Coronavirus

Scientists probe link between high altitude and low coronavirus cases

Bolivian team seeks to understand why low-lying areas have been hit harder than cities on higher ground

There have been few recorded cases of coronavirus in Bolivia's highland provinces © Martin Alipaz/EPA-EFE/Shutterstock

Gideon Long in Bogotá and **Camilla Hodgson** in London YESTERDAY

Scientists are investigating links between coronavirus cases and high altitude, after a study suggested that those living well above sea-level were more resistant to the virus than lowland dwellers.

Bolivian researchers are seeking to understand why La Paz, the country's capital at 3,600 metres above sea level, has suffered relatively few virus fatalities, while its low-lying second city, Santa Cruz, and the surrounding province have been hit hard.

One reason could be that those living at altitude have developed a resilience to the low levels of blood oxygen that the virus can cause — a condition known as hypoxia. Mountaineers who are not acclimatised to oxygen-thin air can suffer the same problem, but people who are used to living high above sea-level have adapted.

"At sea-level, when people get coronavirus and their lungs get destroyed, it is as if they are climbing Mount Everest in just a couple of days, without oxygen," said Gustavo Zubieta-Calleja, director of the country's High Altitude Pulmonary and Pathology Institute, one of the authors of the study published in the journal Respiratory Physiology & Neurobiology.

But “the low rate of infection in Bolivia’s high-altitude population is remarkable and clearly does not follow the often exponential infection rates reported in many countries”, concluded the scientists.

The Bolivian team is one of thousands around the world who are racing to understand a virus that has officially killed more than 369,000 people and how exactly it affects the human body.

Mr Zubieta-Calleja suggested treating virus patients with erythropoietin, a naturally occurring hormone that stimulates the growth of oxygen-carrying red blood cells, which some athletes use to improve performance although it is now banned in professional sport. When people move to higher altitudes, their EPO levels rise as the body responds to the oxygen-thin air.

But others urged caution and warned against drawing firm conclusions too early and promoting unproven treatments.

Andrew Luks, professor of medicine at the University of Washington, said that while the proposed link was “intriguing”, it “by no means establishes that high-altitude residence or high-altitude locations are protective against coronavirus”. EPO was also linked to an increased risk of blood clots, he added.

A paper responding to the original study pointed out that during previous pandemics, such as the 2009 Mexico flu outbreak, “high altitude residence was linked to more adverse outcomes”. Another response said it was premature to draw any conclusions without further interrogation of “social, demographic, risk factors or health variables”.

Limited testing capacity in Bolivia means the true infection and death rates are not fully known. According to official data, La Paz and its surrounding area have 507 confirmed virus cases and 28 deaths. Bolivia’s other highland provinces show similarly low numbers.

By contrast, Santa Cruz, 400 metres above sea level, and the surrounding province have 6,711 confirmed cases and 149 deaths. The province is home to 15 per cent of Bolivia’s population but accounts for two-thirds of its virus cases and almost half its deaths.

A similar pattern can be discerned in Ecuador, where the centre of the virus outbreak has been the port city of Guayaquil. There have been far fewer cases in the capital Quito, which is roughly the same size but sits 2,800 metres above sea level.

Outside South America, the Ethiopian Highlands have registered few cases. The country, with a population of more than 100m, has recorded 1,257 cases of the virus and 12 deaths. Nepal, home to eight of the world's 10 tallest mountains, has 1,811 cases and eight deaths.

But there are exceptions to the rule. Colombia's capital Bogotá, at 2,600 metres above sea level, is home to about a fifth of the country's population but accounts for a third of all its coronavirus cases.

The Bolivian team also suggested another reason why the virus had not spread in its capital: ultra-violet light. Sunlight is a natural sanitiser and ultra-violet rays are particularly strong at altitude. "This virus floats in the air but here in La Paz it gets blasted by UV light," Mr Zubieta-Calleja said.

Ewan Eadie, head of scientific services for photobiology and optical radiation at Ninewells Hospital in Dundee, Scotland, said that while this was partially true, the UV rays would only have a germicidal effect on the virus if they hit an infected surface directly. Anything in shadow or in enclosed indoor spaces — where scientists think most people contract the virus — would not be affected. Windows also prevent the sanitising UV rays from getting through, he added.

Sunlight was "definitely not a sort of magic pill" against the virus, he said.

Hermann Brugger, head of the Institute of Mountain Emergency Medicine, agreed the spread of the virus was slower at high altitude but stressed that this was likely down to a complex set of reasons that should not be reduced to "physiological immunity".

These areas were often sparsely populated and the residents were often physically fitter than those in lowland regions, he said. But they often had limited medical facilities meaning cases were also likely to be under-reported. "It may be true that survival of the virus is reduced at altitude due to a harsh environment (cold and dry air) and higher UV radiation, but this has not been confirmed," he said.

Mr Zubieta-Calleja acknowledged that other factors such as diet, lifestyle, chronic diseases, age and obesity might also influence who survives the virus. He stressed that those living at altitude should also continue to take precautions such as washing hands thoroughly and wearing face masks.