

## MicroPest: Gorda (*Gordonia amarae*)

(J.J.A. Rose and S. Petrovski)



Left: photograph of severe bacterial foaming in a wastewater treatment plant (Petrovski et al., 2022).

Right: diagram of Gorda foaming in wastewater (Nielsen and Singleton, 2021).

### Claim to fame: operational disruption of wastewater treatment plants

Wastewater treatment plants (WWTPs) receive our wastewaters and use microbes to clean them up by degrading and removing the excess nutrients and nasty organic substances they may contain, including the pathogens that sick people excrete. Although microbes do a wonderful job in cleaning up the water, some of them may misbehave and cause problems.

One such problem is the formation of foam – like the soap suds that form when you add a detergent to hot water to clean the dishes after a meal, or the surface of the waves coming onto the beach after a storm. A lot of foam is bad for WWTPs because it disrupts the correct movement and mixing of the wastewater designed by engineers, and causes operational disruption of the plant. Foaming episodes can be extremely expensive, preventing wastewater treatment plants from recycling wastewater we flush down our sinks and toilets every day. Dealing with the problem involves responses like the addition of chlorine, which is a toxic chemical and can kill the good bacteria that help with the treatment of wastewater.

Because the aerobic treatment of carbon-rich wastes involves the vigorous bubbling of air through the liquid, and vigorous mixing and splashing, foaming is natural in WWTs. However, foam bubbles are ordinarily short-lived, so do not generally cause problems. The exception is when a special group of bacteria called the Mycolata stabilises the bubbles and the foam they create and prevents it from breaking down, thereby promoting its accumulation. The Mycolata are a natural part of the wastewater community but, for one reason or another, sometimes their populations increase too much, and then they become a big problem: pests in fact!

*Gorda*: a foam-stabilising bacterium of wastewater. *Gorda* is one of these Mycolata bacteria that overgrows and stops this foam from breaking down, causing major disruptions to the operation of the plant. *Gorda* grows as long branching filaments and contains a special substance

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in its cell envelope (mycolic acids) that makes it tough to kill and gives Gorda its ability to stabilise foam.



Image of the filamentous Gorda under a light microscope (Petrovski et al., 2022).

*Gorda is a mighty awful pest!*

### The importance of Gorda to us.

Gorda is notorious for the stabilisation of wastewater foam, affecting treatment plants worldwide. It is estimated that these foaming disruptions caused by Gorda costs the wastewater industry millions of dollars every year, making this bug quite the pest! Not only is foaming expensive, but it stops wastewater from being treated, which is a very important process. If we don't treat wastewater, the ecosystems of the waterways it is released into will become polluted, and the biodiversity and ecosystem services they provide will suffer. Because of this, population management of Gorda is really important to us.

### What to do?

Even though Gorda can cause problems, it is naturally present in wastewater and plays a very important role in the WWTP ecosystem, forming the backbone of a biological floc. These biological flocs are aggregates of different types of bacteria. All these bacteria work together to feed on all the unwanted organic substances, degrading and removing them from the water. Once the bacteria have fed on all the nasty organic substances, their flocs have grown heavy enough to settle to the bottom, separating from the treated water. Settling is an important process in WWT so, because Gorda is an important member of the WWTP community, we don't want to remove it altogether. We just need a way to keep its populations down to safe levels.

And we need an alternative way to deal with Gorda's foaming, so we don't have to use toxic chemicals like chlorine.

**Microbes to the rescue!** New findings suggest that some parasites of Gorda, including viruses and parasitic nanobacteria, may be useful agents for biological control of Gorda populations in WWTPs. If we can exploit these to limit the size of Gorda populations, we will be able to reduce the frequency and severity of foaming, hopefully preventing or curing foaming problems in WWTPs.