Mixed news on hair dyes and cancer risk

In this era of cancer scares at every turn, a new study offers women mostly reassuring news about the cancer risk of hair dyes.

The large study finds that most women who use permanent hair coloring do not face an increased risk of fatal cancers. The research does, however, uncover a link between very prolonged use of black hair dye and two immune system cancers.

Hair colorings contain substances similar to the chemicals in coal tar that cause cancer in laboratory animals. Yet studies of the link between hair dyes and human cancer have proved inconclusive.

Most previous research efforts involved asking volunteers who already had cancer about their hair-coloring habits, a retrospective approach that can skew findings. Furthermore, past studies often focused on a small number of participants and thus lacked the statistical muscle to pick up an association between hair coloring products and malignant tumors in a specific subgroup.

To help get a clearer idea of cancer risk, Michael J. Thun of the Atlanta-based American Cancer Society and his colleagues embarked on a large-scale prospective study that queried healthy women about their use of permanent hair dye. The researchers collected information on 573,369 women enrolled in a study of cancer mortality. About one-third of the women used permanent hair dye, the investigators reported in the Feb. 2 JOURNAL OF THE NATIONAL CANCER INSTITUTE.

A statistical analysis revealed that women who reported any use of permanent hair-coloring products actually showed a slightly lower risk of all fatal cancers than women who had never used such dyes. That finding underscores the belief that such products generally do not increase the risk of cancer, Thun says.

"I think we can rule out hair dyes as a major [cancer] concern," adds epidemiologist Graham A. Colditz of the Harvard Medical School and Brigham and Women's Hospital in Boston. Colditz wrote an editorial accompanying the new study.

These data are "reassuring," comments epidemiologist Shelia Hoar Zahm of the National Cancer Institute in Bethesda, Md. However, Zahm is quick to point out that this new study does add to evidence suggesting that hair colorings can pose specific cancer risks to a select group of women.

For example, Thun and his colleagues found that, compared to women who didn't color their hair, women who used permanent black hair dye for 20 years or longer ran about a four times greater risk of dying from non-Hodgkin's lymphoma, a cancer of the lymph tissue, or multiple myeloma, a malignancy of the bone marrow cells that produce antibodies.

That finding is consistent with an earlier study by Zahm and her colleagues. The team found that using hair-coloring products (particularly the darker colors) heightened a woman's risk of developing non-Hodgkin's lymphoma and multiple myeloma. That study, in the July 1992 AMERICAN JOURNAL OF PUBLIC HEALTH, revealed that semipermanent hair coloring products also raise the risk of such immune system cancers.

It could be that dark hair dyes contain higher concentrations of mutagenic chemicals and thus are associated with a greater risk of these specific cancers, Zahm notes. The skin absorbs the chemicals in hair colorings during the application process, she adds.

Another hint that hair-coloring products may lead to non-Hodgkin's lymphoma — and certain other cancers — comes from a study of hairdressers conducted by epidemiologist Paolo Boffetta of the International Agency for Research on Cancer in Lyon, France.

Boffetta's team studied the incidence of non-Hodgkin's lymphoma and ovarian cancer among women who worked as hairdressers in four European countries. The team discovered no overall pattern of risk; however, Danish hairdressers had an increased risk of both ovarian cancer and non-Hodgkin's lymphoma. Boffetta and his co-workers report their findings in the January JOURNAL OF OCCUPATIONAL MEDICINE.

Still, the evidence that on-the-job exposure to hair dye boosts the risk of such cancers remains far from conclusive, Boffetta says.

The full story of cancer risk and hair-coloring products remains of considerable importance to people who work in beauty salons and to women who rely on such products, Zahm says. "We have an exposure here that we know is carcinogenic in animals," she says. "We need further research." — *K.A. Fackelmann*

Atlantic current gives climate the shakes

The mammoth ocean current that keeps Europe warm in today's world may have sped up and stalled repeatedly 130,000 years ago, sending the planet through a malaria-like series of alternating fevers and chills. These conclusions, drawn from computer simulations of the ocean, suggest that global warming could prompt similar rapid current fluctuations that would destabilize the climate.

Oceanographers describe the North Atlantic Deep Water current as a conveyor belt that transports heat around the globe. The current carries warmth from the tropics north toward Iceland. There the water cools and sinks, releasing tremendous amounts of energy that keep Northern Europe much warmer than land at the same latitude elsewhere. The cold water formed this way then travels south and eventually into the Pacific.

Andrew J. Weaver and Tertia M.C. Hughes of the University of Victoria in British Columbia used a model of the world's oceans to study how shifts in climate affect the strength of the North Atlantic conveyor, which today has a flow rate roughly 50 times that of the Amazon, the world's largest river.

Weaver and Hughes found that the conveyor can run at three different speeds: extremely slow, fast, and at its present rate, which falls in the middle. Under today's conditions, the modeled current displays stable behavior because it does not jump between different speeds when scientists tweak the climate slightly.

But when Weaver and Hughes simulated a warmer climate, the stable system broke down. To mimic balmier global conditions, the researchers increased the rates of evaporation and rainfall in the model and allowed these processes to fluctuate. Such changes in the water cycle caused the conveyor current to switch wildly between slow, medium, and high speeds, they report in the Feb. 3 NATURE.

These results are important because they offer a potential explanation for rapid climate flip-flops that researchers believe happened during the Eemian stage — the period preceding the most recent ice age. In general, the Eemian climate was warmer than today's. But scientists studying ice cores drilled in Greenland recently found evidence that the Eemian climate was unstable, with temperatures swinging up and down by as much as 14°C in the span of a few decades.

In the past, researchers studying the ice ages have suspected that the large ice sheets in North America and Europe helped drive rapid climate shifts. But the glacial sheets did not exist during the warm Eemian, so experts have had to look elsewhere to explain the fast changes then. Weaver and Hughes suggest ocean currents can provide the answer.

In the same issue of NATURE, Wallace E. Broecker of the Lamont-Doherty Earth Observatory in Palisades, N.Y., urges further study of instabilities in the conveyor current because global warming threatens to push temperatures into the same range as during the Eemian.

But Broecker also cautions that the story may be more complex than first appears. Recently, a second research group working in Greenland has questioned the evidence for climate instability during the Eemian, raising the possibility that temperatures did not fluctuate wildly during this period (SN: 12/11/93, p.390).

A report in the Jan. 28 SCIENCE adds yet another twist. Scientists studying Greenland ice have long thought that rapid temperature changes occurred during the last ice age. Christopher D. Charles of the Scripps Institution of Oceanography in La Jolla, Calif., and his colleagues now challenge that interpretation.

To gauge how Greenland temperatures fluctuated thousands of years ago, researchers traditionally analyze the ratio of two oxygen isotopes in the ice, which is thought to reflect the temperature of precipitation. Charles tested that assumption by using a supercomputer to simulate atmospheric flow and precipitation during the last ice age. The study showed that temperature changes account for only part of the isotopic variations; shifts in the direction of air currents also alter the isotopic ratio.

Charles and his colleagues thus suggest that the isotopic blips during the ice age largely reflect changes in atmospheric flow patterns spurred by waxing and waning of the glacial sheets in North America and Europe.

Charles' findings offer potential comfort for those concerned about rapid climate changes. "If these dramatic changes depend on ice sheets being around, then we don't need to worry about them," says Charles. For now, however, he notes that the question of rapid climate shifts requires more study. — *R. Monastersky*

Experts debate merits of radiation studies

At two congressional hearings in the past two weeks, researchers, federal officials, and people believed to be victims of government-sponsored radiation experiments gave conflicting testimony on the value of the studies, carried out from the mid-1940s to the mid-1970s.

At a Senate hearing Jan. 25, Energy Secretary Hazel R. O'Leary said the Clinton administration's panel investigating the studies will have an interim report on its findings by July 15. The President asked the group to find out whether the research had a clear medical or scientific purpose, included appropriate follow-ups, and met the ethical standards of its day and of today. O'Leary initiated an investigation in December after learning about the federally supported radiation experiments (SN: 1/15/94, p.39).

Some scientists conducting the studies neglected to tell those studied that they would be exposed to radiation, according to experts testifying about the research. But the ethical lapses went beyond failure to provide informed consent, physician David Egilman of Brown University in Providence, R.I., said at a hearing of the House subcommittee on energy and power on Jan. 18. Egilman has studied the history of the radiation experiments.

One study he said fell short of the ethical standards of its time examined how the body retains and excretes plutonium. Although it would provide no medical benefit, scientists injected plutonium into 18 terminally ill patients. Only two patients knew they were being exposed to radiation, said Patricia W. Durbin, who worked at the Energy Department's Lawrence Berkeley (Calif.) Laboratory.

The average dose amounted to nine times the quantity allowed workers by federal regulations, she said. The radiation may have damaged one subject's bones, but none of the subjects died from plutonium exposure, she testified. In fact, nine of the subjects in the study, conducted from 1945 to 1947, lived considerably longer than expected.

Egilman, however, said the medical records reveal that not all of the patients were terminally ill. Moreover, the study had many errors and "didn't provide meaningful information," he asserted.

But Durbin and health physicist Kenneth L. Mossman of Arizona State University in Tempe testified that this experiment, like most of the other radiation studies, provided considerable data for current radiation exposure standards.

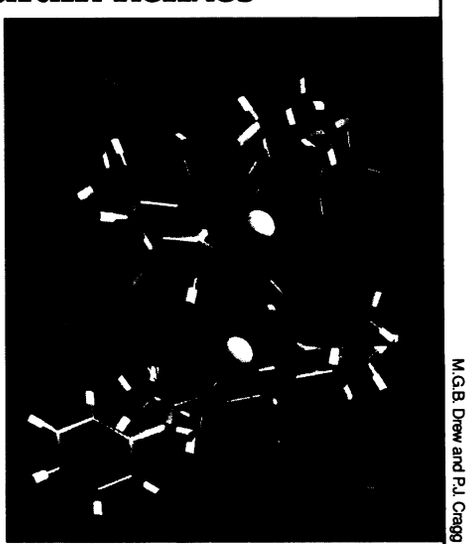
Others at the hearing testified that while the plutonium may not have killed any participants, in some cases it made their lives miserable. Elmerine Allen Whitfield said doctors injected her father's injured leg with plutonium and, for reasons that are still unclear, amputated it three days later. Her father, Elmer Allen, often suffered seizures and other illnesses during the 44 years he lived after the injection, she said, though no one has directly linked the two.

Sen. John Glenn (D-Ohio), who chaired the Jan. 25 Government Affairs Committee hearing, asked witnesses what laws nowadays would bring "a rogue operator" doing improper research "before the bar of justice." No one knew, so the committee is now looking into whether a law with criminal penalties is needed to govern human experimentation, a Senate staffer told SCIENCE NEWS.

Coincidentally, shortly before Glenn's hearing, the Jan. 15 newsletter SCIENCE AND GOVERNMENT REPORT revealed that the National Institutes of Health is helping to finance vaccine trials in Europe that would be forbidden in the United States. In these studies, designed to test the efficacy of new vaccines against pertussis, or whooping cough, 10 to 25 percent of the child volunteers do not receive the pertussis vaccine.

The trials do meet the legal standards of the two European countries, says David L. Klein, who heads the project. But in the United States, researchers would have provided the new or old vaccine to all volunteers. — *T. Adler*

Self-assembly for sodium helixes



M.G.B. Drew and P.J. Cragg

The elegant, sinuous coils of the DNA double helix now rank among biology's most familiar images. The helixes show that naturally occurring large molecules can indeed assemble themselves from smaller ones.

The image above shows a synthetic, self-assembling double helix based on sodium. Designers Thomas W. Bell and Hélène Jousselin, both chemists at the State University of New York at Stony Brook, tell how they made this molecule in the Feb. 3 NATURE. "This is the first molecule known to form double-helical complexes with alkali-metal ions" such as sodium, they explain.

The winding molecule is made up of pyridine rings joined by bridges of ethylene. The pyridine rings and ethylene bridges alternate, almost like steps on a spiral staircase. That the rings fall so comfortably together into this coiled shape depends on each ring's specially tailored geometry.

"We want to understand why certain molecular interactions favor self-assembly," says Bell. "Very little is known about this process, which is fundamental to life — for instance, how one small molecule's structure controls the gross structure of a large molecule. If we can understand that process, then maybe we can design large molecules by making small ones with the information necessary to control self-assembly."

The coils' ability to channel ions, too, has Bell thinking they might prove useful in biology. "If we can make organic molecules that self-assemble into ion channels able to span biological membranes, then maybe we can kill bacteria, make new antibiotic drugs, or find other uses in pharmacology."