Experts Ponder Simian Well-Being

Scientific community awaits with some trepidation new regulations governing the "psychological well-being of primates"

WHAT KEEPS A MONKEY from being bored? Does a chimp need company in order to be a real chimp? What is an acceptable level of aggression for caged primates? Does physical health imply mental health? These were the kinds of questions discussed at a September symposium on "the psychological well-being of captive primates" at Harvard Medical School which brought together researchers, veterinarians, and government representatives.

Sponsored by Tufts University, Harvard's New England Primate Center, and the University of Massachusetts, this was an unusual meeting, occasioned by a vague and highly controversial stipulation contained in the 1985 amendments to the Animal Welfare Act. Inserted by Senator John Melcher (D–MT) without benefit of any floor debate, it states that captive primates must be afforded a "physical environment" that "promotes" their "psychological well-being."

The Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) was supposed to issue regulations implementing the amendment 2 years ago. A draft proposal last year elicited 8000 comments, mostly negative, so APHIS scurried back to the drawing board. A final version, whose contents have been closely guarded, is now being vetted by the Office of Management and Budget.

Congress had little idea of what a tall order it was issuing in the simple phrase "psychological well-being." There are more than 200 species of known primates in four major groups—prosimians, New World monkeys, Old World monkeys, and apes. Their needs vary widely according to species, sex, age, background, and individual personality.

Decisions being made now are going to have a major impact on the costs of research. Estimates of the investment required to implement the regulation range from more than $100 million (APHIS) to $1 billion (the American Foundation for Biomedical Research). Regulations will also affect the research itself. Changes in housing conditions and "enrichment" techniques may change the baseline data on the animals and could jeopardize comparability of old and new research. Furthermore, substantial resources are likely to be devoted in the future to a whole new research enterprise on what promotes psychological well-being.

Widespread interest in the subject goes back to 1980, the year that police, acting on complaints from animal rights activists, confiscated 15 monkeys from the Silver Spring, Maryland, laboratory of Edward Taub. Some large labs, such as the Yerkes Primate Center in Atlanta, have long provided large and varied environments for their research animals, but many others continue to keep individuals alone in barren cages.

Cage size may be one of the most expensive areas where changes are called for. But as speakers at the meeting pointed out, human intuitive judgments on this, as well as in every other area, are often wrong, and the only way to establish the optimum answers is through empirical observation.

Scott Line of the California Regional Primate Center reported, for example, that when individual rhesus monkeys spent time in both 0.4-square-meter and 0.54-square-meter cages, there were no differences in the animals' heart rates or activity levels. For prosimians such as lemurs and tarsirs, said Kay Izard of the Duke University Primate Center, the vertical environment is more important than the amount of floor space. Some animals, she said, prefer outdoor runs even when the indoor ones are larger. Quality, including opportunities to manipulate and control, rather than the quantity of the environment is what counts.

Companionship: *Old monkey paired with juvenile at Wisconsin.*

Cage size is especially tricky when it comes to group housing. Several researchers, including Melinda A. Novak of the University of Massachusetts at Amherst, one of the conference organizers, have found that more is not necessarily better. Ten years ago, Novak and her colleages experimented with doubling the cage size of a group of six monkeys. They found that there was a tripling of aggressive activity and fighting. This finding runs "counter to every notion you have about the relationship of space and aggression," said Novak.

Researchers are also experimenting with various means of enriching cage environments. Leonard Rosenblum of the State University of New York's Health Sciences Center in Brooklyn reported an intriguing finding with squirrel monkeys, a species that likes to hang out in sex-segregated subgroups. Normally, the young females stay close to their mothers while the males, at about 6 months, start to differentiate by leaving the mothers and engaging in more autonomous exploratory behavior. When Rosenblum created a high-arousal environment by means of toys and bright-colored wallpaper, this differentiation was accelerated by several months, with the females responding by clinging more closely to their mothers while the males went out earlier to seek the company of other males.

Rosenblum said environments can be made more interesting by making it more complicated and time-consuming for the monkeys to find their food—by burying it in bedding, hiding it in compartments or boxes with holes in them, or by lining shelves with thousands of possible small sites to find food in. He said this approach results in less food wastage, reduces squabbles over food, and is more "stimulating and health-producing" for the animals. The important thing, he said, is for the system to be consistent so the animals could develop consistent food-search strategies. Otherwise, the young ones get confused and depressed.

Other enrichment approaches range from high-tech, such as displaying videotapes of others of the same species, to the provision of mirrors or simple pieces of wood to gnaw on. Scott Line reported that when rhesus monkeys had a radio they could turn on for short periods, there was a decrease in abnormal behaviors such as fur-plucking and cage-chewing, and less stress as measured by

plasma cortisol levels.

Viktor Reinhardt of the Wisconsin Regional Primate Center reported that by far the most effective way to enrich an animal's environment is to pair it with another animal. "Companionship is best of all," said Reinhardt, and "does not ever lose its boredom-reducing value." He added that "inanimate objects don't stop stereotyped behavior" (repetitive activity such as rocking and pacing), but that pairing does.

Reinhardt said pairing has had "no adverse impact on common experimental protocols" including implantation of a permanent headcap for taking blood samples. When an animal is taken out for an experimental procedure, it shows less stress when the companion is placed in a cage nearby for a "psychological support system." Reinhardt said "there is no need to prove scientifically" the benefits of pairing. "You can just see it."

Although solo caging is required for much research, including infectious diseases and research on drugs and metabolism, Frans de Waal of the Wisconsin Regional Primate Center felt that all primates, being social animals, should be socially caged. "A single-housed chimpanzee is not a chimpanzee," he said. "A review of their social needs and intelligence makes it clear that the common practice of housing macaques, baboons, and chimpanzees in a single cage is comparable to keeping fish out of the water.

Christopher Coe of the University of Wisconsin's Harlow Primate Center supplemented behavioral observations with a report on the effects of changes in living conditions on immune function. "There are very serious physiological impacts of these changes that will affect baseline data," he said. Among his findings: with adolescent male rhesus monkeys, living in pairs modestly elevates plasma cortisol levels, particularly in the subordinate animals (who also have lower testosterone levels than dominant males). When a pair was formed, lymphocyte production shot up to 95 from the baseline of 8, and then went down somewhat. Coe said that among older animals, putting them in pairs seemed "a nice thing to do"—but socialization seemed to lower rather than raise immune function in old animals who when alone spend 95% of their time inactive. Coe also said that "every decision we make about rearing has an impact on the immune system."

Decisions made during rearing also affect the bottom line: reproductive ability and infant survival, according to Lorna Johnson of the New England Regional Primate Center. She said that with cottontop tamarins, those who were nursery-reared showed only a 30% survival rate, but when they were raised in family groups the rate was 70%. The lab also conducted an experiment comparing cages of tamarins in two rooms. In one room, the cages looked out at a wall; in the other, animals had visual contact with other animals across the room. The ones who could see their fellows had a lower breeding rate, but 90% of the young were successfully reared by the family and 100% survived. In the room where they looked at the wall there was a decreased birthrate, an increase in stillborns, and only 58% of the family-reared ones survived weaning. Many of the infants were abandoned and had to be put in the nursery.

Group housing remains a controversial issue. Veterinarian Roy Henrickson of the University of California (Berkeley) said he felt some people had presented too "idealized" a picture of monkey social life, and that his experience at the University of California, Davis, was that handling the aggression of a group of macaques was "more like the emergency room at Bellevue on Saturday night."

There were no sharp disputes at the conference, but neither was there a concensus on exactly what constitutes "psychological well-being," much less what measures will "promote" that end.

Charles Snowdon of the University of Wisconsin (Madison) noted that one plausible criterion for well-being might be "ability to cope if reintroduced into the wild." But, as he said, that would include exposing animals to high levels of dirt and stress, parasite loads, predators, and high levels of fighting and wounds. "It's a jungle out there," said Snowdon.

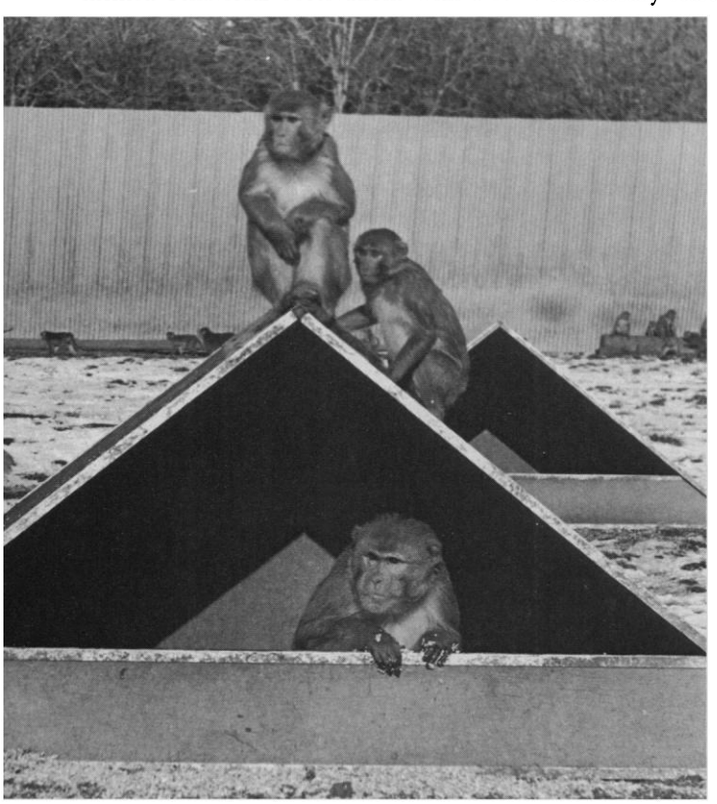
One set of criteria has been developed by Novak and Stephen Suomi of the National Institute for Child Health and Human Development. Suomi remarked that there is no single across-the-board prescription "even for a species so well studied as rhesus monkeys." In an article in this month's *American Psychologist*, Novak and Suomi propose the use of four parameters in gauging the well-being of primates: health, behavioral repertoire, stress/distress, and coping.

With regard to health, single-caged animals are better off because there is less wounding and joint disease, but they are also more prone to obesity and lethargy. Behavioral repertoires are far more limited and there is more abnormal behavior.

As for stress and distress, there is still no good definition. Some stress is beneficial, and absence of stress may mean boredom. Suomi also pointed out that there are major individual differences in "reactivity" that determine stress levels in rhesus monkeys. About 20% of the animals are highly reactive, shy, and easily frightened. They show high heart rates when put in pairs and depressive reactions when separated from their mothers. But other animals will experience stress if prevented from leaving their troops when they are ready.

One of the central concerns of those at the conference was not to let "anthropomorphism" or "asthetics" govern decisions that should be based on empirical observation. Intuitive assumptions are dangerous; instead researchers should "let the animals tell us what is optimal for them," said Novak. "We can't make up the answers," said Joseph Erwin of National Geographic Research. "Let us hope that before $500-million decisions are made about cage size we better look at the effects of cage size."

It becomes clear why researchers fervently hope that APHIS will not come out with anything too specific in the pending regulations. Existing regulations, for example, say



Outdoor corral. *Rhesus monkeys at Oregon Regional Primate Center.*

that materials used in cages must be "substantially impervious to moisture." Thus, if a piece of wood is a fixture in a cage it must be coated with polyurethane, which prevents chewing and scent marking. Metal fixtures may cause tooth damage. "Sanitation and psychological well-being are at some point going to butt heads," said Izard. "Life is not sanitary."

"If APHIS had been properly funded in the first half of the decade the last half wouldn't be in such turmoil," said Tom Wolfle of the National Research Council's Institute for Laboratory Animal Resources. APHIS's research animal inspection functions are being upgraded in a new Regulatory Enforcement and Animal Care Administration reporting directly to APHIS director James Glosser. APHIS, however, is still struggling with a budget (which the Administration has repeatedly tried to zero out) of $6.2 million for fiscal 1988. This covers 6732 site visits a year, including inspection of about 500 primate facilities.

Primate researchers may be forgiven if they feel they are in a race with time, money, and animal activists. Franklin Loew of Tufts University School of Veterinary Medicine complained that "costs in this new research environment have fallen on the backs of animal users." He proposed that the National Institutes of Health and the National Science Foundation devise an institutional block-grant program for annual animal care grants, which would be based on past expenditures at the institutions.

As for animal activism, it "is at its highest level yet," said Dale Schwindaman from APHIS. Loew pointed out that as the population has become increasingly urbanized, "human-animal interactions have become increasingly romanticized." Last year, polls showed that almost 15% of the population disapproves of all animal research.

Furthermore, according to Steven Carroll of the Incurably Ill for Animal Research, there is no area where public "misconceptions are greater than that concerning the use of primates." People think they are common research models and are being stolen from the wild, whereas they make up fewer than 1% of research animals and have not been imported since 1976.

Speakers emphasized, as they do at every conference about animals in research, that scientists are little match for the activists when it comes to money and emotional energy. So they must try harder to educate the public and come up with better scientific rationales for how animals should be treated.

■ CONSTANCE HOLDEN

Open Season on USDA

The opportunity for confrontations between animal rights activists and the biomedical community will increase if a bill pending before Congress becomes law. Representative Charles Rose (D–NC) (left) has introduced legislation, H.R. 1770, that would give any interested person or group legal standing to sue the U.S. Department of Agriculture (USDA) as a way of compelling it to enforce the provisions of the Animal Welfare Act. This approach of using citizens as "private attorneys general" came in for strong opposition at a recent congressional hearing. Organizations such as the National Association for Biomedical Research (NABR) and the American Physiological Association fear that, if the bill passes, the flood of lawsuits could halt the use of animals in medical research.

The Animal Welfare Act, originally passed in 1966, regulates the care and handling of animals that are used in research, by dealers, and in exhibitions. USDA's Animal and Plant Health Inspection Service (APHIS) is responsible for administering and enforcing the Act. The Act governs many aspects of animal care including the kinds of records that are kept on animals, the sizes of cages and their cleanliness, the amount of exercise that the animal gets, and the care that is taken during experiments to avoid unnecessary pain to the animal. Violations can result in loss or suspension of license (for animal dealers), civil fines, or even criminal prosecution. James W. Glosser, administrator of APHIS, reported that there were 16,310 inspections held last year; 351 reports of violations were filed, 145 cases were referred to the Office of the General Counsel as the beginning of legal proceedings, and 180 violators were sent official notices of warning.

However, the USDA is being accused of either not doing anything in the presence of clear violations or not acting quickly enough. "Serious violations that cause unnecessary pain, suffering, and death for animals have occurred at major universities and other research facilities across the country," Rose told a judiciary subcommittee of the House.

There is precedent for laws that give ordinary citizens standing to sue— environmental laws including the Clean Air Act among them. However, organizations opposing passage of this bill believe that the earlier laws are significantly more restrictive than H.R. 1770. NABR presented testimony that the environmental statutes do not give "blanket authority to any citizen to sue" but instead require citizens to demonstrate that they are being directly affected by an alleged violation.

Another difference cited is that citizen standing in environmental statutes has been limited to nondiscretionary violations, such as being in excess of numerical emission standards for pollutants. Opponents contend that H.R. 1770 could place the federal courts in the position of deciding such nonquantifiable issues as whether conditions were available to promote the psychological well-being of primates (an area where there is still considerable uncertainty among scientists) or whether alternative, less painful experimental procedures could have been used by the researchers.

The bill also brings into question the discretionary powers of the USDA itself. The U.S. Department of Justice cites this as one reason for its opposition to H.R. 1770. "Agency decisions reflecting an exercise of the discretion necessary to function effectively routinely would be second-guessed in the courts," wrote Thomas M. Boyd, acting assistant attorney general, in a letter to the House subcommittee.

Enactment of this bill would have a serious effect on the USDA, as agency officials readily acknowledge. "It would shut down our enforcement activities," says Richard Crawford, a senior staff veterinarian at the USDA. Furthermore, the pending bill provides that unless a suit is deemed to have been "frivolous, unreasonable, or without foundation," USDA might have to pay attorney fees and litigation costs for both sides, which would further limit USDA resources. The threat of suits could also extend to members of animal care committees at each research facility.

It is almost certainly too late in this congressional term to see a vote on H.R. 1770. But there is a general consensus that this bill will be back in one form or another.

■ BARBARA JASNY

Barbara Jasny is an editor at Science.