tional investment," he says.

As part of the budget allocation, the government also announced a raft of measures to help improve career prospects for university researchers. This year it increased the minimum annual grant for Ph.D. students by $1600 to $10,500—the first increase above inflation for 30 years. And now the number of fellowships awarded by the Royal Society will be increased from 265 to more than 300. The increased research council budgets will also mean that university-based researchers on council grants will be able to hire more graduate and postdoctoral staff, and the councils' own labs will also be able to create new positions.

Even the lobby group Save British Science, a longtime critic of government funding policy set up during the previous Conservative government, could find little to complain about. Says lobby chair Richard Joyner, dean of research at Nottingham Trent University: "I'm very pleased to see that everybody has got something." —NIGEL WILLIAMS

AGING RESEARCH

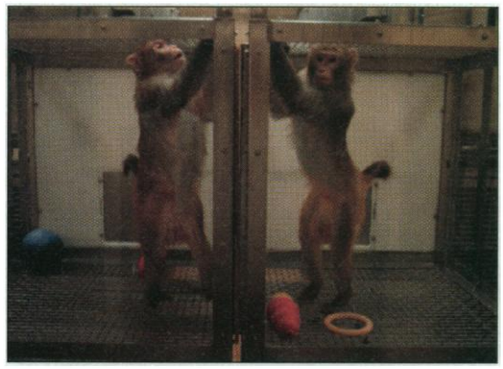
Low-Calorie Diets May Slow Monkeys' Aging

Scientists are edging closer to proving in primates what's been demonstrated dozens of times in rodents since the 1930s: Sharply reducing caloric intake can slow the process of aging to a crawl.

At a Society of Toxicology meeting 2 weeks ago in Reston, Virginia, three groups presented data showing that rhesus monkeys fed severely calorie-restricted diets show fewer signs of diseases associated with advancing age, including diabetes, heart disease, and cancer, than their comfortably full—and in some cases comparably lean—counterparts. Because most of the hungry monkeys are only now entering middle age, it's too early to tell whether the low-calorie diets will significantly extend their life-spans. But one of the studies provided a tantalizing hint: Mortality due to disease among the calorie-restricted monkeys was slightly lower than among the controls.

Even if monkeys do live longer on low-calorie diets, it doesn't necessarily follow that humans would experience similar benefits—or that they would find such diets acceptable. But researchers hope that these animals might provide clues to why calorie restriction is beneficial—information that could point to strategies and medications for delaying aging in humans.

The three groups reporting their results at the meeting—which were led by Mark Lane at the National Institute on Aging (NIA), Richard Weindruch at the University of Wisconsin, Madison, and Barbara Hansen at the University of Maryland, Baltimore—kept the animals on tight rations but well above starvation levels. The Wisconsin and the NIA teams provided the test animals with 30% fewer calories than the controls (while enhancing their diets with a vitamin and mineral supplement), while Hansen tailored the monkeys' food intake to prevent them from putting on more pounds than they carried in young adulthood.



Hungry but healthy. Monkeys eating sharply restricted diets (right) may live longer than well-fed controls.

All three groups found that in nearly every system tested, the calorie-restricted (CR) animals were better off than the controls. All recorded lower blood lipids and blood pressure, enhanced insulin sensitivity, and a lower incidence of diabetes in calorie-restricted monkeys. The Wisconsin group also found less spinal arthritis, while Lane's team saw fewer cancer cases and a slightly lower mortality rate due to diabetes and cardiovascular disease. One of the 120 animals on the diet died, compared to five among the 120 controls. "[The] major message from the monkeys is that 99.9% of those markers that we have examined in the monkeys behave exactly as they do in rodents," says Lane.

What's more, the severe calorie reduction seems to produce few adverse effects. Lane's group, which began caloric restriction in young animals, saw the only potential problem: delayed sexual and skeletal maturity. None of the primates have been bred, however, so no one knows whether their reproductive capabilities are affected. And although all three groups acknowledged that their animals were regularly hungry—wolfing down food more quickly than controls, or becoming excited if accidentally given excessive food—none found that the added stress affected behavior. Controls and CR monkeys were equally energetic, social, and nonaggressive, and a weeklong videotape of Lane's animals showed no measurable differences between the two groups.

Why caloric restriction so dramatically improves the functioning of organ systems remains under debate. Certain changes, like the reduced incidence of diabetes, might simply be a benefit of leanness, as obesity predisposes to the disease in nonhuman primates as well as in most humans. Others are more puzzling, however.

One possibility, Weindruch says, is that restricting food consumption reduces the production of tissue-damaging oxygen free radicals that are a byproduct of food metabolism. He has shown in mice that such oxidative damage leads to muscle atrophy, producing the frailty common in old age.

But reducing oxidative damage is only one way calorie restriction might work. "The problem with [caloric restriction] is that it fits any of the theories of aging," says Roy Walford, a professor of pathology at the University of California, Los Angeles, and a pioneer in the field. "[It] increases DNA repair, regulates glucose insulin, decreases free radical damage, preserves the immune system."

The primate studies haven't gone on long enough to determine whether caloric restriction will result in the kind of increases in life-span seen in near-starving rodents, which live up to 40% longer than controls. Rhesus monkeys can live up to about age 40 in the lab, whereas the test animals are still in their mid-20s. The primate data are "very tantalizing preliminary results," says Lane. "But [I'm] not at the point where I'm willing to stand up and wave the flag and say it works."

If further work confirms that caloric restriction pays off in extended primate life-spans, though, and researchers can pin down the reasons why, aging experts hope to tap into something that, until now, has been restricted to the realm of fiction—controlling the process of aging. —JENNIFER COUZIN

NEUROBIOLOGY

New Leads to Brain Neuron Regeneration

Neurobiologists have long considered the neurons in the adult brain to be like a precious nest egg: a legacy that dwindles with time and illness and is difficult if not impossible to rebuild. Two sets of findings published this week raise hopes that this principle could one day be overturned. In one, research teams at Harvard and the National Institute of Neurological Disorders and Stroke (NINDS) independently isolated what appear to be the first human cells that can differentiate into all the cell types found in the brain—so-called neural stem cells. In the other, a team based in California and Sweden found a small area of the human brain that produces new neurons into old age.

The discoveries aren't biologically surprising, because both neural stem cells and

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