SEARCHING FOR THE ORIGIN OF AIDS

BRIAN MARTIN

The River: A Journey Back to the Source of HIV and AIDS, by Edward Hooper, Harmondsworth: Penguin/Boston: Little, Brown, 1999, 1070 + xxxiii pages, £25/$35.

This book is a scientific blockbuster about the origin of AIDS. It is in the great tradition of scientific detective stories—except that, instead of reconstructing a scientist's discovery, it is a process of scientific discovery itself. It is also a pathbreaking endeavour in integrative investigation, cutting across the usual disciplines and involving everything from molecular biology to subtle interviewing strategies. Finally, it is intensely engaging to read.

Undoubtedly I'm biased, since I've been following this area for quite a few years. So let's go back a step and get some perspective on the topic.

When a new disease suddenly appears, it is natural to ask, why? Partly this is just curiosity. In addition, understanding the origins of disease can help point to possibilities for prevention or cure. AIDS, first recognized in 1981, has killed millions of people worldwide and no cure is in sight. Origins should be of special interest. Many people have explored the issue. Ed Hooper's epic book, the story of his quest, eclipses all previous efforts.

There are numerous theories of how AIDS arose. The standard one is that a hunter in Africa, in butchering a monkey, got some monkey blood in a cut. Monkeys carry viruses called simian immunodeficiency viruses or SIVs, which are generally thought to be the source of the human viruses, HIVs, responsible for AIDS. Once infected, the hunter could pass the virus—now adapted for survival in humans—to others. Another possibility is that AIDS developed after someone ate undercooked monkey meat or was bitten by a monkey.

Address correspondence to: Brian Martin, Science and Technology Studies, University of Wollongong, NSW 2522, Australia, E-mail: brian_martin@uow.edu.au

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There are also other theories. One is that HIV came from a biological warfare lab, created either intentionally or unintentionally. Another view, championed by Peter Duesberg, is that HIV is neither necessary nor sufficient for AIDS, which is a name applied indiscriminately and inappropriately to many other diseases.

GUILTY VACCINE?

Hooper started his quest in 1990, investigating a number of theories and tracking down relevant evidence. For example, he looked into the earliest cases of alleged AIDS. He also investigated the spread of AIDS, for example, analyzing patterns of infection in Africa, generally thought to be the cradle of AIDS, and relating them to movements of soldiers and commerce. His earlier book *Slim* focussed on AIDS in Africa.

Several things are not explained by the standard theory. By examining the mutations in HIV, it is possible to determine when HIV started evolving in humans. This seems to be around the 1950s. Furthermore, the two major variants of HIV both seem to have evolved from about the same time. Since humans have been butchering monkeys for millenia, it seems rather a coincidence that two separate species-crossing events would occur in the same decade.

Some scientists have speculated that AIDS has been around for centuries but has been restricted until recently to remote tribes. Hooper came up with many reasons to doubt this explanation. Most significantly, he was unable to find a single convincing case of AIDS before the late 1950s.

Some time into his quest, Hooper decided that the theory most worthy of further investigation was that HIV-1—the virus responsible for most AIDS around the world—originated in contaminated polio vaccines used in Africa in the 1950s. Polio pioneer Hilary Koprowski led several vaccination campaigns in central Africa over the period 1957–1960. These were the world's first mass vaccinations for polio. Both the timing and location are a perfect fit for the origin of AIDS. Polio vaccines are grown on monkey kidneys, thereby potentially providing a means for SIVs to infect humans.

There are also some other suggestive details. Another monkey virus, SV40, is known to have contaminated polio vaccine given to

millions of people around the world before it was discovered in 1960. No screening was carried out for SIVs at the time; they weren't even discovered until 1985. Monkeys with SIVs often show no sign of illness, yet when an SIV from one species infects another monkey species, it can lead to rapid death from an AIDS-like illness. Albert Sabin found an unidentified, non-polio virus in Koprowski's vaccine. Many of the vaccinations were of infants whose immune systems were not developed.

In pursuing the polio vaccine theory, Hooper was able to build on the work of a number of others. South African scientists Jennifer Alexander and Mike Lecatsas proposed the possibility in the late 1980s. Independent scholar Louis Pascal developed a fairly comprehensive picture; journals refused to publish his articles in 1987, but in late 1991 his work became available. Independently of this, AIDS activist Blaine Elswood came to an identical conclusion and authored scientific papers. The biggest impact, though, came from a story by investigative journalist Tom Curtis, who pursued it at the urging of Elswood. Curtis' article in *Rolling Stone* at the beginning of 1992 triggered a cascade of articles. The theory's most eminent supporter is William Hamilton, professor of zoology at Oxford and a world-famous evolutionary biologist.

Alexander, Lecatsas, Pascal, Elswood, Curtis and Hamilton were all essentially saying 'here's a plausible theory; please investigate', but many scientists displayed a remarkable reluctance to do so. Curtis and others called for the Wistar Institute in Philadelphia, which Koprowski had headed, to provide seed samples of the vaccine for independent testing, but this has never been done. In fact, many AIDS scientists say that the origin of AIDS is not important and that the main thing is to figure out how to stop it. This ignores what could be learned from the origin, including how to prevent further diseases from cross-species transfers of biological material.

There is one obvious reason for the reluctance of mainstream scientists to investigate the polio vaccine theory. If people believed that AIDS came from a contaminated vaccine, this would undermine confidence in vaccines generally and perhaps lead to more controls on research.

Some people, certainly, don't want the theory discussed. Koprowski sued Curtis and *Rolling Stone* for defamation, thereby shutting down media discussion for years. *Science* refused to publish

Curtis' reply to Koprowski and later refused to publish Hamilton's reply as well.

While Curtis and others were saying that the theory *should* be investigated, Hooper actually went ahead and did it. Eventually he quit his job and worked for years full-time on the investigation. *The River* is the story of his remarkable effort.

DETECTIVE STORY

Hooper wanted to find out about the earliest AIDS cases. He combed the medical literature for possibilities and then explored the most promising ones intensively. He went to the locations and interviewed relatives, obtained records and explored whether there was any way the person could have been infected. He focussed especially on the case of David Carr, a sailor from Manchester who died in 1959 from what was later diagnosed as AIDS. He also explored the life and travels of some key individuals who he believes were responsible for spreading AIDS in different parts of the world.

Hooper also interviewed many scientists. He wanted to find out whether the steps in the theory were possible. When did HIVs enter the human species? Could SIVs survive the processing of polio vaccine? This led to further investigations. How exactly was Koprowski's vaccine manufactured? What species of monkeys were used? Precisely where was the vaccine used and when? Which lots of vaccine were given in which parts of Africa? By talking to Koprowski's collaborators in the 1950s, to their relatives, and to other polio researchers of the same era, he learned more and more details. Furthermore, the new details did nothing to undermine the polio vaccine theory. They all helped to fill out an emerging picture.

One of the arguments used against the theory is that the SIV most similar to HIV-1 is found only in chimpanzees, which were not used in making polio vaccines. Hooper probed into the chimpanzee colony established by Koprowski in the Congo, and found that chimpanzee kidneys had been sent back to the US. He explored Koprowski's early research with polio vaccines, which were first given to US children with intellectual disabilities. He obtained some frank admissions from key scientists, but also had some setbacks when people clammed up on him.

The River reads like investigative journalism at its best. It includes

revealing interviews, sleuthing through archives, tracking down elusive leads and piecing together a complex history. It is a scientific detective story, and Hooper is the detective. But is what he is doing 'science'?

The origin of AIDS is not something that can be worked out solely by doing research in a lab. Arguably, it requires a combination of skills from several disciplines. In the life sciences, knowledge is needed of molecular biology, immunology and epidemiology, to understand the molecular evolution of HIV, the possibility of vaccine contamination and the patterns of spread of AIDS. In the humanities and social sciences, skills are needed to search archives, compare stories, obtain information through interviews and understand the social dynamics of the response to theories.

Perhaps this explains why so many of the leading figures in developing the polio vaccine theory have been journalists, activists or independent scholars rather than professional scientists. No specialist alone could do what was required—and it would also mean bucking strong resistance by some scientists to pursuing a vaccine theory. This in turn suggests that the present organization of science, based on extreme specialization, is not suited to deal with certain types of problems that essentially require fearless and critical thinking and a willingness to incorporate ideas from a range of disciplines and avenues.

Whether or not you think the polio vaccine theory is likely to be correct, *The River* is a powerful story—a scientific blockbuster. It deserves a readership and a serious response from the scientific community.

Note: Copies of many documents about the polio vaccine theory are available at http://www.uow.edu.au/arts/sts/bmartin/dissent/documents/AIDS/html