



THE END OF THE WORLD AS WE KNOW IT?

The biggest threat to mankind is from the microbe. *ShortList's* Matt Hussey talks to the man who is risking his life to save us all

The scene sounds as though it could have come straight from the film *Outbreak*. Somewhere deep in a Cameroonian rainforest, several days' trek from the capital of Yaoundé, a native hunter has come down with a sickness that his tribal elders cannot recognise.

What he doesn't realise is that he has become a host to a new type of virus that jumped the species barrier from monkey to man after he and his family consumed an infected primate. If the virus was to escape the confines of the village it could be transmitted to many more people.

Welcome to another day at the office for Dr Nathan Wolfe, head of the Global Virus Forecasting Initiative (GVFI). While many of us spend our working hours avoiding anyone exhibiting the telltale symptoms of swine flu, Wolfe is purposely placing himself at ground zero for far more dangerous nasties.

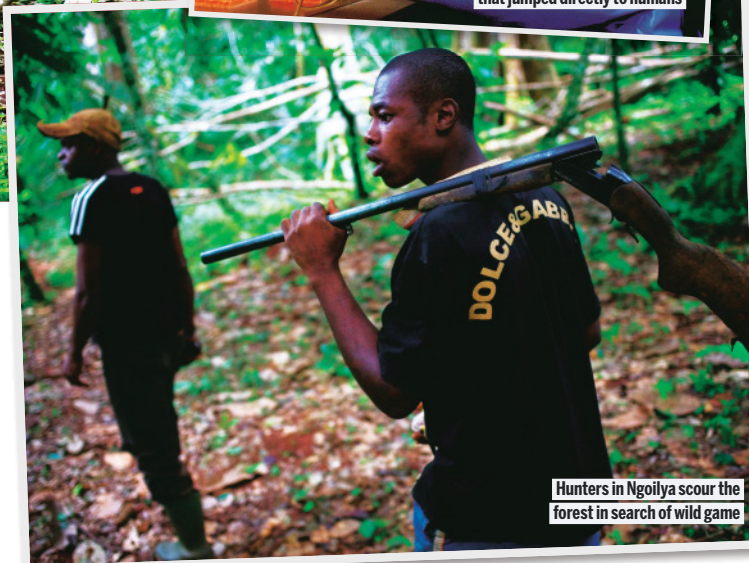
He and a team of scientists spend their time travelling the world's worst viral hotspots – from the rainforests of Africa to the live animal markets of South-East Asia – in pursuit of new viruses. Their aim is to identify them before they jump over from the animal kingdom, spread to the wider population and become a possible future pandemic. It's a radical approach that could, in theory, stop the next supervirus from appearing. And it is a role that is increasingly vital. Almost three-quarters of the new infectious diseases that have been identified since 1940 originally came from animals. These include HIV, Ebola, bird flu and, most recently, swine flu. Between them they could represent the biggest immediate threat to us all – yet



Nathan Wolfe at the GVFI field research site in Ngoiya, Cameroon



The CDC discovered that the flu of 1918 was a bird flu that jumped directly to humans



Hunters in Ngoiya scour the forest in search of wild game

they are only the tip of the iceberg. By the year 2025, the UN believes that Aids-related diseases could kill as many as 31 million people in India and 18 million in China. And, if the current swine flu pandemic worries you, be warned: you haven't seen anything yet in terms of the potential for viruses become more lethal.

BAFFLING THE EXPERTS

So how big is the threat? To find out, *ShortList* tracked down Wolfe in Kuala Lumpur, where he's currently helping the Malaysian Ministry Of Health to find new ways of monitoring diseases. "When I started this work in 1999," he explains, "we didn't have a good idea of the

"Every once in a while I get hit by things that I study. I've been infected with malaria two or three times"

frequency with which they were crossing over from animals to humans."

The results of his early experiments were astonishing. Not only did he find cross-species transmission, but also that it was happening regularly. What's worse, the mechanisms in place to detect this were woefully inadequate; if a pathogen did jump the species barrier, it could establish itself within a population before scientists had any idea what they were dealing with.

So, Wolfe and his team embarked on an ambitious plan to monitor the interaction between wild animals and humans. They headed to the same region in Cameroon where the HIV virus is thought to have

emerged, to find out whether any new strains were entering into the human population.

Travelling to remote villages, they were on the lookout for hunters who routinely catch and kill porcupines, antelope and monkeys – which are one of the major sources of disease to humans, due to their similar genetic make-up. Taking blood samples from the families of hunters revealed several animal viruses never before seen in humans, including – much to Wolfe's dismay – a strain of the Simian Foamy Virus, which is closely related to HIV. In other studies in the area, other viruses were found that are now believed to cause cancer and neurological disease. "Viruses are genetically unstable," explains Dr Paul Clayton, a visiting

fellow of Oxford Brookes University. "During the Spanish flu epidemic in 1918, there were several waves, or mutations, of the pandemic as it swept across the world. So if you caught the first wave of Spanish flu, you were still susceptible when it came around the second time as the virus had mutated. The same applies to the swine flu pandemic." So, catching a virus before it has a chance to mutate could save millions of lives.

TACKLING THE VIRUS

Initially, Wolfe's entire operation relied on a run-down Toyota to collect samples from 17 villages. If that broke down, he and his team headed on foot to make sure the samples were collected on time and shipped back to laboratories at the Centre for Disease Control and Prevention (CDC) in Atlanta. Today, in just over a decade, there are more than 100 scientists, technicians and IT experts in six countries across the world working to track potentially dangerous agents as they move from animals into human populations. Wolfe's team have amassed one of the most comprehensive blood collections on earth, with over 25,000 human and 16,000 animal samples available to scientists all over the world. But this level of progress has come at a cost. "Every once in a while I get hit by things that I study," Wolfe says. "I've been infected with malaria two or three times, including one time when I almost died."

Despite these obstacles, Wolfe knows that his discoveries are helping to combat a growing problem. "From the perspective of infectious agents, the whole world is now one village," he says. "Individuals almost anywhere have the potential to seed pandemics everywhere."

A typical example of the potentially lethal effects a highly mobile population can bring was witnessed earlier this decade. In the spring of 2003, the World Health Organisation received a report of a flu-like outbreak in southern China, an area famed for its 'wet markets' that sell wild animals for food. Authorities did what they could to control the

movement in and out of the area but a doctor (who had already been infected with what we now know as Sars) had taken a trip to Hong Kong. During his one-night stay on the ninth floor of the Metropole Hotel he managed to infect 16 people who subsequently departed for Europe, the US and other parts of Asia – spreading the virus to more than 8,000 people in 32 countries. In the end, the virus killed more than 700 – largely because people can now fly great distances before they show symptoms.

"If you look at the evolution of H1N1 (swine flu) in 2009, it eclipsed the other influenza viruses in terms of its coverage across the world in just a few months. It really is incredible how quickly these viruses can now move around the world, thanks to air travel," explains Dr Scott Dowell, director of the CDC's global detection programme. But it's not just our desire to travel to distant locations that has brought us closer to a global pandemic. "We're seeing more emerging pathogens than we were a decade ago," says Dowell. As we move deeper into microbe-rich rainforests across the world, more humans are coming into contact with pathogens. ■

Infection hotspots

Destinations you should probably avoid

CAMEROON

The low down: HTLV 3 and HTLV 4, both Aids-related viruses, are emerging.

Avoid: Eating bush meat, which is one way the virus is spread.

CHINA

The low down: Sars spread from the Guangdong province to 37 countries in 2003, while H5N1 (bird flu) kills 60 per cent of everyone it infects.

Avoid: 'Wet markets' – locations where live animals are sold and butchered.

BRAZIL

The low down: The Sabia virus causes the lethal Brazilian hemorrhagic fever; but the Hantavirus, spread by the cotton rat, is a more far-reaching threat.

Avoid: Slum areas, deforestation points, remote villages.

DEMOCRATIC REPUBLIC OF THE CONGO

The low down: A long-standing war zone and the home of Ebola, monkeypox and the similarly lethal Marburg virus. HTLV 3, HTLV 4, and a new strain of HIV are all emerging viruses.

Avoid: Contact with hunters, as these viruses can be passed on.

MALAYSIA

The low down: Nipah, a respiratory virus, crossed over from pigs in 1999 and has a fatality rate of up to 75 per cent. A fifth variation of malaria – Plasmodium Knowlesi – came from here and now accounts for 70 per cent of all Malaria cases in SE Asia.

Avoid: Most wildlife.

Research shows that HIV originated through the hunting of wild game, such as this drill monkey



“A human might catch both swine and bird flu. When these two viruses meet in one organism, all bets are off”

that have previously lay undisturbed. And scientists are also concerned with the possible impact of global warming, which is turning previously hostile cold climates into breeding grounds for tropical viruses.

The West Nile virus, a potentially deadly disease transmitted by mosquito, had been confined to Africa for thousands of years until a case was reported in New York in 1999. Three years later it had spread across the US and is now considered an endemic problem, claiming the lives of more than 100 people to date.

COMBINATION ATTACK

Most serious of all though, according to Dr Clayton, is viruses combining with other viruses. “Swine flu is not a very serious problem,” he says. “There’s a lot of it, but people don’t tend to get too sick. What is worrying people is bird flu, which is still knocking around in

certain corners of the globe. As swine flu spreads, the chances that at some point in the future, or it may have already happened and we don’t know it yet, is that a chicken, pig or human will catch both swine and bird flu. When these two viruses meet in one organism, all bets are off.” At this critical point, says Clayton, the viruses will exchange information, spitting out hundreds of different combinations. “The worst-case scenario is a flu pandemic that spreads rapidly around the world and kills 60 per cent (the mortality rate of bird flu) of those who contract it.”

And don’t think that these are problems solved with a dose of Tamiflu. According to a paper written by Professor George Poste, a former chairman of the task force on bioterrorism for the US Department of Defense, our current preventative measures could soon be made redundant as viruses become more and more resistant to conventional medicines.

“The age of infectious disease control is coming to an end,” declares Poste’s report. “And most governments are asleep. By 2010, antibiotics will be effectively useless.”

So what are governments doing to combat these new threats? Not enough, according to the experts. The CDC, the world’s largest government-funded organisation combating the spread of disease, was

allocated just £95m for pandemic prevention last year, compared to the £120bn spent on wars in Afghanistan and Iraq.

Meanwhile, in Britain the government is spending what limited resources it has on Tamiflu and vaccines – and this could actually prove to be our downfall. “The more you use something the more resistance builds up,” says Dr Clayton. “If, or when, the virus gets more serious, we’re going to find that Tamiflu is deeply compromised.”

“The fallback strategies involve mass graves and judicious use of the military to try to prevent panicking populations from de-stabilising the country.”

It’s a doomsday scenario, and no one can predict exactly what potential outbreak is next. But with Dr Wolfe and other experts like him continuing their research, there is, at least, a flicker of hope as some governments appear to be beginning to take heed of the message. “Following our discoveries concerning the relation between exposure to primates and these new viruses, the Canadian government modified its blood donation policies to exclude donors who have had contact with nonhuman primates,” reveals Wolfe. It’s a small gesture, true, but let’s hope it’s simply the start of something far more important, as many lives could depend on it.