Although some experts say the findings raise concern about a threat to human health, others decry the media frenzy and contend that the new research adds little to what is known about the mysterious, fatal diseases.

What's beyond dispute is that scientists have only a vague idea about how vCJD victims become infected and when the brain begins to deteriorate. That is itself alarming given that the incidence of vCJD is rising 23% per year in the United Kingdom and may yet accelerate into a devastating epidemic (*Science*, 1 September, p. 1452). So neurologist John Collinge and his colleagues at St. Mary's Hospital in London decided to take a new look at the so-called "species barrier" that appears to block or slow transmission of prions between most species. By convention, the species barrier is determined by the time between experimental inoculation of an animal with prion-infected brain extracts (from an infected individual from another species) and the onset of symptoms, such as loss of balance.


Scientists find new BSE links

James Meikle

Scientists are to re-examine controls against variant CJD, the deadly human form of BSE, in the wake of evidence that both diseases may be highly infectious even when their unwitting carriers do not display outward signs of suffering from the condition.

They will also consider whether a new system of checks on sheep, pigs and chickens is needed to ensure that existing safeguard methods have not created other potentially fatal routes for BSE to enter humans.

New research has raised fears that animals thought to be healthy and incapable of acquiring BSE can in theory pass the disease on. The results have also renewed concern that humans not displaying vCJD symptoms but incubating the condition may infect others undergoing medical or dental procedures.

Experiments on mice and hamsters have suggested that the barrier to infection between species most feared than had been supposed and spread within species even when obvious symptoms are not yet evident.

Although scientists in the field of BSE research have suspected this, Professor John Collinge, who headed the research funded by the medical research council, said its results could have important public health implications.

The latest developments come amid signs that the incidence of vCJD is growing at between 20% and 30% a year in Britain. 70 people have died of the disease, all of them suffering the always fatal condition. There have been two deaths in France and one in Ireland. All are thought to have been infected years ago through exposure to cheap meat from parts of cattle containing high concentrations of the agent responsible.

Since 1989, the government has introduced a series of controls, including a ban on certain offal entering food, a ban on all cattle over 30 months old being used for food, and measures to stop the use of mechanically recovered meat in products for human consumption.

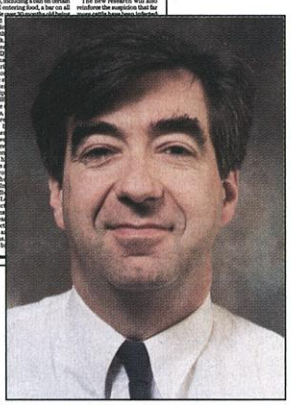
WHO THE HARVEST FROM COWS ARE DRAWING CLOSE AT ALL

injected into other mice and hamsters, it eventually killed them. The suspicion is that the process created a new strain, or strains, of more virulent disease.

The findings, published last night in the Proceedings of the National Academy of Sciences, will cause concern that contaminated material from people not displaying vCJD symptoms but incubating the condition may infect others undergoing medical or dental procedures, or the recycling of contaminated instruments.

Present sterilisation and cleaning techniques cannot remove all traces of the vCJD agent, although experts say they can substantially reduce levels of infectiousness.

The new research will also reinforce the suspicion that many cattle have been infected



Sounding the alarm. British newspapers pounced on a report from a team led by John Collinge (*inset*) suggesting that infectious prions may be lurking in asymptomatic livestock or even in people.

The best studied species barrier is that between hamsters and mice. Previous research has found that mice show no signs of disease over their lifetimes, about 2 years, after being infected with a hamster prion strain known as Sc237. Thus mice are considered highly resistant to this strain. Collinge's group replicated these experiments and confirmed that mice infected with Sc237 prions do not get sick. But the researchers went a step further, examining the brains of infected mice as they age.

They discovered that good health was only skin deep. Brain slices revealed that some mice had neurological damage typical of that seen in some human and animal prion diseases, including clumps of prion protein. Moreover, using antibodies to distinguish similar proteins from one another, the researchers found that the brain tissue was riddled with mouse prions—not the hamster Sc237. Writing in the 29 August issue of the *Proceedings of the National Academy of Sciences*, the authors conclude that the hamster prions had converted healthy mouse prion protein into the aberrant form. Indeed, the researchers were able to make other healthy mice ill by injecting them with brain extracts from the asymptomatic mice, demonstrating that the newly created mouse prions are infectious.

The study "undermines what we have thought about species barriers," Collinge told *Science*. His group speculates that chickens, pigs, or other livestock fed BSE-infected animal feed may be silent carriers of the disease. That grim prospect set off a frenzy in the British press. Newspapers suggested not only that animals deemed healthy and incapable of acquiring BSE could transmit the disease, but also that people not displaying vCJD symptoms might infect others.

Some researchers have taken Collinge's group to task for extrapolating from rodents to livestock. The findings "do not say anything directly about whether pigs, poultry, or sheep have become silently infected," says biologist Moira Bruce of the Institute for Animal Health in Edinburgh, Scotland. She argues that the findings speak only to mice and add little to the prion debate. "All that has happened is to change the story from mice are resistant to mice are susceptible but with very long incubation periods."

Similar reservations are expressed by Oxford University mathematical biologist Angela McLean. Her investigations of the potential danger of BSE infection in sheep have come up reassuringly empty so far. Scientists, McLean says, "were already worried about preclinical infections" in livestock long before the Collinge study.

Others, however, say that the findings might have public health implications. The paper "does suggest that species in which we've never seen disease might be carriers," says epidemiologist Peter Smith of the London School of Hygiene and Tropical Medicine. Smith, who is acting director of the U.K.'s Spongiform Encephalopathy Advisory Committee, says the panel will discuss the study at its next meeting later this month.

But whereas Collinge's group argues that their data should prompt a program of screening apparently healthy cattle for "subclinical" levels of BSE, Smith doubts the findings will persuade his panel to call for changes in anti-BSE control measures now in place. These controls, which ban the use

ScienceScope

Biological Riches Conservationists are shaking the tropical copaiba tree, hoping it will rain cash. Their goal, set last month at a California conference, is $5 billion to save the richest—and most threatened—areas of biodiversity.

The weeklong summit, held at the California Institute of Technology in Pasadena and organized by Conservation International (CI) of Washington, D.C., produced a draft "practical agenda" for saving 25 "hotspots" that cover 1.4% of Earth's surface. They range from the deserts of Morocco to the cloud forests of the Andes and are believed to hold 44% of the world's vascular plants (such as South America's copaiba, above) and 35% of all mammals, amphibians, birds, and reptiles.

CI, the World Bank, and the Global Environment Facility have already pledged $75 million over the next 5 years to create, expand, or improve protected areas, beginning in three of the "hottest" spots: Madagascar, West Africa's Ghanaian forest, and the tropical Andes. They hope to double that seed fund with private and foundation gifts. Says CI chief Russ Mittermeier: "If we don't start investing in living biodiversity with the same enthusiasm and commitment as we did in the space race of the 1960s, we're going to fail."

Adding SALT South Africa has broken ground on what will be the Southern Hemisphere's single largest optical telescope. Thousands of onlookers gathered on a windy hill near the town of Sutherland last week to celebrate the start of the Southern African Large Telescope (SALT), a 10-meter-class observatory that will take advantage of the Karoo Plain's clear skies to track nebulae and other celestial objects.

South African officials are banking on the telescope to produce more than imagery. The multinational project, which includes partners from the United States, Poland, Germany, New Zealand, and the United Kingdom, "will provide a focus for the development of basic sciences on the African continent," predicts Ben Ngubane, South Africa's science minister. He also sees it drawing tourists to the rural region, long targeted by astronomers as prime observing grounds.

Visitors, however, have a while to wait before there will be anything to see: Construction isn't due to be completed until 2004.

CREDITS: (LEFT TO RIGHT) COURTESY *THE GUARDIAN*; IMPERIAL COLLEGE SCHOOL OF MEDICINE; MISSOURI BOTANICAL GARDEN

was the Permian-Triassic (P-T) boundary, a layer of rock marked by evidence of extinctions and a globally recognized shift in carbon isotopes. In tens of meters of rock laid down before the boundary, the researchers found sandstones filling broad channels, as if deposited by meandering rivers. Above the extinction bed, the river deposits are entirely different. They are typical of quick-flowing, "braided" river systems carrying large amounts of water and sediment in narrow, interconnecting channels.

The scene of the crime. Extinctions in 250-million-year-old rock (foreground) were followed by heavy erosion (lighter rock above and beyond).

CREDIT: P. WARD/UNIV. OF WASHINGTON, SEATTLE

The group's preferred explanation is the loss of the larger rooted plants, including the recorded extinction of the treelike seed fern *Glossopteris*, that held the soil in place, especially along stream and river banks. Montgomery can often see the same sedimentary transition when forests are clear-cut today. At the P-T boundary, it seems to have been global. "The pattern they see is matched beautifully in Australia and Antarctica," says Retallack, based on his own work. Everywhere the transition occurred, says Ward, "it was fast. This was a really rapid, short-term event."

The rapidity shows up best in marine sediments. In the 21 July issue of *Science* (p. 432), paleontologist Jin Yugan and his colleagues at the Nanjing Institute of Geology and Palaeontology in China and paleontologist Douglas Erwin of the National Museum of Natural History in Washington, D.C., showed that the devastating extinctions in the sea took place even faster than anyone had thought. Radiometric dating of the P-T outcrop at Meishan, China, had narrowed the generally accepted duration of the extinctions from millions of years to less than 500,000 years (*Science*, 7 November 1997, p. 1017). Now, by conducting a detailed census across the boundary of 333 species of everything from fish to microscopic foraminifera, they find that all the extinctions could have occurred in a single bad day 251.4 million years ago, says Erwin, just as many species clearly went extinct in a geologic instant 65 million years ago at the moment of an impact.

For the moment, an impact is just one of several contenders to explain the P-T extinctions. The most discussed of the possible earthbound causes centers on lavas known as the Siberian Traps, whose million-year-long eruption coincided with the P-T extinctions as near as radiometric dating can place them (*Science*, 6 October 1995, p. 27). Four other extinctions, both major and minor, have now been linked in time with huge basaltic lava eruptions like that of the Siberian Traps (*Science*, 18 August, p. 1130). So far, however, no one has found a decisive link between cause and effect.

To shorten the list of potential mass murderers, researchers are combing the P-T geologic record for clues. In south China, Jin and his colleagues reported, the spike in carbon isotopic composition precisely coincides with the extinctions. It may mark a collapse of biological productivity in the sea in parallel with the ecological disaster on land. Other researchers have reported a huge spike in the amount of fungal remains around the world. The spike, which begins just before the extinction in south China, may be a sign of massive decay on land. So far, however, the big picture refuses to snap into focus. The Siberian eruptions could be behind all this, says Erwin, but "it's still difficult to pin down the extinctions to a single mechanism."

–RICHARD A. KERR

FRENCH SCIENCE

New CNRS Chief Hopes to Deliver on Science

PARIS—For years, French research ministers have prodded the nation's scientists to make their research pay off for society. But that message has been slow to sink in. Last week, the government gave the assignment to a biologist who has done exactly that, but who believes that the carrot works better than the stick.

Geneviève Berger takes charge of the CNRS with orders to nudge France's basic research agency out of a malaise stemming from a steady decline in research funding, the graying of the agency's scientific cadre, and debates over how best to reform the $2.2 billion behemoth (*Science*, 30 July 1999, p. 647). "The CNRS has been slipping for several years," says chemist Pierre Potier, a former government science adviser. "Madame Berger is very courageous to agree to lead it."

As director of the CNRS Laboratory of Parametric Imagery in Paris, in the early 1990s Berger co-invented the first instrument to use ultrasound to visualize human bones. The device is now used worldwide for diagnosing osteoporosis. "I would find it

ScienceScope

Help Wanted The United Kingdom may open its borders to droves of foreign high-tech workers. Worried that the nation's economic engine may begin to sputter as record-low unemployment rates make it harder for businesses to find qualified workers, the government next week plans to unveil a proposal to relax its strict immigration laws.

Current law limits foreign workers to temporary stays in the country. The new plan would allow up to 100,000 skilled workers a year to permanently move in and fill jobs in fields such as information technology and teaching, the *Sunday Telegraph* reported on 3 September. Conservative lawmakers, however, are already taking shots at the proposal, arguing that the current rules are sufficient to sustain the boom.

Biomedical Balance The National Institutes of Health (NIH) shouldn't encourage universities to churn out any more biomedical scientists—but it should strive for greater balance in how they are trained, a new National Academy of Sciences report recommends. Currently, the agency's National Research Service Award (NRSA) training program gives grants to universities to help roughly 7000 graduate students a year pursue multidisciplinary studies. Twice that number get NIH funds through grants to individual researchers, who then hire students to work on specific projects.

In the future, however, the proportion of students drawing money from each funding pot should be about equal, concludes *Addressing the Nation's Changing Needs for Biomedical and Behavioral Scientists*, the 11th report in a series that began in 1975. By gradually shifting funds from more focused assistantships to broader NRSAs, NIH can better train researchers able to bridge the gaps separating disciplines, says the report committee, led by medical professor Howard Hiatt of Harvard Medical School in Boston.

NIH officials generally agree with the goal and are considering guidelines that would "encourage" universities and investigators to fund more generalized training, says agency training officer Walter Schaffer. But in an unusual addendum to the report, psychologist John Kihlstrom of the University of California, Berkeley, warns that the behavioral sciences may get short shrift without further reforms. The panel, he says, did not fully consider "the actual and potential contributions that the behavioral and social sciences can make to health and health care."

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