FORUM

ONE PLANET, ONE HEALTH

Like Ebola, Marburg and many other disease epidemics, Covid-19 is highlighting the close interconnections between the health of the environment, animals and humans, and its protection: a cultural paradigm known as "One Health". We talked with David Quammen, the author of *Spillover*, about what is going on in the world today and what role international organizations such as ours can play.

ANDREA ATZORI AND CHIARA DI BENEDETTO INTERVIEW DAVID QUAMMEN

One of the words and concepts Covid-19 has brought with it is "spillover". Until recently unfamiliar to laypeople, the term is now well known, and signifies a virus's "jump", or transmission, from one species to another, from one host to another, for example from a bat to human beings, as presumably happened in the case of the current coronavirus. It is also the name of a popular book written by David Quammen, the U.S. science writer, and published in Italy in 2014 by Adelphi. The book describes in a detailed yet compelling manner the linkages between the animal and human worlds, the environment and viruses, providing readers with an in-depth understanding of the equilibriums necessary for both individual and collective health. The book – one of whose best-known quotes hypothesized a future pandemic that would likely "come out of a rainforest or a market in southern China" – made a convincing case for the idea that "spillover" viruses are nature's inevitable response to human beings' assault on the environment and ecosystems. The author wrote this back in 2012.

Today, as the pandemic rages on, we decided to talk with David Quammen about global health, Africa, and the role that international organizations such as CUAMM can and must play.

- **Now more than ever, political and operational choices should be driven by the so-called "One Health" paradigm, a collaborative, interdisciplinary approach towards the environment, the human ecosystem and the animal ecosystem. But this is not always the case. What isn't working, and why is it likely that we will be faced with more and more zoonotic epidemics in the near future?**

Most people don't realize that the world is filled with viruses that we've never seen and know nothing about. Every kind of animal, every species of animal, every species of plant, every kind of fungus, every bacteria — they [all] have their *own* viruses. Most people don't realize that viruses are natural. There are millions of kinds of viruses living out there in the natural world, and most of them are no threat whatsoever to human health. But if one in a thousand is, you still have many, many viruses that could be dangerous to humans. We humans have always come in contact with the natural world, we've always hunted wild animals, hunted and gathered, so that's not new, but now there are 7.8 billion of us on this planet. We are smart, we are hungry, we are powerful, we have technology that allows us to disrupt the natural world and take out resources, take out animals, take out timber, take out minerals. So we are doing that on a scale vastly greater than ever before and as we do that, we come into contact with wild animals, we capture them, we kill them, sometimes we catch them live and transport them to markets, even in other countries, and we expose ourselves to their viruses. The viruses don't seek us out, the animals don't seek us out; *we* go to *them*, we disrupt them, we invite their viruses to take a chance on becoming human viruses. So they fall into us, and some of them happen to be able to replicate in humans and transmit from human to human: that's a "winner" virus, and we have a "spillover".

- **Many more viruses are believed to originate in animals – not just swine or bird flu, but also Nile fever, HIV, Marburg and Ebola – than is generally thought. In 2005, CUAMM tackled a Marburg epidemic in Angola, where we lost one of our pediatricians, and in 2014, an Ebola outbreak in Sierra Leone. But our organization stayed on, working to identify, trace and treat suspected cases as well as to keep basic health services going, in order to avoid total collapse in those countries. In your opinion, what can be done by an organization like CUAMM, whose focus is on strengthening health systems?**

That's hugely important what you are doing in those sub-Saharan countries; those are places with a desperate need of assistance in terms of resources and expertise to strengthen their health systems. You deal with that emergency situation and you do your very best to control it before it becomes an epidemic throughout the country. So that's important - to help them strengthen their local and national health systems in order to respond to spillovers, and respond to outbreaks and control them before they become epidemics, like Ebola in West Africa in 2014. That could have been stopped; every other Ebola outbreak had been stopped. Why in West Africa did it get away? Because the virus was different? No. Because transmission was different? I doubt it. It got away because those three countries had suffered two decades of civil war and they had crippled healthcare systems. And they didn't have enough support of the kind that you at CUAMM give. I think the other thing that's important when we come out of this pandemic is for countries of the world to realize

that what we need is internationally-coordinated surveillance and fast responses to protect against outbreaks becoming epidemics. And that means a linkage between organizations like CUAMM and national agencies and organizations in other countries, other non-profit, independent organizations, the World Health Organization, in a better and more empowered form so that when there is an outbreak, twenty people in a village in South Sudan are suffering from a "mystery fever" that is not malaria, that is "not anything we've seen", that it will be recognized as a new virus. We need fast surveillance so that everybody knows about it, and the virus can be isolated, it can be sequenced, the sequence goes around the world. Platforms, vaccines to be quickly developed and adapted, in order to stop these things before they turn into a big forest fire across the world.

- **Cuamm devotes most of its time and effort to Africa, but we also work at the international level to promote the notion of global health as a cultural framework, collaborating with Italian and European universities and offering training on global health to medical students and young doctors. What role will global health play now that everyone has seen how a small virus from Wuhan can go on to infect the entire world? And what kind of changes should be made now?**

That "One Health" concept is not a program or a specific action, it's a philosophy, a way of thinking. There is no human health on one side and animal health on the other; it's *one* health, because you don't have human health if your interaction with wild animals exposes you to more diseases. In this globalized world we all are neighbors: if people in China are dying of a new virus, the rest of the world can't say "Well, we're gonna close our airports against China, because it will get here. So we can't solve this problem one country at a time, we can only solve this problem together. This is global health.

- **In the midst of the current crisis caused by the SARS-CoV-2 virus, discussions are taking place about the approaches that could be implemented in the face of possible viral threats: a reactive approach, where the very first signs activate measures to contain a possible epidemic, or a surveillance/detection approach, a kind of "atlas of viruses", as the Global Virome Project describes it, to get to know the enemy "before it emerges". Which of the two approaches will prove more effective and, even more importantly, more viable? In fact, the differences between countries in the global South and global North mean that they have very different possibilities and opportunities.**

About a month ago Dennis Carroll, who led the Global Virome Project, talked to me about the importance of viral discovery. He wouldn't call it surveillance; he would call it viral discovery, going out sampling animals in diverse ecosystems all over the world to find out what viruses are there, identifying, characterizing as many as possible and then seeing which ones are potentially dangerous to humans, for instance, that have the capacity to enter cells through the ACE2 receptors in the respiratory track like this virus does. On the other hand, there is a very different school of thought that is embodied by a very fine evolutionary virologist named Edward C. Holmes (University of Sydney, Australia). Holmes and colleagues say that just learning about what viruses are out there is not the most effective way to spend resources. He argues for surveillance, and what he means by surveillance is not viral discovery, but reaction as soon as there's a spillover. An alarm bell starts to ring all over the world resources flow in that direction, supporting the national health agency to contain that outbreak in that village or in that cluster of villages. So those are two opposing ideas, but they are both propounded by people that I respect very much, and I'm not expert enough to say that one is completely right and one is completely wrong. They are opposing views, and it will be an interesting discussion, as it proceeds, to say which of these approaches should be the highest priority and receive the most resources. There's a strong intellectual argument, I think, for each of them, and those two people have made those arguments in review papers and journal papers among other places, so I'll be watching that conversation.

- **CUAMM works in the field in countries with semi-nomadic and nomadic populations, such as Ethiopia and South Sudan, as well as in others. These populations live with animals, but up until now the "One Health" approach has never received adequate resources. We hope that this new awareness may bring changes in the future.**

The health of those herds is strictly connected with the health of their people, because herds can be intermediate hosts for viruses. I went to Ivory Coast with a scientific team that was testing out a hypothesis that Ebola came from small bats, a little insectivorous bat. We collected lots of those bats and we took blood samples without finding Ebola. But there was the story about one little boy in a village, and he seemed to be the index case. He got sick, and then his mother and his aunt and his grandmother and his caregiver, they all died. That was the beginning, but there was just one spillover, probably to that little boy from one animal. After that you have twenty-seven thousand people infected by Ebola and eleven thousand people dead. All from one interaction. That's why our relationship with wild animals and with the environment is so important.