Chemical health risks

Not so great

Washington

After reviewing the scientific literature on the health risks associated with the use of nitrites and nitrates as food preservatives, a committee of the National Academy of Sciences National Research Council (NRC) has concluded that current exposure levels constitute an insufficient risk to require major reductions in their use.

However, because many nitrosamines and other nitroso compounds which can be formed from nitrates and nitrites have been found to cause cancer in laboratory animals, and can therefore be associated with cancer in humans, the committee has recommended some reductions.

The committee was set up by NRC at the request of the US Department of Agriculture and the Food and Drug Administration to study the health effects of nitrate, nitrite and *N*-nitroso compounds, following the publicity which occurred in August 1978 when workers at Massachusetts Institute of Technology found that sodium nitrite caused tumours in the lymph systems of rats.

At the time the federal government rejected calls for a temporary ban on the use of nitrites as a food preservative, but established an immediate study of the problem. In August 1980, the two agencies announced that they had found "insufficient evidence" to link the use of nitrites to cancer but said that they intended to study the issue further.

Last week's report is the first of two to be produced by NRC in response to the government's request by a panel chaired by Dr Maclyn McCarty of the Rockefeller University in New York. The panel's second report will consider current research and prospects for developing alternatives to nitrite as a food preservative.

In its first report, the committee says that the results of limited experiments suggest that nitrate is neither carcinogenic nor mutagenic, but that evidence from several epidemiological studies in human populations is consistent with the hypothesis that exposure to high levels of nitrate may be associated with an increase of cancer of the stomach and oesophagus, recommending further studies to confirm these preliminary findings.

The committee also says that scientific evidence does not indicate that nitrate acts directly as a carcinogen in animals. In contrast it says that most *N*-nitroso compounds are carcinogenic in laboratory animals, mutagenic in microbial and mammalian test systems, and that some are teratogenic in laboratory animals. However, it adds that such results are of limited value for predicting the quantitative risk to humans.

At the same time, it points out that nitrites found in cured meats account for only a small proportion of the total exposure to nitrosamines.

According to the committee, cigarettes represent the single largest source of nitrosamines, with a daily pack of American filter cigarettes producing an exposure of 17 microgrammes. In contrast, the level ingested from all dietary sources is about 1.1 microgrammes a day.

David Dickson

Backing a winner

One of the few European research facilities which can claim a substantial lead over the United States in both size of budget and research quality, the high flux neutron beam laboratory at Grenoble (Institut Laue-Langevin, ILL), now has the money and agreements it needs to keep ahead of the opposition until the 1990s, its directors believe.

In the past two weeks two major decisions affecting the future of ILL, which provides services to 1,700 visiting scientists each year, have been taken. The treaty between France (the host country), Germany and the United Kingdom, which guarantees support for ILL, was extended a further 10 years to 1992; and the international steering committee, which decides the budget and a five-year forward look each December, has agreed to a substantial addition to the neutron source costing some £2 million, and an increase in the number of major instruments at Grenoble to make use of it.

The improvement — a new "cold source" which produces neutrons at long wavelengths for large-scale structural studies such as of polymers or of biological materials — was the principal part of a large programme approved in outline in 1979; but there were fears that cuts in German and British budgets might threaten it. These fears have now proved unjustified.

ILL directors see the new source, basically a tank of liquid deuterium which cools thermal reactor neutrons to low velocities and hence long de Broglie wavelengths, as a means of capitalizing on ILL's greatest successes (which have been in long-wavelength scattering) and of countering — or complementing — competition from accelerator-driven "spallation" neutron sources. These may provide improved flux and resolution at short wavelengths by making use of spallation reactions, where incoming protons (from an accelerator) collide with heavy neutron-rich nuclei (such as uranium) to produce a spray of neutrons ten to one hundred times the intensity of the incident proton beam. Spallation sources are planned in Japan, and at Argonne and Los Alamos in the United States; and one is under construction at the Rutherford Laboratory in the United Kingdom.

Robert Walgate

Satellite launcher market

Ariane set fair?

The European commercial satellite launcher business is itself well launched. With two successful test flights to its credit, Ariane, the European Space Agency's heavy satellite launcher, is already qualified for service. So whatever the outcome of the fourth and final test flight this week, the fifth launch next March will be the first of six promotional flights, after which production and marketing of subsequent launchers will be officially handed over to the French-based company Arianespace. But the space agency's role in rocket development continues. By 1983, Ariane 2 and 3, capable of placing 2,100 kg and 2,580 kg payloads into geostationary transfer orbit, will be in service.

Further ahead, in 1985 there will be a test launch of Ariane 4, which uses the basic design of Ariane 3 but is to be offered in six versions, with payloads of 2,300–4,300 kg, achieved by strapping onto Ariane 3 various combinations of liquid and solid-propellant boosters. This more ambitious version of Ariane 4 has been prompted by calculations of the mass of the telecommunications statellites likely to be built towards the end of the decade. The European Space Agency's swift approval of this version of Ariane 4 is evidence of its determination to compete internationally in the growing market for satellite launchers.

The only other present source of commercial launching facilities is the United States National Aeronautics and Space Administration. The Thor Delta and Atlas Centaur launchers can put 900 kg and 1,850 kg into geostationary transfer orbit respectively, compared with the current capacity of Ariane 1 of 1,700 kg. Although the shuttle will be capable of carrying much heavier payloads, Europeans are quick to say that it is technically unproven and that availability is still in doubt.

Meanwhile, there is little competition for Ariane from elsewhere. The Soviet Union has geostationary launch capabilities of 2,400 kg and 5,000 kg aboard Soyuz and Zonda, but these are not generally commercially available. Thus the most likely competition in the future will come from Japan, which already has a small rocket capable of launching 220 kg into a low circular orbit and is developing a heavy satellite launcher, which could rival Ariane, for a first launch in 1987.

The only other contenders so far are China, India and Brazil. China and India have already launched small scientific payloads into near-Earth orbits. The immediate goal of the Indian programme is to develop a Polar Satellite Launch Vehicle by the mid-1980s for putting meteorological and remote sensing satellites weighing up to 600 kg into near geopolar orbits which pass over all points on the Earth at the same time of day. Only then will attention be turned towards a launcher

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for heavy communications satellites.

Brazilian plans are more tenuous. For a decade, the government has been talking of launchers to place remote sensing and meteorology satellites into orbit, though little seems to have been done.

Judy Redfearn

Polish science advice

Reforms in limbo

One of the casualties of the Polish government's sudden suspension of the Solidarity trade union at the weekend may well be the draft bill that would have made it obligatory for government agencies to consult "scientific experts" before making important decisions. News of the bill came in a communiqué issued last month after a meeting between the Prime Minister, General Wojciech Jaruzelski, the Primate of Poland, Archbishop Jozef Glemp and Lech Walesa, leader of Solidarity.

To be effective, the proposed bill would have had to ensure that consultations were more than an empty formality. In some cases it would seem, past governments acted without even an appearance of consulting scientists. A notorious case was the siting of vast industrial plants — the Skawina aluminium smeltery and the Lenin steel mills — just outside Krakow. The decision to develop industry in the area in the 1940s had political overtones but meteorologically Krakow is a very poor site because of the limited circulation of the air. The toxic fumes from industry have undermined the health of the population and made the produce of farms unsafe within a radius of 50–60 km.

Until September 1980, any public discussion of such issues was impossible. Within a month of the signing of the Gdansk accords, however, a new Club of Polish Ecologists was established, based in Krakow, which early in January succeeded in having the obsolete production lines at Skawina (which had been emitting hydrogen fluoride) closed down. General Jaruzelski has been a strong supporter of moves to give scientists a louder voice, and he seems committed to continuing with consultations. But exactly who will be involved in any future talks is now unclear, as a new format is likely to emerge after a brief hiatus.

A second new bill now being prepared is aimed at reforms in the Academy of Sciences. The academic secretary of the academy is at present directly responsible to the prime minister and has himself quasi-ministerial rank. In recent months there has been a considerable movement within the academy to change this anomalous status by making the academic secretary responsible only to his fellow academicians. It seems likely that the prevailing "state of emergency" will mean a considerable weakening of provisions in the bill aimed at increasing the independence of the academy. **Vera Rich**

Creation on trial

Battle engaged

Washington

While a federal judge in Little Rock, Arkansas, listened to the closing arguments this week in a case claiming that a new state law which requires the teaching of "creation science" violates the separation of church and state, both sides in the dispute were already sharpening the arguments for the next round of what promises to remain an escalating battle of wits.

In Washington, the National Academy of Sciences held the first meeting on Monday of a committee made up of prominent scientists and legal advisers who will prepare a legal brief on the scientific status of the theory of evolution to be presented by the academy as an *amicus curiae* ("friend of the court") document, either to the Arkansas court if there is enough time, or in any future legal proceedings.

Meanwhile the creationists are working on a revised version of their "model bill" used as the basis of the Arkansas law passed in March, requiring equal efforts to be devoted to teaching the theory of evolution and creation science in school biology classes. The new bill is designed to meet some of the legal challenges thrown up in the Little Rock proceedings and elsewhere.

Whichever way the Arkansas verdict goes, there is a good chance that the fight will make its way up to the Supreme Court. And the supporters of creation science are unlikely to be put off by an adverse legal ruling, since they claim to be backed by a groundswell of popular support.

The academy panel is being chaired by Dr James Ebert, vice-president of the National Academy of Sciences and president of the Carnegie Institution of Washington. Others on the panel include Dr Steven Weinberg, professor of theoretical physics at Harvard; Dr Preston Cloud, professor of biogeology at the University of California, Santa Barbara; and Professor Norman Newell, curator emeritus in the department of invertebrates at the American Museum of Natural History in New York.

Several legal experts have been included on the panel to advise on the constitutional issues raised by the creationists. These include Mr Peter Barton Hutt, previously general counsel of the Food and Drug Administration, and Dr Richard Maserve, a staff member of the Office of Science and Technology Policy under the Carter Administration. Both are now members of the Washington law firm Covington and Burling.

The legal brief will concentrate on providing an academy-endorsed statement on the definition of science which, it is hoped, will help both courts and state legislatures distinguish the philosophical status of the theory of evolution from creation science.

The academy is also considering producing a booklet to summarize current thinking on evolutionary theory.

The main claim being put forward by the state attorney general, Mr Steve Clark, in Little Rock is that, since holes can be picked both in the theory of evolution as a conventional science and in creation science as a conventional religion, the two are "just as scientific" and "just as non-religious" as each other.

The American Civil Liberties Union (ACLU), which has filed the case against the state of Arkansas on behalf of several local religious groups and school teachers,has so far had no difficulty in generating substantial support, from both the legal and the scientific professions, in preparing its case. A prominent New York law firm for example has been providing free legal support — including extensive research and the services of eight back-up attorneys in Little Rock — which would normally cost many hundred thousand dollars.

"Next witness"

ACLU has received help and advice from between 60 and 70 scientists in preparing a brief. Among those called to the witness box who gave a vigorous defence of evolutionary theory and challenged the claims of creation science were Professor Francisco Ayala of the department of genetics at the University of California in Davis, a member of the new National Academy of Sciences committee; Dr Gary Dalrymple, a geologist who is an associate director of the Western region of the US Geological Survey; and Harvard evolutionary biologist and historian Dr Stephen Jay Gould.

In contrast, although the state attorney general's office is presenting a number of scientists to put the creationist interpretation of human origins, few have significant standing in the scientific community. Attorney General Steve Clark complained last Thursday that several scientists had refused to testify in defence of the new law, suggesting that they had been subject to "peer group pressure".

Not all creationists have been happy with the way that their case is being handled. Two of the more prominent attorneys associated with the creationist movement, constitutional expert Wendell Bird and Virginia attorney John W. Whitehead, complained that they had been excluded

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