Amino acids: Fixed in space?

In living systems, amino acids, the main building blocks of proteins, rotate light to the left, giving them a distinctive optical signature. In space, however, according to studies conducted after the Murchison meteorite crashed into Australia in 1969, amino acids are "racemized"—they rotate light in both directions to the same degree, canceling out optical activity. A persistent question has been: Why did biological systems on earth select the L-form rather than its optical twin, the D-form, which rotates light to the right?

Two scientists who have taken another look at an uncontaminated stone from the Murchison meteorite report that some of the amino acids also display the L-form. This could mean that when life evolved, L-forms were already preferred through extraterrestrial processes. Michael Engel of the Carnegie Institution in Washington, D.C., and Bartholomew Nagy of the University of Arizona in Tucson, describe their findings in the April 29 NATURE.

Part of the difficulty in studying amino acid components in meteorites is the danger that the porous meteoritic material is contaminated by terrestrial forms. Using a water extraction process slightly modified from that used during the original analyses in the early 1970s, the scientists found that the amino acid composition of the meteorite was similar to that reported previously, including the absence of four amino acids common on earth—an encouraging sign that the sample is uncontaminated.

The sample then was subjected to a test in which hydrochloric acid was used to extract the remaining amino acids, presumably those bound more tightly into the structure of the stone. This test, to the scientists' surprise, yielded more of the L-form amino acids than did the water extraction process — further proof that the optical bias of the molecules was determined in space.

"If it is proven that there is no contamination, this would be the first evidence of an inorganic reaction in space that forms optically active compounds," Engel says. Such a reaction, the scientist says, could occur during the synthesis of the amino acids or, perhaps, the racemized amino acids are preferentially destroyed later, resulting in the greater proportion of the L-forms.

An editorial in NATURE states that the authors "present a good case." However, the findings do complicate the pleasantly consistent picture of random, non-biologic processes. "In a non-biologic process, you'd expect to get racemic mixtures," says Keith Kvenvolden, an author of the original papers on racemization in the Murchison meteorite, and a consulting professor at Stanford University. "I believe their analytical work, but I don't understand the processes that the results imply." One question, Kvenvolden told SCIENCE NEWS, is why are some of the amino acids L-form and some racemic? The new findings would make more sense, he says, if all of the amino acids were L-form, or D-form, for that matter. "Whatever explanation applies to all of their results must be one of extreme complexity," he says. "Every amino acid should be telling you approximately the same story."

—C. Simon

Nitrite substitutes: Partial success

Several proposed alternatives to nitrite as a cured meat preservative look "promising," concludes a new National Academy of Sciences committee report, but all require further testing before they can be considered replacements. Nitrite, added to processed foods to prevent the growth of organisms causing spoilage and botulism, has long been implicated as a health risk. The NAS report, released last week, is the second half of a larger study prepared for the Food and Drug Administration and Department of Agriculture. The first part, completed in December (SN: 12/19&26/81, p. 390), summarized the health effects of nitrite and recommended that it be reduced in meat—but only when reduction would not compromise protection against botulism.

Because of the diversity of products containing nitrite—including bacon, ham, sausage, hot dogs and other cured meat and fish — testing of substitutes should proceed on a case-by-case basis, the committee recommends. Even if an alternative proves to be highly effective, small amounts of nitrite may still be needed to give meat the red color consumers expect. Among the specific alternatives considered were treating meat with ionizing radiation, which kills bacteria, adding non-toxic chemical compounds like potassium sorbate and sodium hypophosphite, and adding bacteria that lower pH, inhibiting botulism bacterial growth. All of these techniques have proved to be partially successful, but require further research.

In the meantime, the committee concludes the best way to reduce the health risk of nitrite is to prevent its conversion to nitrosamines, known laboratory animal carcinogens. To do this, nitrosamine conversion inhibiters, ascorbate (vitamin C) and α-tocopherol (vitamin E) should be added to bacon, it says, because bacon contains more nitrosamines than any other food product. Some vitamin C is currently used in bacon, but it does not dissolve well in the fat. Vitamin E, however, is very fat soluble and could enhance the effects of ascorbate in inhibiting the conversion. □

Interferon: More anticancer response

While interferon is no cancer panacea, it can counter some human cancers, a handful of clinical trials have suggested (SN: 6/7/80, p. 358). What's more, these effects are achievable whether interferon is from natural or synthetic (recombinant DNA) sources (SN: 4/3/82, p. 231). Now further evidence that natural or synthetic interferon has at least some human anticancer activity comes from the results of six National Cancer Institute-sponsored trials. The results were reported last week at the annual meetings of the American Society of Clinical Oncology and the American Association for Cancer Research in St. Louis, Mo.

John R. Neefe and colleagues of Georgetown University School of Medicine tested leukocyte interferon from natural sources on 33 patients with advanced cancers who had received prior chemotherapy alone or in conjunction with radiation therapy. Two patients experienced a reduction in tumor size. Leukocyte interferon made by recombinant DNA, in contrast, was tested on 81 patients with various types of cancers for whom no cure existed, by Stephen Sherwin of the NCI-Frederick Cancer Research Facility in Frederick, Md., and colleagues. Nine patients had a decrease in tumor size. Similarly, leukocyte interferon made by recombinant DNA was tested on 52 patients with various cancers that had not responded to standard treatments or with cancers for which there was no cure. R. D. Leavitt of the University of Maryland Cancer Center in Baltimore and co-workers reported that seven of the patients experienced tumor regression. In one of them, two of three tumors regressed completely.

Still another kind of interferon — lymphoblastoid — from natural sources was tested on cancer patients by John Laszlo of Duke University Medical Center in Durham, Gregory Sarna of the University of California at Los Angeles and James Knost of the NCI-Frederick Cancer Research Facility. Of the 31 patients tested by Sarna and colleagues, four had a decrease in tumor size. Of the 20 studied by Knost and of the 17 studied by Laszlo, two showed decreases.

All of the trials were preliminary Phase I trials, designed to determine the dosage as well as schedule of administration at which interferon is most effective against cancer. Scientists will now test what appear to be the most effective doses and schedules of administration for interferon in Phase II trials to determine for how long interferon can induce tumor regression and whether interferon can increase patient survival. Two other interferons — gamma and fibrolast — will also soon be tested against cancer in NCI Phase I trials.

—J. A. Treichel