

There is a vast diversity of viruses but we employ a limited vocabulary to talk about them, says Carl Zimmer

The case of the unfamiliar outbreaks

In May, a pair of viruses seized the headlines. First came a hantavirus outbreak aboard a cruise ship, which caused 13 infections, three of which were fatal. Then an Ebola outbreak flared in Africa, so far leading to more than 900 infections and 220 deaths.

In both cases, the news has been not only frightening but also confusing. The hantaviruses didn't seem to be acting like hantaviruses, and the Ebola viruses weren't behaving like Ebola viruses.

Hantaviruses are carried by rodents and other animals, and typically infect people who inhale dried animal urine and saliva. But aboard the cruise ship MV Hondius, hantaviruses were moving from person to person.

As for the African outbreak, scientists have made huge strides in fighting Ebola in recent years. They've created vaccines and antiviral drugs. But these treatments are probably going to be weak or useless. This is a very different Ebola virus.

Jens Kuhn, a virologist who serves on the International Committee on Taxonomy of Viruses, said that the recent outbreaks point to yawning gaps in our un-

derstanding of the virosphere, the millions—perhaps even trillions—of virus species thriving around us.

These are case-use examples of why taxonomy is important," he said. "Is something the same or is it different? If it's different, stuff we know about the other thing will not work on it."

Ebola viruses got their name from the site of one of the first documented outbreaks in 1976, the Ebola River in what was then Zaire, now Congo. When scientists examined blood from the victims, they isolated long, snake-like viruses distinct from any previously known.

But in 1976 had another outbreak that also caused deadly, bloody fevers—this one hundreds of miles to the east, in what was then Sudan, now South Sudan. The infected also harboured snake-like viruses.

When scientists compared the viral genes, however, they found a striking number of differences. Eventually, Kuhn and his colleagues formally recognised the two kinds of viruses as two distinct species. And, as taxonomists do in such cases, they gave each species a Latin name: *Orthobolavirus zairensis* and *Orthobolavirus sudanensis*.

But in the 50 years since the first Ebola outbreak, scientists have found other relatives of these viruses. In 2007, for example, 149 people in the Bundibugyo

district of Uganda came down with haemorrhagic fevers, and 37 died. The virus they harboured was, genetically speaking, more than 30 per cent different from the viruses isolated in Zaire and Sudan—a new species, known now as *Orthobolavirus bundibugyoense*.

The Bundibugyo virus caused a second small outbreak in 2012 before exploding back on the scene last month. The vaccines and the drugs that were developed for the Zaire species don't work against the Bundibugyo virus, which belongs to a different evolutionary lineage. That's one reason the new outbreak has public health experts so worried.

Hantaviruses also got their names from a river: the Hantan River, which flows through North and South Korea. It's in a region where a mysterious kidney disease struck people every year. In 1978, researchers isolated the cause—a virus carried by striped field mice.

Since then, scientists have discovered hantaviruses lurking in rodents and other mammals around the world. Some of them also cause kidney damage, while others strike the heart and the lungs.

Actor Gene Hackman's



AT WAR: Health workers suit up during an Ebola outbreak in the mining town of Mongwalu in Congo

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wife Betsy Arakawa died at their New Mexico home last year after being infected with a type of hantavirus called Sin Nombre. Diagnosed earlier with Alzheimer's, Hackman died days afterwards.

As hantaviruses have adapted to rodents and other mammals across much of the world, they have evolved an enormous diversity—Kuhn and his colleagues recognise 38 species in the genus *Orthohantavirus*. The Ebola genus, by contrast, includes six species.

The outbreak on MV Hondius was caused by a species called *Orthohantavirus andesense*, carried by a number of rodents in South America. There are four strains of this species; the outbreak was caused by one called Andes virus. Unlike the other three strains—and the 37 other species of hantaviruses—Andes virus can spread directly from one person to another.

Kuhn suspects that the other strains related to Andes virus are lurking in rodents and share this ability to spread among people. After the MV Hondius outbreak, he predicts, scientists in Argentina and Chile will "go into their freezers with all the samples and sequence the crap out of everything and figure out—what are all these things?"

As for Ebola, Kuhn expects more unpleasant surprises.