

News in focus

participants, until they reached a level 10,000 times the initial dose. A few volunteers developed short-lived infections, but these quickly vanished.

“We were quite surprised,” says Susan Jackson, a study clinician at Oxford and co-author of the latest study. “Moving forward, if you want a COVID challenge study, you’re going to have to find a dose that infects people.”

An ongoing COVID-19 challenge trial at Imperial College London, in which participants have been exposed to the Delta SARS-CoV-2 variant, has also encountered problems with infecting participants reliably, says Christopher Chiu, an immunologist and infectious-disease physician at Imperial who is leading the trial and was involved in the others. Some participants have experienced infections, but probably not enough for a study testing whether a vaccine works, adds Chiu.

“We need a challenge strain that’s more representative of what’s circulating in the community,” says Anna Durbin, a vaccine scientist at Johns Hopkins University School of Medicine in Baltimore, Maryland, who was a member of the board that oversaw the safety of the McShane’s trial.

Viral strains used in challenge trials are produced under stringent conditions, a process that can take six months or longer, say scientists, making it impossible to match circulating variants perfectly. McShane and Chiu are readying a challenge trial using the BA.5 Omicron subvariant that emerged in 2022.

Raising doses

Researchers are looking at other ways to give people COVID-19. Jackson says that an even higher SARS-CoV-2 dose might be needed – one similar to doses used in influenza challenge trials, in which participants have substantial immunity. Another method could be giving participants multiple doses. Chiu says that his team is exploring the possibility of screening potential participants to identify those with low levels of immune protection against the BA.5 variant and any future challenge strains.

Chiu is leading a consortium that in March was awarded US\$57 million by the European Union and CEPI, the Coalition for Epidemic Preparedness Innovations in Oslo, to use challenge trials to test inhaled and intranasal COVID-19 vaccines that might also block transmission. He’s hopeful that such changes to trial protocols will do the trick. “What you really want is a model that replicates a genuine infection and ideally one that causes some symptoms,” he adds.

Zimmer-Harwood, who works for a non-profit organization that advocates for challenge trials and their participants, says he would welcome changes that make COVID-19 challenge studies more useful to researchers – even if it means less time on the bicycle trainer.



TANDEM STILLIS + MOTION/GETTY

Select fires in the Yukon Flats National Wildlife Refuge in Alaska will be allowed to burn.

EPIC BLAZES THREATEN PERMAFROST. CAN FIREFIGHTERS SAVE IT?

Some scientists want a rethink of the policy of letting blazes burn themselves out in northern wildernesses.

By Jeff Tollefson

Fire season is approaching in the massive Yukon Flats National Wildlife Refuge in east Alaska, where fires have long been allowed to burn unchecked unless they threaten human life and property. But as climate change increases the frequency of these fires, the land’s overseers are changing course. Working with scientists, refuge managers have designed a pilot programme to parachute elite firefighting teams into remote areas to quash infernos – to protect not people, but permafrost.

The forests and tundra of the Denmark-sized refuge cloak a deep layer of permafrost, frozen ground that holds enormous quantities of carbon across the Northern Hemisphere. After fires remove vegetation and soils, however, that frozen ground often begins to thaw, releasing its stores of greenhouse gases into the atmosphere. New research¹ suggests that the resulting emissions could be on a par with those of a major global economy over the course of this century. This could effectively reduce by up to 20% the amount of carbon dioxide that humanity can emit and still meet its goal of limiting global warming to 1.5 °C above preindustrial levels. The research has not yet been peer reviewed.

These numbers suggest that a rethink of long-standing fire policies in high-latitude boreal forests might be needed, says Brendan Rogers, an Earth-systems scientist with the Woodwell Climate Research Center in Falmouth, Massachusetts. The pilot programme at Yukon Flats will test that idea in an area where permafrost is particularly vulnerable.

“What we’re talking about is aggressive attacks on fires when they ignite in these areas,” Rogers says. Once such fires get going, he adds, it’s often too late. “That carbon is lost.”

Earth ablaze

The proposal to suppress boreal fires to help fight climate change follows years of increasingly intense conflagrations across northern forests and Arctic peatlands. By some estimates, the wildfires in Canada’s boreal forests last year released more than three times as much carbon dioxide as the entire country emitted from burning fossil fuels. Officials at Yukon Flats say that the frequency of major fires on the refuge has quadrupled since 1988.

A rise in fire frequency can have cascading effects on the ecosystem, and thus carbon, says Xanthe Walker, an ecologist at Northern Arizona University in Flagstaff, who has studied the effect of fires on permafrost.

Historically, boreal forests have burnt once every 70–120 years, she says, which gives the black-spruce forest that dominates the ecosystem time to regenerate and rebuild carbon in the soil. More-frequent fires can burn ‘legacy’ carbon that has accumulated over centuries² and can also kill off the black spruce (*Picea mariana*). That provides an opening for trees that do not promote the kind of carbon-rich soils that insulate permafrost.

Emissions win

Fire suppression could help to stave off some of these effects, buying humanity time to address the climate crisis. In a 2022 paper³, researchers at Woodwell and the Union of Concerned Scientists, a non-profit organization in Cambridge, Massachusetts, found that fire-suppression efforts in Alaska tend to reduce the total area burnt. Their calculations suggest that investing in fire suppression could reduce carbon emissions at a lower cost than that of many technologies for reducing industrial emissions. With an investment of around US\$700 million annually in suppression over the next decade, Alaska alone could reduce carbon emissions by up to 3.9 billion tonnes of carbon dioxide by mid-century. That is more than the annual greenhouse-gas emissions of the European Union.

The idea that governments should attempt fire suppression in remote boreal forests has encountered scepticism. Fires play an important part in the ecosystem, and research shows that suppression efforts allow fuel to build up in many forests, contributing to increasingly intense fires⁴.

Still, because of the looming climate crisis, many researchers say that the suppression efforts at the Yukon Flats might be worthwhile. “Stopping fires across the boreal forests is an impossible feat, but targeted suppression in areas that are vulnerable seems like a great strategy,” says Walker.

A refuge for permafrost

The pilot project at Yukon Flats began last year in 8 areas covering nearly 650,000 hectares of land. Those zones include 40% of the land underlain by a uniquely vulnerable type of permafrost called Yedoma, which contains deep ice wedges that often melt after fires. This causes the land to collapse, exposing ancient carbon to microorganisms whose activity releases greenhouse gases. The target areas contain some 1.1 billion tonnes of carbon, which, if released, would be equivalent to around 7 years of emissions from US coal burning.

Yukon Flats refuge manager Jimmy Fox says that he decided to move forward with the project after consulting with scientists and firefighters. He also involved Indigenous communities that own some 1.2 million hectares of land in the refuge in the discussion. These communities have voiced concerns about wildfire

smoke and the negative effects of the fires on water quality and on the land used for hunting, berry picking and other subsistence activities.

Under the pilot programme, firefighters will be deployed on fires that start early in the season and have the potential to burn for several months. Firefighters will engage only if they determine that they can put out the fires within three days, so as to minimize costs and the use of firefighting resources.

Fox notes that Yedoma permafrost zones that burnt decades ago and then collapsed are slowly beginning to recover as vegetation thickens and produces carbon-rich soils that

once again insulate the ice below. But with rising temperatures and increasing fire frequency, he says, the danger is that these areas will reach a tipping point at which point recovery would no longer be possible.

Ultimately, the goal is to hold fires to a more historical level. It could be a few decades before scientists can determine whether the effort pays off, Fox warns, “but we have to try”.

1. Trehame, R. et al. Preprint at <https://doi.org/10.21203/rs.3.rs-3909244/v1> (2024).
2. Walker, X. J. et al. *Nature* **572**, 520–523 (2019).
3. Phillips, C. A. et al. *Sci. Adv.* **8**, eabl7161 (2022).
4. Kreider, M. R. et al. *Nature Commun.* **15**, 2412 (2024).

ONLINE TOOL IDENTIFIES PAPERS DISCUSSED ON PUBPEER

Plug-in flags when studies – or their references – have been posted on a site for raising integrity concerns.

By Dalmeeth Singh Chawla

A free online tool alerts researchers if a paper cites studies that are mentioned on the website PubPeer, a forum scientists often use to raise integrity concerns surrounding published papers.

Studies are usually flagged on PubPeer when readers have suspicions, for example about image manipulation, plagiarism, data fabrication or artificial intelligence (AI)-generated text. PubPeer already offers its own browser plug-in that alerts users if a study that they are reading has been posted on the site. The new

“When you see a large number of problems in a bibliography, that just calls everything into question.”

tool, a plug-in released on 13 April by RedacTek, based in Oakland, California, goes further – it searches through reference lists for papers that have been flagged. The software pulls information from many sources, including PubPeer’s database; data from the digital-infrastructure organization Crossref, which assigns digital object identifiers to articles; and OpenAlex, a free index of hundreds of millions of scientific documents.

It’s important to track mentions of referenced articles on PubPeer, says Jodi Schneider, an information scientist at the University

of Illinois Urbana-Champaign, who has tried out the RedacTek plug-in. “Not every single reference that’s in the bibliography matters, but some of them do,” she adds. “When you see a large number of problems in somebody’s bibliography, that just calls everything into question.”

The aim of the tool is to flag potential problems with studies to researchers early on, to reduce the circulation of poor-quality science, says RedacTek founder Rick Meyler, who is based in Emeryville, California. Future versions might also use AI to automatically clarify whether the PubPeer comments on a paper are positive or negative, he adds.

Third-generation retractions

As well as flagging PubPeer discussions, the plug-in alerts users if a study, or a paper that it cites, has been retracted. There are existing tools that alert academics about retracted citations; some can do this during the writing process, so that researchers are aware of the publication status of studies when constructing bibliographies. But with the new tool, users can opt in to receive notifications about further ‘generations’ of retractions – alerts cover not only the study that they are reading, but also the papers it cites, articles cited by those references and even papers cited by the secondary references.

The software also calculates a ‘retraction association value’ for studies, a metric that measures the extent to which the paper is associated with science that has been withdrawn from the literature. As well as informing