Gene Samples From an Extinct Animal Cloned

The last quagga grazed the South African steppes more than a century ago. But the now extinct zebra-like animals left a legacy of their DNA. Muscle tissue taken from a salt-preserved pelt in a German museum has now yielded gene fragments that can be purified and reproduced for biochemical study. This discovery is expected to provide a new tool to determine evolutionary links between living and extinct species.

Scientists have also extracted—but not yet analyzed—small amounts of what appears to be the original DNA from a frozen mammoth found in the Soviet Union.

The quagga analysis—the first analysis of genes of an extinct species—indicates that the quagga and mountain zebra shared a common ancestor about 3 million years ago, says Allan Wilson of the University of California at Berkeley. His co-worker, Russell Higuchi, reported at a meeting this week that two gene fragments obtained from the quagga muscle differ from their counterparts in zebra in about 5 percent of the information-carrying subunits. In less than a fifth of these changes would the difference produce an alteration in the gene's protein product. Wilson says these results fit rather well with some other estimates of the quagga-zebra relationship. The scientists are currently analyzing equine genes to see also how closely the quagga is related to the horse.

Wilson and his collaborators used enzymes to release the DNA fragments from the preserved muscle, then purified the DNA and made multiple copies in bacteria. They have a total of about 25,000 such clones. They looked first at genes found in the mitochondria, rather than in the nuclei, of cells because Wilson has found these genes to be especially useful in evolutionary studies (SN: 8/13/83, p. 101). The gene fragments were detected by their binding to similar stretches of DNA taken from zebra mitochondria. The scientists chose to first analyze quagga fragments that bind to two known zebra mitochondrial genes — the gene for cytochrome oxidase subunit one, a key protein in the electron transport chain, and URF1, the gene for a protein of unknown function but thought to be located in the mitochondrial membrane. In each case the quagga fragment, a little more than 100 subunits long, represents less than 10 percent of the intact gene.

A wide variety of preserved animal tissue may be amenable to this type of analysis. "Some preserved animal skins are okay; others are not," Wilson says. He and his colleagues failed to find DNA in another quagga skin, which was tanned rather than only salt-preserved, but they got "terrific" results from an American bison skin that had been in a museum for more than 100 years.

In Wilson's frozen mammoth study, while most of the DNA isolated is due to bacterial contamination, some small pieces of DNA have been shown to specifically bind, and thus be closely related to, DNA of elephants. Wilson also hopes to obtain DNA from samples of an extinct bison recently discovered frozen in Alaska.

The scientists speculate that their work may open the way to recovery of intact genes from muscles, bones and teeth of animals that died out millions of years ago. But because only a small fraction of the millions of gene-sized pieces of DNA from any extinct species is likely to be preserved, and because of current technological limitations, they believe the possibility of actually bringing ancient species "back to life" is extremely remote.

—J.A. Miller

Industry gene-splice field tests approved

A major federal advisory committee voted last week unanimously to approve two field experiments involving the release of recombinant DNA by biotechnology companies. This decision of the National Institutes of Health Recombinant DNA Advisory Committee (RAC) now awaits review by the director of NIH.

One experiment, planned by Advanced Genetic Sciences of Greenwich, Conn., is very similar to the University of California field test prohibited by a federal court last month (SN: 5/26/84, p. 325). The University of California work is supported in part by the company. In the experiment, bacteria lacking a gene required for ice crystallization are to be sprayed on young plants growing in an isolated two-tenths-acre plot. These bacteria are expected to reduce damage caused by light frost.

The other field test approved, discussed only in a closed session, involved disease-resistant plants developed by the Cetus Madison (Wis.) Corp.

The court decision last month issued a temporary injunction on the University of California field test and on any further NIH approvals of experiments involving deliberate release by NIH-funded scientists of genetically engineered organisms. The court cited the National Environmental Policy Act (NEPA) in requiring NIH to write an environmental impact statement on their activity approving deliberate release experiments.

But the court ruled that the injunction does not apply to NIH's review of private companies' experiments because no federal funding is involved, NIH lacks regulatory authority over the companies and the submission process is voluntary.

Jeremy Rifkin, who as director of the Foundation on Economic Trends filed the federal suit, subsequently asked NIH to postpone any approvals of private deliberate release experiments.

"Are we going to have two standards, one for universities and one for private industry?" Rifkin asked at last week's meeting, calling the possibility "capricious" and "inequitable."

On the other hand, Harvey S. Price of the Industrial Biotechnology Association headquartered in Rockville, Md., told the committee that complying with NEPA can lead to "overly elaborate procedures." He states, "... I believe that NIH should resist the temptation to apply that statute's [NEPA's] often-strangling formalities to areas where it is expressly inapplicable."

Chairman of the RAC, Robert E. Mitchell, a Norwalk, Calif., lawyer, responded that the court was very clear that approval only of NIH-funded deliberate release experiments was prohibited. Mitchell also said that the injunction was against approving final action, whereas RAC decisions are only advisory. "The director [of NIH] will have to decide what final action he will take," Mitchell says.

Tackling another controversial topic earlier in the day, the RAC approved (with none opposed and one abstention) a proposal for experiments on a bacterial toxin called Shiga-like toxin. Earlier this year, on the basis of new information on the toxin and the bacteria that produce it, scientists at the Uniformed Services University of Health Sciences in Bethesda, Md., requested that they be allowed to work under the less elaborate P2 safety conditions, rather than P4, which had been stipulated in 1982. RAC voted to approve that work in February (SN: 2/11/84, p. 84), but the NIH director did not accept the recommendation because the RAC vote did not represent a clear consensus.

However, at last week's RAC meeting, the committee overwhelmingly approved a compromise request: that the scientists be allowed to conduct their experiments under P3 conditions, which could be lowered to P2 as specific criteria during the research are met. Rifkin has opposed this research because he believes it might be used for biological warfare. *—J.A. Miller*