

Nature's deadly agents unlocked

How can a new virus appear without warning in suburban Brisbane and start killing horses? Surprisingly, such events aren't rare. A whole new field of research has opened up in the past few years looking at just such 'emerging' viruses.

The best-known recent case of an emerging virus is HIV, which causes AIDS. There are dozens of theories, ranging from the bizarre to the defamatory, about where it came from. The theories most loved by the media are that it crossed into humans from monkeys through interspecies sex, or through the use of simian plasma in vaccinations. But AIDS might just be an old human disease which has been spread to the world from some small, once-isolated human population.

Wherever it came from, HIV is just one example of a virus awakened from its slumber. Epidemiologists believe 20th century technological and social advances are helping stir up an international ants' nest of new viruses.

Humanity is now a global species. A person can move in a week from any environment on Earth to any other. As we speed about the planet doing business and having holidays, and as we smash our way into new environments, we are blending an archipelago of once-isolated viruses into a dangerous, cosmopolitan mix.

Many human viruses which emerged in the past 10 000 years probably crossed over from animals, as humans abandoned hunter-gathering for agriculture. Agricultural societies lived intimately with their domestic animals, and were worse fed and less healthy than their hunter-gatherer ancestors.

Even now the close relationship between impoverished Chinese farmers, ducks and pigs is thought to cause periodic new waves of influenza. Influenza virus originated in aquatic birds, and ducks and pigs are its living reservoirs. When the animals are farmed together, as in Asia, duck viruses swap genes with pig viruses, creating new strains. They then infect humans.

After the Industrial Revolution people in the developed world returned slowly to health as good as, and nowadays better than, they enjoyed as hunter gatherers. But as their health and diet improved, and as they moved away from intimate contact with animals, post-industrial urbanites also started to travel, and to import exotic biota. Viruses came too.

European imperialism carried viruses around the world. Smallpox and measles in Australia, for example, killed countless Aborigines. And in Australia a new virus, myxoma, was deliberately unleashed on the feral rabbit population in the 1950s. The result was a text-book example of what an emerging virus can do. The first wave of myxomatosis killed more than 98% of infected rabbits, a toll which fell rapidly as both virus and rabbits evolved. Such high death rates for emerging viruses are not unusual, which is one reason scientists are so nervous about them.

In 1993 the alarm bells rang when an unknown illness killed 32 people in the US, mostly healthy Arizona Navajos. The disease was eventually traced to a virus carried by a native American rodent, unusually abundant that year following a boom in its favoured food.

In a recent book about emerging viruses, US science writer Robin Marantz Henig warns that humans are taking huge risks as they tame a once-wild planet:

'New viruses have always emerged, since the beginning of recorded time. But the pace might well be quickening as we continue to encroach on nature in ever-more insidious ways. Human actions from forest clearing to genetic recombination are making viral catastrophes increasingly more likely; the result could well be the ecological equivalent of a nuclear holocaust.'

Marantz Henig's book also quotes US bacteriologist and Nobel laureate, Joshua Lederberg: 'The single biggest threat to man's continued domination on the planet is the virus.'

The next AIDS might be lurking somewhere in a Brazilian rainforest, waiting to cross into humans who barge into its environment. Or it might be lurking in the bloodstream of a Queensland kangaroo. The more humans invade and homogenise world ecosystems the more we risk unleashing and spreading new viruses. Epidemiologists say global changes like greenhouse warming could expand the range of virus-carrying insects, creating future epidemics.

Viruses are strange beasts — it's even debatable whether they are living things at all. The famous British evolutionary biologist Richard Dawkins describes viruses as bits of 'rebel human DNA', which have broken off and turned feral. Viruses do just one thing: they infect, multiply and infect again. Any illness they cause is usually incidental.

Biological viruses are nothing more than short bits of DNA, or sometimes RNA, wrapped in a protein coat. They are usually just a few thousand base pairs long, compared to the three billion pairs which make up human DNA. They don't so much invade a living cell; they hijack it.

A virus wriggles in through the cell membrane, unpacks itself in the cytoplasm and, by various means, takes over the genetic instructions which tell the cell what proteins with make. The virus tricks the cell into manufacturing lots more viruses. Then this swarm of new viruses buds off from the cell membrane and drifts off to find more cells to invade. The speed of multiplication can be explosive.

More about viruses

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