of animal feed derived from animal carcasses and require cattle slaughtered for food to be no older than 30 months, "already take into account the possibility of subclinical infection," says Smith. He notes that previous studies have turned up no evidence that pigs and chickens are infected with BSE.

Although Smith thinks the findings might raise a warning flag, he too believes the media went overboard. But he's not surprised. "Anything that has BSE attached to it is going to produce a big media response," he says.

–MICHAEL BALTER

DEVELOPMENTAL BIOLOGY

Brain Cells Turning Over a New Leaf

Many of us may pine for our lost youth, but we know we can't turn back the clock. Biologists had long assumed that the same is true in development—that once a cell becomes committed to a particular fate, it can't reverse its tracks and become something else. A spate of recent work seems to have turned this biological dogma on its head, however. New findings described on page 1754 offer the strongest evidence yet that certain cells can be steered onto new career paths after all.

Previous reports that adult cells can be reprogrammed have been dogged by the question of whether scientists had really tapped a cellular fountain of youth or whether immature cells hiding in their culture dishes gave rise to unexpected cell types. In the current work, Toru Kondo and Martin Raff of University College London, managed to coax rat oligodendrocyte precursor cells (OPCs), which scientists thought were irreversibly committed to becoming neuronal handmaidens called oligodendrocytes or astrocytes, into becoming neurons. Because Kondo and Raff ran several experiments to test the purity of their well-characterized OPCs, they say it is unlikely that the effect was due to undetected immature cells.

"Until recently in most people's minds, there was no reverse arrow" for OPC development, says stem cell researcher Ron McKay of the National Institute for Neurological Disorders and Stroke in Bethesda, Maryland. With this work, he says, "it's pretty clear there is a reverse arrow." If the feat can be duplicated with human OPCs, it raises the tantalizing prospect of a new approach to treating Alzheimer's or other diseases marked by the loss of functional neurons: OPCs drawn from fetal tissue or even an adult patient might be reprogrammed to serve as replacement neurons.

Kondo and Raff began by isolating OPCs from the optic nerves of newborn rats and used previously described techniques—culturing the cells in fetal calf serum or exposing them to bone morphogenetic proteins—to turn them into astrocyte-like cells. They then treated the cells with basic fibroblast growth factor, a protein known to stimulate proliferation of neural stem cells. Nearly half started dividing, producing cells resembling nervous system stem cells, which the team induced to develop into neurons and astrocytes as well as oligodendrocytes.

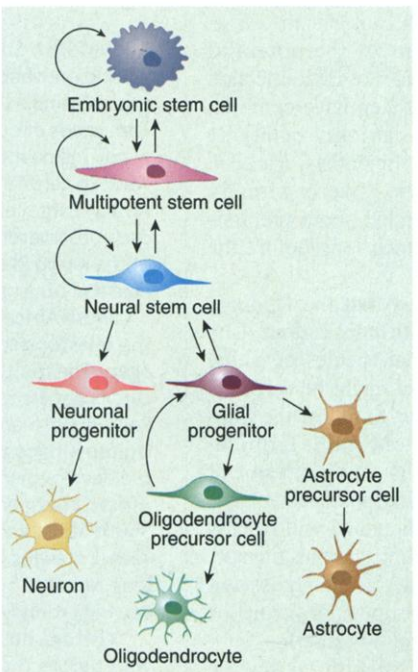
Fetal calf serum and fibroblast growth factor, it appears, had somehow induced the OPCs to revert to a more primitive state. "There had been all sorts of evidence that these were committed precursor cells," says stem cell biologist Ben Barres of Stanford University. But the evidence that the OPCs' developmental clock can indeed be wound back, he argues, is "totally convincing."

Not to everyone, however. To test for renegade stem cells, the researchers cultured the OPCs in a series of factors that turn neural stem cells into neurons. After 2 weeks, they found no sign of neuronal markers in their cells. But neuroscientist Fred Gage of the Salk Institute for Biological Studies in La Jolla, California, says that "it still remains possible that there are undetected multipotent stem cells that exist within the culture." Last fall, his team reported that cells from the optic nerve of adult rats could, when treated with similar proteins, also become neurons. But adult cells are harder to purify than those from fetal nerves, and Gage says he wasn't convinced that his team's preparation did not contain immature stem cells.

The evidence that OPCs can rejuvenate in the lab is good news for eventual disease treatments. But it is not yet clear what it means for researchers who study how normal brains develop and repair themselves, notes Sean Morrison of the University of Michigan, Ann Arbor. "We have to be very careful to distinguish what happens to a cell in vivo and the potential it can have after being reprogrammed in vitro," he says. Still, he adds, attempts to pin down the molecular signals that drive reprogramming should help scientists better understand the signals that govern normal development.

Together with previous reports of shape-shifting cells, Barres says, the new work "raises the question, 'What else can be reprogrammed?' " If more elixirs can be discovered for various cell types, then more degenerative diseases might fall victim to newfound fountains of youth.

–GRETCHEN VOGEL



Reversing course. Extracellular signals can prompt oligodendrocyte precursor cells to "de-differentiate" and become neural stem cells.

ILLUSTRATION: C. CAIN

PALEONTOLOGY

Biggest Extinction Hit Land and Sea

There was no hiding from the greatest mass extinction of all time. Two hundred and fifty million years ago, at the end of the Permian period and the opening of the Triassic, 85% of the species in the sea and 70% of the vertebrate genera living on land vanished. Whatever pummeled life in the sea did its dirty work in a geologic moment of less than half a million years (*Science*, 15 May 1998, p. 1007). Now from South Africa comes evidence that the Permian-Triassic extinction of land plants was equally brutal and swift.

The new signs of ecological catastrophe come from rocks that started as sediments laid down in South Africa's Karoo Basin 250 million years ago. In a paper on page 1740 of this issue of *Science*, paleontologist-geologist Peter Ward and geomorphologist David Montgomery of the University of Washington, Seattle, and sedimentologist Roger Smith of the South African Museum in Cape Town report that the rocks tell of an abrupt switch in style of sedimentation, as if the land had been permanently stripped of the rooted plants that held it in place. "It looks a lot like we just lost the forests," says paleontologist Gregory Retallack of the University of Oregon, Eugene. Something with the power of an asteroid impact seems to have shattered life on Earth. But in the absence of any trace of an impact, researchers are groping for an equally far-reaching explanation.

The Karoo ecological disaster left its mark in the mud and sand laid down as water drained from the landscape. At seven spots scattered across 400 kilometers of the basin, Ward and colleagues found the same pattern of changing sedimentation. Their benchmark