Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Puzzle over viral load

We don't yet know if being exposed to more coronavirus particles leads to more severe covid-19 symptoms, reports Linda Geddes

RUMOURS circulating on social media suggest that those exposed to more particles of the coronavirus have a higher viral load and become sicker than other infected people. But the relationship between infection and severity may be more complex in covid-19 than in other respiratory illnesses.

The average number of viral particles needed to establish an infection is known as the infectious dose. We don’t know what this is for covid-19 yet, but given how rapidly it is spreading, it is probably relatively low – around a few hundred or thousand particles, says Willem van Schaik at the University of Birmingham, UK.

Viral load, meanwhile, relates to the number of viral particles carried by an individual and shed into their environment. “The viral load is a measure of how bright the fire is burning in an individual, whereas the infectious dose is the spark that gets that fire going,” says Edward Parker at the London School of Hygiene & Tropical Medicine. If you have a high viral load, you are more likely to infect others, because you may be shedding more virus particles. Yet for covid-19, it doesn’t necessarily follow that a higher viral load will lead to more severe symptoms.

For instance, health workers investigating the outbreak in the Lombardy region of Italy looked at more than 5000 infected people and found no difference in viral load between those with covid-19 symptoms and those without (arxiv.org/abs/2003.09320).

Similarly, when doctors at the Guangzhou Eighth People’s Hospital in China took throat swabs from 94 covid-19 patients, starting on the day they became ill and finishing when no virus could be detected, they found no clear difference in viral load between those with milder cases and those who had more severe symptoms (medRxiv, doi.org/dqbr).

Although it is difficult to draw firm conclusions at this stage, such studies “may impact our assumptions about whether a high number of viral particles predisposes to a more serious disease”, says van Schaik.

However, a study of people hospitalised with covid-19 in Nanchang, China, found a strong association between severity and the amount of virus present in the nose (The Lancet Infectious Diseases, doi.org/dqrr). “Those with more severe disease had a higher level of virus replication, although we have no evidence to relay the initial exposure dose to disease outcome,” says Leo Poon at the University of Hong Kong, who was involved in the study. “That rumour is still an open question to me.”

It is early days, but if the infectious dose doesn’t correlate with the severity of symptoms, this would mark covid-19 out as different to some other infections. For influenza, a higher infectious dose has been associated with worse symptoms. This has been tested by exposing volunteers to escalating doses of influenza virus in a controlled setting and carefully monitoring them over several weeks. Covid-19 is unlikely to be tested in a similar way, given its severity.

Animals infected with higher doses of the SARS and MERS coronaviruses also experienced worse outcomes, says van Schaik.

Even if the infectious dose isn’t related to disease severity, it still pays to minimise our exposure to the virus because this will reduce our chances of falling ill in the first place. “Any measures we can take to avoid infection are worth taking,” says Parker.

Will warmer spring weather slow down the rate of spread?

IN THE northern hemisphere, as winter ends, cases of seasonal flu dwindle. Could the same happen with covid-19?

Flu surges in winter for three reasons. First, the virus is more stable in cold, dry conditions with low levels of ultraviolet light. Second, people spend more time together indoors, which facilitates viral spread. Third, our immune systems may be weakened due to the mild vitamin D deficiency a lack of sunlight can cause.

In theory, these factors could also cause the covid-19 virus to dampen down in spring. But we don’t know if this will happen, and the evidence so far is conflicting.

In a study posted online in February, researchers at Harvard University looked at the effects of temperature and humidity on the transmission of the virus in China, Thailand, Singapore, Japan, South Korea and Taiwan, based on weather reports and data on covid-19 incidence between 23 January and 10 February.

They found no significant difference in transmission rates between cold and dry provinces of China and tropical ones, as well as Singapore, concluding that higher temperature and humidity “will not necessarily lead to declines in case counts” (medRxiv, doi.org/dqsn).

But most other studies of the impact of warm weather on the virus have discovered the opposite.

“In theory, the factors that cause seasonal flu to surge in winter could also dampen down covid-19”

These include one that examined every global confirmed case up to 29 February, which found that higher temperatures are associated with lower disease incidence (medRxiv, doi.org/dqsp).

Researchers say any conclusions are provisional due to limited data. “Seasonality is difficult to predict,” says Francois Balloux at University College London.

For now, the World Health Organization says on its website that the virus can be transmitted in all areas, “including areas with hot and humid weather”. I