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“BUSHMEAT” AND THE ORIGIN OF HIV/AIDS:

A Case Study of Biodiversity, Population Pressures, and Human Health

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The Center for Health and the Global Environment at Harvard Medical School, Population Action International, the Jane Goodall Institute, and the Environmental and Energy Study Institute co-hosted a Congressional briefing, entitled “Bushmeat and the Origin of HIV/AIDS: A Case Study of Biodiversity, Population Pressures and Human Health.” The AIDS epidemic is a global problem with challenging social implications and no easy solutions. In the United States and around the world, citizen groups and governments are rallying to help scientists find a cure for HIV/AIDS and encouraging widespread education about the disease. To date, over 60 million people have been infected with HIV (human immunodeficiency virus), approximately five million more become infected each year, and over 20 million have died from the disease.

In their quest to understand more about this deadly disease, researchers have sought to

understand where it came from, and how humans contracted it. What they have discovered is that many answers about HIV and even the potential cure will most likely come from the same place as the original source of the disease – from chimpanzees and a monkey called the sooty mangabey in the West Central African forests. Unfortunately, it is also becoming frighteningly clear that human actions and population pressures are destroying these forests and the species that inhabit them at alarming rates, which may have significant implications for human health.

OVERVIEW

Through harmful activities in relation to the environment, Dr. Eric Chivian, director of the Center for Health and the Global Environment, stated “humans are creating a crisis of unprecedented proportions, going on at several levels at once.” Rapid and unchecked human population growth near wilderness areas; the purposeful clearing of forests by farmers, loggers and miners; and the continuing bushmeat trade – which is the practice of hunting forest animals commercially for food – are combining to irreversibly mar a number of “biodiversity hotspots” in Africa and around the world. But humans are not simply destroying some of the most precious forests in the world and causing the

PANELISTS

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Robert Engelman
Vice President for Research, Population Action International

Jane Goodall, Ph.D., C.B.E.
Founder and Trustee, The Jane Goodall Institute for Wildlife Research, Education, and Conservation

Beatrice H. Hahn, M.D.
Professor of Medicine, University of Alabama at Birmingham

extinction of species, they are also creating the conditions that make possible the spread of animal viruses to people. Through extensive analysis of HIV, scientists have come to believe that the disease is a zoonosis – a disease transferred from animals – that humans first contracted from chimpanzees and sooty mangabeys by being exposed to their blood through handling and eating the slaughtered animals. And even more distressing for many African governments and citizens is the fact that the bushmeat trade is most likely exposing countless people to new primate viruses that have the potential to cause other epidemics. The ebola virus looms as one threatening example. Dr. Beatrice Hahn, professor of medicine at the University of Alabama at Birmingham, stated that “with the ebola virus, we have been lucky because it has not spread.”

In fact, as Dr. Chivian noted, AIDS is just one of many powerful stories that can be told “to illustrate how we, the human species, are an intricate part of nature, and that we cannot threaten the survival of other species without ultimately threatening ourselves.” Also, species can be linked to cures for diseases, and chimpanzees, in particular, have a lot to offer to the scientific community. DNA analysis found that humans are almost identical genetically to chimpanzees, differing by only 1.5 percent. According to Dr. Goodall, “We find that chimpanzees have an intellectual [and emotional] capacity that we once thought unique to ourselves... In my 42 years of research at Gombe [National Park], the most important thing that has emerged is how like us they are – or rather, how like them we are.”

BIODIVERSITY “HOTSPOTS”

Many potentially beneficial species are dying out as forests continue to be destroyed, often to create farmland to support growing human populations. According to Dr. Stuart Pimm, professor of conservation biology at Columbia University, about half of the earth’s tropical forests have disappeared in the past fifty years. Pimm projected that at current deforestation rates, almost all of the world’s remaining tropical forests will be lost in thirty to forty years – “not just in the lifetimes of the small children that are here, but in the lifetimes of some of the more senior people here.” About a third of forests in Central and in West Africa, where many of these chimpanzees live are already lost. These forest areas have diminished to 50-60,000 square miles from about half a million square miles just fifty years ago. With the loss of these forests, tragically, the world is also losing an incredible amount of plant and animal biodiversity. “We are actually in the midst of the sixth extinction event of the last 500 million years,” Dr. Chivian stated. Although the earth has gone through extinction periods similar to now, scientists know that recovery will take millions of years. Chivian cautioned, “Our behavior is not just making the world a more impoverished place biologically now and for our children, but perhaps for all human children to come, as the human species, like other species, may have a natural life span of only a few million more years.”

In the face of such disheartening statistics, it must be determined where to focus limited resources. Researchers have identified a number of biologically-sensitive areas, termed “hotspots,” which contain high species concentrations. Dr. Pimm stated that “a high percentage of the variety of life on earth is found in just twenty-five hotspots,” which make up just 1.4 percent of the earth’s total land area; a significantly higher figure is reached if the Amazon, Congo, and New Guinea rainforest regions are included. However, these areas “are shrinking on a day-by-day basis,” Dr. Pimm continued. “When you fly over the Amazon, you can see it going up in smoke; the same goes for the Congo.”

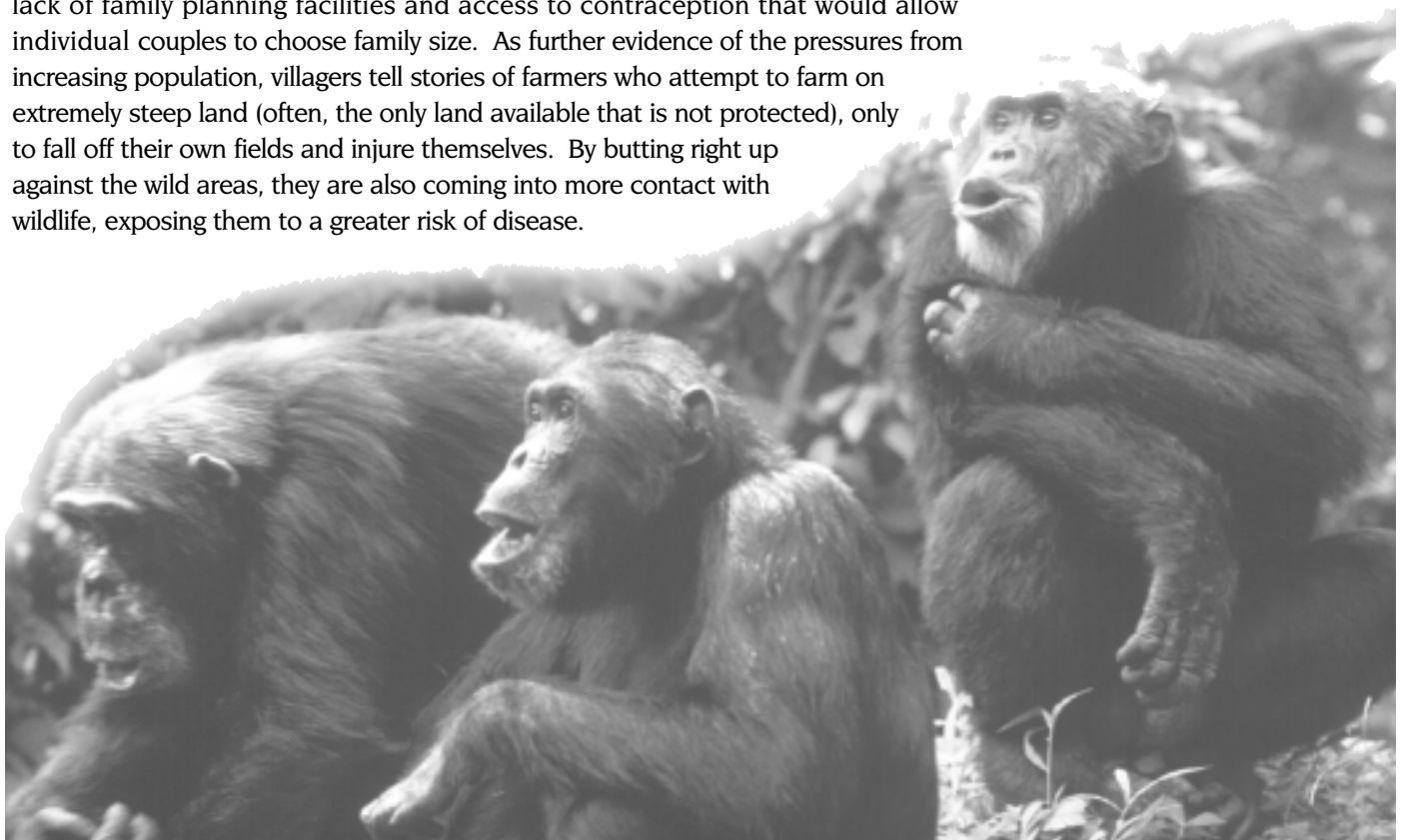
HARMFUL IMPACTS OF LOCAL HUMAN ACTIVITIES

The root of the problem lies with the past hesitancy of governments to make the environment a priority, especially when their economies are lagging, which is partly due to a lack of recognition of the value of the forest areas in their nations. Foreign logging and mining companies enter wild forest areas because cheap land is abundant. They build camps and roads through the forests, hunt large and often endangered animals for food or pay impoverished indigenous people to kill bushmeat. Not only is this an unsustainable way for the loggers to live, but the villagers who stay behind after the companies leave continue this pattern of consumption. In addition, farmers who were forced farther away from towns by growing village populations,

expand along the roads that the loggers have built, roads which provide access to areas once inaccessible. Even if the animals were not killed in these areas outright, their habitats are being destroyed. Tropical forests often contain many species which are very vulnerable even to minute changes in their environments, such as temperature variations.

With less land, dwindling animal populations become divided, and individuals become weaker and more susceptible to disease. This process is a negative feedback cycle that results in the "phenomenon of the empty forest," which both Dr. Goodall and Dr. Pimm recounted is sadly becoming more and more common. "Empty forests" still have trees and other plants and seem intact from a superficial examination. However, from a closer look (or listen!) subtle differences, such as a distinct lack of bird, monkey, and even insect calls, prove that these forests are not healthy. In addition, when the species that keep the forest ecosystem functioning are gone, the trees are more vulnerable to fires and other damage.

At the same time, village populations are growing. Robert Engelman, vice president for research at Population Action International, remarked that "human beings are drawn to the same areas on the planet that attract other life." Fifty years ago, 28 percent of the world's population resided in the tropics, but since then, about half of all human population growth has occurred in the tropics, where most hotspots are also located. Human population growth in and around hotspots is occurring at 3.1 percent annually – more than twice the world's average population growth rate. Population growth in these areas reflects in-migration and cultural preferences for large families to some extent, but mostly it reflects the lack of family planning facilities and access to contraception that would allow individual couples to choose family size. As further evidence of the pressures from increasing population, villagers tell stories of farmers who attempt to farm on extremely steep land (often, the only land available that is not protected), only to fall off their own fields and injure themselves. By butting right up against the wild areas, they are also coming into more contact with wildlife, exposing them to a greater risk of disease.



THE IMPORTANCE OF WILDLIFE

Many species, some of which are not yet identified, are becoming endangered or extinct. Not only is a healthy natural world needed in order to maintain the balance of life on earth, but animal species are needed to teach us humans volumes about ourselves. Dr. Jane Goodall's extensive observations of wild chimpanzees have done just that. "We used to think there was a sharp line with humans on the one side and the rest of the animal kingdom on the other. Our research has shown so clearly that this line is blurred," stated Dr. Goodall. For example, chimpanzees can form abstract symbols when communicating, live within complex social groups, and amazingly, can make tools. Interestingly, chimpanzees also show the same emotions as humans, in the same context. After being separated for a time, friendly chimpanzees will pat each other on the back, and even kiss and hug each other. When a chimpanzee dies, they show sadness and grief. Strikingly like humans, they also demonstrate aggressive and violent behavior toward unfriendly chimp groups. Dr. Goodall emphasized that understanding them "leads to a new respect – not only for the chimpanzees, but for so many of the other amazing beings on this planet. And so it is a tragedy that they are disappearing in the wild. It's so desperately important that we try to save these forests and the amazing beings who live in them."

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Chimpanzee, great ape, and monkey populations have all decreased dramatically in recent years. Currently, it is estimated that there are only 150,000 chimpanzees, down from approximately one to two million at the beginning of the last century. Robert Engelman, who tracks human population growth in wilderness areas, has found that some of the highest population growth is occurring around the Ghanaian forest hotspot and the Congo basin, where sub-populations of chimpanzees also live.

HIV AS A ZOOONOSIS

Clearly, chimpanzees have taught scientists much about HIV, and more can be learned. Dr. Beatrice Hahn and Dr. George M. Shaw, along with a team of scientists, have studied Simian Immunodeficiency Viruses (SIVs), in an effort to determine the origin of HIV/AIDS. There are two main types of this disease in humans: HIV-1, which is the disease that has spread throughout the world; and HIV-2, which has remained confined to people in a relatively small region of West Central Africa. The earliest known case of HIV-1 was identified in a 1959 blood sample, although Hahn and others think that humans probably contracted it at other times earlier in the century. In fact, they have determined that no less than ten distinct instances occurred where either HIV-1 or HIV-2 was introduced to humans. Through painstaking molecular analysis and a comparison of the various types of SIV to HIV, Dr. Hahn's team discovered that HIV-1 derived from chimpanzees in the West Central African region, and HIV-2 stemmed from sooty mangabeys in this same region. Two additional factors support this conclusion – geographic coincidence and the existence of plausible routes of transmission.

While many local people do keep monkeys as pets, the most likely source of HIV has been through contact with primates' blood via the bushmeat trade. Thus, in order to better quantify the level of the threat of HIV from bushmeat, an international group of scientists and conservationists joined together in cooperation with the Cameroon government to complete a survey of primate bushmeat. At least thirty different species of primates are natural hosts of SIV, and although they carry the virus, it does not make them sick. Of the sixteen

species of primates they examined, thirteen were infected, each with a distinct form of SIV. In all, 20 percent of the 800 primates sampled were infected with SIV. This is shocking, according to Hahn, especially since humans are still killing and eating these very animals. "It is a public health concern that additional virus strains not detectable by current blood tests for HIV could infect humans and go unrecognized," Dr. Hahn adds. Of course, not all of these viruses may be able to jump species, and since humans have hunted for a long time but only recently contracted the disease, probably only the individual is affected in most instances when humans are exposed to forms of SIV. However, Dr. Hahn summarized the issue stating, "The bushmeat trade is not only driving chimpanzees to extinction, not only exposing humans to other SIVs and, likely, a variety of other pathogens, but it's wiping out the very species that could lead to a fuller understanding of HIV/AIDS."

POSSIBLE SOLUTIONS

So what can individuals, non-profit organizations, and governments do to relieve population pressures and eliminate the bushmeat trade, both of which have adverse impacts to biodiversity and human public health? The panelists addressed several possibilities. Engelman explained that future unbridled population growth which impacts biodiversity "is not just a given... there is a lot that governments, in particular, can do to bring that growth to an end, based on the childbearing choices of couples and individuals, by mid-century." A number of nations took an encouraging step forward by participating in a conference on population and development in Cairo in 1994, the goal of which was to make family planning and related health services available to everyone. The ability of governments, including the United States, to follow through with the agreements they reached at that conference, will greatly affect the future of population growth.

On a smaller scale, a number of governments are also making progress. For example, the Ugandan government recently instituted a new policy, which distributes a share of the nation's ecotourism revenue to local committees (which must include women) to be spent in their communities. One of the committees, for example, decided to use the money to build a family planning health clinic. Engelman summarized the strategy for achieving an environmental balance, "Meeting the health and childbearing needs of women puts us in a position where we're most likely to end up with population growth rates that are conducive to saving biodiversity around the world and the human well-being that it supports, by the end of this century."

Dr. Pimm suggested that with a relatively small investment of five billion dollars, an amount certainly manageable for the United States and other wealthy nations, logging leases in endangered hotspots could be bought out. Currently, a number of governments encourage the purchasing of logging rights by conservation organizations.

Education is one of the most important methods of protecting the natural environment. "Project PRESICA," a medical project of Cameroonian

scientists and government ministries, aims to educate people to avoid bushmeat if there is a choice. "There is a political will, but it needs more: help from us, resources, and alternatives," reasoned Dr. Hahn. Dr. Goodall furthered this sentiment, "The fact that around the world, more and more people are becoming aware of the plight of our closest living relative, the chimpanzee, is a sign of hope."

As Dr. Pimm stated, "When things become personal, we care about them." Until then, people often do not take notice of human's interaction with the environment. Unfortunately, AIDS is one result of human carelessness with respect to the environment that has become all too personal for many communities. Through experiences with HIV/AIDS, humans may come to see that life on earth is interdependent, and that humans are not excluded. Humans are now at last expending the resources to understand how their actions resulted in the AIDS epidemic, and taking steps to halt the harm being inflicted on endangered species in the world's forests. If this is not done, Dr. Goodall described a foreboding situation: "Animals that are endangered will be gone, like the great apes. Animals that are threatened today will be endangered. Animals that today are common will be threatened. And so it goes on until the forests are left silent and dead." Humans must recognize that if we do not work together for these common goals, we will ultimately jeopardize ourselves.

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