The Acid Test: A Way to Quit Smoking?

University of Nebraska researchers believe they may have found a "revolutionary, biochemical way to help people quit smoking." Preliminary results of their first experiments with 42 men and women were scheduled to be presented at the April 16 meeting of the Rocky Mountain Psychological Association in Las Vegas. The data from that still-unpublished research were made available to SCIENCE NEWS by A. James Fix, psychologist at the university's Regional Chest Center and leader of the study team.

"The results are very tentative, very tenuous ... but it could be the breakthrough that the surgeon general says we've never had," Fix said in an exclusive interview. The treatment that seems to enable chronic smokers to drastically cut down on or eliminate cigarettes involves the administration of simple sodium bicarbonate. The possibility of such an approach was first suggested by Columbia University psychologist Stanley Schachter (SN: 5/7/77, p. 297). Schachter found that persons with high levels of acid in their urine were likely to smoke more, and those with lower acid levels smoked less. Highly acidic urine tends to excrete more unmetabolized nicotine from the body, which, in turn, creates a greater physical craving to replace that lost nicotine, he explained. Schachter further found that students who took acid lowering bicarbonate tablets in stressful situations smoked less than those who took placebo tablets. After seeing the Columbia results and conferring with Schachter's colleague Brett Silverstein, Fix formulated the next logical step — to test the method on smokers who wanted to stop, but couldn't. "A gong went off in my head," he says, "and we wrote up a proposal and did a study."

Working with the American Lung Association, Fix and colleagues Irving Kass, Joseph Shipp and Jack Smith attracted 88 volunteers from the Northwestern Bell Telephone Co. in Omaha. The 42 men and women who eventually completed at least four weeks of the five-week experiment were divided into three groups, matched by sex, age, daily cigarette consumption and other factors. One group in the "semi-blind" study received the equivalent of almost four grams a day of bicarbonate, another group received two grams a day of acid-raising vitamin C, and the third group took nothing. (Participants in the first two groups knew they were taking one of the two substances, but they did not know which one was supposed to help them quit smoking.)

The results — which Fix emphasizes are extremely preliminary — indicate that "the bicarbonate people did best on every measure you can get — in total cessation and the ability to cut down." During the first four weeks of the study, comparable rates of decline were seen among all three participating groups. Volunteers who started the program smoking close to 30 cigarettes a day had cut back to 7.5 to 8.7 cigarettes a day by week four. Fix describes this as a "compliance effect or motivational effect." "This is no surprise," he says. "The people who really came to the groups and did everything we said were the most likely to quit [or cut back]."

By the fifth week, however, the effects of the drugs themselves became statistically significant beyond any compliance or placebo effect (bicarbonate and vitamin C were given in the third, fourth and fifth weeks — the first two weekly sessions involved tests and instructions but no pills). In the fifth week, Fix's group obtained results that he terms "totally astonishing": The bicarbonate group's average daily consumption dropped drastically to 0.14 cigarettes, while the vitamin C and placebo groups went to 7.8 (up slightly from the fourth week); moreover, bicarbonate takers proved more likely to abstain from smoking for a 48-hour period.

Fix is quick to note that because of the number of program dropouts, problems in controlling pill-taking compliance and other factors, he is reluctant to announce conclusive "proof" that sodium bicarbonate helps "cure" smokers. "But we did get some significant results that have shown our hypothesis to be a totally viable one," he says. "We plan to do a better study where all the people are kept in and totally controlled." What the results do offer, he says, is hope for chronic smokers to cut down and eventually stop smoking without going cold turkey, a method that most researchers believe is "the only way to go," Fix says.

Univ. of Neb.

Fix: Results are tentative but astonishing.

"But most people, if you talk to smokers, hate going cold turkey," he says. "They want to cut down, and this may be the first chance they have to do it [stop smoking] by cutting down." Fix suggests that bicarbonate alone may not be the only remedy; "adding beet and spinach greens [and other alkalizing foods] to the daily diet might have much more profound alkalizing effects than four grams of sodium bicarbonate."

John Pinney, director of the Department of Health, Education and Welfare's Office of Smoking and Health said he is somewhat familiar with work on the acid-smoking connection, and added that Fix's results sound "fascinating ... encouraging." "If we've got 53 million smokers, we've got 53 million different kinds of smokers," he said. "If we can find some common denominators between them — biochemical or otherwise — then that will help." □

Making the most of the CO_2 problem

Policymakers got the first official signal last week of a growing scientific opinion on the carbon dioxide issue. The message is: Don't panic, stay adaptable; increasing CO_2 might not really be a "problem" — it could even be of net benefit.

This apparent turnaround from warnings about the use of fossil fuels and the "greenhouse effect" that might melt polar ice caps and wipe Miami Beach off the map was presented in Annapolis, Md., at a conference called "The Environmental and Societal Consequences of a Possible CO_2-Induced Climate Change." Sponsored by the Department of Energy's Division of Carbon Dioxide Research as part of a master plan to get a grasp on the CO_2 issue (which is supposed to culminate in "an authoritative report" by 1984), five panels were charged with outlining specific steps in the physical, biological and social sciences toward handling the effects of CO_2.

The panels relied on a well-accepted scenario: Based on current rates of increase, atmospheric CO_2 will double by 2050, causing an average global warming of 6°C and an overall increase — with changing patterns — in precipitation.

The panel on oceans and polar regions, headed by Francis Bretherton of the National Center for Atmospheric Research in Boulder, Colo., pointed out that increased CO_2 will have its greatest effect on fisheries and the West Antarctic ice sheet. Warmer temperatures will result in weakened winds, which in turn will reduce the mixing and circulation of the oceans. As ocean upwelling is reduced, the pro-

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ductivity and distribution of nutrients in the oceans will change. The West Antarctic ice sheet, according to many scientists, is particularly vulnerable to warmer oceans (SN: 10/7/78, p. 246). Should it melt — and estimates give it 50 to 300 years — it could raise sea levels worldwide by five meters, they say. Studying ocean physics is the key to understanding such effects, according to the panel.

Increased CO_2 and warmer temperatures will begin to nudge the limits of plant and animal tolerance, altering competition among species and possibly changing forest succession among plants. Such changes are particularly researchable, said the panel on the "unmanaged biosphere," chaired by Frederick Smith of Harvard University. Salt marshes might be studied, for example, as areas that must adapt rapidly to changing environmental conditions.

The strongest pro-CO_2 signal came from the panel on agriculture and domestic animals. Agriculture, limited primarily by water, stands only to gain from CO_2-increased precipitation. "The bottom line is that we don't see catastrophe in the dislocation of agricultural productivity as a result of an increase in CO_2," Michigan State University's Sylvan Wittwer, chairman of the panel, told SCIENCE NEWS. "There are opportunities here that we need to look at." New strains of crops attuned to such changes could reap maximum benefits from increased CO_2, he said.

The attitude expressed by Wittwer and others has come, Bretherton told SCIENCE NEWS, as other scientists — particularly economists and agriculturalists — have taken a look at the CO_2 issue. "There are specific things — details such as the West Antarctic ice sheet — that need to be looked at," he said. "But the clear disadvantages [of increasing CO_2] are in the 'noise' level. We would have to have a much greater response to stop burning fossil fuels."

So how does this translate into public policy? Very simply, it comes out: Be adaptable. The panel on social and political institutions said the social sciences must find ways to encourage and develop those parts of society and institutions that are attuned to the physical world — "build in the appropriate infrastructures" in social science parlance. Learning to manage CO_2 as a "trend crisis" rather than as an immediate problem, the panel said, can serve as a model for managing other long-term issues.

According to the economics impact panel, adaptability means making "decentralized decisions" based on understanding of details. Investing in real estate, for instance, will require attention to the possibility of rising sea levels. No drastic policy changes are required, said economist Lester Lave of Carnegie-Mellon University; such awareness should already be a part of decision-making. "If your house is in order," he said, "you're all right." □

Chemists catch the sun (on electrodes)

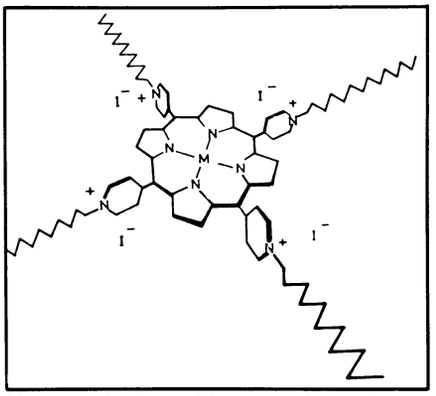
Sunbathing was not the predominant activity of the 8,000 chemists who gathered in Honolulu last week to hear probably the largest number of talks on chemistry ever given at a meeting. Outside the technical sessions, one major activity was socializing with chemists from other countries; the meeting was co-sponsored by American and Japanese chemical societies and attended by scientists from 42 countries including the People's Republic of China. The other dominant pastime was standing in line at the airline agencies. The strike of United Airlines mechanics prevented some U.S. chemists from reaching Hawaii and kept those who did arrive busy trying to make alternative return reservations.

Still, the sun permeated a number of the scientific sessions, exciting the researchers with possibilities for using chemistry, as plants do, to convert solar energy into other forms. Diverse and ingenious schemes are already being applied to harnessing sunlight (SN: 4/22/78, p. 248), but the chemists at this meeting described new angles on materials for generating electricity and for splitting water into oxygen and hydrogen, which can be stored or used as fuel.

An oxide of a rare earth, rhodate, is the key to a system powered solely by light that both produces hydrogen from water and generates electricity. H. S. Jarrett and Arthur W. Sleight of E. I. Dupont de Nemours and Co. report that the red oxide absorbs sunlight better than do white semiconductor oxides, and the new cathode does not decompose as the system is used. "If we take the system out into sunlight, we see hydrogen and oxygen bubbling off the electrodes," Jarrett told the press. "There is enough energy left over that some electrical power can be generated." The researchers now hope to find a less expensive, but suitable, cathode and to develop a more efficient system.

Another approach to making solar cells is to coat an electrode surface with light-absorbing molecules. Kenichi Honda of the University of Tokyo is using chlorophyll as a coating, but others synthesize new compounds to make an especially stable cover. Yoshio Umezawa and colleagues, also at the University of Tokyo, have worked with porphyrin molecules. They report synthesis of a compound, that Umezawa says gives nearly permanently stable coated platinum electrodes. The synthetic porphyrin has long side chains that attach to the electrode, "like an octopus," Umezawa says.

Finally, Shigeo Tazuke of the Tokyo Institute of Technology describes a chemical system in solution, rather than with electrodes, that more directly mimics a green plant. It uses sunlight to transfer electrons


Umezawa

New porphyrin stably coats electrodes.

from water to carbon dioxide, generating a more complex organic compound. Tazuke simplifies the plant's intermediate electron transport steps into three components. Light is absorbed by an aromatic hydrocarbon, which transfers electrons from amines to aromatic cyano compounds. In the presence of water and carbon dioxide, formic acid and hydrogen peroxide are produced. Tazuke says the efficiency of the system now must be increased by separating the products to prevent their decomposition. He plans to develop an electron transport membrane, thus further imitating photosynthesis in green plants. □

Cooking with gas: More NO_x concern

A cozy kitchen with a teapot whistling on a gas stove joins automobiles and factories as a source of nitrogen oxide pollutants. High concentrations of nitrogen dioxide, which have resulted from occupational accidents, can cause lung disease and even death. Recent concern over less obvious effects of long-term, low-level nitrogen oxide exposures has led to comparisons of large groups of people living in different communities and to studies tracing the fate of the nitrogen oxides within experimental animals.

Gas cooking versus electric cooking was one of the questions asked as part of a long-range study of children and adults in six U.S. communities. Frank E. Speizer of Harvard Medical School reported a preliminary result at the Honolulu meeting of the American Chemical Society. The nitrogen dioxide measured inside the houses was higher when cooking was done with gas, rather than electric, stoves. Speizer and colleagues tested approximately 8,000 children, ages 6 to 9, half of whom were from homes with gas stoves.

Across the communities, the children whose parents cooked with gas had lung functions slightly, but consistently, below those of the children from homes with electric stoves. Analysis of medical information provided by the parents revealed that children from gas-stove homes had 15