. . . Insulin

Rockefeller University scientists now propose a chemical approach. They have synthesized an insulin derivative that can be regulated by glucose levels. Other systems being developed elsewhere rely more on bioengineering, such as the insulin pump (SN: 3/24/79, p. 182), and on biological material, such as implantable pancreas cells (SN: 4/21/79, p. 261; 9/22/79, p. 200).

The new strategy, reported by Michael Brownlee and Anthony Cerami in the Dec. 7 SCIENCE, involves attaching a handle, a sugar group, to the insulin molecule without interfering with insulin's activity in the body. The sugar handle can be grasped by a plant protein, called a lectin, and released when there are other sugars available for the lectin to bind. Consequently, a high level of glucose would displace insulin-sugar molecules from the lectin surface. In medical applications, the amount of insulin released from the lectin to act on the body's metabolism would be proportional to the quantity of glucose in the blood.

In experiments so far Brownlee and Cerami have synthesized a stable insulin derivative containing a sugar called maltose. In animal tests the insulin-maltose compound was nearly as effective as the unmodified hormone in lowering blood glucose. The insulin-maltose binds to the plant lectin called concanavalin A and, during short exposures to glucose, the modified hormone is released in proportion to the quantity of glucose present.

A practical insulin delivery system could be developed using a solution of lectin-bound insulin-sugar in an implantable hollow fiber with appropriate permeability characteristics, Brownlee and Cerami propose. The fiber walls must have pores large enough to allow glucose and the modified insulin to pass through, but small enough to trap the larger lectin protein. It would be possible also to adjust the relationship between blood glucose level and hormone release by combining insulin derivatives containing sugar groups with different affinities for lectin. The next steps in the research will be to construct the implantable device and test its effectiveness in animals. □

Leg 69 finds seabed 'gravel pit'

Dreams of seabed burial of hazardous wastes may edge closer to reality as a result of a discovery made during Leg 69 of the Deep Sea Drilling Project.

Beneath two miles of water, 600 feet of mud and 150 ft of solid rock, Leg 69's scientific team found a highly porous rock formation that had been "perfectly sealed" from penetration and alteration by the ocean. Sealed water-tight for an estimated two million years, the porous, rubble-filled zone (like "a gravel pit," says one researcher) was found to have a pore pressure significantly less than the pressure of the overlying water. As a result, when the *Challenger* broke the seal — a layer of flinty rock called chert — the ocean rushed in to equalize the pressure. Just as the water was sucked into the low-pressure reservoir, so, the researchers propose, toxic chemicals and radioactive wastes might be pulled into similar "pits" beneath the sea floor and trapped indefinitely.

"It was extraordinary," said Marcus G. Langseth of Lamont-Doherty Geological Observatory of finding a low-pressure formation in the sea floor. Langseth and Joe Cann of the University of Newcastle-upon-Tyne, England, were co-chief scientists on Leg 69. "A hell of a thing to explain ... unbelievable," said Roger N. Anderson of Lamont. Anderson and Mark Zoback of the U.S. Geological Survey in Menlo Park, Calif., reported on the discovery at the American Geophysical Union meeting last week in San Francisco.

The find was the chance child of a project designed to compare thermal effects at two different sea floor sites. Both sites, one cooler than the other, are located near the equator between the Panama Canal and the Galapagos Islands.

At the cooler site, says Langseth, the rocky basement was rough and fractured, often protruding through the thick sediment layer. Water was able to circulate easily through the sediments and basement and cool the crust. But at the warmer site, says Langseth, the thick sediments successfully stifled any heat loss from the smooth underlying crust. The unrelieved heat began to transform the sediments into hard chert — "a self-sealing system," says Anderson. Capped by thick sediments and chert, no water was able to enter the basaltic basement rocks.

When the Leg 69 scientists drilled through the cap, they detected the flow of water from a temperature change as the cold ocean rushed into the warm basement rock. In addition, experiments manned by Anderson and Zoback measured the permeability of the rock and the rate of water flow. An inflatable rubber "tire" (SN: 10/6/79, p. 232) sealed off a portion of the hole and water was pumped in, allowing a measure of the "thirst" of the rocks. According to Anderson, 4,000 gallons of water were pumped into the rock in 40 minutes with no significant change in the pore pressure. Even after pumping, the rock continued to gulp 40 gallons per minute. (Leg 70 will check to see if the flow is continuing.) The final clue to the pit's structure came from an ultra sonic camera, a tool first used on Leg 68. A scan of the hole's interior showed a loose rubble of pillow-like lavas. In most ocean crust, this is cemented by water-precipitated minerals; in this case, the voids may provide storage space for wastes.

"The sludge from a city, for instance, could be pumped in there and the rock would continue to suck water in and hold it," says Anderson. "Instead of returning the waste, it would all be sucked down." But such projects are years in the future, he stresses. The extent and characteristics of such features must be examined, he notes. As he points out, the DSDP has previously drilled in chert but, until now, has never done experiments that would detect the downward rush of water. For now, says Anderson, what's needed is "a drilling schedule, a program to study it ... [and] help from the Department of Energy." □

Antihistamines can fight colds

Antihistamines are widely used as over-the-counter preparations against colds, but their efficacy has remained unproved; studies attempting to document their effectiveness have contained serious flaws, such as a lack of suitable controls or subjects using other drugs in addition to antihistamines. J. Campbell Howard Jr. of the Schering Corp. in Kenelworth, N.J., along with colleagues at Schering, the Milton S. Hershey Medical Center in Hershey, Pa., Georgetown University School of Medicine in Washington and the Fletcher (N.C.) Medical Center have attempted, in a clinical trial, to eliminate the flaws of previous studies and document the effectiveness of antihistamines in relieving cold symptoms. They report in the Nov. 30 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION that they have been able to do so.

The trial included 271 subjects at Hershey, Georgetown and Fletcher. They had the first symptoms of colds but no other upper respiratory disease. None of the subjects used drugs that might affect their cold symptoms other than the antihistamine being studied. Half of the subjects received a test antihistamine called chlorpheniramine maleate and half received a placebo. The investigators did not know which subjects were receiving which tablets. The subjects' cold symptoms were then measured over the next six days by both themselves and the researchers. Particular attention was paid to the symptoms that antihistamines are supposed to help — nasal congestion, sneezing and nose-blowing.

Results from the trial at all three medical centers, Howard and his team report, showed that the antihistamine was superior to the placebo in providing symptomatic relief and in lessening the duration of symptoms of the common cold. Statistically significant differences and trends favoring the antihistamine were found on the first day and as late as the seventh day. The antihistamine was observed to counter sneezing and nose-blowing and was especially effective in alleviating nasal congestion. □