

Scientists Fear Cataclysmic 'Factor X' Will Emerge From Earth's Permafrost

By [Pandora Dewan](#) On 11/12/23 at 5:00 AM EST

There could be something big lurking in the Earth's permafrost.

As the planet continues to warm, scientists fear a host of deadly diseases will be unleashed from the frozen earth, after lying dormant for decades, centuries, and even millennia. The war between Russia and Ukraine has crippled our attempts to prepare ourselves, and the expansion of mining in the polar regions could nudge us even closer to opening this Pandora's Box.

However, most worrying of all, scientists believe our activities are edging us towards an unknown, ancient threat dubbed "Factor X."

The term "permafrost" describes earth that has been frozen for two or more consecutive years. Two years is a minimum, and some areas in Siberia have been frozen for over 650,000.

Each spoonful of this frozen soil is teeming with life, with hundreds of thousands of dormant microbial species in a single gram. However, the actual identity of these microbes is largely a mystery.

"There is a lot we don't know, and what very few people have looked into is the permafrost," Birgitta Evengård, a professor in infectious disease at Umeå University in Sweden, told *Newsweek*.

In 2014, a group of French and Russian researchers [reactivated a giant virus](#) that had laid dormant under the Siberian permafrost for 30,000 years. Now this particular virus—known as a pandoravirus—infects only amoeba. It does not pose a threat to humans. However, this study does provide a proof of concept.

"If amoeba viruses can survive that long in permafrost, this strongly suggests that animal/human-infecting ones could remain infectious in the same condition," Jean-Michel Claverie, who led the study, told *Newsweek*. "In addition, we know that the [DNA \[of animal/human-infecting viruses\] are detected in permafrost.](#)"

Other research has shown that even microscopic [animals can be resurrected from the permafrost.](#)

"There are a variety of methods including fixing their DNA and lipid membranes [that allow organisms to survive in the permafrost,]" Kimberley Miner, a climate scientist at the [NASA](#) Jet Propulsion Lab in California and professor at the Climate Change Institute, told *Newsweek*. "This is true for a number of microbes that are considered extremophiles—organisms that can survive in extreme temperatures and pressures, including the cold and pressure of the permafrost."

So, what might actually be down there?

"Viruses from extinct diseases such as small pox; the always-present anthrax, through spore-contaminated areas; and also the accelerated spread of diseases already known to [exist] in today's Arctic such as tularemia, a serious bacterial infection, or tick-borne encephalitis," Claverie said.

In 2016, an outbreak of anthrax in northern Siberia killed a 12-year-old boy and thousands of animals. It is thought to have been caused by unusually warm weather in the region accelerating the thawing of the permafrost and exposing the carcass of a reindeer that had succumbed to the infection. The dormant anthrax spores in the deer's carcass were then reawoken and released to find new hosts.

"Anthrax happens to have a very thick cell wall, so it can stay in a long sleep for hundreds of years and then come back to life," Evengård said.

These known infections will most likely exist in the uppermost layers of the permafrost. But [what lurks deeper down is even more concerning.](#)



An abandoned U.S. research base in Greenland. Studying the permafrost is the only way we will be able to prepare and protect ourselves from these emerging infections. Hayriye Tellioğlu/Getty

"Deep down in the permafrost, there must be microbes—especially viruses but also bacteria—that were on Earth long before *Homo sapiens* existed," Evengård said.

Our immune systems have evolved in contact with the trillions of microbes that have existed on Earth during our species' lifetime. However, there may be ancient viruses in the permafrost to which we have no natural immunity, nor effective vaccines nor treatments.

"There is a Factor X that we really don't know very much about," Evengård said.

In fact, these prehistoric pathogens may have contributed to the demise of our ancient ancestors. "These ancient viruses [...] may have infected Neanderthal humans or mammoths, causing their extinction," Claverie said.

Over the past 50 years, the Arctic has been warming [up to four times faster](#) than the rest of the world, and average permafrost temperatures have been increasing at a rate of roughly 0.6 degrees Fahrenheit [minus 17.4 degrees Celsius] per decade, according to the United States Environmental Protection Agency.

Mercury, Nuclear Waste and Bomb Fallout

However, the thawing permafrost is not Claverie's only health concern. Insects such as mosquitoes and ticks will continue to migrate further north, potentially coming into contact with these ancient viruses. "A combination of a very ancient unknown virus being picked up by a resident vector (like a tick, mosquito, or rodent) would be the worst scenario," Claverie said.

Biological hazards are not the only threats the thawing permafrost could release. "Our research has shown that there could be a variety of hazards from human sources that could emerge from the thawing permafrost," Miner said. "Unfortunately, this includes mercury, nuclear waste and bomb fallout, DDT [dichlorodiphenyltrichloroethane] and other pesticides, and heavy metals from mining."

And that is all without factoring in the 1,700 billion tons of carbon locked away in the frozen soil, which will be released as carbon dioxide as the permafrost thaws.

However, climate change is a slow process, and it would still take years for the deepest parts of the permafrost to thaw completely. And yet, we are actively going out of our way to dig into the darkest depths of this frozen soil.

As ice in the polar regions begins to melt, prospectors are jumping at the opportunity to explore the [uncharted territories hidden beneath](#). Early analysis suggests that Greenland and other polar regions could hold great riches, but at what cost?

"With this rush for precious metals that we need for our technological development, there will be mines explored and people will dig deep down into the permafrost very rapidly, and that's the danger," Evengård said.

In other words, our lust for precious metals could unleash Factor X from its icy depths.

"If a miner gets sick and is flown to Moscow without precautions, it can spread," Evengård said. "We saw that with SARS, how it was taken within a couple of days [around the world.]"

Even without global travel, the contents of the thawing permafrost are unlikely to stay isolated in the Arctic. "Permafrost covers a third of the Earth's surface, so it actually is very well connected to all of the oceans, atmosphere and land on the planet," Miner said. "That is why it is so important for us to understand what is going on in the Arctic and to work to slow climate warming."

The warming of the Arctic is also making these polar regions more habitable. "The public health risk is coming from the accelerated release of previously frozen viruses combined with increased human exposure, since global warming is also making Arctic areas much more accessible to industrial development," Claverie said.

To prepare ourselves for these emerging threats, we need to investigate further into what might be lying beneath the icy surface. However, since the start of the war in Ukraine, many collaborative research projects with Russia—and therefore the ancient permafrost in Siberia—have ground to a halt.

"[Research] is absolutely dead," Evengård said. "We have to open up with Russian colleagues again. We just have to somehow get the true facts of what is happening [in the permafrost.]"

Moving forward, Evengård said that a holistic approach to public health will be necessary to predict and protect against infectious disease. "About 75 percent of emerging infections are zoonotic—that is, they come from nature, especially animals," Evengård said.

"This is especially important as species move towards the poles [due to warming environments.] We should have a more fastfooted approach where we put together data from nature, animals and human health. And this is something that politicians really work with."

For Miner, there is one simple solution to safeguarding against these threats. "The best way to mitigate any climate risk is to slow climate change," Evengård said.