Wide World

Swine virus for vaccine is grown in eggs.

in individuals across the country and 2) the Asian and Hong Kong epidemics smouldered before they took off. "No one is saying there *will definitely* be a major outbreak," he says, "but this lead time gives us a chance to protect the public in case there is one—and many of us think it is likely."

Dozens of highly respected scientists, Kilbourne included, from federal health agencies, universities, research institutes and drug companies advised President Ford to request $135 million to produce the virus. $100 million of the newly appropriated funds will go to four major drug companies, $26 million will go to state and local health organizations to cover some administrative costs and $4 million will go for vaccine quality control by the Food and Drug Administration and research by the National Institute of Allergy and Infectious Diseases.

The program is really a public/private venture; the $135 million will cover only part of the costs. Although some vaccine will be administered at no cost by local public health clinics, many—perhaps most—persons will have to pay private physician fees for vaccination during regular office visits.

Not all 217 million Americans will be inoculated, however. Some small children, persons allergic to eggs (virus for the vaccine is grown in chick embryo allantois fluid) and those allergic to vaccines in general aren't included in the figures. Neither are the many individuals expected to decline participation. The drug companies are aiming to make at least 150 to 175 million doses by December, a spokesman says. High-risk individuals (very young, very old and the infirm) will be inoculated beginning in June, it is hoped, and lower-risk individuals by November or December.

The first experimental inoculations will be given next week to thousands of volunteering federal employees at health agencies and military bases. Three dosage strengths will be tested for maximum protection with minimum side effects.

Critics like Nader-raider physician Sidney M. Wolfe contend that the risks of side effects inherent in mass inoculation are clear-cut while the benefits are uncertain. He cites a projection that "15 percent of those immunized will suffer a 'disabling' illness—meaning in most cases missing work or school." That, says FDA virologist Francis Ennis, is a pessimistic prediction, the usual reaction rate being a few percent with sore arms and "nondisabling low-grade fevers." Wolfe also contends the decision was made politically and dissent was discouraged.

Wolfe and others advocate stockpiling the vaccines and beginning inoculation only after there is evidence of a major outbreak. But this, says Kilbourne, is "highly unrealistic, and ignores both the speed with which flu can move through a population and the massive distribution problems we will face."

Kilbourne, as one of Ford's advisers, says he resents the implication that the decision was a political one. "This decision had its origin in the scientific community and a number of us can take responsibility for it, good or bad. I find the claim of politics somewhat ironic in fact, because it is indeed a large gamble with no guarantees except the inevitable criticism of 'wasted money' if the pandemic doesn't occur. We could all wind up with egg on our faces, but then," he says, "we can't ignore the chance to save thousands of lives."

That chance was ignored during the 1957 and 1968 flu epidemics, he says. "To put the whole thing in perspective, the real question is why the hell didn't we do something like this *before* when we had early indicators? Society and government did too little, too late during those epidemics," he says, "and although this is a bold kind of action, we are following the best evidence we have." □

The great tap water energy machine flap

Most inventors of perpetual energy machines never make it to an editor's desk anymore, or past the polite officials corporations hire to handle such cases. But a Southern California inventor named Sam Leach has apparently found a successful new approach, a machine that demonstrably produces hydrogen from tap water in what he claims to be a self-sustaining reaction. Such demonstrations quickly gained him two corporate sponsors and nationwide press coverage. The problem is that to be truly self-sustaining, the unspecified chemical reactions going on inside the machine would have to violate the first law of thermodynamics: Thou canst not create energy from nothing.

Inside the mysterious machine, which is about the size of a trunk, are reportedly two steel tanks, each containing granules of an unidentified metal that supposedly reacts with steam, binding oxygen and releasing hydrogen. After a while, the reactant must be recycled by heating to remove the oxygen and restore the metal to its original condition. To be self-sustaining the heat given off in the hydrogen-generating reaction in one container would have to be sufficient to power the recycling reaction in the other. Therein lies the rub—the laws of physics insist that such energy transfer could *never* keep the reaction going indefinitely, because some heat would always be lost in the process and therefore the reactant could not be fully restored without adding energy from an external source.

Unfortunately, press reports have tended to treat this difficulty as if it were just another case of experts disagreeing over whether something could or could not theoretically be done. The New York Times of March 29 quoted Leach as saying, "The reaction is self-sustaining. . . . Thermodynamicists follow certain things blindly, like tunnel vision." Some physicists and chemists who had never seen the machine were asked by the Times to respond, and not surprisingly they all said the device could not operate as the inventor contended. Compounding the confusion were incomplete reports on tests run on the machine by two independent laboratories. NEWSWEEK of April 19 simply quoted press releases as saying the labs found that the machine worked.

Even before widespread press coverage could catch up, however, rumors about the process circulated on Wall Street and created a spree of speculation. Leach has reportedly sold application rights to his invention to two companies: The Presley Companies, homebuilders based in Newport Beach, Calif., will control residential applications; MJM Hydrotech of Los Angeles, a family owned company headed by Morris J. Mirkin (founder of Budget Rent-A-Car), will control other rights. The value of Presley stock quintupled in just three months, leading the Securities and Exchange Commission to halt trading, pending an investigation.

Both the press and eager investors have apparently overlooked the fact that the basic claim for the machine is still untested. The independent laboratories were asked only to certify that water was indeed being separated into hydrogen and oxygen, and that after an initial warm up period no external energy was added for the duration of the short test. No hydrogen production rate measurements or extended runs were made to see how long it might take before the reactant would have to be replaced or more energy added. Aaron Cohen of Approved Engineering Test Laboratories told SCIENCE NEWS this week that the tests his organization con-

ducted were not sufficient to pass judgment on the chemical or thermodynamic changes in the machine, or to evaluate economic feasibility. Gordon Walker of Smith-Emery Co., the other laboratory that did tests, was quoted in the New York Times article as saying, "I could find no evidence of hanky-panky." But when asked by SCIENCE NEWS whether he would still stick by that statement he would only reply, "I don't care to discuss it further."

Randall Presley, president of the Presley Companies, was also reluctant to talk, saying the issue is "just a bit premature to discuss." Asked whether he believed the process was really self-sustaining, he replied only that "this is the inventor's claim;" just reserving residential application rights is "our total involvement at this point."

Mirkin is still enthusiastic, but because of the continuing SEC investigation he emphasized that his views should not be interpreted as relating to the Presley case. He told SCIENCE NEWS that the tests needed to establish cycling and energy efficiencies will be run in the near future and that he remains confident that "we can get more energy out of it now than we put into it."

When asked about whether the machine would violate laws of physics, Mirkin excused himself on grounds of lacking a scientific background and let his vice president, Patrick McDonald, reply. The basic contribution of the inventor, McDonald said, was to challenge "conventional wisdom;" the machine "liberates the potential energy in water in a way others believed could not be done."

Leach, though he appeared for the Times, is now apparently unavailable for comment. Attempts by SCIENCE NEWS to reach him were unsuccessful.

Hydrogen production from metal-water reactions is nothing new. As long as 60 years ago hydrogen was produced commercially by mixing powdered iron with steam. Today, work on systems similar to Leach's (as far as one can tell) is going on around the world. One of the laboratories involved is Chicago's Institute of Gas Technology, where Derek P. Gregory has been a leader in the movement toward a "hydrogen economy" (SN: 9/1/73, p. 135). Mirkin said that when he showed Gregory the new machine, "He was flabbergasted." But in an interview, Gregory said, "I would not want to be quoted as being enthusiastic."

The promoters, he said, "have failed to prove to me that they did what they claimed. . . . The one vital piece of information needed [flow rate versus energy input] was not available." Gregory said that his institute has also developed a closed-loop hydrogen generator based on cadmium. But no system, he says, will actually approach what Mirkin claims: "If it works the way they say it does, it is perpetual motion. That's impossible." □

Science and safety: 'Acceptable' risk

Though specific safety issues receive widespread publicity—are nuclear reactors safe, will the SST destroy the ozone layer, should possibly dangerous research in genetic manipulation be banned?—far less attention has been paid to discovering better ways to answer these pressing questions.

William W. Lowrance, now a research fellow at Harvard, used a two-year Sloan fellowship at the National Academy of Sciences to attack the problem, and his new conclusions have been published in a new book, *Of Acceptable Risk.*

Much of the current confusion about the nature of safety decisions, Lowrance says, results from deeply rooted misunderstanding about what safety is. Specifically, he challenges the dictionary definition of "safe" as meaning "free from risk." Since nothing is really risk-free, safety decisions must be based on measurements of what risks really are inherent in a given situation, followed by a value judgment of whether accepting those risks is reasonable. The book is thus based on a more pragmatic definition of safety: "A thing is safe if its risks are judged to be acceptable."

His book is an eminently readable attempt to answer the questions that quickly arise from the basic premise—how should risks be measured and who shall judge acceptability? Full of lively anecdotal material and an occasionally frightening summary of just how many hazards do surround us, the book is aimed at the "well-informed layman," to serve as a primer for responsible action. Lowrence worked with the Academy's Panel on Science and the Determination of Safety, which in some measure set the book's tone and scope. But by encouraging this work, rather than issuing yet another formal report on safety policy, the NAS may well have provided a much wider audience with a much more articulate presentation of its case.

Lowrance bears down most heavily on perspective, beginning with the historical perspective of consumer problems in ancient Rome, when lead-glazed pottery may have caused chronic poisoning of the aristocracy. Many of today's controversies, he concludes, arise simply because our ability to assay potential dangers has become so sensitive. The municipal drinking water of Duluth, Minn., for example, appeared clear and free of particulate matter under a light microscope, but when it was examined in 1973 with an electron microscope, it was found to contain up to a hundred *billion* fibers of asbestos per liter. The resulting controversy over the water's "safety" still rages.

To be able to estimate the risks involved in such cases, more research must be done to relate exposure to effect. Already such research has produced some insights into bodily response to environmental hazards, but Lowrance says that for most toxic chemicals, radiation and other low-level or delayed-effect hazards, the question of a threshold for deleterious effects has never been satisfactorily resolved. Indeed, for many hazards, more research is needed just to determine what safety tests to perform. For example, to test a pesticide or food additive to ensure it would cause no more than two tumors in one million people might require experimenting with three million test animals, and even then questions arise about how well one can extrapolate such results.

Even given all these difficulties, the tougher question is still how to determine acceptability once a risk is known. All traditional methods have increasingly evident limits. Table salt and cyclamate were once judged acceptable because of custom; they were "generally recognized as safe." Then in 1969 cyclamate was suddenly banned because of controversial animal experiments. Later experiments have now led to a move to reinstate cyclamate and possibly ban its substitute, saccharine. And what does one do about salt, which has now been implicated in high blood pressure, but which is necessary for life.

One strong recommendation Lowrance makes is to increase the number of retrospective studies on items whose safety has already supposedly been determined. He cites a study that shows that nearly four times as many new drugs became exclusively available in Great Britain as in the United States during the 1960s, with less stringent marketing controls initially but better follow-up programs. The study concluded that "on balance, Britain appears to have gained in comparison."

During an informal discussion last week at the Academy, Lowrance summarized his case by parodying an old ad line: "Progress is our most important problem." Some new ways of slowing down are needed—new choices between the extremes of banning a product or licensing it unconditionally. More people must become involved in the decision making process with both sides of issues brought into real juxtaposition, he says, rather than the sometimes ritualized presentation at regulatory hearings. The result may be a new level of mutual restraint: "I'm a real dreamer, I hope for a different ideal of progress."

Scientists must play a key role. In his book, Lowrance frequently refers to the "any-man's-land" between the two tasks of measuring risk and judging acceptability. It is here that the scientist must accept new responsibility: "Recognizing that they are making value judgments for the public, scientists can take several measures toward converting an 'arrogation of wisdom' into a 'stewardship of wisdom.'" □