Biomedicine

New clue to morning heart risk

"Grimm death took me without any warning: I was well at night and dead at nine in the morning," reads a tombstone in Sevenoaks, England. Indeed, research indicates that heart attacks and sudden death from cardiac failure strike people most often in the first few hours after they awake.

Since cardiologists first made this observation in the mid-1980s, studies have identified a number of morning-related factors that may contribute to the onset of heart failure. These include increased "stickiness" of blood-clotting cells, called platelets; stress-related rises in blood pressure and heart rate (SN: 6/27/87, p.409); elevated concentrations of heart-stimulating hormones; and increased incidence of silent ischemia, a temporary, often painless reduction of blood flow to the heart (SN: 11/25/89, p.341).

A new study implicates silent ischemia even more strongly than before, says Prakash C. Deedwania of the Veterans Affairs Medical Center in Fresno, Calif. Earlier studies were less definitive because they involved smaller groups, whereas some 1,300 patients at 30 U.S. medical centers participated in the new study, he says.

Participants wore portable heart monitors for two days while they went about their normal activities. The longest and largest number of ischemic episodes occurred between 8 a.m. and 10 a.m., the researchers found.

Deedwania speculates that stress, sticky platelets, hormones, or other, unidentified factors may lead to the higher rates of silent ischemia in the morning. This decreased blood flow, in turn, may damage the heart muscle and increase the chances of unanticipated, possibly fatal heart attacks. "The preponderance of ischemia we are seeing in the morning hours may very well act as a trigger [for heart attacks]," asserts Deedwania, who presented his findings at a meeting of the American College of Cardiology last month in Anaheim, Calif.

Not all experts agree. James E. Muller, codirector of the Institute for Prevention of Cardiovascular Disease at the New England Deaconess Hospital in Boston, calls Deedwania's finding "an important clue to the onset of disease," but he points out that cardiologists are divided about the role of silent ischemia in heart attacks. Muller suggests the phenomenon holds some intermediate position in the "causal chain" that leads to heart failure and sudden death in the morning hours. Ischemia by itself is probably not a direct trigger, he says.

Happy birthday . . . maybe

Mondays, bachelorhood, cold weather, and life on the corporate fast track: Statistical studies have linked them all to an increased risk of heart attack. Biochemist Alan C. Wilson now adds birthdays to this morbid list.

Wilson, of the Robert Wood Johnson Medical School in New Brunswick, N.J., examined the records of more than 100,000 patients for seasonal patterns in heart attack rates. He discovered that rates increased significantly for both men and women in the days immediately preceding and following their birthdays. Excessive partying and emotional stress may underlie this increased risk, suggests Wilson, who reported his findings at last month's meeting of the American College of Cardiology.

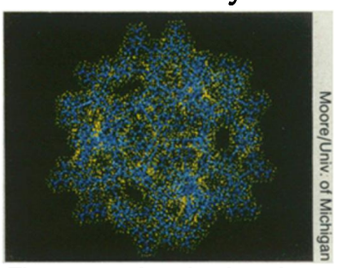
The new study reflects a growing scientific interest in the acute risk factors that set off heart attacks. In the past, research into chronic risk factors, such as high blood pressure and cholesterol intake, has received the most funding, Wilson says.

Wilson does not recommend that people behave any differently on their birthdays. His study and others like it seek only to identify possible triggers for sudden heart attacks. "We're trying to identify situations where heart attacks occur and then . . . work backwards from there [to the underlying causes]," he explains.

Chemistry

Karen F. Schmidt reports from Denver at a meeting of the American Chemical Society

Gargantuan hydrocarbon dwarfs buckyball



The mammoth molecule, a dendrimer, has a skeleton made out of 1,134 carbon atoms and 1,146 hydrogen atoms. Its molecular weight is 14,776.

The dream of engineering molecules that can perform biological functions has moved a step closer to reality. Two chemists at the University of Michigan in Ann Arbor have constructed the largest known pure hydrocarbon, which rivals biological macromolecules in size. The new molecule — a lacy, branched polymer known as a dendrimer — has a precisely defined structure and can be produced in surprisingly uniform batches, says Jeffrey S. Moore, who conducted the work with Zhifu Xu. Other large polymers vary in size and weight from one molecule to another, Moore notes.

"Nature has spent a great deal of effort controlling the structure of macromolecules," he says. "If we can do that too, there's a possibility we will be able to do many of the same things that nature has done."

Like the 60-carbon molecule called the buckyball, the new hydrocarbon forms a hollow sphere. But its 1,134-carbon lattice has a volume 100 times larger, with many niches that could be filled. Moore and Xu believe scientists might someday use it to perform tasks such as carrying drugs in the body or serving as a building block for solar cells that trap sunlight for conversion into chemical energy.

To synthesize the new molecule, the team used a carbon-based building block called phenylacetylene. A temperature of 35°C to 40°C, large amounts of catalyst, and about two days' time brought together the 94 units that must lock into place to form the spherical cage.

Because the dendrimer has a highly repetitive structure and triple-bond linkages, it takes a very stiff form, which made it initially insoluble. Xu and Moore completed the synthesis by attaching "bulky" chemical groups to the molecules to make them soluble. The material can now be dissolved in a variety of organic solvents at room temperature.

The new compound, whose structure has been verified by nuclear magnetic resonance spectroscopy, will be described in detail in an upcoming issue of ANGEWANDTE CHEMIE.

Making materials the environmental way

With hazardous waste becoming increasingly expensive to treat, chemical companies are looking for new ways to synthesize their products without generating toxic by-products. Researchers at AlliedSignal, Inc., in Des Plaines, Ill., say they've found a method for synthesizing conductive polyaniline — a tough material used in conductive films, coatings, and batteries — that produces only water as a side-product.

The new technique, which uses a biological catalyst, could help reduce the production of ammonium sulfate, by tonnage the chemical industry's number-one waste product, says AlliedSignal's Haya Zemel.

The standard process for making conductive polyaniline creates large amounts of ammonium sulfate and leaves strong acid residues. "A biological method that produces no waste would be very attractive," says Zemel. Using hydrogen peroxide and horseradish peroxidase enzyme at a very acidic pH of 3, her group catalyzed a completely clean conversion of aniline to conductive polyaniline. They are now working to improve the 60- to 90-percent yield, boost the product's conductivity, and find a cheaper form of the peroxidase enzyme.