There are diseases hidden in ice, and they are waking up.

June 28, 2021

As the climate of Earth changes, a multitude of organisms (Bacteria & Viruses) are reviving.

Relation of microorganisms & humans with respect to climate.

Microorganism and humans have existed side by side since the deadly Bubonic Plague to small pox. We have evolved in response to develop immunity as well as microbes evolved in gaining resistance to antibiotics via mutation. Thus the battle is endless.

However on the other hand the changing climatic factors are responsible for releasing the ancient deadly viruses and dormant bacteria embedded in soil and ice.

The question arises where these bacteria and viruses have been trapped in the soil and ice deep down. Many researchers, biologists & virologists have found that the buried bodies of dead humans and animals have led to this.

There are reports of 12 year old boy dying of Anthrax at Yamal Peninsula in Arctic circle in August 2016. And reindeers were also infected. In the early 20th Century alone, more than a million reindeer died from anthrax. It is not easy to dig deep graves, so most of these carcasses are buried close to the surface, scattered among 7,000 burial grounds in northern Russia. In a project that began in the 1990s, scientists from the State Research Center of

Virology and Biotechnology in Novosibirsk have tested the remains of Stone Age people that were found in southern Siberia, in the region of Gorny Altai.

Revival of some dormant organisms.

Anthrax is a serious infectious disease **caused** by gram-positive, rod-shaped bacteria known as ***Bacillus anthracis.*** **Anthrax spores** are formed by **anthrax** bacteria that occur naturally in soil in most parts of the world. The **spores** can remain dormant for years until they find their way into a host. Common hosts for **anthrax** include wild or domestic livestock, such as sheep, cattle, horses and goats.

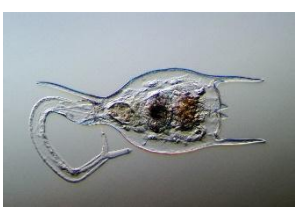
Other bacteria that can form spores, and so could survive in permafrost, include tetanus and *Clostridium botulinum*, the pathogen responsible for botulism: a rare illness that can cause paralysis and even prove fatal. Some fungi can also survive in permafrost for a long time.

In a 2014 study, a team led by Claverie revived two viruses that had been trapped in Siberian permafrost for 30,000 years. Known as *Pithovirus sibericum* (Zombi virus) and *Mollivirus sibericum*,(Mimivirus) causative agent of pneumonia. they are both "giant viruses", because unlike most viruses they are so big they can be seen under a regular microscope. They were discovered 100ft underground in coastal tundra. This virus infects amoeba but not human or animal cells. But this viruses have multiple origin of life and thus can find new host and infect them. Viruses from long-extinct ancestral species like Neanderthals and Denisovans, both of which settled in Siberia, were riddled with various viral diseases. Remains of Neanderthals from 30-40,000 years ago have been spotted in Russia. And by analyzing the DNA content they found that several species had infected humans and still can. Spanish flu RNA fragments were also discovered.

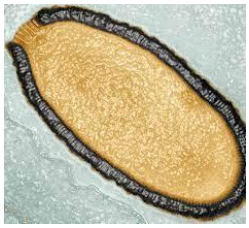
NASA scientists found 10-50,000-year-old microbes inside crystals in a Mexican mine. Rotifers aren't the only living organisms to emerge from permafrost or ice. The same researchers behind this latest discovery had previously found roughly 40,000-year-old viable roundworms in the region's permafrost. Ancient moss, seeds, viruses, and bacteria have all shown impressive longevity in ice.

The Soil Cryology Lab in Pushchino, Russia, has been digging up Siberian permafrost in search of ancient organisms for roughly a decade. For example, last year, the researchers reported a "frozen zoo" of 35 viable protists (nucleus-containing organisms that are neither animal, plant, nor fungus) that they calculated ranged from hundreds to tens of thousands of years old.

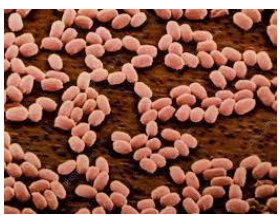
It is important for mankind to understand this phenomenon of melting ice and the risk of diseases caused by viruses, bacteria, fungus and other microbes frozen before hundreds and thousands of years.



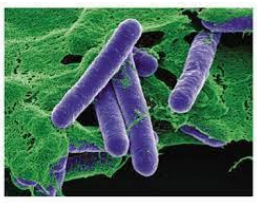
Ancient Critters



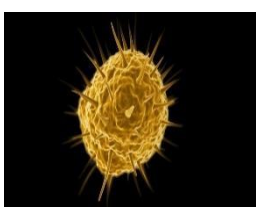
P. sibericum



Anthrax spores



Clostridiuim spores



Mimivirus

Permafrost & global warming.

Permafrost is any ground that remains completely frozen - 32°F (0°C) or colder - for at least two years straight. These permanently frozen grounds are most common in regions with high mountains and in Earth's higher latitudes—near the North and South Pole.

Frozen permafrost soil is the perfect place for bacteria to remain alive for very long periods of time, perhaps as long as a million years. That means melting ice could potentially open a Pandora's box of diseases. "Permafrost is a very good preserver of microbes and viruses, because it is cold, there is no oxygen, and it is dark. Many pathogenic i.e. disease causing bacteria and viruses might be preserved in permafrost, some of which might release into the atmosphere and global epidemic diseases might revive due to increasing temperature.

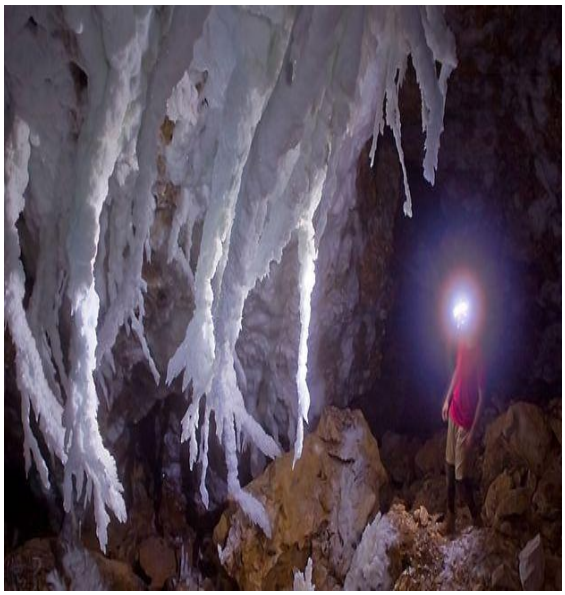
NASA scientists successfully revived bacteria that had been encased in a frozen pond in Alaska for 32,000 years. This year, with a team of 69 scientists from 10 countries, their expedition found that methane discharge was increasing resulting into holes in permafrost along the East Siberian Arctic Ocean Shelf, the Siberian Times has reported.

A rise in methane and carbon dioxide levels in the atmosphere in the 20th and 21st centuries has been named a central cause for climate change.

Global warming does not have to directly melt permafrost to pose a threat. Because the Arctic sea ice is melting, the north shore of Siberia has become more easily accessible by sea. As a result, industrial exploitation, including mining for gold and minerals, and drilling for oil and natural gas, is now becoming profitable.

Arctic regions are warming twice as fast compared to the rest of the planet, its current rate of temperature change being the highest in 2,000 years. In 2016, Arctic permafrost temperatures were 3.5 degrees Celsius higher than at the beginning of the 20th century. A study has shown that every 1 degree Celsius rise in temperature can degrade up to 39 lakh square kilometre due to thawing. This degradation is expected to further aggravate as the climate gets warmer, putting at risk 40 per cent of the world's permafrost towards the end of the century– causing disastrous effects.

When permafrost thaws, microbes start decomposing this carbon matter, releasing greenhouse gases like methane and carbon dioxide. Researchers have estimated that for every 1 degree Celsius rise in temperature, these grounds could release GHGs to the tune of 4-6 years' of emissions from coal, oil, and natural gas. Along with greenhouse gases, these grounds could also release ancient bacteria and viruses into the atmosphere as they unfreeze.



Selenite formations in Lechuguilla Cave

Bacteria's natural resistance to antibiotics.

Antibiotic resistance has been around for millions or even billions of years. The reason for this is that many types of fungi, and even other bacteria, naturally produce antibiotics to gain a competitive advantage over other microbes.

Nevertheless, natural antibiotic resistance is probably so prevalent that many of the bacteria emerging from melting permafrost may already have it. In line with that, in a 2011 study scientists extracted DNA from bacteria found in 30,000-year-old permafrost in the Beringian region between Russia and Canada. They found genes encoding resistance to beta-lactam, tetracycline and glycopeptide antibiotics.

The bacteria were located in the Cave of the Crystals, part of a mine in Naica in northern Mexico. The cave contains many milky-white crystals of the mineral selenite, which formed over hundreds of thousands of years ago. The bacteria were trapped inside small, fluid pockets of the crystals, but once they were removed they revived and began multiplying & never have come in contact with humans.

OUTCOME

Risk from permafrost pathogens is inherently unknowable. For instance, as Earth warms northern countries will become more susceptible to outbreaks of "southern" diseases like malaria, cholera and dengue fever, as these pathogens thrive at warmer temperatures. The alternative perspective is that we should not ignore risks just because we cannot quantify them. If the pathogen hasn't been in contact with humans for a long time, then our immune system would not be prepared. So yes, that could be dangerous. Hence it's suggested that awareness should be raised regarding the threats of these frozen organisms and climate change, which is major reason for their revival.

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