**Fighting fungi with fungi**

***Every pest has a natural adversary, which keeps them in check in nature. Empa researcher Francis Schwarze drew inspiration from this: with the right helper organism, trees and even timber can be protected against fungal parasites, an idea that triggered a new Empa spin-off: MycoSolutions.***

There are half a million wooden telephone poles in Switzerland. They are easy to erect and last up to 35 years without the need for any major upkeep. However, the Swiss telecommunications company Swisscom has to replace as many as 5,000 poles a year for its landline infrastructure – many because fungi have caused them to rot. Although the poles are impregnated with biocides such as copper, they are ineffective if copper-resistant fungi transform the copper using oxalic acid and then destroy the wood – resulting in the poles needing to be replaced far sooner than planned.

Francis Schwarze, a wood, tree and fungus researcher at Empa has now discovered a means to protect the wooden poles against copper-resistant fungi: if deployed early enough, another fungus, a natural adversary of wood decay fungi, is able to inhibit the formation of oxalic acid and kill off the pole destroyers. “In nature,” explains Schwarze, “fungi keep each other in check.” In a forest, this works by itself: “A fungus that destroys wood has an antagonist that stops it in its tracks,” says the scientist. In the case of trees and wooden constructions that are planted or erected outside their natural habitat, however, this equilibrium spirals out of control and the pest can spread unimpeded.

The roots of trees planted in cities and parks, where the soil contains little microbial diversity, are especially afflicted by fungi, such as the shelf fungus or the honey fungus. This can cause them to lose their solid footing and become fragile. Quite a few even die off completely from such infections. With these very old, locally important trees and the fungi infesting them, however, Schwarze discovered a corner of the market, which he has been studying closely in recent years. In his spare time, he advised parks commissions in Europe, Australia or Asia on how they could get fungus-stricken trees back in shape again using customized plant fortifiers.

First of all, Schwarze set about isolating and identifying the harmful organisms on the tree. Then all he had to do was “simply” find a natural adversary and turn it into a product – granules – which tree surgeons could scatter in the soil around the trees’ stricken roots. As Schwarze recounts, things can sometimes get quite emotional, too: “I’ve seen seasoned tree surgeons shed a tear when treated trees suddenly start sprouting new roots again.”

**Identifying the pest and finding its nemesis**

For Schwarze, the priority was always the knowledge of the fungi, which he continually channeled into his research projects at Empa. With time, however, he eventually decided to market the knowhow as well. Not only could the condition of trees suffering from a fungal infestation be improved; he also discovered that timber could also be protected as a precautionary measure, as long as its structure still remained intact. And so Schwarze founded a spin-off in St. Gallen with backing from Startfeld, the innovation network of the St. Gallen-Lake Constance region. The fledgling company, MycoSolutions, is looking to develop products from beneficial organisms that might be used as plant fortifiers, fertilizers in organic farming or for the biological control of wood-destroying fungi. The spin-off recorded its first successes with customized products for valuable exotic trees in Northern Italian parks and gardens infested with wood-destroying fungi. MycoSolutions analyzes the samples from a tree’s affected area supplied by tree surgeons, isolates the pathogen and evaluates it to customize the suitable antagonist to a certain degree.

**Fungi against pests on telephone poles**

Schwarze eventually pitched the proposal of using fungi to treat telephone poles infested with fungi to Swisscom. They were extremely interested in environmentally friendly treatments. The telecommunications company agreed to submit a project to the Commission for Technology and Innovation (CTI) together with Empa and MycoSolutions to find out whether and how the lifespan of wooden poles might be preserved and even extended thanks to biological control.

Once the CTI project had been completed successfully, Swisscom signed up for an extended field trial. They are planning to use the substance proactively in the soil around afflicted telephone poles where there is evidence of a fungal infestation. 2,400 bags have been ordered from MycoSolutions already and are expected to be deployed in the summer of 2017.

**Box: International market entry and production set-up**

In the spring of 2016, Reto Vincenz, a business economist with longstanding experience in industrial companies and start-ups, became CEO of MycoSolutions and took over the operative management of the fledgling company. Thanks to start-up funding, in which Vincenz and Swisscom Ventures (the venture capital division of the Swisscom Group) were also involved, MycoSolutions can now make its entrance on the international market and ramp up production.