From gene presence to function

> ❓ Can we conclude from gene presence to presence of activity/function?

> 💡 **Assumption:** Information about gene activity can be extracted from the sequence

Analysis

The functional analysis of a protein sequence typically involves the annotation of features that are directly or indirectly related to the activity of the protein. Examples include structural protein domains, regions of conserved sequence, signal peptides and transmembrane domains, and low-complexity regions. Alterations in protein feature architectures have been associated with changes in protein activity. Therefore, the comparison of features can help to find out whether orthologs have adapted a different molecular activity in the course of their evolution.

Task 1: The CE8 pectinase

Let's start by inspecting the feature architecture of the CE8 pectinase in the invertebrate *Bradysia coprophila*.

1. Find the row in the phylogenetic profile that contains the orthologs of the pectinase CE8_QRW20161.1
2. Find the dot that represents the ortholog in the invertebrate *Bradysia coprophila*
3. Click on the corresponding dot and display the detailed plot
4. Select XP_037045633.1 and click on 'show domain architecture'
5. PhyloProfile will show you a comparison between the feature architecture of the CE8_QRW20161.1 ortholog in the fungus *Rhizoctonia solani* and the one in the invertebrate *Bradysia coprophila*
6. Which domains do you find annotated in the fungus, which ones in the invertebrate?
7. Which impact do you expect this observation to have on the pectinase-activity of the gene?

Task 2: The GH28 glycosyl hydrolase

This time, let's start by inspecting the feature architecture of the GH28 Glycosyl-hydrolase in the fungus *Rhizoctonia solani*.

1. Find the dot that corresponds to the GH28_QRW23661.1 in *Rhizoctonia solani*
2. Inspect the domain plot and note which domains are annotated.
3. Have a look at the available information about the Glyco_hydro_28 domain

4. Now, find the domain plot for the ortholog in the invertebrate *Bradysia coprophila*
5. What do you observe?

[Back to main](#)

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