



Researchers in Côte d'Ivoire bag the skull of a colobus monkey to check for pathogens.

ZOOZOSIS

Fatal exchange

Nathan Wolfe applauds a tome on interspecies disease transmission that mixes research with human stories.

The exchange of microbes between humans and animals — zoonoses — began to fascinate me nearly 20 years ago, when I was studying wild primate populations. There are a remarkable number of zoonotic agents, ranging from anthrax to HIV, West Nile virus and influenza. It seemed shocking even in the early 1990s that this vastly important class of microbe was considered, if at all, to be a funny-sounding boutique niche in biology.

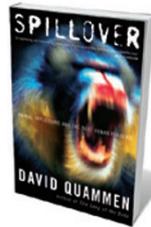
Fortunately, times have changed. Zoonoses have come of age in terms of scientific and public recognition. We now know that these agents are the most likely source of future pandemics. The past few years have seen an explosion in technical literature, government-sponsored research programmes, philanthropic interest and even films such as *Contagion*. During the past year, several general treatments of zoonoses have been published, including Jacques Pepin's *The Origin of AIDS* (Cambridge University Press, 2011), Craig Timberg and Daniel Halperin's *Tinderbox* (Penguin, 2012) and my own *The Viral Storm* (Allen Lane, 2011).

Now comes *Spillover* by David Quammen, one of that rare breed of science journalists who blend exploration with a talent for synthesis and storytelling. Quammen's excellent *The Song of the Dodo* (Prentice Hall & IBD, 1996), on island biogeography,

is difficult to top, but *Spillover* comes close. This is a timely, serious and impressive work that marks the maturation of a field of microbiology.

Quammen takes us into the field, offering an idea of research challenges in remote hotspots of disease emergence such as parts of Gabon and Malaysian Borneo. His narrative on the 'cut hunter' theory, based on our understanding of how HIV began, presents a realistic sense of the first person infected with the chimpanzee simian immunodeficiency virus (SIV) that would become HIV. It is the kind of portrayal that generalists and specialists have waited for.

In researching *Spillover*, Quammen visited scientists such as malaria researchers Janet Cox-Singh and Balbir Singh, and travelled to remote research sites in China, Bangladesh and beyond. He interviewed the usual suspects at leading international universities (myself included, in the context of pandemic prevention). But Quammen also sought out oft-neglected scientists and fieldworkers in places such as the Democratic Republic



Spillover: Animal Infections and the Next Human Pandemic
DAVID QUAMMEN
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of Congo. These doughty professionals do considerable scientific heavy lifting, negotiating political and sometimes security hurdles to collect the samples that form the backbone of zoonosis research. Refreshingly, Quammen also highlights a number of up-and-coming young researchers in the field.

The book gives a dutiful review of the range of research on disease ecology and zoonosis, the subfields and their central concepts. But the behind-the-scenes stories are particularly enjoyable. Quammen brings to light the details left out of papers and technical talks; even workers in the field will find new stories. For example, his accidental encounter and subsequent interviews with survivors of the Mayibout Ebola epidemic in Gabon provide first-person perspectives on the epidemic and the hunting events that led up to it that are absent from any other account I've read.

Specialists will find little new in terms of scientific concepts. Nevertheless, some discussions, such as that on mathematical modelling in chapter three, push scientists towards the next level in their research. There are some minor technical errors, such as the age of the recombination event of monkey SIVs that produced SIV_{cpz}, the variant that infects chimpanzees; Quammen suggests that it may be only hundreds, rather than thousands, of years old. And some will bridle at a few oversimplifications — for example, the suggestion that the H5N1 flu virus is inherently more worrying than H1N1, which among other things belies the potential for reassortment between the two. But these are quibbles.

Importantly, *Spillover* challenges those working in the area of disease ecology and emerging infectious diseases to ask: what is next? Quammen concludes by reviewing some programmes that have been developed by bodies such as the US Department of Defense to understand and address the threats that zoonoses pose for the increasingly susceptible human population. These include the US Agency for International Development's Emerging Pandemic Threats Program, which aims to identify risks early and develop global capacity to stop them before they spread. Quammen rightly believes that such ventures are the way forward.

These efforts, and what they will evolve into, may be pivotal to human survival. As Quammen points out using the example of gypsy moths (*Lymantria dispar*) and nucleopolyhedroviruses, other species on have succumbed to pathogens following explosive population growth. A big question looms over all of us. How will humans fare? ■

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