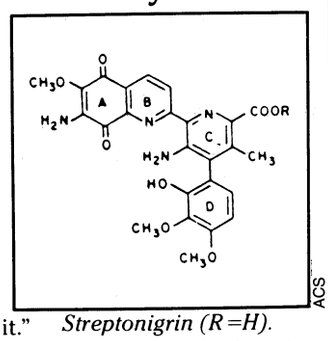
CHEMISTRY

Streptonigrin: A chemist's 'tally ho'

It's the "thrill of the chase" that often prompts chemists to determine the laboratory synthesis of a naturally occurring substance. "We're constantly trying to do difficult problems to see if we can do them," explains chemist Steven Weinreb of Pennsylvania State University. "If we can't do them, it means that the state-of-the-art [of organic synthesis] is not sufficiently advanced and we have to advance it."



ACS

Streptonigrin (R=H).

Weinreb and colleagues discovered six years ago that the chemical "state-of-the-art" was not advanced enough to synthesize streptonigrin — an anticancer agent produced by the common soil bacterium *Streptomyces flocculus*. Now, after "trying a lot of different kinds of chemistry," Weinreb and co-workers have nabbed their laboratory "fox." They describe in the May 21 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY the first total synthesis of streptonigrin — a series of 30 reactions.

Interestingly, one step to synthetic streptonigrin involves the Diels-Alder reaction — an addition reaction that results in a six-membered carbon ring — which is rarely used in natural-products synthesis.

The identification of the chemical specifics of the compound has practical applications, says Weinreb. Studies have shown that although natural streptonigrin is active against a variety of malignancies, it inhibits bone marrow function in some treated patients. The successful synthesis of streptonigrin opens the door to synthesis of chemically related, but less toxic, analogs.

TGA level: The chips aren't down

The potato chipping process results in the concentration of a class of naturally occurring tuber toxicants, Joseph A. Maga and colleagues report in the May-June 1980 JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY. The toxicants, glycoalkaloids, are potent inhibitors of cholinesterase — an enzyme involved in nerve-signal transmission. The recommended concentration limit of total glycoalkaloids (TGA) is 20 mg/100 g of raw potato.

Because the chipping process involves water removal, the raw potato substances — including glycoalkaloids — are concentrated in chips. But Maga and colleagues of Colorado State University in Fort Collins discovered an even greater "TGA enhancer": Examination of one commercial brand with TGA content of 72 mg/100 g of chips revealed that 75 to 90 percent of the potato skin — an area of high TGA concentration — remained in the chips.

Cataracts: A synergistic saga

The combined effect of suboptimal amounts of the amino acid tryptophan and vitamin E in the diet may be conducive to cataract formation, says a Virginia Tech (Blacksburg) researcher. Such a diet fed to female rats during gestation and lactation results in a 30 percent incidence of cataracts in rat pups at weaning, says researcher George Bunce. The phenomenon was first observed in rat pups when Brazilian researchers tested a black-eyed pea and cashew nut diet (deficient in tryptophan and vitamin E) as a protein source for low-income groups.

Bunce, author of a chapter on nutrition and cataracts in the forthcoming *Advances in Modern Human Nutrition*, is investigating the precise synergistic role of tryptophan and vitamin E in the development and maintenance of lens transparency.

EARTH SCIENCES

Susan West reports from New Paltz, N.Y., at the Maurice Ewing Symposium on Earthquake Prediction

Shades of 1906

San Franciscans may not cotton much to the idea, but the increased number of earthquakes that have been rattling them in recent months may be standard fare for a while.

According to William Ellsworth of the U.S. Geological Survey in Menlo Park, Calif., recent seismic activity along the San Andreas fault and its branches in the San Francisco region appears to mirror that of the 50 years preceding the 1906 quake. From 1855 to 1879, he says, the eastern and northern regions of the Bay Area experienced strong quakes — Richter magnitude 5 or greater — and similarly sized temblors rippled through the San Joaquin Valley from 1880 to 1904. Following the devastating 1906 quake (magnitude 8) and smaller quakes in 1911 and 1914, the entire Bay region was seismically quiet.

In 1955 things began to pick up again, Ellsworth says. The pattern of moderate sized quakes returned and is continuing — witness the magnitude 5.5 quakes that hit the area in August 1979 and January 1980. "There is no definite evidence that these separate events are related," he says. "But they serve to remind us that the post-1906 hiatus has stopped and we can expect an increase in seismicity in the Bay region for decades to come."

Utah's hidden faults

Though California's San Andreas may hold the celebrity spotlight among earthquake watchers, it could easily be upstaged by a lesser known, but just as deadly seismic star — the Wasatch Fault in Utah. According to David P. Schwartz and co-workers of Woodward-Clyde Consultants in San Francisco, the Wasatch is 370 kilometers of fault just waiting to pop.

Using mapping, topographic profiling and a technique called trenching, the geologists examined two segments of the fault zone, which stretches from Malad City, Idaho, south through Salt Lake City to Gunnison, Utah. Trenching involves actually digging deep trenches across or parallel to a fault in order to examine the sediments for earthquake-caused disruptions and to determine the age of those sediments. In this way, the potential damage and the recurrence interval — or the time between earthquakes — associated with the fault can be determined.

Since 1847 when the region was settled, no major earthquakes have caused cracks or movement on the ground surface, Schwartz says. But the record for the past few thousand years is something else. At a site 30 km north of Salt Lake City, near a town called Kaysville, trenching showed that at least three earthquakes have occurred in the past 5,000 years and that each caused 1.7 to 3.7 meters of vertical ground movement. The two most recent quakes occurred within the past 1,580 years and the geologists estimate that a major temblor strikes on the average about every 1,000 years along that particular part of the fault zone. At another site near Hobble Creek, about 46 km south of Salt Lake City, six or seven quakes have produced significant ground fracturing in the past 12,000 to 13,000 years, says Schwartz. The average interval between such major events on this section of the fault is 1,500 to 2,600 years.

Schwartz and co-workers estimate that the Wasatch fault zone may consist of at least 10 individual segments, each of which may have recurrence intervals similar to those of the Kaysville and Hobble Creek sites. If that is so, and each of the segments acts independently, then a major earthquake (magnitude 7 or larger) is likely to occur somewhere along the fault every 50 to 430 years, they estimate. Considering that Utah has not been shaken up by a quake in at least 133 years, "This suggests a moderate to large magnitude earthquake ... may be due or past due somewhere along the Wasatch fault," says Schwartz. And considering that about 80 percent of Utah's population lives along the fault zone, he says, that spells trouble.