

CHEMISTRY

Linda Garmon reports from New York, N.Y., at the American Chemical Society Meeting

An antibiotic milestone: Monobactams

They searched the world over, but what they were pursuing was in their own backyard. Researchers at the Squibb Institute for Medical Research in Princeton, N.J., spent years screening more than a million bacteria isolated from ecosystems worldwide for the ability to produce β -lactam antibiotics — the most widely used antibiotics. Ironically, their first bacterially produced β -lactam showed up in soil samples from the Pine Barrens located only a few miles from the Institute. (At about the same time, similar discoveries were reported by A. Imada and colleagues at the Takeda Laboratories in Japan.)

The most famous β -lactam, penicillin, is a complex two-ring structure produced in nature by a mold. The bacterial β -lactams, on the other hand, have a simple single ring, or monocyclic structure. Consequently, they are dubbed "monobactams."

While monobactams are only weakly active against a range of bacteria, certain synthetic versions show greater activity against the Gram-negative bacteria that are so difficult to kill with either penicillins or cephalosporins — the other major family of β -lactams. In addition, they are more resistant to degradation by the enzyme β -lactamase. (Conventional antibiotics are prone to attack by this enzyme, which renders them ineffective.) One of these synthetic versions — SQ 26,776, or az-threonam — now is being tested for safety in humans; clinical trials will follow.

Earlier work by the Squibb researchers — Christopher M. Cimarusti, R. B. Sykes and colleagues — was reported in the June 11 NATURE.

Sea uranium: The tide has not turned

The extraction of uranium from seawater is not likely to be a wave of the near future. While the oceans contain a whopping 4.5 billion tons of the metal, and while technology is reportedly available to both extract and minimize the environmental impact, it will be some time before such recovery can economically compete with the mining of ores, report Milton H. Campbell of the Exxon Nuclear Co. in Richland, Wash., and Stephen E. Binney of Oregon State University in Corvallis.

Campbell, Binney and colleagues conducted a seawater uranium feasibility study that considered everything from the labor force necessary for a model extraction plant to the behavior of the element in the oceans. Seawater uranium, according to the widely held belief of marine chemists, exists mostly as a negatively charged uranyl carbonate complex ion. (Negatively charged uranyl hydroxide ions and neutral forms exist in small percentages.) While billions of tons of this complexed element are distributed much like sea salt in the oceans, only that contained in the upper 100 meters or so of the well-mixed surface layer, or about 160 million tons, "should be considered accessible for recovery," Campbell and Binney report.

To analyze the economic feasibility of removing this available amount, the researchers conceptualized a coastal plant in southeastern Puerto Rico where the Antilles Current would flush in a relatively constant supply of warm, saline water and assist in carrying away the plant outflow. A continuous fluidized bed of the adsorbent material hydrous titanium oxide would collect uranium. At least 160 vertical turbine pumps and a labor force of 700 would be necessary to run the facility. The reference plant would produce 500 tons of U_3O_8 per year.

If this plant were built by 1995, then in addition to government support, the cost of extracting uranium from seawater would range from \$2,100 to \$2,600 per pound of U_3O_8 . "Without several major technical breakthroughs leading to significantly low production costs and/or federal subsidy, a pumped seawater plant to extract uranium from seawater is not economically feasible at the present time," Binney and Campbell conclude.

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BEHAVIOR

Deborah Franklin reports from Los Angeles at the annual meeting of the American Psychological Association

Getting a good start helps . . . boys

An elementary school enrichment program designed in the 1960s to boost the educational opportunities of Harlem's disadvantaged children seems to have benefited boys more than girls, a 15-year progress report indicates. Now in their early 20's, men who participated in the program that became a model for Project Headstart are more likely than their peers from standard classrooms to have attended college, hold full- or part-time jobs and have a strong sense of self-esteem, report researchers from New York University. In contrast, young women from the program who showed early academic and social gains similar to those of their male counterparts seem to have lost ground, though preliminary evidence suggests that loss may be temporary.

Operating from 1961 to 1969, the Harlem program provided extra teaching assistants in classrooms, breakfast in school and a special curriculum that stressed reading and language development for nearly 1,200 children aged four through eight years. One of several surveys to cite long-term positive effects of such a program (SN: 12/27/80, p. 390), the study of 150 participants by Martin and Cynthia Deutsch and Theresa J. Jordan is believed to be the first to record sex differences in results.

Although further study is needed to understand why girls in the program faltered, Cynthia Deutsch suggests the students may have been foiled in the years after the program when their newly acquired assertiveness and inquisitive questions didn't match traditional sex roles prescribed for them by parents and teachers. Motherhood in their late teens may have hampered college and career plans for about a third of the female participants, Deutsch says, though new evidence from a small sample of the women indicates more participants than non-participants resume studies or jobs after their children are born.

Sleepers signal clues to dream anatomy

Not satisfied with simply training dreamers to monitor the plots of their otherworldly odysseys (SN: 1/10/81 p. 26), Stephen P. LaBerge and colleagues at Stanford University's Sleep Research Center are now putting the sleepers to work. LaBerge instructed five persons known to have frequent "lucid dreams" (dreams in which one is asleep but fully aware that one is dreaming) to use several combinations of eye movements and fist clenches to signal when they first realized they were dreaming. Though most subjects barely twitched their fingers, let alone clench fists during the 50 lucid dreams recorded in the study, strong spikes in polygraph tapes and other electrical measurements of brain activity confirmed later verbal reports that, indeed, the dreamers had signaled. Nearly all the lucid dreams occurred during periods of REM sleep.

"These findings show that, in certain cases, dream cognition during REM sleep can be much more reflective and rational than has sometimes been assumed," the researchers report.

Similar roots for comedy and art

If creative juices could be canned, they might be sold generically. The same personality traits that fuel the artistry of sculptors, musicians and painters, produce the funny lines of stand-up comedians, say Waleed A. Salameh and Stephanie Z. Dudek of the University of Montreal. The researchers matched 20 professional comics with 20 "non-comedian artists" of the same age, sex, and socioeconomic status. In standard personality inventories, both groups emerged, the researchers report, as "spontaneous, intelligent, outspoken, aggressive, and self-centered; persuasive, and verbally fluent, self-confident and highly self-accepting."

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