan Sea. There, the low-salinity water flows along the surface and forms an insulating blanket that impedes heat transfer to the atmosphere from the warmer, saltier waters trapped below, says Nof.

Map of eastern Asia shows the flow of ocean currents (red arrows) into and out of the Japan Sea. Shades of blue represent ocean depths.

Even in the coldest part of the winter, when Siberian winds chill the surface water, the Japan Sea's top layer doesn't become dense enough to sink, says Nof. The last bout of large-scale convection in the Japan Sea occurred more than a half-century ago. Since then, warming farther north in the Sea of Okhotsk has melted ice there and sent additional fresh water southward.

Nof contends that if China diverts as little as 10 percent of the Yangtze's flow, the Japan Sea's surface layer at times would become salty enough to sink. Warmer water coming to the surface would cause the temperature of the overlying air to rise. Such convection elsewhere in the world raises regional air temperature several degrees Celsius, he adds.

Alberto D. Scotti, an oceanographer at the University of North Carolina at Chapel Hill, says it's "definitely plausible" that increased salinity in the upper layers of the Japan Sea could restart the convection there, especially during cold winter conditions. Despite the argument's simplicity and elegance, at this point it's only speculation, Scotti says. "Without more detailed analysis, the only way to know [if the argument is valid] is to see what happens when the dam is completed," he notes. *—S. Perkins*

Blood markers of clogging arteries emerge

Japanese researchers have taken a step toward the development of a blood test that could serve as an early warning for people who are at risk of developing vascular disease.

The researchers zeroed in on lipoproteins, biochemicals that ferry cholesterol in blood and are susceptible to a chemical transformation called oxidation. Once oxidized, one type of lipoprotein triggers inflammatory reactions that lead to artery-clogging plaque. Now, the Japanese scientists have measured oxidized lipoprotein in the blood of patients and other volunteers and found that it correlates with the severity of heart disease.

This work opens the prospect that doctors might someday use a simple blood test to screen patients for silent but worsening atherosclerosis, says Makiko Ueda of Osaka City University Medical School.

That won't be easy, she concedes, because her team's novel technique is "cumbersome and time consuming." It takes 2 days to isolate the blood's low-density lipoproteins (LDLs), the so-called bad lipoproteins, and 2 days more to quantify their oxidization. However, she says, this test does represent a proof of principle.

For their study, Ueda and her coworkers collected blood from 46 healthy men and women and 135 heart-disease patients. Roughly equal numbers of the latter group had stable angina (chest pain), unstable angina (more advanced disease), or a new heart attack. When the team used specialized antibodies to screen patients' blood for oxidized LDLs, they found that the concentration of these molecules correlates with the severity of a person's heart condition.

For instance, concentrations of oxidized LDL in volunteers with unstable angina were more than twice those measured in healthy people. Heart attack survivors had 3.4 times as much, Ueda's group reports in the April 17 CIRCULATION.

The researchers note that plaque, which surgeons had extracted from 33 other patients with angina, exhibited a similar trend. The plaque from those patients with unstable angina had significantly more inflammatory cells containing oxidized LDLs than did plaque from patients with stable angina. Ueda told SCIENCE NEWS that the new findings "strongly suggest" oxidized LDL plays an important role in the destabilization of plaque, which in turn could lead to heart attacks.

"The pitfall of this paper is that it didn't find that oxidized LDL [in blood] was significantly elevated in stable angina," says Ishwarlal Jialal of the University of Texas Southwestern Medical Center in Dallas. A test that could identify people with early heart disease would be particularly valuable, he says. Physicians already have reliable, quick blood tests to gauge risk in people with more severe disease.

Jialal notes that measuring LDL oxidation in blood is a tough task that only one other group, in Belgium, has achieved. Evaluating a different LDL modification from that of the Japanese, the Belgian team used a method more amenable to widespread screening, note Sotirios Tsimikas and Joseph L. Witztum of the University of California, San Diego in an accompanying commentary in CIRCULATION.

Still, neither technique appears "sufficiently robust" to use alone, Tsimikas and Witztum say. The best blood tests might employ complementary markers of LDL oxidation. These tests would supplement assays that measure still other features of atherosclerosis, such as inflammation of blood vessels (SN: 11/11/00, p. 311), they argue.

With such information in hand, Jialal notes, physicians could begin targeting high-risk patients for therapies—such as high doses of antioxidant vitamins (SN: 8/1/92, p. 76)—to reduce LDL oxidation and vessel inflammation. *—J. Raloff*