

New Vaccine May Bring Man and Chimpanzee into Tragic Conflict

Trappist monks, Greek prostitutes, New York gays, Colombian nuns, and chimpanzees are groups who do not share many interests in common. All have been collaborating, nevertheless, in their various ways, in an important new medical advance—the understanding of the widespread disease known as hepatitis B and the development of a vaccine against the virus which causes it.

Unfortunately, production of the vaccine may well pose a fatal conflict between the interests of mankind and those of chimpanzees. Chimps are the only species, other than man, in which the safety of the vaccine can be tested. Each chimp can be used for only one test. If the vaccine is produced in quantity—and some 150 million people are thought to be carriers of the virus—many of the 50,000 chimps who remain in the wild may be killed or captured to stock the vaccine makers' breeding colonies.

On the other hand, if the chimpanzees are protected—the species is already classified as threatened—it may prove impossible to safety test and hence to manufacture the vaccine. Yet even in developed countries, where the disease is comparatively rare, hepatitis B takes a heavy toll. In the United States 15,000 cases were reported in 1976. The true incidence was probably 150,000, according to the Center for Disease Control, of which probably about 1500 cases ended in death.

A hepatitis B vaccine is probably 2 or 3 years away from production, but the issue of using chimpanzees has already been raised in practical form. Merck Sharp & Dohme, at present the only American pharmaceutical house developing a hepatitis B vaccine, has applied for a permit to import 125 chimpanzees from Sierra Leone. Merck's plan is to use the chimps once for vaccine testing and then transfer them to a breeding colony.

But Merck's application seems on present indications very likely to be denied by the U.S. Fish and Wildlife Service. The application has been vigorously opposed by Shirley McGreal of the International Primate Protection League and others. The conservationists contend that Sierra Leone has very few chimps

left and that those exported from the country are in fact captured in neighboring countries such as Guinea and smuggled across the border. The charge has been implicitly confirmed by a government group known as the Interagency Primate Steering Committee. At a recent meeting held to assess the population status of chimpanzees, the group's conclusion for Sierra Leone was "Very few. Most exports of Guinea origin."

According to the conservationists, the standard method of capturing chimpanzees in Africa is to find a mother with child and shoot the mother. Animal exporters pay native hunters a bounty without inquiring too closely about the method of capture. Primatologist Geza Teleki estimates that Merck's order "would involve the deaths of about 600 chimpanzees by the time 125 healthy chimpanzees were delivered to the buyer in the USA."

Can Man Outrun Chimp in Wild?

Merck officials deny that their chimpanzees would be captured inhumanely. "The method of capture is generally by locating a group of chimpanzees, surrounding them with a number of people and chasing them. The juveniles would usually tire first and these were captured by hand," a Merck official told the Federal Wildlife Permit Office.

This account, supplied to Merck by its proposed animal supplier in Sierra Leone, does not command a high degree of respect from expert primatologists. "Highly imaginative and pure malarky," is how Teleki describes Merck's alleged capture technique. "Totally impossible unless you had big nets," says Jane Goodall. "Utterly fanciful. . . . Given the sort of habitat where wild chimpanzees are found, no human being could keep up with a wild chimpanzee, much less run it to the ground. . . . I can only conclude that someone is seeking to conceal the actual but less humane method of capture used—that is, shooting the mother to recover the young, which is the standard method used in Africa,"

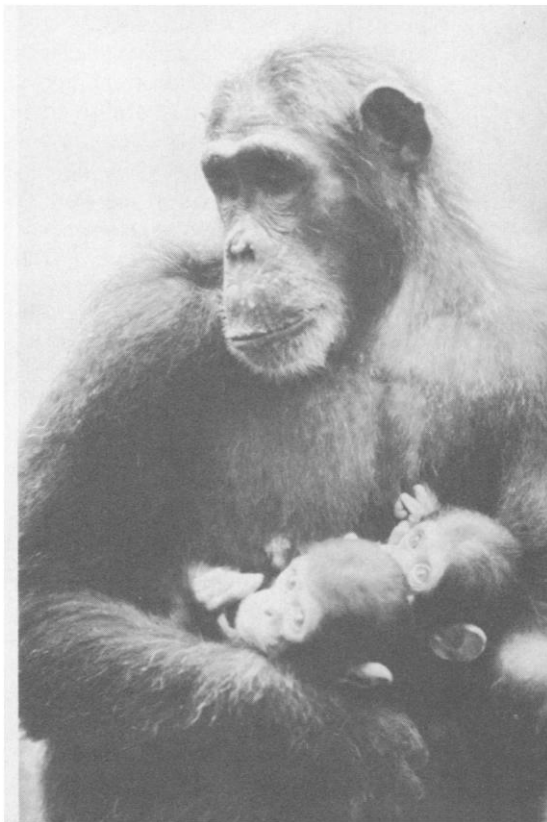
How to capture a chimpanzee: first shoot the mother. Photo by Jane Goodall, © 1978 National Geographic Society.

states William McGrew of Stirling University in Scotland.

Both Alan Creamer, associate director in charge of Merck's animal resources, and Maurice Hilleman, Merck's director of research, say they would not purchase chimpanzees acquired by inhumane methods such as shooting the mother. Their supplier has reaffirmed that he would capture the chimpanzees by chasing them. According to Creamer, both Japanese and Polish vaccine makers have already contracted to obtain chimpanzees from Sierra Leone; denial of Merck's import application would not help the chimpanzees but would merely ensure that the market for hepatitis B vaccine is captured by other nations' manufacturers.

Hilleman, who has spent 7 years developing Merck's hepatitis B vaccine, contends that chimpanzees will inevitably be eradicated in time as forests in Africa are converted to farmland. Their best chance of survival, in his view, is in breeding colonies of the type Merck proposes to set up: hence Merck's plan represents an unusual confluence of interests. If the import permit is denied, Hilleman says, "There will be no hepatitis vaccine, period."

Yet denial at present seems more than likely. Merck has been asked by the Federal Wildlife Permit Office to supply more information, but company officials do not seem yet to possess the evidence to rebut the conservationists' case. "The wildlife people have expressed a number of concerns which should be seriously considered," notes Joe R. Held, chairman of the Interagency Primate Steering



Committee and a reviewer of Merck's application. Held says that in general he "doesn't see that we will be able to import chimps in sizable numbers." Asked if Merck could import from some country other than Sierra Leone he observes that "I think their options are quite limited. I think they are going to have problems."

Merck and the Interagency Primate Steering Committee have widely differing expectations about the availability of chimpanzees. Hilleman says he will need about 80 new chimpanzees a year once his hepatitis B vaccine gets into production. He envisages setting up a very large breeding colony to meet the needs of the vaccine program—"Some day one might need up to 1000 breeders." Domestic production of chim-

panzees by the half-dozen breeding colonies in the United States amounts to a total of 75 animals a year—insufficient to meet Merck's needs even if Merck were to be given first use of them. The scant likelihood of being able to import new animals for breeding stock is one reason why it will be "impractical" to raise the national production, notes a recent report of the Interagency Primate Steering Committee.

Ethics of Chimp Treatment

Besides the question of availability, another aspect of using chimpanzees for medical research is that they should perhaps be treated somewhat differently from laboratory rats. Recent studies have shown not only that they have an elaborate social structure but also that

they can master and communicate in American sign language and other symbolic systems. Primatologist Jane Goodall does not infer from that that chimpanzees should never be used for research, but she does believe there is an obligation to treat them well. "There are occasions when it is justified to use chimps, but what upsets me is the conditions in which they are kept. They should be kept very well but in fact they get lousy treatment. They are kept in small cages with nothing to do, and they are usually put in solitary confinement when they get older. Yet these are creatures which we now know can communicate in sign language—that seems very wrong to me."

Yerkes primatologist Duane Rumbaugh, the educator of chimpanzee

Briefing

A New Career for Norman Cousins

Independent thinker Norman Cousins has resigned the editorship of the *Saturday Review*—for the second and probably last time—to become a university lecturer on health and medicine. He will be spending time both at Columbia University and at the UCLA School of Medicine.

Cousins has given considerable thought to matters of medicine—and the placebo response in particular—ever since 1964, when he successfully cured himself of a bizarre degenerative disease (ankylosing spondylitis) with a combination of laughter, vitamin C, and an understanding physician. He did not write about his adventure until 1976, when his account was published in the *New England Journal of Medicine*. He has since received thousands of supportive letters from doctors which caused him to realize that his notions about the importance of people mobilizing their innate self-healing powers were not as far out as he had imagined.

At UCLA, Cousins will be participating in a new program on medical ethics and philosophies set up by Bernard Tower, a British pediatrician and writer, and philosopher-lawyer William Winslade. Cousins is being given free rein. Among topics he hopes to explore is the perception of physicians in literature and philosophy—"Most of the great books have doctors

wandering through them in one form or another, and perceptions of them are very different." He is also "fascinated by the connection between creativity and longevity," citing as an example the late cellist Pablo Casals. Are there, Cousins wonders, "biological concomitants to creativity and the will to live?"

A decade ago, the idea of having Norman Cousins coach medical students would have gone over like a lead balloon. But times have changed; doctors need all the help they can get. Says UCLA's associate medical school dean Fred Rasmussen, "We're delighted."

Congress Reluctant to Seek Other Worlds

A House appropriations subcommittee has delivered what one NASA scientist calls a "sad rebuff" to the agency's plans to begin its search for extraterrestrial intelligence, or SETI.

On 4 May the committee voted to delete \$1.4 million from the \$2 million requested for rigging telescopes at Jet Propulsion Laboratory and at Goldstone, California, to listen for nonrandom signals from our galaxy. The prospects for having the money restored by the Senate are not too good either. The chairman of the Senate appropriations subcommittee is William Proxmire (D-Wis.), who in February awarded SETI the feared Gold-

en Fleece award for ostensibly dumb federal spending.

If SETI plans collapse, it will be a small but sharp example of scientists' failures when it comes to imbuing legislators with their own enthusiasm. Support for the project is remarkably widespread among astronomers as well as other scientists who consider the investment tiny in view of the potential gains.

The budget request asked for a total of \$14 million over 7 years for the first stage of the project. Although Proxmire thought this was something that could be postponed for "a few million light years," astronomers warn that the microwave "window"—the band of frequencies judged most promising for listening—will become increasingly clouded by radio interference from other earthly sources.

Richard Henry, the SETI program manager at NASA, says the folks there are "very disappointed" and "puzzled" by the House action. Although a Soviet-American venture proposed 7 years ago (called CETI, the C being for communication) never amounted to anything, Henry says that recent developments in large-scale integrated circuits and the availability of million-channel analyzers mean that "a meaningful search is now possible." Henry says the search is worth it even if nothing is found because then we will know "our galaxy is a very lonely place" and adjust our philosophies of life accordingly.

A NASA report on SETI, issued last March, reflects a positively romantic attitude toward the project. "Dare we be-

Lana, says there is "no doubt that we need to upgrade the treatment of chimps and other apes as a result of what we have recently learned about them. The emerging picture is that chimps are a very unique type of animal and the consequences of how they are treated are not just the same as those of the way one treats a laboratory rat."

"All you can do is say what is more important, these chimps or humans?" Maurice Hilleman observes. Endemic in many parts of the world, hepatitis B occurs in low incidence in the United States but is nevertheless on the increase. There has been a steady growth from 1500 reported cases in 1966 to 15,000 a decade later. The increase is partly ascribable to more accurate diagnosis but is otherwise unexplained. A cu-

rious set of population groups seems particularly at risk—patients receiving blood transfusions, staff and patients of hemodialysis units, drug users, and people who have themselves tattooed. Other high-risk groups are male homosexuals and those in institutions for the mentally retarded.

The virus of hepatitis B is found in most body fluids, from milk to blood, sweat, and tears. Transmission through infected blood products is clearly one route of infection in the United States but cannot account for the endemic nature of the disease in most underdeveloped countries. Transmission by "intimate contact" is one route that has been studied by epidemiologists, but often with conflicting results. Often the spouses of patients with hepatitis B, but

no other close family member, contracts the disease. On the other hand, according to a recent review by Arie J. Zuckerman, similar frequencies of hepatitis B surface antigen were found in registered prostitutes in Athens and in a matched group of pregnant women. A comparison of nuns and prostitutes in Colombia yielded the same result.

"That doesn't mean that the nuns are bad, only that there is a high incidence of hepatitis B marker in Colombia," notes Harold A. Conn of Yale University. A large-scale survey conducted in New York turned up a significant excess of hepatitis B antigen among male, but not female, homosexuals, though for reasons that are still obscure. "It must be borne in mind," Conn has written, "that people who sleep together may do other

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gin?" says the introduction. "For us who write here that question has step by step become instead: Dare we delay?" Many members of the general public appear to share NASA's enthusiasm. But it seems the stodgy lawmakers do not.

Holistic Health Concepts Gaining Momentum

A few years ago it would have been unthinkable for the federal government to lend its sponsorship to a conference on health that featured such topics as faith healing, iridology, acupressure, Buddhist meditation, and electromedicine.

But public disillusionment with the limitations and high cost of conventional medicine, combined with consumerism and the human potential movement, has produced a virtual explosion of interest in alternative healing methods and systems, all of which go under the name of holistic health.

Thus Washington, D.C., in April was the setting of a 4-day conference, co-sponsored by four government agencies, on "Holistic Health: A Public Policy." Arranged by the East-West Academy of Healing Arts, San Francisco, the meeting promised entertainment at the very least, with workshops conducted by such varied personalities as Oh Shinnah, an American Indian who specializes in getting people in touch with the energies of

Mother Earth; Jack Schwarz, who lets researchers stick needles through his arms to study how he controls pain and bleeding; the President's charismatic sister Ruth Carter Stapleton, and psychic healer Olga Worrall.

The conference also featured practical attempts to formulate recommendations on health manpower education and training, services, research, and health insurance.

Holistic health is a vague concept that is often construed as relating to meditation, massage, and other things that do not have anything to do with doctors, pills, and scalpels. But East-West Academy's director Effie Poy Yew Chow emphasizes that the concept embraces all health-promoting practices including allopathic medicine (what we mostly have now). And although some of the matters seemed a little far-out, the fundamental principles are not. One principle is that mind and body are inseparable and that the focus should be on the person rather than just the disease. Another is that the patient is the healer—that the patient has the responsibility and power to become and remain well, and the healer acts only as teacher and facilitator. Holistic health also embraces what is called humanistic medicine in that it recognizes anew that the relationship between doctor and patient can be at least as important as the intervention. Central to holistic health is the idea of disease prevention and promotion of "wellness" through nutrition and healthful life-styles.

Holistic health is really a new package

for a lot of ancient concepts and healing methods that have been elbowed aside by high-technology medicine. Now the federal government, frantic for ways to provide comprehensive care and avoid spiraling costs, has opened its mind to some of these concepts. And cost is not the only factor. As Lowell Levin of Yale Medical School noted at the conference, the disease profile of the country is no longer very well matched by available services. The system is geared for acute medical problems, but the ratio of acute to chronic ailments has almost reversed since 1900, owing to public health measures and antibacterial agents, as well as the growth in the elderly population. Now 80 percent of Americans' health problems are chronic in nature.

Some Administration officials reportedly opposed federal participation in the conference on the grounds that it might be construed as an endorsement of scientifically unproved techniques. But George Lythcott, head of the Health Services Administration (HSA) and the highest ranking official present, made it clear he didn't think he had to believe in all the methods to endorse the principles. He said his top two priorities were promotion of holistic concepts and improved care for the aged, and he hoped that "one can ride in on the coattails of the other."

Other government cosponsors in addition to HSA were the Health Resources Administration, the National Institute of Mental Health, and the National Institute on Drug Abuse.

Constance Holden

Changing Profile of Deep-Sea Miners

"The people who thought they would make money in it are disillusioned. Hell, if you were a craps shooter you'd get out of this game by now."

The speaker was Jack Flipse, formerly the president of Deepsea Ventures, Inc., one of the most important, high technology ocean mining companies. Flipse's views on who is and isn't going to make money mining the deep ocean floor for potato-sized manganese nodules could have implications for U.S. policy at the Law of the Sea Conference. The conference's latest session in Geneva, Switzerland, just recessed without resolving a longstanding deadlock on how much access the rest of the world should have to the wealth of the ocean floor.

Flipse is now a professor at Texas A & M University, but, until last year, his job as head of Deepsea was to develop a brand new technology for mining the ocean floor—technology in which Third World countries at the Law of the Sea Conference are demanding to have a share. And, in this venture he had the enthusiastic support of the president of Tenneco Inc., the mineral conglomerate that owned Deepsea. The president, Flipse recalls, was "enchanted" with the prospect of deep ocean mining. Company calculations in the late 1960's showed that the first years of ocean operations could bring in \$100 million per year after expenses, which would enable the company to make back its \$200 million investment in two, quick years. "In all speculative ventures companies want to make back their investment in just a few years," Flipse explained in an interview with *Science* recently.

But by the mid-1970's, Tenneco's president died, its corporate goals narrowed to near-term development of oil and natural gas, and the company's new leaders were less than enchanted by the long-term adventures of deep ocean mining. Today Tenneco no longer owns Deepsea Ventures; Flipse left last year due to a conflict with the managers of the new consortium that took over the company, made up of Sun Oil Company, U.S. Steel, and the Belgian copper firm, Union Minière.

Flipse says he sees a similar pattern elsewhere in the ocean mining industry, where the former speculators, who were "crap shooting" when they got involved, have since cut back their role. Kennecott, another major entry, had diluted its gamble by bringing in oil and mineral interests along with some Japanese as co-investors. Lockheed has entered the game, but also with a mix of oil and mineral companies as partners. The mineral companies, such as U.S. Steel, are in as a hedge against future low availability of minerals they need. U.S. Steel, for instance, has predicted that in 25 years, Gabon and South Africa will be the only Western sources of manganese; and since you cannot make steel without manganese, U.S. Steel will bet on the deep seabeds as another possible source.

The oil companies, he says, are the chief sources of venture capital for the industry these days, partly because they are among the few enterprises rich enough to make such investments, and partly as a long-term hedge that oil may be found under the deep ocean floor where the nodules are found.

For whatever reason, it is widely believed in the industry now that long-term hedges, and not quick profits, are the name of the deep-sea mining game. One former State Department ocean mining expert explains that under the terms now proposed at the Law of the Sea meeting, only 10 mine-sites a year will be allowed to be exploited, each 40,000 square kilometers in area, and together bringing in only \$40 million after expenses to the industry—instead of the \$200 million per company Tenneco once envisioned.

This declining profitability may be one reason that Elliot L. Richardson, the U.S. Ambassador to the Law of the Sea meeting, has been so pessimistic about the conference—in which the United States has invested a decade of effort. Richardson has also testified in support of protective legislation that would encourage U.S. companies to go ahead and mine the seabeds unilaterally, in the absence of an international treaty. Ironically, this protective legislation, now in committee on Capitol Hill, stands a better chance of becoming law now than it did 5 or 6 years ago, when companies like Tenneco helped to draft it in the belief that deep-sea mining would begin immediately and would be immensely profitable.—D.S.

things together as well. They may share eating utensils, razors, toothbrushes, skin abrasions, needles, lovers, and bed bugs, and any of these or others could permit the intimate, but nonvenereal transmission of viral hepatitis."

Two hepatitis B vaccines are under development in the United States, one by Merck and the other by Robert Purcell and colleagues at the National Institute of Allergy and Infectious Diseases. The Purcell team's vaccine, developed as a demonstration project, is at present undergoing safety tests in humans. More stringent requirements for informed consent and other restrictions have created problems in testing vaccines on traditional groups such as prisoners and children in institutions. The Purcell team vaccine is being safety tested in a community of Trappist monks in Georgia. The community is in many ways ideal for the purpose. There is no problem in obtaining the monks' informed consent, and since the community is known to be free of hepatitis B, any cases that occur would be directly attributable to the vaccine.

So far the vaccine is proving remarkably free of side effects, a trait probably due to its unique method of manufacture. The virus cannot be grown in tissue culture, the usual method of vaccine production, but is harvested directly from the blood of human carriers. So profusely does it grow there that three donors have provided Purcell with enough virus for 20 thousand doses of vaccine.

As for the possibility of a shortage of chimpanzees for production safety testing, Purcell says that that is a problem for the government vaccine regulating agency, the Bureau of Biologics. Robert J. Gerety, chief of the bureau's hepatitis branch, notes that the bureau in anticipation of a shortage set up a breeding colony to supply its own needs. "But I know that the bureau doesn't have enough animals to supply to manufacturers for safety testing," says Gerety.

The world has a growing population of 4 billion people and a dwindling population of some 50,000 chimpanzees. Since the vaccine seems unusually innocuous, and since the disease is only rarely fatal, it would perhaps be more just if the larger population could find some way of solving its problem that was not to the detriment of the smaller.

—NICHOLAS WADE

Erratum. In the report by C. W. McCutchen [197, 691 (1977)], the sentence in paragraph 2, column 3, "The downward motion is an inversion of the upward motion about a point on the axis of samara spin" is in error. It should be replaced by "The downward motion is a reflection of the upward motion successively in a horizontal and in a vertical plane."