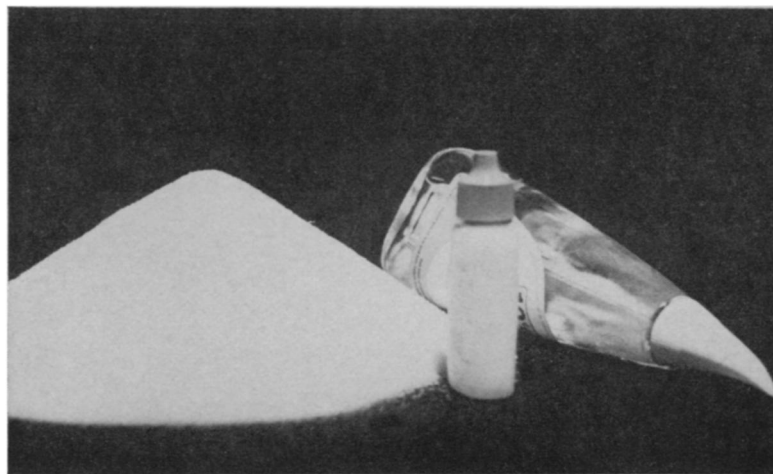


Bitter Battle Over Sweets

With millions at stake, scientists offer conflicting evidence on cyclamates.



Gary Laurish

In 1950, the Food and Drug Administration put its seal of approval on Abbott Laboratory's request to bottle and sell a chemical called sodium cyclamate. That year, Sucaryl became the first major competitor of saccharin, which diabetics and dieters had been using instead of sugar for half a century.

Although cyclamate is a less potent artificial sweetener than saccharin—cyclamate is only 30 times as sweet as sugar compared to 300 for saccharin—cyclamate sweetens without leaving the bitter taste that characterizes saccharin.

In very short order, cyclamate usage boomed and by 1961 consumers were spending about \$25 million a year to sweeten their coffee with drops or tablets of sodium cyclamate.

About the same time bulk usage of cyclamates took an upward turn as more and more diet foods—especially diet soft drinks—swamped the market. Since then, that upward turn has become a sharp ascent with artificially sweetened pop now taking 12 percent instead of 1.5 percent of the soft drink market.

Now, companies manufacturing soft drinks with relatively inexpensive cyclamates instead of sugar no longer advertise their products as dietetic; they call them “now” drinks and try to sell them to the fat and thin alike.

As a result, the amount of sweet chemicals an average individual consumes has gone up and the amount of money the sugar industry makes has gone down.

If the expanding use of artificial sweeteners continues, the sugar industry stands to lose \$1 billion by its own estimate. “That’s a big prize to fight to keep,” according to a spokesman for the Sugar Research Foundation in New York which has laid out some \$500,000 in the last two years to support research into the safety of sodium cyclamate. Its position is that while a few drops of liquid sweetener in coffee or cereal may be perfectly safe, consumption of large quantities constitutes a “significant threat to health.”

Scientists at the Wisconsin Alumni Research Foundation, who have been conducting extensive animal studies under Sugar Research Foundation support, agree. In 1955, they point out, the National Academy of Sciences reviewed the available scientific data on cyclamates and concluded that a maximum of five grams a day would have no effect—except perhaps a slight laxative action—on most individuals. Now that artificial sweeteners have become almost ubiquitous, it is easy to pass that five gram mark and take in up to 10 or 12 grams a day, they say. Cyclamates are used to sweeten pop, cure bacon, coat cereals and flavor candy. “They are insidiously creeping into our culture,” one scientist says.

Five grams is enough to sweeten about 15 small bottles of pop.

Dr. Paul O. Nees and Philip H. Derse of the Wisconsin group report that rats consuming only one percent of sodium cyclamate in a diet of 400 grams of dry food show marked growth reduction. Some cases of infertility in cyclamate-eating rats have also been noted, they say. In October they expect to have further results of animal studies showing that cyclamates are a threat to the public, especially children and pregnant women.

In any area as heavily involved with economics and hedged with special interests, conflicting testimony is inevitable.

In the area of artificial sweeteners, this is doubly confounding, because the definitive, independent research has not yet been done.

Scientists at Abbott in North Chicago say no other researchers they know of have been able to duplicate the Wisconsin results. The Wisconsin group also points to studies reported about six months ago by Japanese scientists showing teratogenic effects in rats fed cyclamates during the first two weeks of pregnancy. Abbott scientists and pharmacologists at FDA say those studies have not been duplicated either.

So far, FDA officials say they have seen no evidence to warrant a change in current regulations permitting manufacturers to substitute cyclamates for sugar. Labeling requirements, however, demand that any such products be clearly identified as artificially sweetened.

Pressured by the sugar industry and prodded by Congressmen prodded by the sugar industry, FDA issued a \$46,000 contract in January to help support Dr. Frederick Coulston of the Institute of Experimental Pathology and Toxicology, Albany Medical College, in the conduct of animal and human tests of cyclamates. FDA, which says emphatically there is no evidence of danger at this point, feels that in view of the ever increasing quantities of cyclamates available to the public, new research with modern, up-to-date techniques is warranted. “At least we can’t be accused of doing nothing,” an FDA official says.

Dr. Coulston, insisting on avoiding even the appearance of wearing any interest’s brand, is also getting financial support from both Abbott Laboratories and the Sugar Research Foundation.

He and his colleagues are testing cyclamates in rats, monkeys and since July, in 32 prison volunteers for possible effects on enzyme systems, liver tissue and reproduction functions, including spermatogenesis.

Animal studies have been going on since early this year, and in liver tissue of rhesus monkeys examined under an electron microscope, some liver changes have been noted. “We cannot say that these changes are harmful, though” Dr. Coulston says.

Scientists at Abbott have also examined liver tissue by electron microscopy. They report no changes between cyclamate-fed monkeys and controls. “It’s a case of experts looking at virtually the same picture and seeing different things,” an Abbott spokesman says.

Biologists at the National Institutes

of Health, however, declare that electron microscopy alone is insufficient to demonstrate tissue damage.

Although a number of the scientific investigations underway seem to show inconclusive results, one new development has turned up recently in the cyclamate question.

Originally, Abbott scientists contended that cyclamates posed no threat because they are not metabolized by the body "Cyclamate is simply excreted as cyclamate," they said.

Then, Japanese researchers reported that some individuals excrete a toxic compound called cyclohexylamine, indicating that the body does break cyclamate down into a metabolite. Work at Dr. Coulston's lab supports this finding, as does recent research by Abbott scientists.

Cyclohexylamine is found in the urine of about 12 percent of persons consuming cyclamates, even at small one or two gram doses, according to Dr. Coulston. When inhaled or applied to the skin, cyclohexylamine, which is used in manufacturing processes and in insecticides, causes dermatitis and may even lead to convulsions. What effect it has when it appears in the body as a breakdown product of cyclamate, however, is not known.

Abbott scientists point out that in 17 years of use, there have been no reported cases of poisoning or death in any individuals who might have been cyclohexylamine excreters.

Because his studies are not yet completed, Dr. Coulston says he can neither exonerate nor condemn cyclamates. However, he urges caution in their use. "Use should be restricted to persons who really need to cut out sugar," he says. "It is possible their use will get out of hand." The greatest potential threat from cyclamates is to children who may drink four or five bottles of diet cola a day, along with artificially sweetened candy and cookies, scientists says. But only one study on children has been reported and that "was not particularly conclusive," according to FDA officials. They expect Dr. Coulston's experiments to be extended to children sometime in the next year.

While all this is going on in the United States, the British Government this month lifted its ban against the use of cyclamates in that country. As of Aug. 1, sodium cyclamates in liquid or tablet form were legalized; as of Dec. 1, foods containing artificial sweeteners will be legal.

After reviewing all of the scientific data on the subject, including the finding that some persons do metabolize cyclamate and excrete cyclohexylamine, the British concluded that the evidence was insufficient to warrant a prohibition of artificial sweeteners. ♦

REACTOR DISPUTE

Teller Attacks Breeder Safety

As nuclear power reactors are being accepted more and more by utility companies as the electric power source of the future, both Government and industry are pushing development of even more efficient uses of the power in the uranium atom.

Heading the list of projects is the so-called fast-breeder reactor (SN: 12/31/66), a sodium-cooled version which is getting major emphasis in the



Power Reactor Development Co.

The Fermi breeder: too dangerous?

Atomic Energy Commission's development program.

Last week, nuclear scientist Dr. Edward Teller, in a statement that drew widespread criticism, warned that the fast breeder may be too hazardous and not worth the risk.

Breeders are a long-range development aim. The power reactors being built now use low concentrations of the rare uranium 235 in fuel elements that have to be renewed regularly. The fuel costs in these reactors are fairly high, but engineering of the reactors is much simpler for two reasons: the low concentration of U-235 makes it easier to handle, and the uranium atoms are split by neutrons that are moving fairly slowly.

The inefficient slow reactors will continue to be economical to build up to about 1980, nuclear power experts believe. But about that time, uranium stocks may dwindle, particularly since the fissionable U-235 makes up less than one percent of natural uranium. Another isotope, U-238, makes up almost all the rest of the uranium as it is mined.

Breeders make use of the other 99

percent of natural uranium. U-238 won't fission easily, but when hit by neutrons it changes into plutonium 239, which will. In order to make use of plutonium breeding, the number of neutrons produced in the reactor has to be high—which means higher concentrations of U-235—and the neutrons have to be moving faster than in present-day reactors.

It is this higher concentration of U-235 and plutonium that bothers Dr. Teller. Big power units will need one-to-two tons of plutonium in concentrated form.

"I do not like the hazard involved," he says.

Dr. Teller, a leader in the development of the hydrogen bomb who has consistently played down the dangers of fallout and atomic weapons testing, believes that the development of fast breeders may never be justified, in view of the safety problems involved.

He claims in the August NUCLEAR NEWS that sources of uranium probably will be large enough to fuel less ambitious reactors for the foreseeable future. A big and systematic exploration for the element has never been undertaken, he claims. He also suggests that uranium could be taken from seawater economically, if the operation were combined with desalination projects now being developed in many parts of the world.

Breeder advocates in industry and Government dispute that approach. They believe that the safety problem, though serious, can be beaten. And they believe that the more economical use of uranium should be followed up, regardless of the supplies of the element.

Dr. Joseph A. Lieberman, nuclear safety director in the AEC's reactor development division, points to experience with experimental breeders already built, as indications that the safety problem can be solved. The U.S. has two breeders, the Experimental Breeder Reactor-II at the AEC's test station in Idaho, and the Enrico Fermi Power Plant at Monroe, Mich.

The primary danger in any reactor is the possibility that a fuel element might get too hot and melt. This could happen if the coolant, which takes heat off the fuel to heat water and drive electric power generators, failed to circulate fast enough.

If a fuel element melted, it could bring a large amount of fissionable material together in a single lump, and the resulting concentration of energy could burst the shielding of the reactor. In that case, radioactive fission products present in the reactor could escape to the air, endangering the surrounding area.

(see p. 202)