The Vaccine Race: The Science, Politics and the Human Costs of Defeating Disease
Review by Norman M. Goldfarb

The Vaccine Race: The Science, Politics and the Human Costs of Defeating Disease has it all: triumph, failure, drama, farce, intrigue, scandal, financial chicanery, and more. The book primarily focuses on the development of vaccines against German measles (rubella). The disease is of little concern today, but when it began sweeping the U.S. and Europe in 1964, pregnant women were terrified of silent infections that would result in catastrophic birth defects in their newborn infants.

As illustrated by the following excerpt, the research was conducted in an ethical environment very different from our own today:

The NIH made no distinction between the role of the researcher motivated by the quest for discovery and that of the physician whose purpose is to heal the patient and defend his or her welfare. The agency held that one person could play both roles at once, without any conflict of interest. So the NIH promulgated no rules about informed consent, and individual researchers at the Clinical Center — like those non-NIH scientists around the country whose projects were funded by the NIH — were under no obligation to inform their patient-subjects about the risks of the procedures being carried out on them, or even that they were subjects of experiments.

Given this backdrop, it is not surprising that few if any eyebrows were raised when Roderick Murray was elevated to head the government’s vaccine-regulating branch, the DBS, one year after he and colleagues published, in the Journal of the American Medical Association, the paper announcing that he had infected healthy young men with a life-threatening virus, establishing that hepatitis B was indeed a blood-borne disease. “The men volunteered for this purpose,” Murray and his coauthors wrote in the pages of JAMA, adding in a footnote: “The service rendered by the volunteers is gratefully acknowledged.”

As common at the time, testing the vaccines for polio, rubella and rabies relied on “unregulated, exploitative experiments on orphans, prisoners, newborns and intellectually disabled children.” Their institutional confinement and lack of agency saved a lot of time and money for the researchers.

Several research labs competed to develop the first rubella vaccine. All but one grew the virus in monkey kidney cells, as had been done previously for the Salk and Sabin polio vaccines. The vaccine that eventually prevailed was grown in human cells after obstinate resistance by the now conservative Roderick Murray. (Much of the book describes the formidable challenges of creating a suitable line of human cells.) However monkey kidney cells had a problem, leaving aside the “sacrifice” (the technical term) of too many monkeys to cite the number here. (Imagine a big number, multiply it by 100, and you might get close.)

The leading polio vaccinologists who convened at the conference at Georgetown University that June were buzzing with optimism. The killed-virus Salk vaccine had already been on the market for five years, and the incidence of polio in the United States had fallen dramatically, from nearly 25 cases per 100,000 people in 1955 to
fewer than five per 100,000 people in 1960. But pockets of polio stubbornly persisted, particularly in poor communities. Still more worrying was the fact that the worst cases — the ones that paralyzed people — had not declined at as steep a rate as cases that sickened people but from which they recovered fully. Alarmingly, cases of paralytic polio more than doubled between 1957 and 1959 to more than 6,000. It seemed clear that the Salk vaccine was going to curtail polio but not conquer it. And so the assembled virologists were eagerly awaiting the licensing of a second solution — the first live polio vaccine — a vaccine that, they anticipated, would be cheaper, easier to administer, and more effective than Salk’s. It would be swallowed rather than injected and so would mimic the natural route of polio infection. It would generate robust levels of antibodies in the lining of the digestive tract, where the virus first encounters the human immune system, as well as in the blood — unlike Salk’s killed-virus vaccine, which was injected into muscle.

But what the audience heard from Hilleman at that June 1960 conference put a damper on the buzz about the hoped-for licensure of a live vaccine. Hilleman shocked them with the news of an unexpected finding by Ben Sweet, a scientist he supervised at Merck’s West Point, Pennsylvania, campus. Sweet had discovered a new, invisible simian virus contaminating Sabin’s live vaccine and almost certainly Cox’s and Koprowski’s live vaccines too. All three vaccines were made using monkey kidney cell cultures. And unlike Salk’s killed vaccine, none of the live vaccines were treated with the formaldehyde that was presumed to kill simian viruses.

This new simian virus differed in an important way from the dozens of others that were now known to infect the monkey kidneys used by polio vaccine makers. The new virus didn’t declare itself by damaging cultures of the cells. It didn’t “go on a rampage,” as Koprowski put it. Instead it sat quietly, leaving the monkey cells looking and acting perfectly normally in their bottles. It was impossible to detect, making it impossible for vaccine makers to jettison infected cultures. But it was there nonetheless...

A scientist at the drug company Eli Lilly, Robert Hull, had begun cataloging each new simian virus that was discovered, classifying it according to the cellular damage that it caused in monkey kidney cell cultures. In 1958 he reported that 18 new simian viruses had been discovered in just the previous two years. “As long as primary monkey kidney cultures are used in the production and testing of virus vaccines,” his paper concluded, “the problem of simian virus contamination will remain.”

The assumption about these simian viruses, made by everyone from Salk to the NIH’s top vaccine overseers, was that while they might be an annoyance in the lab or on the production line, they were not a danger to human beings, because they were killed by the same formaldehyde that killed the polio virus in the Salk vaccine. What was more, the reasoning went, even if simian viruses occasionally managed to survive the manufacturing process, they were clearly innocuous in humans: weren’t there tens of millions of healthy Salk vaccinees walking the streets to prove the point?

Bernice Eddy couldn’t so casually accept those assumptions. In June of 1959, without her NIH boss’s knowledge, she launched a bold experiment. She took monkey kidney cultures prepared by the DBS — these were from rhesus monkeys, the species widely used in polio vaccine making, which will be important. She froze them, ground them up, put them through a very fine filter that strained out bacteria but not viruses, and injected a fraction of an ounce of the resulting fluid under the skin of newborn hamsters. Fully 70% of the 154 animals that she injected developed tumors, and every animal that did so died. What was worse, it wasn’t just one or two
of the ground-up cultures that were at fault: She had prepared 12 lots of ground-up monkey kidney cells, each derived from between eight and 32 monkeys. Nine of the 12 appeared out to be cancer causing.

Vaccine development is much more efficient and humane today, but it still faces at least some of the obstacles described in the book.

The book includes 28 chapters:
- Beginnings
- Discovery
- The Wistar Reborn
- Abnormal Chromosomes and Abortions
- Dying Cells and Dogma
- The Swedish Source
- Polio Vaccine “Passengers”
- Trials
- An Emerging Enemy Chapter
- Plague of the Pregnant Chapter
- Rabies
- Orphans and Ordinary People
- The Devils We Know Chapter
- Politics and Persuasion Chapter
- The Great Escape
- In the Bear Pit
- Cell Wars
- DBS Defeated
- Breakthrough
- Slaughtered Babies and Skylab
- Cells, Inc.
- Rocky Passage
- The Vaccine Race
- Biology, Inc.
- Hayflick’s Limit Explained
- Boot-Camp Bugs and Vatican Entreaties
- The Afterlife of a Cell
- Where They Are Now

Reviewer
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