We have seen traces of a world unseen by naked eye and we need to see more of it...

Our project “Origins and spread of the capacity towards synthesis of bioactive macrolactones in higher fungi” aims to fill a white spot on the enormous map that is our knowledge of secondary metabolites produced by fungi. These incredibly varied substances are usually seen first and foremost through the lens of their usability or dangers to human beings. However, in the field, in the soil or in the forest these substances reveal their face as an indispensable weapons of chemical warfare between competing species of microscopic organisms.

We want to combine classical mycological and molecular biology techniques with analyses based on an incredibly rich source of new information – the high throughput sequencing of whole fungal genomes. Together, these new and old ways of looking at microscopic fungi can bring to light poorly seen but immensely interesting pathways by which fungi make new (or old) secondary metabolites.

We want to look at the sources – the how's and the why's of creation of an incredibly elegant molecular factory – the biosynthetic array of two large proteins, called polyketide synthases (nonreducing and reducing) which can together create one of the vast array of biologically active secondary metabolites called fungal macrolactones (or benzenediol lactones, in short BDLs).

By having access to the vast amount of data from complete genomes of new fungal specimens, we will check if the ability to produce BDLs is, as we now imagine, an early branch of evolution of chemical warfare – one which tends to particularly often zigzag across the boundaries of what we call distantly related species. If so, we think the traces of these jumps (horizontal transfers), will still be found not only in the genome of each fungus but also in the common patterns regulating the making and the usage of macrolactones as weapons of war between competing fungi. In the future, the search for these traces of ancient events might help in using macrolactones as more effective sources of new drugs or better safeguarding ourselves from these compounds which might be harmful to our own health.