Briefing

Carcinogens in Scotch

The Scottish whiskey exporters denounced it as an American conspiracy to ruin their trade but, in fact, there was nothing unexpected in the report issued by the National Science Foundation on 7 August saying that a carcinogen known as *N*-nitrosodimethylamine (NDMA) has been discovered in six out of seven brands of Scotch tested this year. NDMA was found in 18 brands of beer as well, but not in any of the wines, sherries, liqueurs, brandies, gins, vodkas, or rums that came under review.

The research, done by David Fine and E. Ulku Goff of the New England Institute for Life Sciences in Waltham, Massachusetts, did little more than fill a gap in earlier work, most of it done by German researchers, showing that many varieties of beer contain NDMA. Beer and Scotch producers use a similar process of barley malting, and the research on Scotch merely strengthens what was suspected already—that the problem is in the malt.

NDMA is one of a family of carcinogens called nitrosamines, all of which occur widely in the environment. The best known until recently was *N*-nitrosopyrrolidine, a suspected carcinogen in fried bacon. The Department of Agriculture has put into effect a food monitoring program to keep track of nitrosamines, and the "action level" at which bacon is taken off the market occurs when nitrosopyrrolidine concentrations reach 10 parts per billion (ppb) after frying. A decade ago, before meat producers were asked to take remedial action, it was not uncommon to find concentrations as high as 100 ppb. The compound in bacon, researchers say, is considered less carcinogenic than NDMA, the one found in beer and Scotch. NDMA has been shown to cause cancer in nearly every laboratory animal tested, and in one experiment, adding 10 ppb of NDMA to the water of tumor-prone mice tripled the incidence of lung tumors.

The important work on beer was done by B. Spiegelhalder at the German national institute for chemical and cancer research in Heidelberg. In the summer of 1978 Spiegelhalder and his colleagues published a report that 70 percent of the 158 European beers they had analyzed contained NDMA in amounts ranging from around 1 to 68 ppb. In general, dark beer contained more than light beer, and the highest concentrations were found in "rauchbier," made from smoked malt. This was deemed a significant health risk for Germans, whose diet is one-quarter beer. Spiegelhalder calculated that, based on average figures, a young German beer drinker might consume as much as 1.2 micrograms of NDMA a day. Other nitrosamines were found, but none so potent or abundant as this one.

Several possible sources of contamination are under study; the Germans have decided that the point at which NDMA is introduced is in the process of drying or "kilning" the barley malt. The use of hot air drawn directly from a fire is thought to create NDMA in the malt, and indirect heating is thought to inhibit it. Malt for Scotch is prepared in the same way, suggesting that the one Scotch without NDMA in the seven tested—White Label—may use an indirectly heated malt. (The others were Chivas Regal, Black and White, J & B, Ballantine's Sandy Scot, and Cutty Sark.) It is not known which compound in the barley reacts to produce NDMA, although people have suggested it may be a fungicide, pesticide, or anticorrosive agent.

The American work has confirmed the German research and given more weight to the theory that the malting process is the key problem. It also suggests the health risk is lower for Scotch drinkers than for beer drinkers. The concentrations of NDMA are lower in Scotch to begin with, and the volume consumed is lower. The concentrations of NDMA found in the 18 foreign and domestic beers tested at the New England research lab ranged from 0.4 to 7 ppb.

The Distilled Spirits Council, a trade association in the United States, stresses that nitrosamines have not been proved a threat to human health, and a spokesman, Sam Chilcote, claimed recently that it is "practically impossible" to eliminate these compounds from the human diet. The distillers have not decided whether to take any action. However, shortly after the news about nitrosamines in European beer came out last year, the U.S. Brewers Association set up a research committee chaired by William Hardwick of Anheuser-Busch Inc. and asked him to come up with some suggested solutions. A spokesman, refusing to give details, said the brewers have spent "a lot of money" and commissioned research at three labs. Lacking definitive proof that this is a public health hazard, the companies are reluctant to order a complete overhaul of the barley malting process for, as one company official said, that would cost hundreds of millions of dollars and bankrupt half the maltsters in the country.

Worried drinkers always have the

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option of avoiding beer and Scotch. But they should be advised to stay clear of carrot juice and beet juice as well, for they also contain relatively high concentrations of nitrosamines.

Congress Relents, Spares OES Bureau

After a harrowing summer, the State Department's Bureau of Oceans and International Environmental and Scientific Affairs (OES) is expected to glide safely home to port this fall when Congress returns from its August recess and takes up the appropriations bill for the State Department. The OES, which handles negotiations for fishing agreements and scientific and technological exchanges, earlier this year ran afoul of Representative William Alexander (D-Ark.). He slashed both the budget and the staff of the OES in half when they came before a subcommittee on which he sits (*Science,* 8 June 1979).

The funds were restored after a $1^1/_2$-hour debate on the floor of the House on 12 July in which Alexander reported thirdhand that Henry Kissinger had once told another official that OES "is where the Department of State places its incompetents." He continued: "I would rather have one good horse than a whole team of lame nags that sit grazing at the trough of public expense. . . ."

When the harangue was over, several congressmen chided Alexander for failing to hold any hearings on his charges. Representative Clement Zablocki (D-Wis.) spoke of the "unfortunate record" and said the budget slash was adopted "without any consideration and chiefly at the urging of one individual, our good friend, the gentleman from Arkansas." The House then voted to restore the budget; a conference report cleared the House on 2 August; and all that is lacking is the Senate's approval.

An OES official, Leslie Brown, said, "A lot of us were surprised not only by the depth but by the breadth of support" that came through for OES at the last moment. Rep. Alexander had boasted that he would win the battle if it ended up on the House floor. He plainly underestimated the opposition.

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would be doubly concerned about an asthmatic with a common cold."

Greatest concern centers on pilots—and understandably so. The picture of a flight crew incapacitated by ozone is not a very pretty one. Yet most pilots refuse to talk about any problems they may have encountered. This too is understandable. Mere mention of "chest pains" might be equated with "heart trouble," which could mean the loss of a pilot's medical certification to fly.

The most vocal complainers are flight attendants. If they seem to have more problems with ozone than passengers and pilots, Tierney notes, it is probably because they work harder. A person at rest breathes about 5 liters of air per minute. A person pushing a heavy cart up and down an aisle breathes 15 to 20 liters per minute—and thus takes in many times more ozone.

Though flight attendants raise a fuss, the companies they work for are often noncommittal. Trans World Airlines, which operates 11 regular 747's, says it is waiting to see if the FAA regulations go into effect. It will then add ozone-removing equipment.

Pan American says that its 29 regular 747's will get catalytic converters to break down ozone sometime in 1980, and that the ozone problem has already been solved on its very long-range, high-altitude planes. Charcoal filters (each weighing 800 pounds) were installed on all ten of Pan American's 747SP's in March 1978. Since then, there have been only two passenger complaints. The 645 complaints by flight crews in 1978, says a Pan American spokesperson in New York, have to do with politics involving union wage settlements. "As far as we're concerned, there are many more passengers than crew," says James Arey. "Based on the complaint figures, we have done the job. There are no more problems."

Flight attendants, however, say that a wage contract has long been reached—and that complaints are still being sent to New York. "In fact," says Carmen Azzopardi of the Independent Union of Flight Attendants, "Pan Am just settled out of court with two flight attendants for ozone-related injuries. One had developed bronchitis, the other asthma." She also notes that passengers have never sent in many complaints, for few understand the problem.

A spokesperson for Boeing says that Pan American is the only airline putting in filters and catalytic converters. The other airlines can get them as optional equipment, he says, but so far none have. He also says that the FAA regulations will probably never come out, since the problem is so rare. "I've traveled around the world in a 747 and never had a single problem," says Leonard Weiss. "This ozone thing has been vastly overplayed by the news media."

To give credence to their side of the story in the face of industry skepticism, flight attendants presented a 1330-person survey at the House hearing in July. Performed by Dwayne Reed, an epidemiologist with the California State Department of Health Services, the survey looked at flight attendants from Pan American, which flies high-altitude international flights; from Trans World Airlines, which flies both international and lower-altitude flights; and from Pacific Southwest Airlines (PSA), which flies only low-altitude flights within California. The survey tabulated symptoms for five consecutive flight days. With fatigue, backache, nausea, and vomiting, there was little difference between airlines. Chest pain, however, was experienced by 19 percent of the Pan American flight attendants, 13 percent of those on TWA, and 5 percent of those on PSA.

What worries many is lack of data about long-term effects. Ozone, for instance, is a mutagen and is known to cause biochemical changes in the bloodstream of exposed persons. But it is not known if high rates of miscarriages and children with birth defects among flight attendants are a result of ozone exposure.

Even if the FAA does make a ruling on ozone, ALPA fears that the airlines will not take the time and money to put on equipment that really works. As part of the FAA regulation, therefore, ALPA wants a requirement for on-board systems to monitor ozone levels—thus checking the effectiveness of ozone removal equipment.

A few months ago the FAA said the ozone ruling, if it is made, would come in September. Now it has pushed that back to October. Asked how long the airlines would have to comply with a ruling, Ray Ramakis of the FAA's safety regulations division said: "The notice of proposed rule-making said 6 months. It could go to a year. I don't know. There is no set formula." If the airlines have their way, it will take a while. In January the Air Transport Association, which represents the nation's airline companies, told the FAA how long it thought the conversion to ozone-removal equipment would take. The estimate came to somewhere between 4 and 6 years.

—WILLIAM J. BROAD