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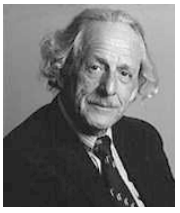

Man-Made and Natural Carcinogens: Putting the Risks in Perspective

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Environmental groups have waged an aggressive campaign to ban Alar, the controversial chemical used on apples to promote uniform ripening and prolong shelf life. They want it banned because a breakdown product of Alar, UDMH, has been shown to cause liver tumors in mice and may pose a cancer risk to humans, especially children.

The Alar controversy has heightened people's awareness—and anxiety—about cancer risks of man-made chemicals in our environment. But little publicity is given to natural substances in our food that also cause cancers in laboratory animals. By informing the public of these "natural carcinogens," we may gain a more balanced perspective on the relative danger of man-made chemicals.

Bruce N. Ames of the University of California, Berkeley, has studied natural pesticides produced by all plants to ward off insects, fungi, and other predators. In a recent letter to *Science* (244:755-7, May 19, 1989), Ames points out that we ingest about 10,000 times more natural pesticides, by weight, than synthetic pesticides. Of the 42 plant toxins so far tested on laboratory animals, 20 have been shown to be carcinogens, Ames notes.

Among the foods containing natural pesticides that cause cancer in rats or mice, he says, are: anise, apples, bananas, basil, broccoli, brussels sprouts, cabbage, cantaloupe, carrots, cauliflower, celery, cinnamon, cloves, cocoa, grapefruit juice, honeydew melon, horseradish, kale, mushrooms, mustard, nutmeg, orange juice, parsley, parsnips, peaches, pineapples, radishes, tarragon, and turnips.

Ames has also developed an index that ranks the relative hazards of human exposure to known natural and synthetic carcinogens. The index expresses the human potency of a carcinogen as a percentage of its potency to laboratory rats and mice. On this relative index, the hazard from Alar in a daily lifetime glass of apple juice is .0017%. In comparison, the possible hazard from natural hydrazines in one daily mushroom is .1%, and that from aflatoxin in a daily peanut butter sandwich is .03%.

Ames's research is not intended to heighten anxiety about the cancer risks of natural pesticides in our food. Nor does it argue for complacency about ongoing efforts to identify and control man-made car-

cinogenic chemicals. Rather, his work provides a more rational and balanced view of the comparative risks of synthetic and natural chemicals. As Ames states, "[The] carcinogenic hazards from current levels of pesticide residue or water pollution are likely to be minimal relative to the background levels of natural substances."

An earlier important perspective on relative risks was reported in a 1981 paper published in the *Journal of the National Cancer Institute* (66:1192-308, June 1981). It presented results of a monumental study of avoidable cancer risks by Richard Doll, Imperial Cancer Research Fund, and Richard Peto, Radcliffe Infirmary, Oxford, U.K. Doll and Peto examined the incidence of about 40 types of cancer that were attributable to various environmental and life-style factors. They then estimated the proportion of U.S. cancer deaths in 1978 that could have been avoided if these factors were controlled. They found that the combined effects of environmental factors—food additives, toxic chemicals in the workplace, air and water pollution, and industrial products—accounted for 7% of 1978 U.S. cancer deaths. But the combined effects of life-style factors including alcohol, diet, and smoking were related to 70% of U.S. cancer deaths.

Animal cancer bioassays serve a useful purpose in protecting society from possible health hazards of man-made chemicals. But publicizing these cancer risks exclusively creates a distorted perspective and undue anxiety about how real the dangers may be. It also distracts our attention from the obviously greater and certainly more fatal hazards of one's life-style, such as alcohol, diet, and smoking.

Individuals have considerable control over these life-style behaviors. Motivating them to exercise that control would have a far greater impact on cancer fatalities than would the removal of all pollutants and additives from our environment. ■