AIDS vaccine: Preliminary but promising

Researchers last week reported a series of significant, incremental steps toward a vaccine to protect against AIDS. They emphasize that general availability of such a vaccine remains, at minimum, many years away. But the recent progress brightens what has been an extremely downbeat assessment of the prospects for an AIDS vaccine.

Speaking in Montreal, Quebec, at the Fifth International Conference on AIDS, Jonas Salk of the Salk Institute for Biological Sciences in San Diego presented early but encouraging results from experiments in chimpanzees and humans infected with the AIDS virus, HIV. Unlike most experimental AIDS vaccines, which use small portions of HIV to trigger a protective immune response, Salk's vaccine contains whole AIDS viruses killed by treatment with chemicals and radiation. Salk used a similar method in the 1950s to make the first commercial vaccine against polio.

While other experimental AIDS vaccines use proteins from HIV's outer envelope to stimulate immunity, Salk's chemical/radiation treatment disintegrates this envelope. Yet the vaccine appears to eliminate HIV from chimpanzees, suggesting it might not only prevent infection but also halt disease progression in already-infected individuals.

Salk and Clarence J. Gibbs of the National Institutes of Health vaccinated two HIV-infected chimps and one uninfected chimp, then followed up with two boosters. Three months later, they infected the three chimps and an unvaccinated control chimp with large "challenge" doses of live HIV. Following that challenge, they detected no HIV in the first two chimps. The originally uninfected, vaccinated chimp tested HIV-positive for a few months after the challenge but has remained HIV-free since then. The unvaccinated chimp's infection has worsened.

In tests assessing safety and side effects rather than effectiveness, the researchers also vaccinated HIV-infected humans showing early signs of AIDS and saw no complications. Moreover, of these 19 patients, seven show increased numbers of immune system cells called CD4s — an indication of improved immune strength, says study collaborator Alexandra M. Levine of the University of Southern California in Los Angeles. Four show a decline in CD4s. Perhaps significantly, six of the seven with increasing CD4s — but none of the four with falling CD4s — show evidence of a specific form of cell-mediated immunity against HIV, as determined by skin tests resembling the commonly performed tuberculin test. Increasingly, researchers believe that an effective AIDS vaccine will have to induce both antibody-mediated immunity and this cell-mediated immunity. Although most vaccine research emphasizes the former, the latter seems more effective at wiping out cells that harbor HIV.

Salk's group and others say that while these results appear encouraging, any real benefits from the vaccine in humans must await larger, controlled trials. Nonetheless, Salk predicts that his vaccine — at least in conjunction with other therapies — may prevent disease progression in infected adults and in congenitally infected babies. "The diagnosis of HIV seropositivity need not be regarded as a death sentence," he says.

National Cancer Institute researcher and HIV co-discoverer Robert C. Gallo calls the results intriguing but has some reservations about the approach. "When you use a killed whole virus, it's impossible to guarantee there's not a live virus left" in the vaccine, he warns.

Other researchers at the Montreal meeting reported progress toward identifying key antibody-inducing fragments of the HIV envelope. And in the June 1 NATURE, researchers at the University of Reading in England and two other British institutions describe a promising vaccine made from an HIV protein bound to a strain of poliovirus developed by Albert Sabin, the virologist who once raced Salk to develop the first polio vaccine.

— R. Weiss

Bush proposes strong air-cleaning measures

Nearly half the U.S. population lives in areas with unhealthy air, according to Environmental Protection Agency Administrator William K. Reilly. This week, President Bush unveiled new legislation to eliminate much of the air pollution responsible. Under a complex proposal he outlined at a press briefing, acid rain precursors would be cut in half over the next 10 years, pollutants responsible for smog-ozone would drop 40 percent within 20 years, and 75 to 90 percent of the toxicity — especially carcinogenicity — in urban air could be eliminated by the year 2000.

"We're expecting that the acid rain provisions alone ... will cost just under $4 billion a year," Reilly says. The ozone limits will probably cost $8 billion to $12 billion per year, the carcinogenic-pollution controls another $2 billion. Though expensive, the investments are urgently needed to protect the nation's health and ecology, Reilly says.

In general, the new bill "contains the right elements," says S. William Becker, executive director of the Washington, D.C.-based State and Territorial Air Pollution Program Administrators. Moreover, he says, "one cannot overestimate how important it is for a U.S. President to back clean-air legislation." Because President Reagan would not acknowledge that the Clean Air Act needed fixing, Becker says, "we saw eight years of stalemate."

A cornerstone of the new bill is its acid rain proposals. One targets 207 fossil-fueled power plants in 17 states for tough sulfur dioxide controls. The limits, phased in over 10 years, should help reduce U.S. sulfur dioxide pollution to almost half the 1980 level.

Nitrogen oxides (NO_x) — the more recalcitrant precursors of acid rain and smog-ozone — would not be attacked nearly as vigorously. Bush calls for reducing nitrogen oxides just 10 percent from 20.4 million tons in 1980. Moreover, the new bill would allow large-scale polluters to substitute greater controls on sulfur for lesser controls on nitrogen — suggesting that actual nitrogen oxide reductions could fall far short of even 10 percent. Ironically, a growing body of research indicates nitrogen controls may offer the most cost-effective approach to limiting urban smog and some acid rain effects (SN: 4/30/88, p.276; 9/17/88, p.180).

Another innovative feature in Bush's new proposal would require phasing in vehicles that use "clean" oxygenated fuels — such as methanol, ethanol and ethyl- or methyl tertiary butyl ether — in the nine areas currently showing no hope of quickly meeting the federal smog-ozone standard: Los Angeles, Houston, New York City, Milwaukee, Baltimore, Philadelphia, greater Connecticut, San Diego and Chicago. Eventually, 12 percent of the new vehicles sold in each area — 1 million annually by 1997 — would have to run on one of these alternate fuels.

Other new measures would include:

- tailpipe hydrocarbon-emission standards for light-duty trucks equivalent to those now required for cars
- new limits on the offgassing of certain hydrocarbon-based consumer products, such as oil-based paints and solvents
- new EPA authority to control emissions from industrial plants, including some of the smaller facilities previously exempted because of size or individual emission rates
- adoption of "best available technology" to control carcinogenic or toxic industrial air emissions
- mandated vapor-recovery nozzles on gas pumps in areas that exceed the federal ozone standard.

Though the President's bill is ambitious, "it does need to be revised," Becker says. He and others — including National Clean Air Coalition Chairman Richard E. Ayres — say they hope Congress will insert language to toughen emissions controls on vehicles and give EPA stronger, less discretionary responsibility for regulating carcinogenic pollutants.

— J. Raloff