**Microbial Enzymes in the Soil: The Microscopic Drivers of Global Carbon and Nutrient Recycling**

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*Background*

Soil carbon turnover is a particularly weak link in our understanding of ecosystem responses to climate change, such as the potential for carbon sequestration or release. Because microbial enzyme production is the fundamental driver of carbon and nutrient recycling in the soil, better understanding and improved models of this process are essential.

*Findings*

- Extracellular enzymes are the tools microbes use to fulfill their roles as material recyclers in the global carbon and nutrient cycles.
- Increased N and P concentration in plant material promotes enzyme production, which increases decomposition and nutrient recycling.
- Adding accessible carbon (e.g. glucose) to microbes growing on new plant litter suppresses enzyme production and decomposition.
- Adding accessible carbon to old recalcitrant material (e.g. humus) increases enzymatic decomposition, releasing nutrients and carbon through a priming effect.

*Model*

Microbes take up simple nutrients (C, N and P), which are used either for biomass growth, or to produce extracellular enzymes in order to decompose complex resources into accessible (simple) nutrients. The microbes optimize the proportions of different biomass components and enzyme production to maximize their growth rate.

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*Reference:*