

**- Virus**

## With Covid, endemic doesn't mean mild

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When someone gets Covid-19, the virus turns some of their cells into virus-producing factories. To produce more viruses, the cells start by making copies of the virus's genetic material. Here's where errors can randomly happen. An adenine swapped out for a cytosine here. Guanine for uracil there. These errors are how the virus evolves.

So far, this evolution has given rise to variants such as Delta, which is more infectious and causes more hospitalisations than previous versions. As the virus becomes endemic in many countries, people are asking how it might continue to evolve. Some think it will become more like the common cold, but it's more complicated.

The common cold idea is based on a theory by Theobald Smith that he called the "law of declining virulence". Virulence is how microbiologists refer to the harmfulness of a microbe and its ability to cause disease.

In the 1880s, Smith was studying a disease called Texas cattle fever, which is caused by a malaria-like parasite that spreads through tick bites. His work led him to believe that as infectious microbes evolved, they became less harmful. In the 1970s, Smith's "law" was shown to be far too simplistic. Robert May and Roy Anderson pioneered the application of mathematical modelling to the ecology and evolution of infectious diseases and came up with the "trade-off" model for the evolution of virulence.

Basically, they showed that there is no reason to assume that disease severity will decrease over time. It will all depend on factors such as how many susceptible hosts there are and how and when the microbe transmits between them.

I've been working in the area of the evolution of infectious diseases for almost 10 years, following the evolution of a bacterium that infects mice the same way some types of E coli infect humans. Several years ago we found that in eight of our 10 experiments, our bacteria evolved to become more infectious.

Bacteria are much more complex life forms than viruses, so there will be many ways they can improve their ability to infect. But we also found our bacteria didn't become any less virulent. I wonder if one reason some people think Covid-19 should become less harmful is because they live in communities where infectious diseases aren't generally a big concern. It could also be because people don't understand what pandemic and endemic mean. They describe where a disease is, not its severity. It's not "pandemic equals bad, endemic equals not so bad".

There are loads of endemic infectious diseases that have been with us for a long time and that are showing no signs of getting less harmful. Measles and polio have been controlled by vaccination but are still deadly to the unvaccinated.

Only time will tell what will happen with Covid-19.