Volker Zinser

New research points to a definite 'psychobiological machine' within every smoker

BY JOEL GREENBERG

You're engaged in some nifty cocktail party conversation and pause to take a long drag on a cigarette. Or, it's the night before an exam and you're nervously puffing your way through 2½ packs. You may think smoking helps you relax or concentrate, but according to recent findings at Columbia University, people smoke for one predominant reason—to fulfill their body's need for nicotine at a particular moment.

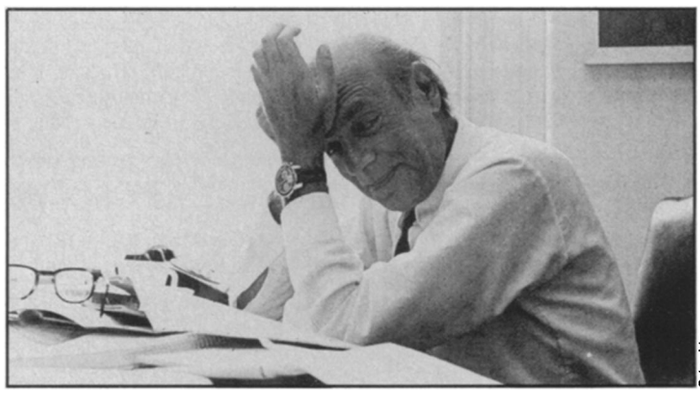
And in many cases, emotional stress actually triggers an intricate, psycho-biological mechanism that dictates how much a person will smoke at a given moment, according to research psychologists at Columbia. It's part of that same mechanism, the researchers say, that controls a smoker's overall addiction level. The experimental confirmation of such a regulating machine ties together a collection of previously vague conceptions about what causes an individual to smoke, and smoke at a given rate.

"There has been sort of an odd incompatibility in the thinking about smoking," Stanley Schachter, who headed the research, said in an interview. "Everyone has always sort of agreed that cigarettes are addicting, and there's also the psychological thinking [that] smokers think it does something for them . . . and we know they smoke more under certain conditions than others." Now, in the March JOURNAL OF EXPERIMENTAL PSYCHOLOGY, the Columbia researchers report on a series of five related studies. Their findings include:

- Some smokers are clearly addicted, and some are not.
- The higher the urine acid level, the more likely one is to smoke heavily.
- In a stressful situation, a person will smoke heavily for physical, as well as emotional reasons. Stress also raises the urinary acid level, which is the biological regulator of nicotine intake.
- Urinary pH—as was shown in the experiments—can be lowered by consumption of vitamin C and, perhaps more important, raised with bicarbonate (thereby lowering the acid level), particularly in high stress situations. In one of the studies, smokers who received bicarbonate smoked 22.7 percent fewer cigarettes than those given placebos.

Concludes Schachter: "The concerned smoker should take Alka Seltzer before, not after the party" or other stressful situations. Under more relaxed circumstances, the effect of an antacid would be "trivial," he says, amounting to a decrease of less than one cigarette per day per pack. But the data do "suggest that if this is the day you're going to take a Ph.D. oral, you can take some bicarbonate of soda," Schachter allows.

While such applications may be intriguing, the Schachter group is more excited at the detection of the body's regulatory machinery itself, and how their findings may be applied to the future design of cigarettes. "It's time to look at what sane constructions of cigarettes should be," says Schachter, who smokes 2½ packs a day himself.


Schachter

Psychologist Stanley Schachter has found that emotions can dictate how much a person will smoke at certain times.

In research funded by Philip Morris, U.S.A., the Columbia group first set out to establish whether cigarettes—specifically nicotine—are addictive, and whether all habitual smokers are addicts. "Although most heavy smokers would unquestioningly agree with this assumption [that smoking is addictive], the research evidence in its support is inconclusive and inconsistent," Schachter wrote prior to the study. Previous studies also indicated—again "imprecisely"—"that there are at least some smokers who smoke for reasons other than a need for nicotine."

Schachter tested the reactions of heavy smokers—persons who regularly smoked at least one pack per day for a number of years, and had experienced "great difficulty and suffering" whenever they had attempted to quit. They also tested light smokers—persons who consumed less than 15 cigarettes per day and had undergone no real difficulty in quitting on previous occasions (but had subsequently resumed smoking "for the taste"). The smokers—most of them friends or acquaintances of Schachter—smoked only experimental high nicotine cigarettes for one week and low nicotine cigarettes for a second week (they were not told which type at any given time).

Schachter found that heavy smokers smoked an average of 25 percent more of the weak cigarettes than the strong ones, apparently to make up for the missing nicotine content. Light smokers smoked about 18 percent more of the low nicotine type. In addition, he reports, there were definite signs of "withdrawal" among heavy smokers while smoking low nicotine cigarettes. One woman gained five pounds in her first two days of the experiment. She had also become "irascible, trigger-tempered, explosive and manic as hell." One man became so testy that at one point he ordered his wife and two adolescent children to leave the house.

"There appears to be no question but that long-term, heavy smokers regulate nicotine intake," Schachter concludes. However, some require less nicotine than others, and the light smokers do not appear to be addicted at all, he says. But what determines a smoker's addiction level?

Work in the late 1950s and 60s indicated that greater amounts of unmetabolized nicotine are excreted in a smoker's urine when the urine is highly acidic. Consequently, a person will smoke more if his urine acid is high, to compensate for the nicotine lost in excretion. Schachter thus theorized that experimentally increasing the acidity of the urine would increase the amounts smoked.

The hypothesis was tested on several groups of smokers by Schachter, Lynn T. Kozlowski (now at Wesleyan University) and Brett Silverstein (now at Princeton). They found that vitamin C and Acidulin, a second acidifying agent, not only "significantly" lower the urine pH (thereby making it more acid), but increase cigarette consumption by 16 to 22 percent more than when a placebo is used. "It seems reasonable to suggest that the rate

of smoking will vary with the chronic level of urinary pH," conclude the researchers. "Smokers who characteristically have a very acidic urine should be expected to smoke more than those with a characteristically alkaline urine. . . . Potentially, this negative correlation is a lead of great importance."

But that still did not explain why smoking frequently seems to increase when a person is under stress. "In our conversations with numerous smokers, they report, among other things, that their smoking increases when they are tense and anxious and when they are at parties [which presumably are sources of social stress and anxiety]," Schachter says. "Conceivably events that stimulate smoking may do so via their action on pH," he hypothesized before conducting the study. "If it is the nature of a party to acidify the urine, it may be that this is the mechanism directly responsible for the increase in smoking that is reported to accompany party-going."

Armed with their favorite cigarettes and instructions to urinate into a bottle before going to bed each night, the smokers tested in this study proceeded to validate the psychologist's theory. Both the urinary acid and cigarette consumption were raised on party evenings, as opposed to routine, nonsocial nights. To make sure that the lower pH was indeed a function of party-going and not simply the result of a late bed time, the researchers managed to convince a number of faculty and graduate school members to urinate before and after a late afternoon colloquium party. A control group of nonsmokers was also included.

"These do appear to be the facts," state Schachter and his colleagues. "Increased smoking and decreased pH are effects of going to a party."

The psychologists went on to perform similar studies with other sources of stress, such as Ph.D. orals, comprehensive exams, class reports and colloquia lectures. "There appears to be no question that this order of extreme academic stress has a markedly acidifying effect," Schachter says. Further, stress has an acidifying effect on both smokers and nonsmokers, they say.

Finally, the Columbia group employed bicarbonate and placebo tablets in a high-stress study to see if raising a person's pH would, in turn, cut down their cigarette consumption under anxious or stressful situations. They found that those who took bicarbonate both smoked fewer cigarettes and took fewer puffs than under placebo conditions.

"If urinary pH is experimentally maintained at alkaline levels, stress has no effect on smoking," conclude the researchers. "We view this set of facts as further support for the general hypothesis that smokers smoke for nicotine, and more specifically, as indicating that the urinary pH mechanism is the crucial biochemical mediator of the stress-smoking relation."

As a result of the group's findings, Schachter is advocating the construction of a "sane" cigarette. "We should be pushing for a high nicotine, low tar and low gas" cigarette, he says. That type of construction would fulfill a smoker's need for nicotine with as few cigarettes and puffs as possible—thereby minimizing the amount of tar and noxious gases (most cigarettes contain some 40 noxious gases, Schachter says, including carbon monoxide, hydrogen and cyanide) he will inhale.

It is somewhat unclear as to how the new knowledge about causes of cigarette smoking might help those who would like to give up smoking but cannot. The psychologists see the withdrawal syndrome as a possible key in a person's ability to give up smoking, and suggest that be the next research focus. "Obviously anyone can give up smoking, limit his daily intake or restrict smoking to particular times or occasions *if* he is willing to put up with the withdrawal syndrome," they say.

Schachter says he has tried several times to quit smoking, but has failed. "Every time I cut down," he says, "I go into withdrawal and wind up getting divorced or something like that." □