Preparedness Framework, WHO guidance that sets the ground rules for data sharing in exchange for access to vaccines and other benefits. But the rules, adopted in 2011, apply only to influenza viruses.

At the moment, access to data on other viruses is, in theory, governed by the Convention on Biological Diversity (CBD), an agreement signed by 196 nations to protect the world's flora and fauna. In 2010, a supplementary agreement, the Nagoya Protocol, was added to the CBD, stating that any company or researcher seeking to use genetic resources from a specific country — including viral samples — must obtain permission from that nation and reach an agreement on how the parties will share any benefits from that material.

But these agreements don't regulate the sharing of data, including viral genomes, and didn't prevent inequity during the COVID-19 pandemic. For example, South Africa, which alerted the world to SARS-CoV-2 variants such as Omicron and Beta, has been able to fully vaccinate only around 40% of its population against COVID-19.

Some public-health specialists think oversight of viral-genome benefit sharing should be given to the WHO, an agency geared towards public health. The latest draft of the organization's pandemic treaty dedicates an entire article to the subject, with an eye towards establishing that oversight.

The draft is a "big deal" because it aims to put pathogens, specifically those with pandemic potential, under a public-health-focused framework, rather than a biodiversity framework, says Amber Hartman Scholz, head of the science-policy department at Leibniz Institute DSMZ, which houses a collection of microorganisms and cell cultures in Brunswick, Germany.

A difficult negotiation

But for the pandemic treaty to govern benefit sharing for pathogen data, a number of hurdles will need to be overcome.

Many low- and middle-income countries won't want the accord to contain any legal obligation that they monitor for potential pathogens and make the data available internationally, says Pierre du Plessis, one of Africa's lead negotiators on genetic resources, based in Windhoek, Namibia. "We are all quite concerned about protecting the sovereign right to control access to genetic resources, and not giving that up without at least getting something substantial in return," he says.

By contrast, pharmaceutical companies say that transactional agreements, in which they must make a deal with a nation amid a crisis, cause delays in the development of treatments and vaccines. They also lead to the "serious politicization of pathogen sharing", says Thomas Cueni, director-general of the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA), based in Geneva.

Potential solutions to the problem have come from all sides. One, proposed by a group of African nations during the CBD negotiations, would be to deposit into a global fund 1% of retail sales from products, such as vaccines and diagnostic equipment, developed with viral genome sequences. "Let's use that money to support conservation, sustainable use, capacity development and technology transfer," du Plessis says.

"There's room for agreement, because all countries want a reliable system."

Pharmaceutical companies have proposed another option. "Companies, looking at what happened in the pandemic, said that we are willing to commit part of our real-time production" of vaccines and other products "for immediate allocation by international institutions to populations in developing countries", Cueni says. IFPMA has formally presented this solution in a proposal it has called the Berlin Declaration. In return, pharma firms would expect governments to guarantee the "immediate and unhindered" sharing of data.

Next steps

Which solution will be incorporated into the pandemic treaty remains to be seen. Currently, negotiators are discussing whether to include language that incentivizes data sharing by ensuring that, for example, a specific proportion of pandemic-related products are distributed in low- and middle-income countries. The international committee responsible for drafting the treaty has less than one year to come to a consensus and submit a final version to be voted on by the WHO's member states at the next World Health Assembly in May 2024.

Some still hold out hope that a strong commitment to low- and middle-income countries will be inserted into the document. If countries aren't motivated to share information, says epidemiologist Salim Abdool Karim, director of the Centre for the AIDS Programme of Research in South Africa, based in Durban, "then that basically means we won't have a global early-warning system in place to prevent the next pandemic".

JWST HINTS AT LOWER NUMBER OF HABITABLE PLANETS

Data from the telescope suggest that a second world in a seven-planet system lacks an atmosphere.

By Alexandra Witze

For the second time, the James Webb Space Telescope (JWST) has looked for and failed to find a thick atmosphere on an exoplanet in one of the most exciting planetary systems known. Astronomers report[1] today that there is probably no tantalizing atmosphere on the planet TRAPPIST-1 c, just as they reported months ago for its neighbour TRAPPIST-1 b.

There is still a chance that some of the five other planets in the TRAPPIST-1 system might have thick atmospheres containing geologically and biologically interesting compounds such as carbon dioxide, methane or oxygen. But the two planets studied so far seem to be without, or almost without, an atmosphere.

Because planets of this type are common around many stars, "that would definitely reduce the amount of planets which might be habitable", says Sebastian Zieba, an exoplanet researcher at the Max Planck Institute for Astronomy in Heidelberg, Germany. He and his colleagues describe the finding in *Nature*.

System with star power

All of the seven TRAPPIST-1 planets, which orbit a star some 12 parsecs (40 light years) from Earth, have rocky surfaces and are roughly the size of Earth. Astronomers consider the system to be one of the best natural laboratories for studying how planets form, evolve and potentially become habitable. The planets are a key target for JWST, which launched in 2021 and is powerful enough to probe their atmospheres in greater detail than can other observatories such as the Hubble Space Telescope.

The planets' host star emits large amounts of ultraviolet radiation, which could erode any atmosphere on a nearby planet. The system's innermost planet, TRAPPIST-1 b, is blasted with four times the amount of radiation that

Earth gets from the Sun, so it wasn't too much of a surprise when JWST found that it had no substantial atmosphere[2]. The next in line, TRAPPIST-1 c, orbits farther from its star, and it seemed possible that the cooler planet might have retained more of an atmosphere.

But, using observations from JWST, Zieba's team calculates that TRAPPIST-1 c's surface temperature, on the side that faces its star, registers at around 107 °C — too hot to maintain a thick atmosphere that is rich in carbon dioxide. By comparing the observations with models of the planet's possible chemistry, the scientists also concluded that TRAPPIST-1 c would have had very little water when it formed — less than ten Earth oceans' worth of water. This and the lack of a thick carbon dioxide atmosphere today suggest that TRAPPIST-1 c never had many ingredients for habitability.

But in a paper[3] posted on 8 June on the arXiv preprint server, Joshua Krissansen-Totton, a planetary scientist at the University of Washington in Seattle, reported that the TRAPPIST-1 planets e and f — the fourth and fifth farthest from the star — could still have thick atmospheres, because they sit far enough away from the star to avoid having all of their water blasted away, unlike planets b and c. "I think it makes sense to remain agnostic on the prospects for the outer planets retaining atmospheres," Krissansen-Totton says.

1. Zieba, S. *et al. Nature* https://doi.org/10.1038/s41586-023-06232-z (2023).
2. Greene, T. P. *et al. Nature* **618**, 39–42 (2023).
3. Krissansen-Totten, J. Preprint at https://arxiv.org/abs/2306.05397 (2023).

HOW THE Y CHROMOSOME MAKES SOME CANCERS MORE DEADLY FOR MEN

Two studies help to explain why colorectal and bladder tumours are worse in men than women.

By Heidi Ledford

The Y chromosome could explain why men are less likely than women to survive some cancers, according to studies that combine data from mice and humans.

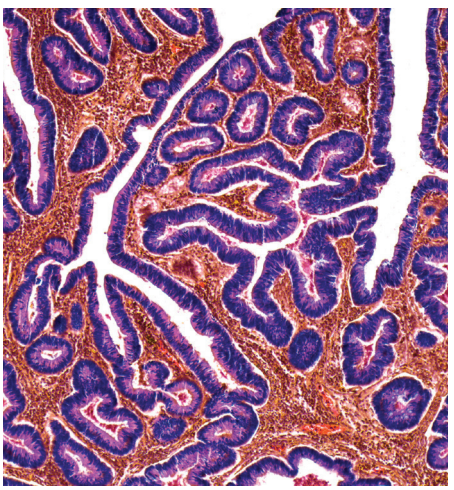
Two studies, both published on 21 June in *Nature*[1,2], address cancers that are particularly aggressive in men: colorectal cancer and bladder cancer. One study finds that the loss of the entire Y chromosome in some cells — which occurs naturally as men age — raises the risk of aggressive bladder cancer and could allow bladder tumours to evade detection by the immune system[2]. The other finds that, in mice, a particular Y-chromosome gene raises the risk of some colorectal cancers spreading to other parts of the body[1].

The two studies help to explain why the incidence of so many cancers is biased towards men, says Sue Haupt, a cancer researcher at the George Institute of Global Health in Sydney, Australia, who was not involved with the work. "It's becoming clear that it's beyond lifestyle," she says. "There is a genetic component."

Lifestyle has long been blamed for the fact that many non-reproductive cancers tend to be more frequent and more aggressive in men than women. Men are more likely to smoke, for example. But even when such factors are accounted for, differences in cancer between men and women persist[3].

(This article uses 'men' to describe people with a Y chromosome, while recognizing that not all people who identify as men have a Y chromosome, and not all people who have a Y chromosome identify as men.)

Meanwhile, researchers have also found that the Y chromosome, which is a normal feature in male cells, can be spontaneously lost during cell division. As men age, the proportion of Y-less blood cells increases, and an abundance of such cells has been linked to conditions such as some cancers.



Colon cancer (pictured) is worse in men.

STEVE GSCHMEISSNER/SPL

To learn more about how this process might affect bladder cancer — a cancer with a male bias[3] — Dan Theodorescu, a cancer researcher at Cedars-Sinai Medical Center in Los Angeles, California, and his colleagues studied human bladder cancer cells that had either lost their Y chromosome spontaneously or had it removed using genome editing.

The team found[2] that such cancer cells were more aggressive when transplanted into mice than were comparable cells that still had their Y chromosome. The authors also found that immune cells surrounding tumours with no Y chromosomes tended to be dysfunctional.

In mice, a therapeutic antibody that can restore the activity of those immune cells was more effective against such Y-less tumours than against tumours that still had their Y chromosome. The team found a similar trend in human tumours. This finding is "the most important message" of the study, says Jan Dumanski, a geneticist at Uppsala University in Sweden who was not involved with the research, because it suggests a better way to treat these cancers.

Risk from the Y chromosome

In a separate study[1], a team working on colorectal cancer in mice found that a gene on the Y chromosome called *KDM5D* might weaken connections between tumour cells, helping the cells to break away and spread to other parts of the body. When that gene was deleted, tumour cells became less invasive, and were more likely to be recognized by immune cells.

This also presents a potential target for anti-cancer therapies, says co-author Ronald DePinho, a cancer researcher at the University of Texas MD Anderson Cancer Center in Houston. "This is a druggable target."

The contrast between the two findings — a protective role for the Y chromosome in bladder cancer and a harmful role for a Y-chromosome gene in colorectal cancer — emphasizes the importance of context in cancer, says Theodorescu. "Not every tumour is going to have the same biological behaviour," he says, and researchers will need to look at the effect of the loss of the Y chromosome on various organs and tumour types.

That context can vary on the basis of not only the organ affected, but also the tumour's location in the organ and the presence or absence of other genetic mutations, says Haupt. "You cannot generalize," she says. "When people just throw all the data together, they miss the point."

1. Li, J. *et al. Nature* https://doi.org/10.1038/s41586-023-06254-7 (2023).
2. Abdel-Hafiz, H. A. *et al. Nature* https://doi.org/10.1038/s41586-023-06234-x (2023).
3. Jackson, S. S. *et al. Cancer* **128**, 3531–3540 (2022).