Biomedicine

Panel clears testing of Lincoln's DNA

Abraham Lincoln's tall, spindly stature and mildly deformed chest have led some modern-day scientists to suspect that he suffered from a genetic condition called Marfan's syndrome. This connective-tissue disorder, which afflicts more than 40,000 people in the United States, can lead to an elongated skeleton, eye abnormalities and a potentially lethal heart defect (SN: 8/4/90, p.79). This month, an ethics committee gave researchers the go-ahead to extract DNA from Lincoln's remains in an attempt to resolve the historical enigma.

"Careful investigation of whether Mr. Lincoln had Marfan's syndrome may help counter problems of genetic discrimination in our society and will enhance the self-esteem [of persons with the disorder]," says geneticist Victor A. McKusick, who headed the nine-member ethics panel. The National Museum of Health and Medicine, in Washington, D.C., set up the panel last February to consider a physician's request to test samples of Lincoln's DNA for Marfan's. The museum's collection includes small samples of blood, bone and hair removed from Lincoln's body during autopsy.

McKusick, of Johns Hopkins University School of Medicine in Baltimore, says the potential for public good outweighs any ethical reasons to prohibit the proposed tests. Because Lincoln has no living descendants, the tests would not violate anyone's privacy, nor would they precipitate a rash of genetic testing of other public figures, living or dead, McKusick asserts.

Ethicist Arthur Caplan disagrees with the panel's conclusion, arguing that public curiosity isn't sufficient reason to examine Lincoln's DNA. Genetic testing without explicit permission from the subject of the test sets a dangerous precedent, says Caplan, of the University of Minnesota's Center for Biomedical Ethics in Minneapolis.

At present, geneticists have no test for the Marfan's gene, but Darwin J. Prockop — who made the original request for Lincoln's DNA samples — says he and others are very close to pinpointing the gene's location. Prockop, of Jefferson Medical College in Philadelphia, expects a genetic test — and an answer to the Lincoln question — to become available within two years.

Fluoridation level linked to fractures

Physicians often prescribe fluoride and calcium to help restore some of the bone mass lost in osteoporosis. Some researchers suspect, however, that the new bone growth may be abnormally brittle (SN: 1/21/89, p.36). Now, epidemiologists add weight to that concern with a report that women over 55 who drink highly fluoridated water are more prone to fractures.

In 1983 and 1984, MaryFran R. Sowers of the University of Michigan in Ann Arbor and her colleagues measured the bone density of more than 800 women, aged 20 to 80, in three Iowa communities with different levels of calcium and fluoride in their water supplies. Five years later, the researchers again measured bone density in most of the women and counted the number of bone fractures suffered since the initial tests.

One community, serving as a basis for comparison, had moderate fluoride and calcium levels in its drinking water. Another had EPA's maximum allowable fluoride level of 4 parts per million — four times that in the comparison community. The third community's water contained more than five times as much calcium as that of the comparison community.

Calcium made no difference in fracture risk, the team reports in the April 1 AMERICAN JOURNAL OF EPIDEMIOLOGY — but postmenopausal women drinking the higher-fluoride water faced more than double the fracture risk of their counterparts in the comparison community.

Physicians treating osteoporosis should be aware of a possible "margin of safety" beyond which fluoride therapy may become counterproductive, says Sowers.

Physical Science

Ivars Peterson reports from Baltimore at the Conference on Lasers and Electro-Optics and the Quantum Electronics and Laser Science Conference

Repeated zapping to melt aluminum

A close look at an integrated-circuit chip reveals an extensive web of "wires" — normally seen as a patterned metal film — linking the circuit's various components. Modifying this pattern by deleting wires or making new connections normally requires melting the metal film at certain points, but that process often causes additional damage that can destroy the circuit. Now, however, such damage can be avoided by using a string of low-power laser pulses instead of a continuous, high-power laser beam to do the melting, say researchers at the MIT Lincoln Laboratory in Lexington, Mass.

Experiments by Simon S. Cohen and his collaborators demonstrate that the cumulative effect of repeated, short laser pulses — each one too low in power to cause melting by itself — will melt a hole in a thin layer of aluminum. Although a pulsed, low-power beam delivers less total energy to the metal surface than a high-power laser beam that continually illuminates the surface, it achieves the same result.

This unexpected behavior results from the stresses caused by the subtle heating effects of each low-power laser pulse, the researchers say. In the same way that repeated bending can break an otherwise durable paper clip, these cumulative, heat-induced stresses produce metal fatigue, allowing melting to occur more readily. When applied to modify the wiring on chips, repeated, low-power pulses not only reduce the laser power necessary to make the changes but also cause considerably less peripheral damage than conventional methods, the researchers say.

Fragments of irradiated crystals

Lithium niobate is an example of a photorefractive crystal — one of a remarkable group of materials that can change their optical properties in response to the very light that passes through them. Widely used for fabricating devices that serve as the optical counterparts of transistors and switches, crystals of lithium niobate are now in great demand. But difficulties encountered in machining and processing the crystals by mechanical or chemical means, and uncertainties about their susceptibility to damage by high-intensity lasers, have persuaded researchers to examine more closely how lithium niobate responds to intense, ultraviolet laser light.

Kai Tang and his co-workers at Vanderbilt University in Nashville, Tenn., studied the effects of intense pulses from a xenon chloride laser focused on the polished surface of a lithium niobate crystal. Their experiments showed that such irradiation forced the ejection of many different types of atoms, ions and molecules, with the proportion of each chemical species dependent not only on the laser intensity, but also on whether a given spot had been previously irradiated.

In particular, the researchers discovered that low laser intensities generated significant amounts of neutral lithium niobate molecules. In principle, the resulting molecules could then be used for growing thin films of lithium niobate.

Developing a photorefractive polymer

Researchers at the IBM Almaden Research Center in San Jose, Calif., have developed the first polymer exhibiting the photorefractive effect. Like a crystal of lithium niobate, this new material responds to light by altering its refractive index, which affects how light propagates through the material. The polymer itself consists of a mixture of a new type of epoxy and an organic material often used in photocopiers.

Because photorefractive polymers should be cheaper than photorefractive crystals, more easily shaped and more readily tailored to have specific characteristics, these novel materials may allow the development of holographic data storage and new coatings that protect sensors from laser damage.