AIDS: The Agony of Africa (4)
The Virus, Past and Future

By: Mark Schoofs
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There Are Two AIDS Epidemics--and More May Be Coming

Franceville, Gabon --Primatologist Caroline Tutin was boarding a flight from her home in Africa when a baby in toddler clothes and sunbonnet caught her eye. Then she did a "horrendous double-take." The baby was a chimpanzee. The animal's French owners, who lived in equatorial Gabon, were childless and they treated the animal as their baby, even giving it its own room, decorated like a little girl's.

About 10 years ago, Amandine, as they had named the chimp, became ill. Its owners--who insisted on being called its parents--took the animal to Gabon's Centre International de Recherches Medicales, Franceville (CIRMF), a world-class primate center. The scientists never discovered what was ailing the ape, but they did find another connection to human beings besides Amandine's wardrobe and the more than 98 percent of DNA that chimps and people have in common. Amandine was the first chimpanzee found to be infected with SIV, the simian equivalent of HIV.

Because of the genetic similarity between the chimp and human viruses, it appeared that HIV had originated in chimpanzees--a theory all but confirmed in February of this year by University of Alabama researcher Beatrice Hahn, who appears to have identified the exact chimpanzee subspecies--Pan troglodytes troglodytes--that harbors HIV's mother virus.

This finding is no mere historical anomaly. There is strong evidence that the virus has jumped from animals to humans on at least seven occasions. Unfortunately, the way this critically important science has been reported is undermining its credibility in Africa, the very place where most new variants of HIV are arising.

When Hahn presented her findings to about 5000 AIDS researchers in Chicago, she emphasized how the virus could have passed from apes to humans through the hunting and butchering of chimpanzees--a common practice that has provided protein for rainforest Africans over many centuries. But the hunting of "bush meat" has become commercialized, pushing the apes toward extinction. To emphasize her point, Hahn showed slides of slaughtered chimps. The normally staid scientific audience groaned in disgust, and it wasn't long before eating chimps was compared to cannibalism in The New York Times Magazine.

To many Africans, this was one more sign that nothing about Western thinking could be trusted,
that HIV could have first come to attention far from its source. Edward Mbidde, a leading Ugandan AIDS
activist, suggested, "How could Africa be the source? But given the long lag between HIV infection and disease, the ease of
spread may lead us to mistake the source of AIDS for the continent itself, rather than recognizing that AIDS may
have originated elsewhere and then spread to Africa."

"How will you treat him? It feeds into racism." Says Zekeng, director of Cameroon's national HIV research program. Eating monkeys and apes, he says, "is part of our culture." Portraying it as barbaric could backfire, Zekeng warns: "Politicians could close up and say, 'We don't want you to do research because you might come out with findings that lead
to more discrimination.'"

In fact, research into the origin of AIDS could help save Africans and everyone else, because the virus is
still emerging: still mutating and moving from apes and monkeys into humans.

Léopold Zekeng vividly remembers the 26-year-old patient he calls Miss A. In 1991, she came to his lab in
Cameroon's capital, Yaoundé, with "all the symptoms of AIDS--diarrhea, fever, weight loss, swollen
lymph nodes. I was 200 percent sure she would test HIV-positive." But she didn't. Zekeng took her blood
to a sophisticated German lab and discovered that the woman was infected with a new, previously
undocumented variant of HIV called Group O. It is so genetically distinct that scientists believe it didn't
evolve from the main strains of HIV, but represents a separate transmission from chimps to humans.

Eighteen months after Miss A came to Zekeng's office, the virus had killed her.

Just last year, another team of researchers found a variant of HIV, Group N, that is more closely related
to the chimp virus than any yet found in humans. As with Group O, scientists say it entered humans
through its own cross-species transmission. And it, too, eluded conventional blood tests.

"I still see patients with the clinical symptoms of AIDS, yet they turn out HIV-negative using all assays," says Zekeng.

"The AIDS viruses are not over," agrees Preston A. Marx, another expert in the evolution of HIV, who
works at the Aaron Diamond AIDS Research Center. "We have the potential for more to come. It's
possible we could develop an AIDS vaccine and have viruses that the vaccine doesn't work against. This
isn't science fiction. New viruses are still emerging, viruses that can cause AIDS."

In the mild rainforest evening, along a red-dirt logging road in southern Cameroon, the palm wine
flows freely as a group of villagers talk around an open fire. The men all hunt, taking whatever the forest
yields, from the small antelope called duikers to the great apes. "Our parents were hunters, and their
parents," says Gerard Ampoh Mentsilé.

But hunting has changed. In addition to spears and snares, the hunters now use guns, some homemade
from truck axles. Bullets are expensive, so they get them from poachers who sell the bush meat in cities.
Sometimes bullets constitute the hunters' only payment. When they get paid in cash, they use themoney
to buy soap or fuel for their gas lanterns. No one here has electricity.

They also lack basic hygienic protection such as gloves. When animals are butchered and dressed,
bleed spatters on the hunters' skin. Scientists speculate that the virus could pass into them through cuts
or sores. But the hunters drinking palm wine are not convinced. "We've been eating chimps and
monkeys for years and years, and never had anyone get sick from AIDS," says Lazare Ampomadjimi. "So
it can't be true."

Everywhere, people have theories on how AIDS began. "The average Cameroonian will tell you it all
started in L.A. with the gay community," says Zekeng, "or they'll tell you it's a virus Americans produced
for biological warfare." In Senegal, Sara Sagne, the leader of a traditional healing cooperative, offers
probably the most poetic theory. He believes that after diseased dogs urinate, a flame rises that chars
the earth and leaves a foul stench. A person who smells the odor can get AIDS. But this is no more
fanciful than University of California professor Peter Duesberg's idea that AIDS is not caused by HIV but
by drug abuse, and even by the AIDS drug AZT.

In fact, the same methodology that helped scientists determine that the flu virus comes from pigs and
ducks has convinced most of them that HIV comes from chimpanzees. Says Zekeng: "When I look at the
phylogenetic analysis"--a comparison of DNA that reveals how closely related organisms are--"there's no
doubt about it." The human and chimp AIDS viruses, he says, "really cluster together."

Another reason to believe that the virus originated in Africa is that the continent is home to a greater
variety of HIV strains than anywhere else. An organism's greatest genetic diversity generally lies in its
home region, since strains that leave the motherland represent only a fraction of the whole, just one or
two lineages. Then, too, chimpanzees live in the Central African region where the first AIDS cases were
found. Finally, chimps appear not to get sick from their strain of SIV, suggesting that they and their virus
have co-evolved. (Hahn is trying to crack the mystery of why infected chimps stay healthy, which could
lead to treatments for people.)

Yet, sensitive from centuries of white stereotypes, many Africans view the theory that HIV came from
apes as just another smear against "the dark continent." Kenyan president Daniel arap Moi denounced
the out-of-Africa theory as "a new form of hate campaign," according to Laurie Garrett's book The
Coming Plague. Earlier this year, Zekeng refused to have his picture taken by a New York daily because
"I could see their front page covered with monkeys." He has another fear: "Journalists who point their
camera and say, 'These black Africans are the ones who originated HIV.' Now, let's imagine you and I are
neighbors--what will be your reaction after seeing that show? If my child comes over to play with yours?
How will you treat him? It feeds into racism."

Many ordinary Africans point out that the disease was first found in white gay men half a world away, so
how could Africa be the source? But given the long lag between HIV infection and disease, the ease of
international travel, and the industrialized world's medical surveillance system, it is perfectly plausible
that HIV could have first come to attention far from its source. Edward Mbidde, a leading Ugandan AIDS
If it can't replicate efficiently, it won't be able to spread from one person to another. Viruses are parasites; they replicate only by hijacking the machinery of cells. So a virus that jumps both biological and social.

The origin of a virus and the origin of an epidemic are different. The first is purely biological; the other is transmissible. A transmissible virus that, nonetheless, can kill. While HIV-1 almost certainly comes from chimpanzees, HIV-2 comes from the sooty mangabey monkey.

A little-known fact is that there are two separate AIDS epidemics. The major one—which has killed more than 16 million people, according to figures released this week—is caused by HIV-1. But there is another AIDS epidemic, much smaller and concentrated in West Africa, caused by HIV-2, a less virulent and less transmissible virus that, nonetheless, can kill. While HIV-1 almost certainly comes from chimpanzees, HIV-2 comes from the sooty mangabey monkey.

Subject 11008 tested positive for antibodies to HIV-2. But when Marx examined her virus, he found that it was quite distinct from any other known HIV-2, though still clearly within the family. It was what virologists call a different "subtype" or "clade," from the Greek for "branch." A "strain" generally indicates a small variation in the genetic code of viruses—an HIV-positive person usually has several strains in his or her body—but a subtype or clade is genetically much different. Scientists have identified 11 subtypes in the main group of HIV-1 and six subtypes of HIV-2. Subject 11008's virus was labeled subtype F. To this day, it has never been found in any other person.

What's more, subtype F is so genetically distinct that it very likely did not evolve from one of the common subtypes but crossed into humans, quite possibly into Subject 11008, who said she ate sooty mangabeys. "It's an example of a crossover virus that didn't get the help that it needs to become an epidemic," says Marx.

The origin of a virus and the origin of an epidemic are different. The first is purely biological; the other is both biological and social.

Viruses are parasites; they replicate only by hijacking the machinery of cells. So a virus that jumps species must be able to operate in cells that are biologically different from those of its original host. In his home in Kenya—a 15-acre estate staffed by black servants—Ammann all but blames Africans for spawning AIDS. Explaining his media strategy, he says, "The average Westerner hears so much about Africa's problems, they're sick and tired of it: 'So a bunch of Africans eat a bunch of monkeys, why should I care?' But if that particular practice has brought him AIDS, he has to now change his lifestyle. Because of the lifestyle in Africa of people eating monkeys he has to now wear a condom."

Ammann bought a baby chimp from a hunter who had killed its mother. Childless, Ammann says the chimp aroused his "fathering instinct," and today the animal sleeps together with him and his wife. A former hotel marketing director, Ammann has been trying to spotlight how the bush-meat business is wiping out the great apes. Then he heard about Hahn's research. Sensing a golden opportunity, he provided her with his deliberately shocking photographs that would make her audience groan with disgust.

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No one knows how often aids viruses leap the species barrier, but when they do, what often transpires is what happened to Subject 11008, as she is known in the scientific literature. A 52-year-old woman living in Sierra Leone who eked out a living by farming, Subject 11008 was one of 9300 people whom Marx screened for a virus called HIV-2.

The Italianans eat carpaccio and the Japanese sushi, so the question was not necessarily racist. But given the continent's history, the question raises African suspicions. Those turn to hacksles when Ammann makes statements such as "The colonial powers and the missionaries had managed to wipe out cannibalism. When do we start on 98.4 percent cannibalism?"

Such inflammatory rhetoric discredits AIDS science in the minds of many Africans. After all, if whites think eating animals is cannibalism and that Africans have sex with monkeys, how can anything they say be true?

Roy Mugerwa is the principal investigator of Africa's first AIDS vaccine trial. Even though the vaccine had already been tried in Europe and America, Mugerwa had to push for more than three years to launch the trial, and even had to appear before Parliament. He recalls that a common argument was: "White people say AIDS originated here, and now they're bringing this vaccine, which could make it worse." As the AIDS-vaccine debate was unfolding, the government announced an effort to eradicate polio from Uganda. In the cauldron of suspicion and fear, a radio broadcaster announced that the polio vaccine might be contaminated with live HIV. As a result, thousands of children were not vaccinated, leaving them vulnerable to being crippled. "Why," Mugerwa asks, "does the false tend to be more easily believed than the true?"

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Viruses are parasites; they replicate only by hijacking the machinery of cells. So a virus that jumps species must be able to operate in cells that are biologically different from those of its original host.
Many viruses can't. Hahn and renowned AIDS researcher David Ho studied another person infected with a unique subtype of HIV-2. That patient never exhibited symptoms; in fact, researchers were only able to extract fragments of the virus, footprints of its failed attempt to survive in humans.

But even if a virus can replicate efficiently, it might not spark an epidemic. In 1976, a Norwegian sailor who had been in West Africa died of a mysterious disease. His wife and one of his three children also succumbed, both with shattered immune systems. "Now, the Norwegians are very well organized," says Francois Simon, a French researcher who studies HIV's diversity, "so they kept tissue samples." Those samples tested positive for HIV-1; the Norwegian sailor is Europe's first known case of AIDS.

Yet despite the fact that his virus was obviously capable of spreading, it died with his wife and child. The viral subtypes that have terrorized the world are genetically very different from the sailor's virus. And yet his HIV was the same very rare variant that turned up more than a quarter century later in Zekeng's 26-year-old Cameroonian woman: Group O. In other words, it was a tiny, sputtering epidemic all on its own. In parts of Cameroon, it now accounts for 5 percent of all HIV-1 infections.

AIDS viruses have probably existed in many different animals for thousands of years, perhaps longer. Cows have been found with bovine immunodeficiency virus (BIV), while feline immunodeficiency virus (FIV) infects house cats, lions, cheetahs, and North American pumas. Many species of monkeys have now been found carrying SIV. (The fact that the virus is in so many simian species strongly suggests that it has circulated among them for a long time, whereas HIV only entered large human populations in the 1970s. That's one reason scientists are convinced the virus went from simians to humans, and not the other way around.) "The reservoir" of animal AIDS viruses, says Simon, "is unlimited."

Where did viruses come from, period? HIV is a retrovirus, which copies its genetic code onto the DNA of its host. So perhaps, Robert Gallo, co-discoverer of HIV, the virus started out as a kind of genetic messenger, transporting key segments of DNA among life's early organisms. "Did viruses play a role in evolution, perhaps a role in speciation or in embryonic life? Or did they start out as junk DNA with no purpose? What the fuck was their role? We don't know."

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Because viruses more chances to adapt to human biology. And, of course, once the viruses had adapted, needles would help them spread, as they have among IV drug users throughout America. But needles and transfusions probably aren't the whole story. After all, traditional African healers reuse blades to make medicinal incisions in their patients, and elders reuse knives for ritual scarification. What allowed a crossover virus to explode into an epidemic is almost certainly the cultural upheaval that has shaken Africa. Cameroon, a country smaller than Spain, has more than 200 indigenous languages. After World War II, colonial rule imposed just two: colonial languages--English and French--permitting people who would never have intermarried, or even interacted, to do so. Roads, railways, and air travel allowed people to move and mingle more easily than ever before. And urbanization gathered huge numbers of people in one place, where poverty and the breakdown of traditional cultures led to industrial-scale prostitution. Early in the epidemic, it was noted that HIV cases clustered in the towns along Africa's trucking routes, because truck drivers frequented prostitutes.

Marx wants to understand as much as he can about the emergence of HIV, biologically and socially, in hopes of preventing the emergence of new viruses. Indeed, new microbes have already arisen. "Hepatitis C, there's no good explanation for the emergence of that virus," Marx says. "Where'd it come from?"

While HIV's history is fascinating, the more urgent question concerns its future. The Hollywood scenario is that a deadlier or more transmissible AIDS "supervirus" might arise. "Unlikely," says Simon. Many scientists believe that it is in the best interest of a virus not to kill its host, so the virus may evolve into more benign strains. But it's also in the best interest of the virus to become more transmissible, in which case it doesn't matter if the virus kills its host because it will live on by spreading into new patients. Still, Simon had to screen many thousands of blood samples to find just five cases of the newest HIV-1 variant, Group N. Clearly, new crossover viruses are rare.

But they do occur, and even if they are not more virulent, they still pose problems. For one thing, they might escape detection on tests and so pass into the blood supply. They also might be able to evade drugs or a vaccine. Already, Simon and colleagues found that one HIV variant, subtype G, is resistant to at least two of the powerful protease inhibitors that have given patients in the West a new lease on life.
Indeed, a "signature" of this subtype is a mutation which renders the drugs less effective.

HIV is amazingly protean, averaging one alteration of its genetic code every time it infects a new cell, which it does millions of times each day in each patient. The math is dizzying. With tens of millions of people infected globally, HIV is probably changing every letter in its genetic code many times every day.

But HIV can leap ahead of even its swift pace of mutation by "recombination." If a person gets infected with two separate strains, then through a kind of viral sex those strains can mix their genetic material to form a hybrid strain. Through recombination, a virus can instantly and radically transform itself. Several of HIV's subtypes were formed through this process.

That's a reason to study the origin of HIV. Some researchers envision a science of emerging microbes that could short-circuit viral evolution and protect humans. But for the moment, recombination is a reason to worry about new types of HIV entering human beings: the greater the variety of strains, the greater the chance that they will reshuffle their parts into a more dangerous subtype. "There is genetic engineering going on in nature," says Piot of UNAIDS. "The virus is experimenting with itself."

"The most striking case I have seen in the last six months," says Zekeng, "was a 45-year-old man sent to me from the TB unit. He had chest problems but not TB. He had lost weight. He had KS--an HIV-related cancer--on his ankle. And he had a persistent fever. In short, a classic AIDS case. Yet he--repeatedly--tested negative on at least six different screening tests. Twice, Zekeng has sent this man's blood to a state-of-the-art laboratory in Germany, but no virus has been detected. "Is it going to be HIV-3?" asks Zekeng. "I don't know."

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