Blocking diabetes with an impostor

The chemical cross-linking believed to be responsible for some of the long-term effects of diabetes can be blocked, Rockefeller University researchers have found. After completing toxicology studies in animals, they hope to try the technique in humans within a year.

The blocking process halts some sloppy biochemistry that comes with diabetes. High concentrations of glucose in the blood react with structural proteins — primarily collagen — throughout the body, resulting in the formation of clumps that protrude from the protein. These agglomerations are also a result of the normal aging process.

The agglomerations in turn link to one another or to blood proteins. Many researchers believe the cross-linking stiffens blood vessels and other structures, leading to such diabetic complications as eye, kidney and cardiovascular problems. These complications occur despite insulin treatment, and are a major cause of death and disability in diabetics.

The agglomerations on the structural proteins, says Michael Brownlee, one of the researchers, grab onto other structural or blood proteins like bear traps. "The cross-links become permanent features," he says.

To break into the cycle in diabetic rats, he and Anthony Cerami and their colleagues at Rockefeller in New York City used aminoguanidine, a chemical that resembles the protein "feet" that can get caught in the trap.

Aminoguanidine prevents the collagen-collagen binding, they report in the June 27 SCIENCE. At last week's meeting of the American Diabetes Association (ADA) in Anaheim, Calif., they reported that it also prevents the binding of collagen to blood proteins and prevents the early structural changes of diabetes-associated kidney damage.

Brownlee's group is currently working on toxicity studies in animals. In the initial studies, "the rats that used it for four to five months tolerated it well," Brownlee says.

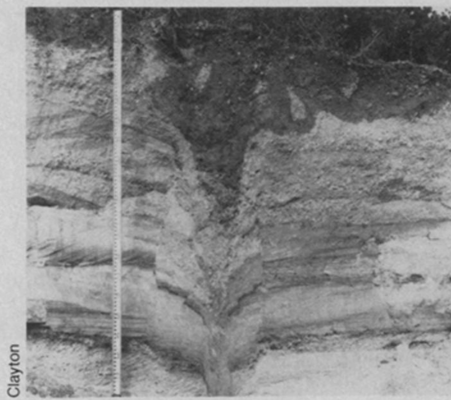
Using aminoguanidine will enable researchers to determine definitively the role of cross-linking in diabetes, says ADA President Daniel Porte, a diabetes researcher at the University of Washington and at the Veterans Administration Medical Center in Seattle. "At this point it is still hypothetical that this mechanism is important," he says.

If further research bears it out, the work has great potential for diabetics, Porte says. But first that research must be done. "It may mean tremendous things in the future, but it may simply lead to absolutely nothing," he cautions.

— J. Silberner

New traces of ancient eastern quakes

Twenty years ago, architects designing buildings for the eastern United States gave little thought to earthquakes. In New York City, for example, engineers assumed that any building withstanding the forces of winds could also endure what was expected to be only gentle shaking of eastern quakes. Today, scientists and architects in New York and elsewhere are considering strengthening earthquake building codes, because scientists have realized that the East is susceptible to the large destructive quakes once thought to occur almost exclusively in the West.


Clayton

A cross section of one of the fissures found in Connecticut's Hain Quarry that researchers believe were created by a prehistoric earthquake. The scale is 2 meters high.

In order to assess eastern seismic hazards, scientists need to know the magnitudes, locations and timing of past quakes. Because so few large quakes have occurred since historic record keeping began, scientists are hunting for geologic traces of prehistoric earthquakes.

Last year, researchers working near Charleston, S.C., reported finding remnants of sand geysers that had spewed out of the ground after a large prehistoric earthquake had shook and liquefied the soil (SN: 2/2/85, p. 78). Now, in the June GEOLOGY, scientists present what they believe is the first geologic evidence of prehistoric seismicity in New England.

Geologists Robert M. Thorson and Wilson S. Clayton at the University of Connecticut in Storrs and seismologist Leonardo Seeber at Lamont-Doherty Geological Observatory in Palisades, N.Y., examined 40 wedge-shaped vertical cracks in Hain Quarry (eastern Connecticut) that they think were probably formed when a large earthquake jolted the region. Previously, other scientists had argued that these, as well as similar structures throughout the northeast, were glacial "ice wedges" created at least 12,000 years ago by the thermal expansion and contraction of the land. But in 1983 Robert F. Black of the University of Connecticut ruled out a glacial origin for the Hain structures. "We picked the study up from there," says Clayton.

Thorson's group thinks the wedges, each of which extends about 4 meters deep and can be traced up to about 40 meters on the surface, were probably created in the topmost, gravel layers when the seismic shaking liquefied underlying soils. They also see evidence that the liquefied soil and water came up to the surface either through the fissures or in other conduits.

The researchers note that there are historic precedents for quake-induced liquefaction in the area. In the 1700s, for example, two earthquakes near Cape Ann, Mass., with magnitudes of about 5.5 and 5.0 caused liquefaction. And Clayton notes that in the quarry today, the underlying soils appear to be easily liquefied, because the rumbling of heavy trucks causes volcanoes of mud to erupt.

At this stage, the researchers cannot tell if the fissures were made by more than one earthquake. And they can only narrow down the age of the fissures to within the last several thousand years, although soil trapped in one fissure was radiocarbon-dated at about 1,050 years old. Clayton estimates that the quake or quakes responsible for the fissures had their epicenters close to the quarry and were at least magnitude 5.5.

"If there had been a house built on this terrace [at the quarry] at the time these fissures developed," says Clayton, "it probably would have collapsed." Lots of cities in New England are built on land similar to that at the quarry, he notes. "That means that if there were a large earthquake, a lot of people would be in trouble."

Seeber says the researchers still have more homework to do before they can be 100 percent certain that an earthquake was responsible for the quarry fissures. His group would first like to see if they can find and link geologic features in the Cape Ann area to the historic quakes. Then they can hunt for traces of prehistoric seismicity. They have also been looking throughout the Northeast for geologic structures that might have been created by quakes.

"If the relation between large earthquakes and [fissures] is substantiated at our study locality and other localities," the researchers write, "these possibly contemporaneous features may provide an opportunity to determine the felt-area magnitude of prehistoric earthquakes in the northeastern United States."

— S. Weisburd