dently, Harry Orr and Heston at the University of Minnesota are beginning to look at chromosome 21 for an Alzheimer's gene marker. Many people with Down's syndrome get Alzheimer's disease, and Down's syndrome is caused by an extra copy of chromosome 21. "We have blood samples from members of five high-risk families," says Heston. "We will just have to plug away." Gusella has cell samples from members of six large high-risk families that are being followed by Polinsky and Nee at NIH.

Investigators are now trying to find genetic markers near the gene for Alzheimer's disease.

If most cases of Alzheimer's disease are in fact inherited, what advice can researchers give to concerned family members? First of all, says Donald Price of Johns Hopkins University Medical School, it is no surprise to members of many families that the disease may be inherited. Price, who is collaborating with Polinsky and Nee, says, "as our work on Alzheimer's disease got publicity, people began to write to me. Over the years, I must have gotten thousands of inquiries. Some included really striking pedigrees. These people were saying, 'This disease seems to be in our family. What are the risks to me and my children?' "

Price advises these people that, even if they are at risk, they may not live long enough to get the disease. Folstein makes the same point. "Because the probability is low that people will live to be very old, the individual risk to a brother or sister or child of an Alzheimer's patient is still very low—in the realm of 17%."

All the researchers involved in this search for an Alzheimer's disease gene say that the basic message to relatives of Alzheimer's patients is a hopeful one. If a gene is found, it will most likely lead to a fundamental understanding of what causes the disease. From there, it is at least conceivable that researchers can devise treatments or even means of prevention. ■ GINA KOLATA

This is the second in a series of articles on the development of genetic tests to determine susceptibility to disease. The first article appeared in the 18 April issue.

ADDITIONAL READING

J. C. Breitner and M. F. Folstein, "Familial Alzheimer dementia: A prevalent disorder with specific clinical features," *Psychol. Med.* **14**, 63–80 (1984).

Briefing:

Mountain Goat Horn: A Clue to Extinction?

The precipitous collapse of the last glaciation, a little more than 10,000 years ago, coincided with the extinction of 57 species of large mammal in the Americas. The conclusion that the events were causally related is clearly very attractive, and has a good deal of support among paleobiologists. But the extinctions also coincided with the first thoroughly documented appearance of the so-called Clovis big game hunters. And this correlation encouraged other paleobiologists, Paul Martin of the University of Arizona most prominent among them, to suggest that the extinctions had been man-made. The debate has continued and developed over several decades.

Martin, together with seven colleagues from the University of Arizona and Northern Arizona University, has just produced a new set of data that, he contends, further strengthens the case in favor of man-made extinction. These data include new carbon-14 dating results on horn sheaths of Harrington's mountain goat, *Oreamnos harringtoni*, from several caves in the Grand Canyon.

The last of these goats apparently lived in the canyon a little more than 11,000 years ago, which makes their disappearance contemporaneous with that of the famous Shasta ground sloth, *Nothrotheriops shastensis*. Remains of these two very different animals—one an agile and gregarious grazer, the other a ponderous and nonsocial browser—are to be found in the same caves. In addition, the goat probably originated in holarctic latitudes while the sloth is a creature of the neotropics.

"Given these differences," note Martin and his colleagues, "one might expect that under natural stress, such as that imposed by severe climatic change, the two species would not disappear at the same time. A climatic change inimical to one might well favor the other, at least initially. Instead, our findings suggest concurrent loss."

Both the environmental and the human-impact hypotheses for the large mammal extinctions face problems of one sort or another. For Martin and his school there is the embarrassing fact that, although 57 species of mammal are supposed to have died at the hand of man, there are very few cases of remains of the putative victims in direct association with spear and arrow points of the Clovis hunters.

Martin argues that this is simply the result of the statistics of preservation under catastrophic conditions. The impact was so sudden that the chances of finding a "kill" are remote, he says. The argument is similar to the one over the absence of dinosaur remains at the very edge of the Cretaceous/Tertiary boundary. Some say this shows that the dinosaurs were extinct before the boundary event (comet impact?), while others suggest it is simply a matter of sampling statistics.

In the absence of a convincing smoking gun, Martin's only recourse is to produce more and more evidence of the contemporaneous disappearance of ecologically disparate creatures. The new data on the Harrington's mountain goat provide such evidence.

The dating was done using the tandem accelerator mass spectrometer, which has the disctinct advantage of requiring less than a gram of test material. Conventional carbon-14 dating techniques typically consume several grams of test material, which for many museum specimens represents too big a sacrifice. The Harrington's mountain goat material used in the recent tests was from the remarkably preserved horn sheaths, which are keratinous and ideally suitable for carbon dating. The dry conditions of many of the Grand Canyon caves has provided favorable conditions of preservation, so that in some cases the horn sheath is still attached to the skull (see photograph).

Horn sheath and skull

A leading proponent of the environmental hypothesis, Ernest Lundelius, of the University of Texas at Austin, considers this latest paper by Martin and his colleagues to be "significant and important," not because it solves the debate, but because it provides the kind of precision in dating that will be required if a resolution is ever to be reached. ■ ROGER LEWIN

ADDITIONAL READING

R. Lewin, "What killed the giant mammals?", *Science* **221**, 1036 (1983).

J. I. Mead *et al.*, "Extinction of Harrington's mountain goat," *Proc. Natl. Acad. Sci. U.S.A.* **83**, 836 (1986).