Contested Testimony in Scientific Disputes

The Case of the Origins of AIDS

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THERE IS MUCH EVIDENCE THAT, IN MANY domains of human life, lying and deception are ubiquitous.[1,2] Most children learn to lie quite successfully at an early age. It has been argued that certain types and levels of deception are selected in evolution, with many plants and animals using deception for survival. Though many people believe they can detect lies, very few actually can.[3] Therefore, in assessing contested testimony, the possibility of lying cannot be discounted. Another possibility is self-deception, whereby a person knows something at one level but denies it at another.

The passage of time provides ample opportunity for selective memory and self-deception. Memory is highly malleable: people frequently come to believe partial, misleading or false reconstructions of things they experienced, and sometimes to believe things happened that actually never occurred. When this occurs, their accounts of events do not constitute lying, which requires intention to deceive, but assertion of an incorrect memory.

Science is one of the few areas of human endeavour where lying is uncommon. Doing science arguably relies heavily on trust.[4] The stigma attached to scientific fraud is a reflection of the priority placed on truth-telling in science.

However, there are limits to honesty in science, especially outside the scientific literature. Some cases of fraud do occur, including by prominent scientists.[5] In some contested cases, involving claims and counter-claims,[6] the presumption must be that at least one side is not revealing the full story, or is suffering from self-deception or reconstructed memory. Many priority disputes reveal deep differences in perceptions of events by the involved parties. In many cases where dissenting scientists are suppressed, attackers make false or misleading claims.[7] Even setting aside these major cases, minor deception and misrepresentation in science, for example not revealing full details of experimental procedure, not reading all citations used or not acknowledging conflicts of interest, are widespread.[8] The import of these examples is that, although the scientific literature as a whole may be oriented to truth-telling more than most domains of human life, nevertheless there is still considerable scope for lying, deception and self-deception.

Thus far, this discussion has assumed that scientists are the researchers and that the subjects of their investigations are quasars, viruses, human bodies or some other parts of nature. But in the case of contested testimony, scientists are actually the *subjects* of investigation, a different role and one for which the institutionalised imperative for truth-telling has a weaker hold. Anthropologists, whose subjects are people and cultures, have had to confront the challenge of "lying informants" in a more direct fashion.[9] A famous case is the argument made by anthropologist Derek Freeman that Margaret Mead, in her influential study *Coming of Age in Samoa*, was deceived by her Samoan informants.[10]

Some sociologists of science have undertaken fieldwork among scientists as if scientific communities are different cultures,[11] though these "laboratory studies" do not appear to have addressed deception. Still, in the spirit of the anthropology of science, it is straightforward to propose criteria for assessing testimony. Testimonial evidence is likely to be more credible when:

1. Testimony is freely offered, with no expectation of payments or other inducements for testifying. Inducements may encourage answers that maximize further rewards, as with some scientists who make large incomes by testifying on behalf of corporations.
2. Testimony is solicited neutrally, without encouragement for answering one way or another. This is a basic principle of good practice in social research as well as journalism.
3. The person testifying has nothing to gain or lose as a result of their testimony. This is one reason why some journals request declarations of relevant financial interests. Negative inducements can be very powerful: criminals, for example, have a strong incentive to lie.
4. The significance of the testimony is not apparent to the person giving it. People are less likely to lie if they do not realise the implications of the truth for themselves or others. This is one reason why independent witnesses are given greater credibility and why double-blind testing is held in such high regard.
5. The testimony-giver's reputation is not at stake. Answers given anonymously are considered more reliable because the respondent is less likely to lose face, suffer reprisals or obtain rewards. This is a central justification for anonymous refereeing.

These criteria for assessing testimony are neither exhaustive nor always mutually exclusive, but they do offer a convenient checklist for assessing the quality of testimonial evidence. The case of the origin of AIDS illustrates how they can be applied in practice.

The Origin of AIDS

For over a decade there has been a fierce debate over how AIDS began, a debate involving disputes over scientific and historical evidence, allegations of dishonesty, defamation suits and a cycle of claims that a challenging theory has been disproved and resurrected. A French-produced film titled *The Origins of AIDS,* shown on television in several countries, has given graphic visibility to the debate.

It is widely accepted that most cases of AIDS are due to a simian immunodeficiency virus (SIV) that passed from chimpanzees to humans within the past century, becoming HIV-1 Group M. Disagreement centers around how this transfer occurred.

Two theories have received the bulk of scientific investigation over the past decade. The first, commonly called the bushmeat, cut-hunter or natural transfer theory, proposes that a hunter, in the course of butchering a chimp, got chimp blood in a cut, or that SIVs were transferred by a chimp biting a human or in the course of some other human-chimp interaction.[12] The second theory is that oral polio vaccines (OPVs) given to more than a million people in central Africa in the late 1950s were contaminated by chimp SIVs. This is called the polio vaccine or OPV theory.

The origin of AIDS is of more than historical interest. Given that several transfers of SIVs to humans took place about the same time—HIV-2, HIV-1-O and HIV-1-N seem to be independent

infections from different SIVs—determining the source of these outbreaks could provide insight in preventing future zoonoses (diseases transmitted from one species to another). If the OPV theory is correct, then searching for surviving individuals who received contaminated vaccine could provide clues about resistance to HIV.

The OPV theory focuses on the world's first mass polio vaccination campaign, in central Africa from 1957-1960, using vaccines developed by polio pioneer Hilary Koprowski of the Wistar Institute in Philadelphia. In support of the theory, there is a remarkable coincidence in time and place between the vaccination locations and the earliest known cases of AIDS and HIV+ blood samples, both found predominantly in certain areas of what are today Rwanda, Burundi and the Democratic Republic of the Congo. Polio vaccines were—and in many cases still are—cultured on monkey kidneys, providing a route for SIV contamination. There was no screening of vaccines for SIVs until after their discovery in 1985. There is a precedent: tens of millions of people were given polio vaccines later found to be contaminated by another simian virus, SV40.[13] The theory thus includes a plausible mechanism—contaminated polio vaccines—and fits well with the early epidemiology of AIDS.

The bushmeat theory, in contrast, is poorly developed. It offers no explanation for why SIVs entered humans and became contagious in the past century rather than hundreds, thousands or tens of thousands of years ago. It gives no explanation beyond chance for the physical location of the earliest HIV+ and AIDS cases. It can offer no direct evidence of the specific events that led to AIDS. Its advocates typically believe that SIVs entered humans prior to the 1950s but that AIDS maintained a low profile until commerce and urbanisation led to wider contacts with infected individuals, though they do not mention the massive flows of humans in Africa prior to the 1950s, for example during the slave trade.

The bushmeat theory thus is based on numerous assumptions for which evidence is scant or extremely difficult to obtain. Despite these shortcomings, it is commonly adopted as the default option: if flaws can be found in the OPV theory, then the bushmeat theory is taken to be true. Thus the OPV theory is treated by one standard—subject to intense scrutiny and rejected if any apparent flaw is found—and the bushmeat theory by another—subject to little scrutiny and assumed to be true if other theories have any apparent flaws.[14]

The result is that there is a considerable body of literature supporting or opposing the OPV theory, with very little on the bushmeat theory. Here, too, the emphasis will be on evidence for and against the OPV theory.

Premature Burials

More than once, the OPV theory has been pronounced refuted by its opponents. In 1992, a committee set up by the Wistar Institute concluded that the OPV theory was extremely unlikely, using as its definitive evidence the case of a British sailor, David Carr, who apparently died of AIDS in 1959 without having visited Africa: Carr's tissues were found to contain HIV. However, this judgement was premature: a few years later, independent testing of Carr's tissues, with more advanced techniques, found no HIV, and also found cells of another human, suggesting serious deficiencies in the original testing.[15] The mistaken assumption of the OPV critics in this case was that a specific piece of evidence could be definitive.

Some proponents of the bushmeat theory argue that, using HIV's rapid mutation rate, it is possible to work backwards from the diversity of known HIV isolates to calculate a date for a postulated origin point. A prominent "molecular clock" calculation along these lines gave a date of 1931, plus or minus 15 years, well before polio vaccination campaigns, again apparently refuting the OPV theory.[16] Others, though, argue that recombination of HIV variants can give rise to present-day HIV diversity in a much shorter time[17] or that molecular clock calculations are flawed.[18] The lesson from this exchange is that it is unwise to reject a theory solely on the basis of theoretical calculations, because some assumptions underlying the calculations may be flawed.

The most likely precursor of HIV-1M is one of the SIVs found in some chimps. The most powerful argument against the OPV theory is that there is no evidence that polio vaccines were ever produced using chimpanzee kidneys. The polio vaccines used in Africa in the late 1950s—attenuated strains of live polio virus—were developed by the Wistar Institute in Philadelphia and shipped to Africa. Testing of samples provided by the Wistar revealed no SIV, HIV or chimp cells, but instead suggested that

the vaccines had been produced using various species of monkeys.[19]

The Political Context

The stakes in the origins debate are very high. AIDS has killed over 20 million people, with tens of millions more at risk. If people believed that medical research was responsible, however inadvertently, for the origin of the disease, this would do tremendous damage to the reputation of medicine, and would make many people more apprehensive about vaccinations. This may be the reason why there seems to have been serious resistance to a fair examination of the OPV theory by scientists. Louis Pascal, who first proposed the theory,[20] was unable to find a journal willing to publish any of his articles.[21] After the theory received widespread attention through a 1992 story in *Rolling Stone* by Tom Curtis,[22] polio pioneer Koprowski sued for defamation, causing *Rolling Stone* to drop a subsequent story by Curtis and deterring media coverage of the theory. The settlement of the suit included a "clarification" by *Rolling Stone* that was seized upon by critics of the OPV theory as evidence of scientific capitulation despite it being published under financial duress. The leading journals *Nature* and *Science* have rejected most submissions supportive of the OPV theory; *Science* even rejected a submission by W. D. Hamilton, a world-renowned evolutionary biologist.[23] The combination of legal action and the hostility of editors gave the misleading appearance, in the 1990s, that the theory had been refuted.[24]

Edward Hooper's epic book *The River,* first published in 1999, presented extensive new evidence in support of the OPV theory and reopened the origin-of-AIDS debate in both scientific and popular forums.[25] Hooper's UK publisher was subjected to veiled threats of defamation action, but did not succumb. The new attention to the OPV theory, plus Hamilton's support, led the Royal Society to hold a discussion meeting on "Origins of HIV and the AIDS epidemic" in September 2000. The agenda for the meeting was manipulated so that a press conference, held on the first day of the two-day event, was just after the announcement of the tests on Wistar vaccines that gave the superficial appearance that the OPV theory had been refuted. In this and other ways, the Royal Society meeting became a means for scientists antagonistic to the OPV theory to attempt to demolish it in a way that could be deemed authoritative and definitive.[26]

Conflicting Testimony

At the Royal Society meeting, Hooper announced new evidence suggesting that polio vaccines used in the 1957-1960 vaccination campaigns might have been prepared in Africa. This meant that the tests of Wistar vaccine were far from fatal for the OPV theory. However, due to the way the meeting was organised, Hooper's new claims received little publicity. Following the meeting, Hooper found new evidence that batches of polio vaccine were prepared in African laboratories in order to boost their concentration strength and enable vaccination of more people. Hooper interviewed Africans who in the late 1950s worked at the Laboratoire Médical de Stanleyville (LMS) and the nearby research camp at Lindi, where more than 500 chimps were sacrificed from 1956-1959. The evidence from these workers suggested that chimp kidneys may have been used at the LMS to prepare polio vaccines.[27] Growing new vaccine batches locally would have reduced the amounts needed to be shipped from the U.S. or Belgium. Hooper has also obtained support for this scenario in interviews conducted with Americans and Europeans who had direct dealings with LMS and Lindi in the 1950s.

Challenging Hooper's new claims, several scientists—including ones interviewed by Hooper—have made statements saying they did not use chimp kidneys.[28] The written record does not provide an easy resolution to this disagreement. Papers reporting African polio vaccine trials in the late 1950s often fail to report the species used to culture the vaccine. Furthermore, records of the fate of chimps at Lindi camp are less than comprehensive.

The content and style of the debate can be illustrated through the statements of Dr Paul Osterrieth, one of the key players in the controversy. He worked at LMS from 1956 and also sacrificed chimps for the research being carried out at Lindi. Hooper, in one of the many interviews for *The River,* spent ten hours with Osterrieth in 1993, probing his memory of polio and other research in the 1950s. The interview is recounted in several pages of the book, giving the strong impression that Osterrieth had had a hard time remembering details from nearly 40

years earlier. Hooper worked up to his key question: had Osterrieth sent chimp kidneys to the Wistar Institute? (At the time of the interview, Hooper believed that contamination of the vaccines had occurred during their production in Philadelphia.) Hooper reports,

> There was a long pause, and he didn't answer. I pointed out that this fact had been mentioned in Deinhardt's paper, and he began laughing. "Then I did," he said, holding up his hands, "yes, I think I did." (pp. 351-2).

At the conclusion of the day, Osterrieth said that the OPV theory was "a political time bomb" and counselled Hooper not to publish unless he was absolutely sure the theory was correct (pp. 354-355).

Osterrieth had published papers in the 1950s but did not write about these events again until after publication of *The River*. In September 2000, he attended the Royal Society meeting. In his short contribution to the published proceedings, Osterrieth categorically denied using chimp kidneys to produce polio vaccine:

> In Stanleyville, at the time of vaccination campaigns, tissue cultures were primitive, experimental and used solely for diagnostic purposes. Production of vaccine was impossible to carry out. A few chimpanzee kidneys were minced and sent to Philadelphia as part of the hepatitis experiments of Dr. Deinhardt. Vaccine was never handled in my laboratory and contamination with chimpanzee cells was not possible.[29]

Osterrieth also noted that, "the way the conversations Mr. Hooper had with me are recounted in his book gives the entirely false impression that I had something to hide."

Hooper returned to Africa for further investigations, which he reported in his mammoth paper presented at a meeting organised by the Accademia Nazionale dei Lincei (the Italian equivalent of the Royal Society) on "Origin of HIV and Emerging Persistent Viruses." Hooper interviewed several individuals who had worked in key Africa labs in the late 1950s, including two of Osterrieth's former assistants.

> The first of these assistants had been speaking about his former boss for several minutes when he quite casually volunteered: "and he was also making the polio vaccines in the laboratory." ... I asked him again how Osterrieth had made the polio vaccine, and he replied: "I was just sterilising the materials in the lab. What he was doing with that blood to make vaccine I don't know." (p. 46).

Hooper obtained telling accounts of events relating to polio vaccines from Osterrieth's two assistants, an assistant from the lab of Ghislain Courtois and two workers at Lindi Camp, all of which he claimed support his view that polio vaccines, initially produced in the U.S., were later "prepared" (amplified) in Africa using chimp kidneys as the substrate.

Hooper also refers to non-interview evidence in support of his position.

> For instance, a Léopoldville newspaper article from August 1958 specifies that Koprowski's polio vaccine had been both "prepared" and "controlled" in the Belgian Congo, and that the control, at least, had been carried out at the lab in Stanleyville. (p. 50).

Hooper uses this to challenge Osterrieth's claim that, "production of vaccine was impossible to carry out."

Osterrieth in a later article challenged Hooper's claims. He stated that,

> I want to reiterate that I did not participate in any program of sacrificing chimpanzees in order to obtain organs and/or blood for tissue culture purpose. I did not prepare CHAT or other OPV in cell culture. In particular, I never prepared chimpanzee cell culture.[30]

Assessment

In this particular scientific controversy, a central point of contention cannot be resolved by laboratory testing or mathematical modeling, because it hinges on contested testimony. However, this does not mean that all claims in this tangled and uncertain area should be tossed out as unsustainable. Rather, there is a need for careful consideration of all evidence that is available, assessing it for quality and reliability. Using the analogy of metastudies of drug trials, the goal should be to use all evidence but to take into account differences in quality.

A preliminary assessment of the testimonial evidence for and against the use of chimp kidneys in African preparation of polio vaccines in the late 1950s vaccination campaigns could be offered based on the five criteria presented earlier. The key protagonists are Hooper,

supporting the OPV theory; and Stanley Plotkin (a long-time associate of polio pioneer Hilary Koprowski) and his collaborators, opposing the OPV theory.[31]

(1) No promises of payments, in advance of interviews, are known to have been made by Hooper to his African interviewees or by either Hooper or Plotkin et al. to European and American scientist interviewees.

(2) Judging by his accounts, Hooper has avoided using leading questions in his interviews. This is supported by a witness to a number of his interviews.[32] However, Plotkin et al. apparently offered their respondents prepared statements to sign, thus providing a strong encouragement to answer in their preferred fashion.

(3) Hooper's African respondents had little to gain or lose as a result of their testimony, except perhaps the pleasure of being helpful to Hooper. European scientists approached by Plotkin et al., in contrast, knew that the OPV theory cast them in an unfavourable light, namely as potentially involved in the origin of AIDS, and thus knew they had much to lose by admitting to use of chimp kidneys.

(4) Hooper's African respondents would have had little awareness of the significance of their testimony about use of chimp kidneys in the 1950s, so long as Hooper did not tell them beforehand. When, in the 1990s, Hooper interviewed European scientists, only some of them were aware of the OPV theory. However, the theory developed a much higher profile after *The River* was published in 1999. Those scientists giving testimony to Plotkin et al. after 1999 had full knowledge of its significance.

(5) Hooper's African respondents had little at stake in the way of their reputation, given that their work in the Lindi camp was of little relevance to their social circles, and that they had no expectation of wider fame or notoriety. In Hooper's interviews with European scientists in the 1990s, they would have been concerned about their reputation, among peers, for doing good science. After publication of Hooper's book, the European scientists would have been aware of the dangers to their reputations from the OPV theory.

In summary, Hooper's interviews with Africans appear to have the greatest potential for veracity, scoring satisfactorily or well on all five criteria. Hooper's interviews in the 1990s with European scientists who worked in Africa score not quite so well due to the scientists' concern for their reputations. In contrast, Plotkin et al.'s collection of statements from European scientists do not score well at all—respondents were given prepared statements in a situation in which they were fully aware of the significance of their testimony and its possible effect on them.

This assessment of testimony does not prove what happened in Africa in the 1950s, but it does demonstrate the use of explicit criteria for judging which accounts are more credible. Note that the credibility of an account does not derive from the formal status of the respondent but primarily from the conditions under which the evidence is collected. This exercise shows the importance of assessing all evidence relevant to a theory in a careful, systematic fashion, whether the evidence comes from laboratories, mathematical models or interviews.

Testimonial evidence, though central to the current debate on the origin of AIDS, has to be treated as only one component in a wider picture including phylogenetic, epidemiological, and archival evidence. Although testimony currently seems to favour the OPV theory, new contrary testimonial evidence could come to light, or other sorts of new evidence might be treated as definitive. A similar set of considerations applies to the bushmeat theory.

Given the state of the evidence, it is reasonable to ask why the OPV theory has come under unrelenting attack whereas the bushmeat theory has received little scrutiny. One explanation is that the OPV theory is a threat to the reputation of medical research, which might be held responsible for causing AIDS, even though inadvertently, and a threat to public trust in vaccinations. The bushmeat theory, which removes scientists from the origin of AIDS, is far safer for the image of researchers.

The origin-of-AIDS dispute highlights the importance of not contaminating the evidence. Just as it is vital to avoid contamination of cell cultures, so it is important for social researchers to minimise contamination of interviewees by leading questions or worries about repercussions. However, unlike laboratories where it is possible to clean the equipment and repeat experiments, the social world is constantly changing: a witness, once interviewed, can never again be a pristine source. ▼

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