

Science

How a painting's microbiome might help restore artworks and find fakes

ABC Science By science reporter [Belinda Smith](#)

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[Carlo Bononi's *Incoronazione della Vergine* waited 400 years to have its microbial population mapped.](#) (Wikimedia Commons: Nicola Quirico)

Art is a matter of taste — and quite literally, if you're a microbe.

A team of Italian scientists have analysed the various bugs inhabiting a 400-year-old painting that was left leaning against a church wall, neglected, after a 2012 earthquake.

Reporting in [PLOS One](#) today, they found different species and strains of bacteria and fungi colonised different-coloured parts of the artwork, probably because they chowed down on ingredients that made up the various pigments.

While some microbes were in the process of destroying the artwork, they report, others could possibly be enlisted to help preserve it and other ancient pieces.

They also suggest that analysing a painting's "microbiome" might help detect forgeries.

Study lead author Elisabetta Caselli from the University of Ferrara is a microbiologist who normally focuses on how microbes contaminate hospitals.

She and her colleagues have discovered that in clinical settings some strains of "beneficial" bacteria [outcompete their nasty counterparts](#).

Key points:

- Bacteria and fungi can eat ingredients used to make paints
- Italian scientists analysed the microbial populations on a neglected 17th-century painting
- Some bacteria might help preserve the painting by outcompeting microbes devouring the paints

So when the opportunity arose to help restore Carlo Bononi's oil painting *Incoronazione della Vergine*, Dr Caselli and her team decided to take the same approach



[Front, back and damaged parts of Carlo Bononi's *Incoronazione della Vergine*: 1616–1620](#). (Supplied: Caselli et al., 2018)

Incoronazione della Vergine was completed in 1620, but had been left deteriorating in a location that was ripe for microbial growth since 2012.

"The painting is located in a historical church of our city," Dr Caselli said.

"The aim of the project was to understand the composition of the painting's microbiome to drive the restoration procedure and develop systems able to prevent new contamination."

Harmful bugs

When it comes to battling microbes, mould — which is part of the fungi kingdom — is an art conservator's nemesis, said Robyn Sloggett, director of the University of Melbourne's Grimwade Centre for Cultural Materials Conservation.

"So for example, in 2011 there was [a big flood](#) in a remote Aboriginal community at Warmun [in Western Australia] and their artworks were underwater," Professor Sloggett said.

After being rescued, the paintings were wet for a day or so.

"So in that case, of course, that's the number one priority — to get rid of that mould."

That's because mould can stain and penetrate artworks, causing paint to lift and flake away.

Some bacteria can cause issues too, she added — some also cause staining, for instance, "but that's pretty rare".

"Mainly it's the fungi, the mould, that do the most damage."

Microbes have been shown to [nibble away at pigments](#), including those made from red and yellow ochres, and red lac, which contains organic dyes mixed with a base such as chalk.

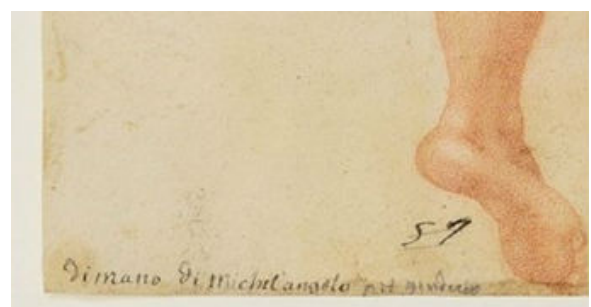
So to see what fungi and bacteria called the 17th-century Bononi painting home, Dr Caselli and her crew swabbed and grew microorganisms from different parts on agar plates.

Sure enough, they found that certain bugs did prefer to live on — and eat — certain paints.

For instance, *Penicillium* and *Aspergillus* species tended to congregate on red and dark brown patches, while *Chadosporium* species dwelled in lighter areas.

Indeed, some dyes and pigments are naturally antimicrobial.

[Hidden 'Michelangelo' inscription found under old piece of sticky tape](#)



On Middle Eastern manuscripts, for instance, dyes made with turmeric seem to [inhibit mould growth](#), Professor Sloggett said.

[But don't get too excited — it was likely sketched by one of his students.](#)

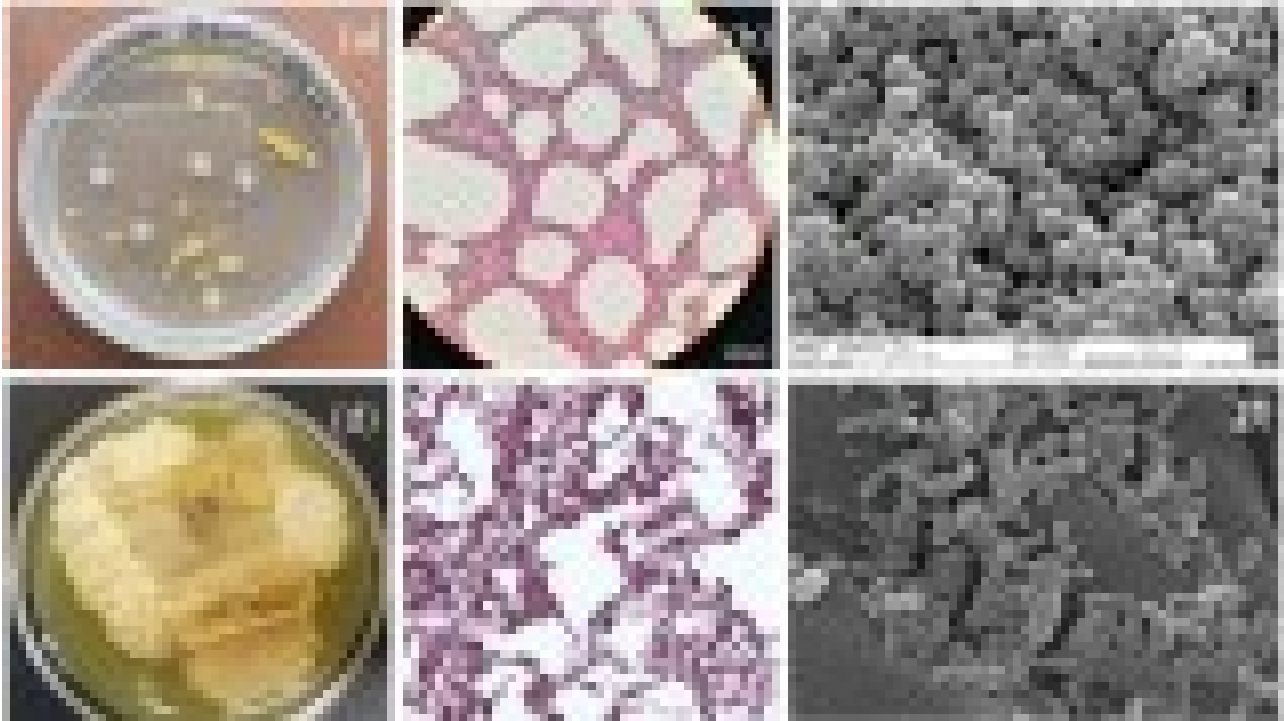
Helpful bugs

So those are the harmful microbes. What about the helpful?

Dr Caselli and her team once again grew various fungi and bacteria, taken from the painting, in petri dishes.

But this time, they also added a probiotic cocktail made from three strains of Bacillus bacteria.

The probiotic slowed or almost stopped growth of some strains of microbes.



[Different bacteria detected on the painting](#), (Supplied: Caselli et al., 2018)

Although their experiments have only been done in dishes — they've not yet applied probiotics to a real canvas yet — Dr Caselli said a fungi-fighting probiotic concoction might be mixed in a weak alcoholic solution and sprayed on artworks, but only after showing Bacillus species won't cause damage, of course.

A painting's microbiome might one day also be used to sniff out fakes.

"The evolution of a microbial population on an ancient artwork is a slow and balanced process, and cannot be recreated easily in a short time," Dr Caselli said.

That's still a way off though, she added, with more comparative studies needed to set up such procedures.

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