New Drug Staves Off Osteoporosis

An estimated 25 million people in the United States, most of them women past menopause, suffer from osteoporosis, a disorder that gradually weakens and thins the bones. Though the condition often causes crippling fractures of the hip and spine, physicians in the United States have only a few treatments for osteoporosis—none of them perfect.

Now, another choice has appeared on the horizon. A drug called alendronate cuts the risk of vertebral fractures nearly in half among women diagnosed with osteoporosis, researchers reported last week in Washington, D.C., at the annual meeting of the Endocrine Society.

That finding emerged from a 3-year study of 994 postmenopausal women in 16 countries. Half of the women received a placebo pill plus a daily calcium supplement, and the other half took calcium and a pill containing alendronate. Compared to the placebo group, significantly fewer women taking alendronate suffered their first spinal fracture during the study. Moreover, among the alendronate group, only 18 percent had two or more fractures, compared to 68 percent of women in the placebo group.

Alendronate represents a new line of defense against osteoporosis, says Laurence J. Hirsch of Merck & Co. in Whitehouse Station, N.J., the pharmaceutical company that sponsored the clinical trial and now hopes to market alendronate in the United States.

"It's safe, new, and very powerful," agrees Robert R. Recker of Creighton University School of Medicine in Omaha, Nebraska, who led 1 of the 16 centers that participated in the study.

Osteoporosis results when the body's delicate balance of creating and breaking down bone goes askew. Normally, bone-forming cells called osteoblasts keep pace with their destructive kin, the bone-destroying osteoclasts.

When osteoclasts start winning the race, however, bone density begins to fall. The skeleton, particularly the hips and spinal column, becomes vulnerable to fracture. The dramatic hormonal changes accompanying menopause, notably the decrease in estrogen, hasten this bone thinning.

From studies in a variety of animals and early trials in humans, researchers knew that alendronate thwarted this phenomenon. In case after case, they found that the compound helps the body maintain or increase bone density. "It was this data that really encouraged us," says Hirsch. Researchers believe that the compound somehow interferes with the ability of osteoclasts to break down bone.

What remained was to determine whether alendronate actually prevented osteoporosis-induced fractures while causing no difficulties of its own.

"There was almost no problem with side effects," says Recker, noting that a few women complained of minor stomach pain.

This news on alendronate comes at a time when the debate over estrogen replacement therapy, one of the two currently approved treatments for osteoporosis, has intensified.

On the plus side, estrogen therapy helps protect women from osteoporosis and from heart disease, which is the leading killer of women. However, just last week a controversial new study added to a body of evidence that estrogen replacement therapy increases women's risk of breast cancer (SN: 6/17/95, p.375).

Alendronate, which is not a hormone, may offer an alternative to estrogen in this difficult debate, which divides even physicians.

"It's pretty exciting. It gives us a further option for women who cannot or won't take estrogen," says Robert A. Lindsay, president of the National Osteoporosis Foundation and director of the metabolic bone disease unit at St. Luke's-Roosevelt Hospital in New York City.

The other approved treatment for osteoporosis depends on injections of a hormone called calcitonin. Calcitonin's ability to ward off osteoporosis seems to diminish with time. After the first year or two of treatment, says Lindsay, it does not increase bone mass as effectively as alendronate appears to.

Researchers predict that alendronate is just the first of a new class of nonhormonal compounds, called aminobisphosphonates, that physicians will soon wield against osteoporosis. —*J. Travis*

Night lights: Seeing in quantum darkness

It sounds like an impossible mission: Safely detect the presence of a bomb so sensitive that even a single photon triggers it.

Although no such bomb exists, it serves as a convenient target for the probes of physicists exploring the fringes of quantum mechanics. Researchers have now shown that, in principle, they can shine a photon at a bomb's suspected position in such a way that the bomb neither absorbs nor reflects the photon, yet still reveals its presence.

Paul G. Kwiat, Harald Weinfurter, Thomas Herzog, and Anton Zeilinger of the University of Innsbruck, Austria, and Mark A. Kasevich of Stanford University describe their interactionfree quantum measurements in the June 12 PHYSICAL REVIEW LETTERS.

These researchers have come "closer than any before to inventing a way of seeing in total darkness," comments Charles H. Bennett of the IBM Thomas J. Watson Research Center in Yorktown Heights, N.Y.

In the realm of quantum physics, any measurement typically disturbs the system being measured, whether an electron orbiting an atom or a light beam passing through a pair of narrow slits. But this isn't the full story.

In 1993, Avshalom C. Elitzur and Lev Vaidman of Tel Aviv University in Ramat Aviv, Israel, developed a scheme in which a partially silvered mirror splits a photon so it travels along two separate optical paths before recombining. If no obstacle is present along either path and no measurement is made to determine along which path the photon travels, the photon behaves like a wave, traversing both paths simultaneously and exhibiting interference at its destination.

Elitzur and Vaidman set up their interferometer so that if no bomb is present, the two photon "halves" interfere constructively to give a signal at one detector and destructively to give no signal at a second detector. By checking which detector picks up a photon, they could sometimes ascertain the presence of a bomb without exploding it. In these cases, the bomb modifies the photon interference pattern without interacting with the photon.

Kwiat and his coworkers improved on this technique. Using a more complicated measurement scheme, they can detect whether a bomb is present, while reducing the chance of exploding it as close to zero as desired.

Their strategy hinges on the idea that continued observation of a quantum system can suppress spontaneous changes in behavior that would naturally occur in the undisturbed system. Thus, by repeatedly checking whether a system is in its initial state, one can prevent it from ever leaving that state.

The researchers take advantage of this effect in the passage of polarized photons through a medium that rotates a photon's direction of polarization. They set up an apparatus in which a photon emerging with its original polarization signifies the bomb's presence (without exploding it), while a new polarization indicates the bomb's absence. —*I. Peterson*