tant, Goldman says, improvements need to be made in the peptide delivery system that carries the drug into the bacterial cell. Because the inhibitor does its duty *inside* the bacterium, but is itself incapable of penetrating the bacterial membrane, it requires a carrier molecule to get it across. Currently, researchers are binding the drug to tiny peptides that are naturally capable of crossing that membrane. Once inside the bacterium, intracellular enzymes cleave the molecular complex, releasing the drug.

"The peptide gets the compound in sort of like the Trojan horse, and then you clip off those amino acids to release that warhead molecule," Goldman says. However, the carrier peptides now being used do not penetrate all gram-negative bacteria equally well. So although all gram-negative bacteria contain CMP-KDO synthetase — and are theoretically susceptible to the enzyme inhibitor — not all of them are equally vulnerable to the invading antibiotic. Other peptide carriers may prove more invasive for a broader spectrum of bacteria.

A second problem is that peptide carriers tend to be very short-lived in the human body. Improvements are needed, Goldman says, "so that the compounds will stay around long enough to do their job." — *R. Weiss*

Alzheimer's update

As recently as March of this year, genetic studies were pointing to the likelihood that a single genetic defect responsible for overproduction of amyloid protein in the brain might be the cause of the hereditary form of Alzheimer's disease (SN: 3/21/87, p.188). Two new studies, however, provide strong evidence that the gene coding for amyloid production is not the same gene that is responsible for the hereditary form of Alzheimer's — even though the genes are neighbors on chromosome 21, and even though the two syndromes often coexist.

The two multicenter international studies, one led by C. Van Broeckhoven from the University of Antwerp, Belgium, and the other by James F. Gusella from Harvard University, followed familial inheritance patterns of the two syndromes using new genetic markers. Their findings, reported in the Sept. 10 NATURE, suggest that the two genetic defects are inherited independently.

Although the studies don't rule out some kind of link between amyloid plaques in the brain and Alzheimer's disease, the direction of causality remains unclear. It's likely, two of the researchers told SCIENCE NEWS, that either syndrome can be caused by any of a number of genetic or environmental factors.

"It's a very heterogeneous disease," one researcher sighs. "Talk to me again in about a year." □

Seeking aneutronic nuclear fusion

"Aneutronic" is a word that has not yet made its way into the dictionaries. It refers to processes of thermonuclear fusion that produce few or no neutrons. In energy-producing fusion reactors, aneutronic processes would have advantages in both safety and in ease of gathering the energy released. However, this breed has had low priority in the fusion research program funded for the last 40 years by the Department of Energy (DOE) and its predecessors. Now something of a push toward them seems to be developing.

Last week, the Committee on Advanced Fusion Power of the National Research Council's Air Force Studies Board issued a report advising the Air Force that research on aneutronic fusion processes is worth supporting as a possible answer to Air Force requirements both for electric current and for propulsion. As the report was issued, many of the interested scientists were gathered at the International Symposium on Feasibility of Aneutronic Power, meeting at the Institute for Advanced Study in Princeton, N.J.

The report was generally well received, although some people, particularly Bogdan Maglich of AELabs in Princeton, thought it too pessimistic in predicting how many years it would take to bring about practical aneutronic reactors.

Conventional fusion requires confining atomic nuclei at high density and high temperature. The easiest conditions of confinement and temperature, and therefore the ones sought first by the mainstream fusion program, are those for fusion of deuterium and tritium. However, the energy released in such a fusion is carried away by neutrons — dangerous, penetrating particles, which will yield their energy only by the inefficient means of heating something.

But in an aneutronic reaction (for example, deuterium and helium-3), the energy comes off with protons. Protons can be converted directly into electric current, or they can generate power in the form of radio waves. Protons are not very damaging or dangerous and so minimal shielding is necessary. However, in the jargon of the DOE, these substances are called "advanced" fuels, because the confinement and temperature conditions necessary for them go beyond those for deuterium-tritium.

Proponents of aneutronic fusion say that to the DOE "advanced" means far in the future or even in the hereafter. But Bruno Coppi of the Massachusetts Institute of Technology argues that experimentation with deuterium and helium-3 could be done in some current mainstream experiments — MIT's Alcator, for example. "You could make with today's technology an experiment that burns deuterium and helium-3," he says. However, it lacks funding. Quoting the Swedish physicist Hannes Alfvén, one of the grand old men of this kind of physics, Coppi says that there seems to be "a conspiracy not to do fusion."

Instead of depending on more or less random encounters of nuclei that have been heated to overcome their repulsion for one another, as the mainstream experiments do, aneutronic systems like Maglich's "migma" use the principle of colliding beams, directing the nuclei into intersecting orbits, where they are more likely to encounter each other. "Our position is that the whole concept of heating to achieve collisions is obsolete," he says.

The most recent migma experiment, Migma III, achieved confinement conditions that rival those of conventional experiments, and did it without the disruptive instabilities that plague conventional experiments (SN: 3/9/85, p.151). Migma IV, to be built in Palatka, Fla., in collaboration with the University of Florida at Gainesville, will attempt to increase the density of nuclei in the center of the experiment to 300 billion, 10 times that of Migma III, reaching the "space-charge limit," the point where electric repulsions will prevent further crowding. It will test whether neutralizing some of the charge by introducing electrons will permit higher densities, and it will also test predictions that the resulting plasma should be stable under these conditions.

If deuterium-helium-3 fusion works out as a source of power, it will require a continuing supply of helium-3. (Deuterium can be obtained from sea water.) Although helium-3 is rare on earth, George Miley of the University of Illinois in Urbana-Champaign notes that it is "one of the most plentiful fuels we can find in the universe." But we will have to go off the earth to get it.

On earth, the immediate source is radioactive decay of tritium, a by-product of nuclear fission reactors. According to Miley and the National Research Council, by the year 2000 we can obtain about 600 kilograms of helium-3 from tritium decay. This would run a 200-megawatt power plant for 20 years, "not enough for an economy," says Miley.

Scientists would have to go to the moon and mine helium-3, which the solar wind generates on the lunar surface. Ultimately, when space travel is sophisticated enough, says Miley, we could get it from Jupiter. — *D. E. Thomsen*