

Letter to the Editor

'Zombie virus' and the social media: A social media analysis and call for action

Dear Editor,

The recent COVID-19 pandemic tested us on our pandemic preparedness protocols and highlighted various administrative shortcomings. The role of social media and news media cannot be understated. Alarmism, hoarding of essential medical and non-medical resources, and racism were among the consequences of the rapid spread of false information. Not only patients, but also their family caregivers, were shown to be significantly affected by their exposure to the news and social media during the epidemic, with negative effects on their mood and sleep quality. While the world worked tirelessly to contain the pandemic, the spread of misinformation about newly emerging viruses and mutants continued to raise public concern about the re-emergence of other epidemics [1,2].

On November 10, 2022, a preprint article entitled "An update on eukaryotic viruses derived from ancient permafrost" was published, reporting the isolation of viruses that dated 48,500 years back and were still capable of causing an infection [1]. The media reacted quickly to this new development, with several articles describing the newly discovered 'zombie virus'. Social media was quick to pick up on this 'catchy' information and responded with several posts on the topic that spread like wildfire, with people panicking about the potential global spread [2]. Even though the researchers acknowledged that global warming affects the melting of glaciers and consequentially the release of these bacteria into the environment, they emphasized that it is currently impossible to determine their infectivity in the environment [1].

A total of 13 viruses affecting *Acanthamoeba castellanii*, which was used as a virus bait, were identified from 7 prehistoric permafrost samples, 1 from Kamchatka cryosol and the other from Lena River. The identification procedure entailed taking antibiotic-prepared virus samples and depositing them in *Acanthamoeba*-containing Petri-dishes, followed by examining cell changes under light microscopy. PCR sequencing was then used to characterize the viruses. Pandoravirus, Pithovirus, Megavirus, and Pacmanvirus were among those identified. Characterization of the isolated viruses is in its infancy, and genetic analysis of further viruses that could be isolated is ongoing [1]. A metagenomic study on Siberian permafrost samples by the same university revealed that Pithoviridae and Orpheoviridae-like viruses contributed the most to the gene pool. This included herpesviruses and poxviruses, both of which are known to infect humans [3]. The major limitation of the study was the exclusive use of *Acanthamoeba* as a host species, which restricted the study sample to 'large' easily detectable viruses, limiting the study of lytic viruses. But it's important to note here that only a small number of viruses were found, and we cannot ignore the possible effects of global warming-caused thawing on biodiversity. The evolutionary gap of *Acanthamoeba* with humans and other mammals was one of the protective mechanisms employed by the researchers to

prevent possible contamination and spread to laboratory workers, thus preventing a potential cascade [1]. Previous metagenomic analysis on similar permafrost samples also showed a high content of beta-lactamase producing organisms, possibly because of their evolutionary advantage, further indicating a possible threat to the population in terms of antibiotic resistance [4].

Permafrost is the permanently frozen ground that lies beneath much of the Arctic land surface. This thick layer of permafrost is being disrupted as Arctic temperatures are rising twice as fast as the rest of the world. Permafrost thawing has dramatic consequences for human society, such as exacerbating climate change by releasing greenhouse gases from the decomposition of previously trapped organic material and endangering human health by triggering the metabolic reactivation of various microorganisms. These pathogens have been trapped beneath this layer for nearly 500,000 years and pose a serious threat if released into the environment [1]. While the literature on prokaryotes and bacteria is extensive, information on 'live' viruses has been scarce with the major two studies on the pithovirus and mollivirus published in 2014 and 2015, respectively. To the best of our knowledge, the first one isolated was influenza RNA extracted from the lung tissue of corpses buried in permafrost since 1918, which aided in the coding of the entire hemagglutinin gene. Another was the Variola virus, which causes smallpox and was discovered in a 300-year-old Siberian mummy in 2004 [5]. During the 2016 summer, when Arctic temperatures broke records, an Anthrax outbreak was recorded in Yamal Peninsula, Siberia, killing over 2300 reindeer, infecting dozens of people, and killing a 12-year-old kid. Climate change-induced permafrost thawing has been identified as one of the key causes of this outbreak. Given the infrequent character of these events and the limited number of studies, determining the potential hazards and scale of the consequences is difficult [3–5].

During the last week of November 2022, articles began to appear in the media. The social eagerness to match the 'trend,' initiated a ripple effect with panic-filled posts and mentions on social media. Our detailed analysis of the social media history from November 6th to December 5th, 2022, using the terms 'zombie virus' and '#zombievirus' revealed that these terms were mentioned 11,500 times with a reach of 323.9 million. The overall sentiment regarding the news was negatively skewed. A sharp spike in the google search trend for 'zombie virus' was seen in the last week of November indicating the rapid spread of the news. Twitter received the majority of mentions (88.5%). India had the most mentions (1400), followed by the United States of America (826) and Nigeria (502). Some of the other popular hashtags used included #zombieapocalypse and #pandemic which demonstrated the people's fears (Fig. 1).

Figure Attribution- Maps and Charts created using Microsoft Excel- Powered by Bing- Australian Bureau of Statistics, GeoNames, Microsoft, NavInfo, OpenStreetMap, TomTom

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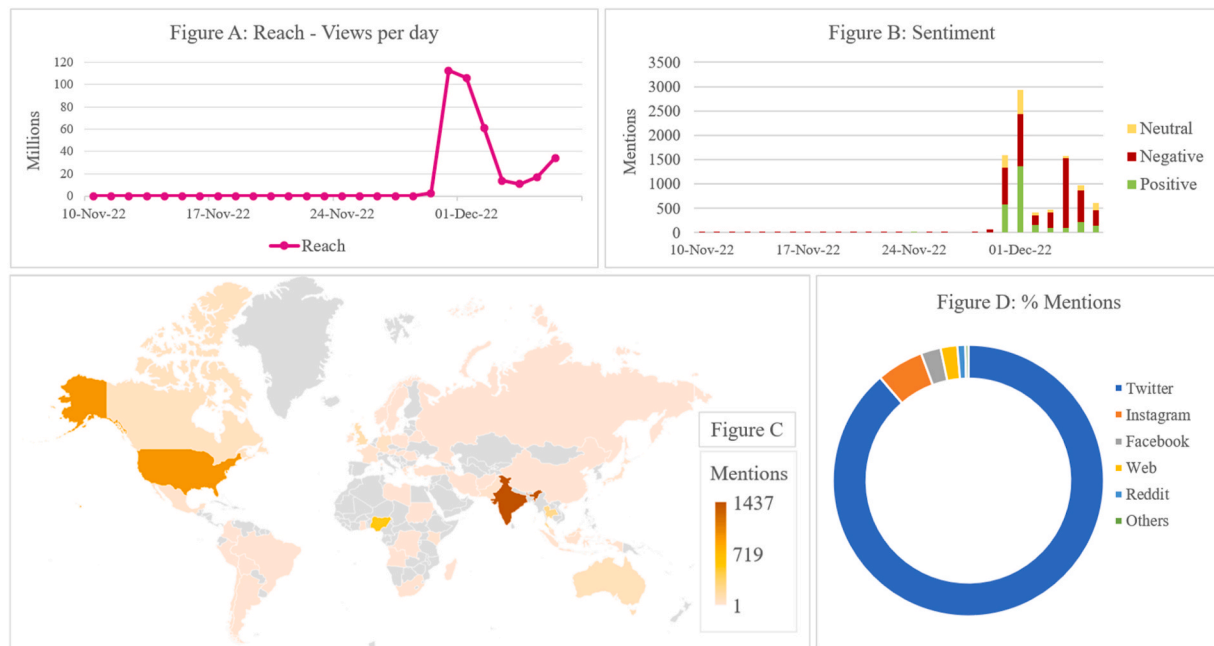


Fig. 1. Social Media and the 'Zombie Virus'

Figure A shows the number of views per day on all online platforms. A sharp spike is seen at around 1st December. **Figure B** shows the progression of sentiment with days. An increase in negative sentiment is seen. **Figure C** shows the worldwide distribution of the number of mentions across web and social platforms. **Figure D** shows the distribution of mentions among different social media platforms.

With the sheer pace at which the Arctic environment is changing, continued research and mobilization of resources are required. Global collaboration needs to be promoted with substantial research funding to identify environmental triggers and healthcare complexities to detect acute health disturbances. The biohazard associated with reviving the pathogens can be prevented with on-site quarantine/isolation facilities with strict surveillance protocols. Social media intelligence is where our future lies. The challenge of health misinformation is a hurdle we have faced with the last Covid-19 pandemic which appears to be a product of a global shift in digitization. Furthermore, print, television, and social media currently act as double-edged swords. Despite their best efforts to educate and entertain the audience, due to a lack of appropriate training, they are sometimes forced to gloss over health-related issues that require a more nuanced understanding and mature perspective. Incorporation of social intelligence and health education right from basic school levels can have long-lasting positive effects.

Declaration of competing interest

Authors declare no conflict of interest

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