

## REVIEWING THE DATA-II

## Fulfilling Koch's Postulates

A century ago, German bacteriologist Robert Koch devised a test for proving that a disease is caused by a specific microbe. That test, known as "Koch's postulates," has become a standard in medicine. Peter Duesberg claims HIV fails it. But some researchers think recent evidence suggests the virus does pass this test.

Koch maintained that for causation to be established, it must be possible to isolate the microbe from an organism that has come down with the disease. The microbe must then be given to a healthy host, where it causes the same disease; then the microbe must be isolated again. Until recently, many AIDS researchers agreed HIV had not satisfied Koch's postulates, largely because there is no good animal model for AIDS. But those researchers did not agree that because HIV didn't satisfy Koch's postulates, it wasn't the cause of AIDS. They pointed out that Koch's postulates have not been satisfied in many other diseases where the cause has been well established by other means.

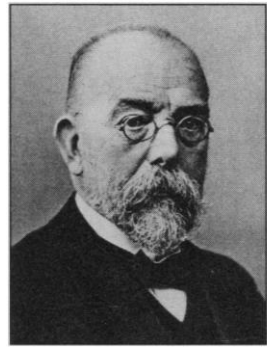
But recently some leading AIDS researchers have stopped conceding that HIV doesn't satisfy Koch's postulates, as powerful new evidence emerged from tragic accidents: the infection of three laboratory workers with a pure, molecularly cloned strain of HIV. As reported at the 1993 international AIDS conference in Berlin by the National Cancer Institute's William Blattner and his colleagues, one of the three lab workers developed *Pneumocystis pneumonia*, an AIDS-defining disease, 68 months after showing evidence of infection. This lab worker had not received AZT (which Duesberg contends can cause AIDS), or any other anti-HIV drug, until 83 months after infection, when the patient had fewer than 50 CD4 cells, the key immune system cells destroyed by HIV. (A healthy person typically has a count of 600 to 1200 CD4s.)

Blattner reported that a second lab worker, who also received no anti-viral drugs, had 250 to 400 CD4s at 83 months. The third lab worker had CD4 counts of 200 to 500 at 25 months and had been given anti-virals. "These people have no other risk factors" for AIDS, such as illicit drug injection or homosexual sex, Blattner says.

Duesberg told *Science* that, in his view, the lab-worker data don't prove that HIV satisfies Koch's postulates. Two of the lab workers, he notes, did not have AIDS, but only a severe decline in CD4 counts. Duesberg did not directly address data on the one lab worker who has the AIDS-defining illness *Pneumocystis pneumonia* and therefore does have AIDS. Instead, Duesberg responded by asking why, if HIV causes AIDS,

more HIV-positive people don't develop this AIDS-defining pneumonia within 5 years. (The average time between HIV infection and an AIDS-defining illness is 10 years.)

Rather than accept the lab-worker data as definitive, Duesberg said he would like to see an epidemiologic study to answer the question of whether HIV causes AIDS. The study he wants would compare two large groups of people matched for age, lifestyle, and "non-drug use" who differ only in HIV status. "If the HIV-positive group had significantly more AIDS-defining diseases



Postulator. Robert Koch.

than the negative group, HIV could be the cause," Duesberg says. But, he says, "there is not even one study in the vast AIDS literature that shows that an HIV-positive group of 20- to 50-year-old people who do not use drugs and do not have congenital diseases, like hemophilia, have more AIDS diseases than an HIV-negative control group."

Others contend that this study isn't necessary. "As far as I'm concerned, the laboratory workers prove causation," says Anthony Fauci, head of the National Institute of Allergy and Infectious Diseases. "I don't need any more than that."

—Jon Cohen

## REVIEWING THE DATA-III

## The Epidemic in Thailand

Two years ago, Peter Duesberg used epidemiological data from Thailand to argue that HIV doesn't cause AIDS. In his 1992 HIV/AIDS paper in *Pharmacology and Therapeutics*, Duesberg wrote: "An AIDS crisis that was reported to 'loom' in Thailand as of 1990 and that was predicted to 'explode' now has generated only 123 AIDS patients from 1984 until June 1991." But researchers familiar with the Thai epidemic argue that new data from Thailand present strong epidemiological arguments that HIV is indeed the cause of AIDS.

Thailand began extensive HIV-antibody testing in 1985, as documented by Bruce Weniger of the Centers for Disease Control and Prevention, with Thai co-workers, in a 1991 paper in the journal *AIDS*. By the end of 1987, nearly 200,000 HIV blood tests had been done on Thais from every known risk group—and there were fewer than 100 positive samples.

But then the virus began a rapid spread. By the end of 1988, in one risk group alone—users of injectable drugs—more than 1000 people had tested positive for HIV. Tim Brown, a theoretical physicist at the East-West Center in Hawaii who has worked with the Thai National Economic and Social Development board to model the AIDS epidemic, estimates that by the end of 1993 more than 700,000 Thais had become infected with HIV. "It's hard to think of any other country that has had such large amounts of spread that is well documented," says Weniger.

The linchpin of the argument that HIV

causes AIDS in Thailand, say Weniger and others, is that the dramatic rise in HIV infections is being closely followed by a rise in AIDS cases. Brown's data show that, as of the end of 1993, there were more than 8000 cumulative AIDS cases. "The Thai data is quite compelling that HIV preceded AIDS, and the increase in HIV infection is now being seen in AIDS cases," says Weniger.

| RAPID SPREAD |                          |                                   |                                |
|--------------|--------------------------|-----------------------------------|--------------------------------|
| Year         | Estimated HIV prevalence | New AIDS cases reported this year | Cumulative reported AIDS cases |
| 1988         | 12,850                   | 18*                               | 18                             |
| 1989         | 86,000                   | 34                                | 52                             |
| 1990         | 297,000                  | 91                                | 143                            |
| 1991         | 499,000                  | 460                               | 603                            |
| 1992         | 634,000                  | 1485                              | 2088                           |
| 1993         | 708,000                  | 6026                              | 8114                           |

\*Includes pre-1988 cases

SOURCE: TIM BROWN

Duesberg counters that there is "no explosion" of HIV infection in Thailand. "Instead, we look here at an explosion of HIV testing that began in 1989, and that has discovered a long-established, low incidence of HIV in Thailand," he wrote in reply to questions from *Science*. As for the rise in Thai AIDS cases, he agrees that there has been "a small explosion," which he writes "appears to be a consequence of new Thai sex and drug practices, not of a long-established latent retrovirus."

But Brown predicts that by 2000 there will be 1.4 million cumulative HIV infections and 480,000 AIDS cases in Thailand. "Thailand proves exactly why Duesberg is wrong," says Brown.

—Jon Cohen