reaction of monkeys to progestogens was different from the reaction of women, a claim also made by WHO. Endometrial cancers in monkeys develop from a condition unlike that found in women, Upjohn and WHO said. In addition, the drug is approved for use within the United States as a treatment for some forms of endometrial cancer, a fact that casts even more doubt on the significance of the monkey study, Upjohn said.

On the basis of the same animal data, Sidney M. Wolfe, director of the Washington-based Health Research Group is convinced that Depo-Provera is "a dangerous drug." The beagle, he says, does provide an acceptable experimental model. "Industry did not object to the validity of such dog studies as long as they yielded negative results, but protested only when some of their products caused tumors in these studies," Wolfe wrote in 1976 to the Department of Health, Education, and Welfare to protest pending FDA approval of the drug.

In Wolfe's opinion, the monkey study was clearly positive, an alarming finding because a cancer-causing effect was now demonstrated in two species. Wolfe's 1976 letter said that any substance, with few exceptions, which conclusively causes cancer in animals should be considered "a potential cancer hazard in man."

The FDA still believes the two species were valid models to test progestogens. Former FDA commissioner Donald Kennedy told a congressional hearing on Depo-Provera in 1978: "FDA has required tests in both the beagle and monkey because the beagle is highly susceptible to spontaneous mammary tumors, while the monkey is relatively resistant. The human female falls between the beagle and monkey in spontaneous mammary tumor incidence." He testified before the Select Committee on Population, "No contraceptives currently approved

NASA Student Rat Project Questioned

There has been a minor conflict within the National Aeronautics and Space Administration (NASA) over a student experiment that is scheduled to be flown on one of next year's space shuttle flights. The project, involving rats with artificially induced arthritis, is moving full steam ahead and is tentatively scheduled to go up next April. However, the head of NASA's life sciences division, Gerald A. Soffen, has serious reservations about the quality of the experiment and believes that if it is allowed to fly it may bring down the wrath of antivivisectionists, who have made NASA animal experiments a special target in the past couple of years.

Although Soffen is supposed to have the final say on which animal experiments go into space, he has no authority over this one which is in the charge of the shuttle office.

The rat experiment was selected 2 years ago, in the first year of NASA's new Shuttle Student Involvement Project. The SSIP holds a yearly contest for high school students in conjunction with the National Science Teachers Association. Three winning experiments have so far been flown on the shuttle: one that observed the flight of insects in zero gravity; one looking at the effects of diet, exercise, and zero gravity on lipoprotein profiles of astronauts; and one that examined the effects of space travel on astronauts' trivalent chromium levels.

The arthritic rat project, conceived by Daniel Weber from Hunter College High School in New York City, is the first mammalian experiment scheduled to be flown on the shuttle. Weber's hypothesis is that zero gravity will have a beneficial effect on the inflammation by reducing hypercalcification of the bone that is associated with it. The plan is to inject three rats with Freund's complete adjuvant to induce inflammation and send them up for 5 days in the shuttle along with three noninjected control rats. The rats' movements will be photographically monitored for 8 hours a day. Enzyme, serum, calcium, and phosphorous levels will be measured before and after the flight. Daniel is currently working on the project with NASA consultant Emily Holton of Ames Laboratory, a specialist on bone loss in space, and with Pfizer Inc., which is supplying the drug and the rats. General Dynamics Corporation is designing and building a cage at a reported cost of over $50,000. Everyone involved is very enthusiastic about the project.

Except Soffen, who says he "hit the roof" when he heard about it. Soffen consulted two arthritis experts—Ira Goldstein, head of the Rosalind Russell Research Laboratory at the University of California at San Francisco, and John Dekker of the National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases. In a May memo to his superiors, Soffen summed up the objections as follows: first, that the hypothesis was faulty and bore no relation to human arthritis. The number of animals was too small to yield meaningful results; the reaction of adrenaline due to the stress of a zero-G environment may have a positive effect itself on the disease and therefore could confound the results; and the test could just as well be done on the ground using immobilized or suspended animals. Goldstein, contacted by *Science*, pronounced the proposed project "very naïve" and said it was unlikely any useful information could be gained from it.

David Larson, senior researcher at Pfizer who is working with young Weber, does not think any of the criticisms are valid. He says there are enough rats because a highly susceptible strain (Wistar Lewis) is being used, and that the amount of stress-induced adrenaline they produce will not be enough to alter the course of the disease. He believes that the project will enable participants "to clearly say something changed or didn't change as a result of the weightless condition."

Another defender of the project, Alan Ladwig of the shuttle office, concedes that it is not "great science," but contends its primary purpose is educational. (The only formal scientific review of the project came during the judging, but Ladwig says a new layer of scientific review is being added for future student experiments.)

The basic question here seems to be whether student shuttle experiments should conform to the standards of professional science or whether their role in educating and stimulating scientists of the future is sufficient to justify their presence on the shuttle. Probably no one would raise much of a fuss if a marginal bug project made it into outer space, but with the eyes of the newly hyperactive animal welfare community trained on its every move, NASA would do well to see to it that any experiment involving vertebrates has solid scientific justification.

—CONSTANCE HOLDEN

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