# Treat Hypertension, Nix Kidney Failure

Treating elevated blood pressure can halt – and even repair – kidney damage caused by the disorder, according to a new analysis of a large study. However, the renal benefits of lowering blood pressure extend only to nonblacks: For as-yet-unknown reasons, blacks with hypertension tend to go on to develop kidney damage whether they receive treatment for the disorder or not, the study found.

The results represent the first time researchers have proved that mild hypertension – defined as blood pressure between 140/90 millimeters of mercury (mm Hg) and 159/99 mm Hg – or moderate hypertension – between 160/100 mm Hg and 179/109 mm Hg – in fact impairs kidney function. Previous studies only suggested a link between kidney damage and blood pressures in either of these two ranges, which physicians now refer to as stage 1 and stage 2 hypertension, respectively (SN: 11/7/92, p.311).

Kidney dialysis centers estimate that the renal failure of roughly one-third of all new dialysis patients derives from damage caused by hypertension. Besides severely curtailing patients' lives, these new dialysis cases add approximately $300 million per year to already spiraling U.S. health care costs, according to the National Institute of Diabetes and Digestive and Kidney Diseases in Bethesda, Md.

To confirm the hypertension-kidney damage connection, a research team led by W. Gordon Walker of Johns Hopkins University School of Medicine in Baltimore measured concentrations of a waste protein called creatinine in the blood of 5,524 hypertensive men of all races. Because the kidneys usually filter creatinine – a by-product of normal metabolism – out of the blood and into the urine, blood creatinine measurements can indicate whether a patient's kidneys are working properly.

The men studied by Walker's group were a subset of participants in the Multiple Risk Factor Intervention Trial (MRFIT), an even larger study evaluating measures to prevent heart disease among men at risk for the disorder because of cigarette smoking, elevated blood cholesterol, or elevated blood pressure. As part of the MRFIT design, roughly half of the men were given a standardized regimen of drug therapy and put on a modified diet to control their blood pressure. The other half received a variety of different drugs and diet advice from their own physicians.

Walker's group found that the same treatments effectively controlled blood pressure among both blacks and nonblacks, most of whom were white. However, the blood creatinine concentrations of blacks continued to rise, despite reductions in blood pressure, indicating ongoing kidney damage. In contrast, the creatinine concentrations in nonblacks successfully treated for hypertension either stabilized or dropped, signaling that their kidneys were either getting no worse or recovering. The patients were followed an average of seven years.

The researchers conclude that while they cannot explain this racial difference, "the proposition that blacks are more susceptible to renal damage from elevated blood pressure than whites must be considered." But they caution that the number of blacks in their study – 463, or less than 9 percent of all participants – may have been too small to draw definitive conclusions.

Walker and his colleagues report their results in the Dec. 2 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

"The good news," writes Robert G. Luke of the University of Cincinnati Medical Center in an editorial accompanying the new report, "is that efficient blood pressure treatment . . . can probably prevent the annual incidence of end-stage renal disease due to hypertension in patients over 65 years of age from increasing" – primarily by lowering the incidence of the disorder among whites. However, he warns, "the bad news . . . is that progressive renal impairment may not be prevented in African Americans by what is currently accepted as excellent blood pressure control."

"This study is an important advance in our ability to combat the effects of high blood pressure," comments Claude Lenfant, director of the National Heart, Lung, and Blood Institute, which administered the 1973-1982 MRFIT study. Following the study's findings, he says, "millions of patients are now known to be at risk for kidney dysfunction if stages 1 and 2 hypertension go untreated."

Lenfant says his institute is planning to launch another study to determine why hypertension treatment that prevents kidney damage among whites doesn't work for blacks. The study – scheduled to begin next year and to involve several medical centers throughout the United States – will also examine the causes of hypertension among blacks, he says. – *C. Ezzell*

# Large prehistoric earthquake ripped Seattle

On a wintry day about 1,000 years ago, a fault running beneath the site of Seattle's Kingdome let loose a whopper of an earthquake that sent a tsunami wave sloshing through Puget Sound. The ground shook with such fury that avalanches tumbled from the Olympic mountains and landslides ran into Lake Washington, near where some of Seattle's tonier neighborhoods now stand.

No written documents record the quake. But through a remarkable series of complementary studies, several teams of geologists have pieced together enough evidence to show that a strong quake did strike Seattle – a realization that will force hazard planners there to reconsider the seismic risk to their city. Until now, seismologists had not considered a threat so close to Seattle.

The separate research groups present evidence of the prehistoric quake in five papers published in the Dec. 4 SCIENCE.

"It's a combination of all these diverse lines of evidence that suggests there was a large earthquake in the Seattle area about 1,000 years ago. What this has shown is that something like this can happen, which wasn't known before," says geologist Robert C. Bucknam of the U.S. Geological Survey in Denver.

The convergence of geologic techniques used in this case study can also help researchers study the seismic hazard of other regions around the globe.

Bucknam and his colleagues discovered evidence of the prehistoric Seattle earthquake while studying a raised terrace at Restoration Point on Puget Sound. Cut by ocean waves, the terrace once lay at sea level. But the former shoreline now sits some 7 meters above high-tide level. Bucknam's group believes the land must have risen quite abruptly, because the ocean did not cut any terraces between the current and former shorelines. Carbon-14 dating of organic material on the terrace indicates that the uplift occurred between 500 and 1,700 years ago.

This raised shoreline at Restoration Point and another one in Seattle lie directly south of a geologic structure that parallels interstate 90, running in an east-west direction through the city. Geologists have suspected the structure was a fault and this year named it the Seattle fault. But until Bucknam's group documented the evidence of uplift, it remained unclear whether the fault was active.

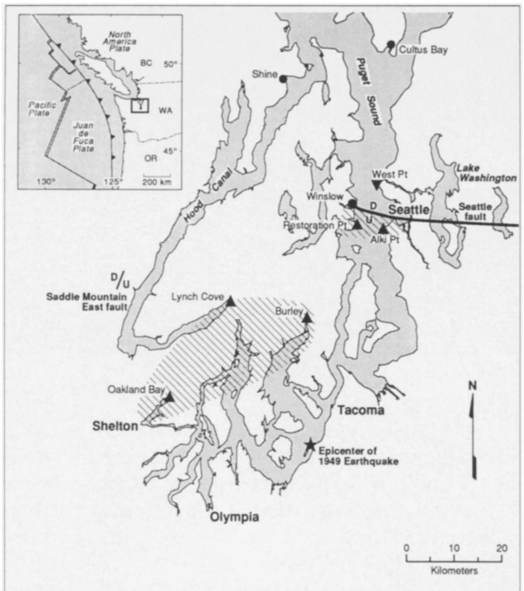
While land south of the fault went up, Bucknam's group sees a different story on the fault's northern side. At Winslow, just 5 kilometers north of Restoration Point, the land hasn't gone through any sudden change in level during the last 2,000 years. This finding helps provide a measure of the prehistoric earthquake's size. In 1980, a magnitude 7.3 earthquake in Egypt jacked up land on one side of a fault by 5 meters – an amount comparable to the uplift in Seattle.

Because such rapid shifts in land height often cause tsunami waves, Brian F. Atwater and Andrew L. Moore of the University of Washington searched the region for evidence of past surges. At two sites, they found signs that a tsunami flooded tidal marshes, blanketing them in centimeters of sand. Using especially precise carbon-14 dating techniques, they found that the tsunami hit between 1,000 and 1,100 years ago.

In previous work, Atwater had found tsunami deposits along the Washington coast. This and other evidence convinced many scientists that the Pacific Northwest coast has produced great quakes of magnitude 8 or larger, caused by a piece of ocean floor subducting beneath the North American continent (SN: 2/17/90, p.104). The discovery of these tsunami deposits led many researchers to look within the Puget Sound area for signs of shaking caused by great coastal quakes. While the search has turned up hints of coastal shocks, some of the emerging evidence fits the idea of a jolt on the much closer Seattle fault, Atwater says.

In particular, tree-ring specialists have studied deposits left from landslides that carried trees and rock into Lake Washington. The researchers, from Lamont-Doherty Geological Observatory in Palisades, N.Y., and from the University of California, Berkeley, recovered trees from the lake and used carbon-14 dating to determine that the landslides occurred between 1,000 and 1,300 years ago.

With a bit of luck, they established an even more precise connection by comparing rings in Douglas firs found in Lake Washington with rings in a Douglas fir found in the tsunami deposit discovered by Atwater. Though these sites lie 23 km apart, the ring analysis shows that the trees all died within the same year and season – sometime in the fall, winter, or early spring.



Bucknam

*Diagonal lines show two uplifted areas.*

Other researchers studying sediments in Lake Washington found evidence of a major disturbance about 1,100 years ago. In the Olympic mountains, geologists dated six prehistoric rock avalanches to between 1,000 and 1,300 years ago.

In a commentary in SCIENCE, geophysicist John Adams of the Geological Survey of Canada in Ottawa says that a repeat of the Seattle quake would shake the city far more than would a larger subduction quake along the coast. Damage from a shallow Seattle quake would also exceed that from deep quakes that hit Puget Sound in 1949 and 1965, Adams says.

Bucknam's group has also found evidence of uplift between 1,000 and 1,500 years ago in an area southwest of Seattle. He suspects a different fault may have caused the prehistoric uplift there, raising the possibility that the Puget Sound area has several active faults. While these quakes could cause considerable damage, geologists have yet to find enough evidence to determine how often they occur. "It might be thousands of years [from now] or it might be tomorrow," Bucknam says. *– R. Monastersky*

# Fullerene-like molecules without carbon

To date, all known hollow, cage-like molecules have contained at least some carbon. The widely studied fullerenes consist of nothing but carbon atoms, while the metallo-carbohedrenes (SN: 4/18/92, p.250) mixed in a few titanium atoms to help bend the structure into a puckered ball.

Now materials scientists have discovered a molecular cage with no carbon whatsoever – tungsten disulfide. This inorganic semiconductor will also curl up to form cylindrical and closed polyhedral structures, says Reshef Tenne at the Weizmann Institute of Science in Rehovot, Israel. He and his colleagues have made microscopic tubules ranging from less than 10 nanometers to more than 100 nanometers long, as well as cages of various sizes, they report in the Dec. 3 NATURE.

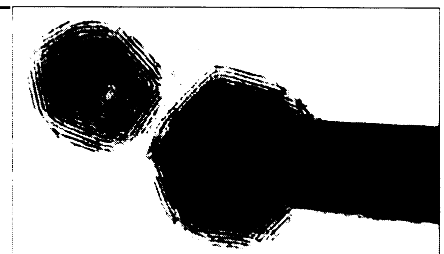
Because it is an inorganic cage, the tungsten disulfide crystal will likely have properties very different from those of fullerenes. "[The discovery] opens up a whole new area; it will stimulate research on nanotubes in new materials," says Thomas W. Ebbesen, materials scientist at NEC Corp. in Ibabaki, Japan.

For the past two years, Tenne and his colleagues have been designing better photovoltaic cells by making thin films of tungsten sulfide. In one experiment, they deposited tungsten in thin layers onto quartz, then exposed it to hydrogen sulfide in an oven heated to 1,000°C. They examined the resulting films with an electron microscope.

Only after seeing electron micrographs of the onion-like fullerenes that form when fullerene films are subjected to high-energy electron beams (SN: 10/24/92, p.277) did the Israeli scientists realize that the unusual shapes in their micrographs of the tungsten disulfide warranted a closer look, Tenne says.

When Tenne and his colleagues tilted their samples in the electron microscope, they could distinguish closed three-dimensional structures from open curved sheets. Also, the electron diffraction patterns and a technique called lattice imaging further verified the closed nature of these molecules, says Tenne. However, they have yet to develop a way to make large quantities of these new molecular cages.

Like fullerene tubules (SN: 7/18/92, p.36), the tungsten disulfide tubules consist of concentric layers. They seem to sprout from the tungsten film and are


Tenne et al./NATURE

*Electron micrograph of tungsten disulfide tubule.*

sealed at the top. The smallest, with four layers, has an internal diameter of 4 nanometers. The polyhedrons exist singly or in linked chains of three or more, Tenne's team reports.

Like graphite atoms, tungsten disulfide atoms arrange in layers of parallel honeycomb sheets. Hexagons of tungsten are sandwiched between hexagons of sulfur. A seventh atom lies in the center of each hexagon. Weak forces link the sulfur sheets.

High temperature may cause the sheet to curl or convert the hexagons to pentagons or other formations that can stabilize the rounded shape, the researchers suggest. Or, oxygen or some other contaminant may escape from the quartz substrate during heating and help cause the sheets to curve, they add. *– E. Pennisi*