

Researchers have discovered a new type of coexistence between algae and fungi

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Once the fungus coating is disturbed, a green layer of algae appears. Credit: Institute of Botany, Czech Academy of Sciences

Researchers from the Institute of Botany, Czech Academy of Sciences, have described the symbiotic relationship between fungi and algae that science has largely overlooked until now. The coexistence of algae and corticioid basidiomycetes, which are common in temperate forests, has been given a new name: "alcobiosis." Their work has been published in *Scientific Reports*.

Jan Vondrák of the Department of Taxonomy, Institute of Botany, and the first author of the study says, "Years ago, during [field trips](#), we were repeatedly puzzled to find a layer of green algae where some of the fungal coatings on wood or bark (so-called corticioid fungi) are disturbed. We discovered that this is a close symbiosis of fungi and algae, not a lichen, though, because the fungus does not depend on its alga for nourishment."

The new term introduced by the researchers for this type of coexistence, "alcobiosis," is formed by letters from the three key words: algae, corticioid fungi and symbiosis.

In the course of several years, the team of researchers gathered a large number of samples and performed DNA sequencing of the algal and fungal partners. They discovered that the symbiosis is very common and occurs in a great many corticioid fungi across the class of agaricomycetes. Individual fungal species are usually faithful to a specific algal species from a range of algae described in various alcobioses.

Ensuing physiological measurements of algal activity in alcobioses confirmed that the algae are alive, active and engage heavily in photosynthesis, which proves that they prosper inside fungal tissue. Alcobioses bear a striking resemblance to lichens, but differ from them in that the fungal partner does not depend on its alga for nourishment.

"And so the main unknown still is in what way this symbiosis is beneficial for each of the partners. However, our discovery also brings many questions related to geographic, ecological and taxonomic parameters of the symbiosis, such as whether alcohobioses diversity increases from polar to [tropical regions](#)," says Jan Vondrák.

"This coexistence has been mentioned in articles before. Most often, though, these were just fragmentary comments that such and such species of corticioid fungus is often found together with algae. We were the first to grasp alcohobioses as a widespread phenomenon which includes a large number of algae and fungi."



Alcobioses are common in urban areas, too. *Lyomyces sambuci*, pictured here, is abundant on elder bark. Credit: Institute of Botany, Czech Academy of Sciences

During their research, the authors also discovered that the spread of alcobioses is aided by small gastropods who often feed on corticioid fungi. Their excrements contain viable cells of [algae](#) and fungi who give rise to new alcobiotic coating shortly after. This type of reproduction is similar to lichen "isidia" (i.e., specific lichen thallus structures used in vegetative reproduction).

Scientists at the Institute of Botany have described a [symbiotic relationship](#) that is very common in Europe, but which has so far escaped attention. In this way a new space has opened for the further study of alcobioses from various points of view by both professional biologists and biology enthusiasts, since alcobioses are clearly visible to the [naked eye](#) and it is easy to distinguish them from similar [fungi](#) that do not form this kind of relationship.

More information: Jan Vondrák et al, Alcobiosis, an algal-fungal association on the threshold of lichenisation, *Scientific Reports* (2023).
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