Daily exercise fights hypertension, clots

If breaking a sweat in a fast game of racquetball doesn't hold the same appeal as a leisurely walk, take heart. A new study suggests that middle-aged men, at least, can lower mild hypertension with moderate daily exercise.

Another study hints that a grueling, six-month exercise regimen can boost blood levels of a clot-busting enzyme in healthy men aged 60 and older, helping to ward off heart attacks and strokes.

While physicians prescribe exercise to combat a variety of ills, researchers have yet to prove it can reduce blood pressure in people with hypertension. But a preliminary study at the University of Connecticut School of Medicine in Farmington has taken a step in that direction by showing that a 30-minute bicycle ride reduces blood pressure in men with mild hypertension.

"Mild hypertensives should be encouraged to engage in activity pretty much on a daily basis, but the activity doesn't have to be intense," says study director Linda S. Pescatello. At the same time, she cautions people with hypertension to see their doctors before starting such a program.

Pescatello and her colleagues recruited 12 men aged 30 to 54, six of whom had mild hypertension and six of whom were healthy. People with mild hypertension have systolic (heart-pumping) pressures of 140 to 160 millimeters of mercury (mm Hg) and diastolic (heart-resting) pressures of 90 to 100 mm Hg.

To get a pre-exercise reading of blood pressure, Pescatello's team fitted all volunteers with portable devices that monitored their blood pressure as they went about their daily routines. The men then returned to the laboratory for two 30-minute exercise sessions on stationary bikes. On one workout day, the men pedaled at a pace equivalent to a leisurely stroll; on the other, they went at a faster clip, roughly comparable to a slow jog. Afterward, they donned the monitors again and returned to their normal activities.

On the two days of cycling, the researchers discovered that the hypertensive men's blood pressure readings were "dramatically" lower than their pre-exercise values. Cycling reduced systolic blood pressure by an average of 10 mm Hg and diastolic blood pressure by an average of 4 mm Hg—an effect that lasted for at least 13 hours after the workouts, the team reports in the May CIRCULATION. (Pescatello says the benefits may actually last longer than that, but the researchers couldn't measure blood pressure beyond 13 hours because volunteers took off their monitors at bedtime.)

"For certain mildly hypertensive individuals, these reductions may be enough to get their pressures within the normal range," she says. Moreover, the slower-paced cycling proved just as effective as the faster rate, she notes.

In contrast, the six healthy volunteers showed no lasting differences in their pressure readings after exercise.

In the same issue of CIRCULATION, scientists at the University of Washington in Seattle focus on another aspect of cardiovascular health: the body's ability to dissolve blood clots. If a clot blocks blood flow to the heart or brain, a heart attack or stroke can result.

The Seattle team, led by John R. Stratton, studied 10 men aged 24 to 30 and 13 men aged 60 to 82. All were healthy and had passed a battery of medical tests that demonstrated their ability to endure a vigorous, six-month training program. Volunteers started training slowly, eventually reaching a sweat-breaking routine of jogging, walking or cycling for 45 minutes four or five days a week.

When the researchers compared blood samples taken at the study's start and at the end of the six-month program, they discovered the elderly men had significantly improved their ability to break up blood clots. For example, the team documented a 39 percent rise in the activity of a clot-dissolving enzyme called tissue plasminogen activator (TPA). In addition, the elderly men showed a 58 percent activity drop in an enzyme called plasminogen activator inhibitor-1, which blocks TPA.

The findings suggest that the intensive exercise gave the older men an edge in the biochemical battle to prevent clots from plugging key arteries, says coauthor Wayne L. Chandler.

The younger men showed no significant change in clot-dissolving prowess. However, Chandler points out that they generally led more active lives and showed better clot-busting ability at the study's start.

A number of key questions remain. For one, scientists need to determine whether women show similar health benefits from exercise, notes cardiologist Arthur Leon of the University of Minnesota in Minneapolis. Stratton and his colleagues agree. In addition, the Seattle team wants to determine whether elderly people can obtain the same clot-busting benefits from mild exercise as they did from vigorous workouts. "We're not sure how much activity is enough," Stratton says.

And, cautions Chandler, "we don't really want [elderly people in general] to go out and try to run six miles a day."

—K. A. Fackelmann

Trouble with bubbles precedes the popping

When people talk about their bubbles bursting, they usually mean their dreams have fizzled. But two scientists have new evidence that could revise these frothy clichés and the science of effervescence.

Bubbles do most of their damage not when they burst but when they billow, according to a new study by You Lung Chen and Jacob Israelachvili at the University of California, Santa Barbara. In the May 24 SCIENCE, they conclude that a bubble's birth involves violent stresses that can deform and destroy nearby surfaces. This counters the conventional explanation of how bubbles cause pitting, or cavitation damage, in turbine blades, pumps, propellers and other materials in contact with moving fluids. Such cavitation causes millions of dollars in damage each year, and engineers may now need to reevaluate their anti-cavitation strategies, says Israelachvili.

The two researchers noticed bubble damage while studying forces between moving surfaces. Israelachvili had invented a device with two mica sheets that he could move toward and away from each other. The instrument allowed him to monitor forces affecting the sheets and to view their effects through a microscope (SN: 4/30/88, p.283).

For their experiments, the scientists sandwiched a thick, slow-moving liquid between the mica sheets, compressed it and then started pulling the sheets back. As the sheets separated, the gooey liquid rushed in to fill the space. Israelachvili and Chen found that if the viscous liquid does not fill the gap fast enough, a tension develops in the mica. Then the bubble forms and the mica snaps back, recoiling so forcefully that damage occurs. All this happens within a millionth of a second, Israelachvili explains. "It's like an earthquake."

Many bubble experts express skepticism over the new report. "My first reaction is that it must be wrong," says cavitation expert Robert J. Etter with the U.S. Navy's David Taylor Research Center in Carderock, Md.

At most, says Lawrence A. Crum, an acoustician at the University of Mississippi in Oxford, "it's something that may occur only in a very limited number of cases."

Andrea Prosperetti, a mechanical engineer at Johns Hopkins University in Baltimore, agrees. "In water," he notes, "you don't have to pull very hard to create a bubble." As a result, no big stresses have a chance to develop in water as they do in the liquid used by the California team. Prosperetti adds that the new data appear to contradict the fact that "you usually find the cavitation damage where the bubbles collapse."

—E. Pennisi