

Investment in Substrate Uptake by Leaf Litter Fungi is Affected by Nitrogen Availability

Nicole Hynson & Kathleen Treseder

DOE Meeting

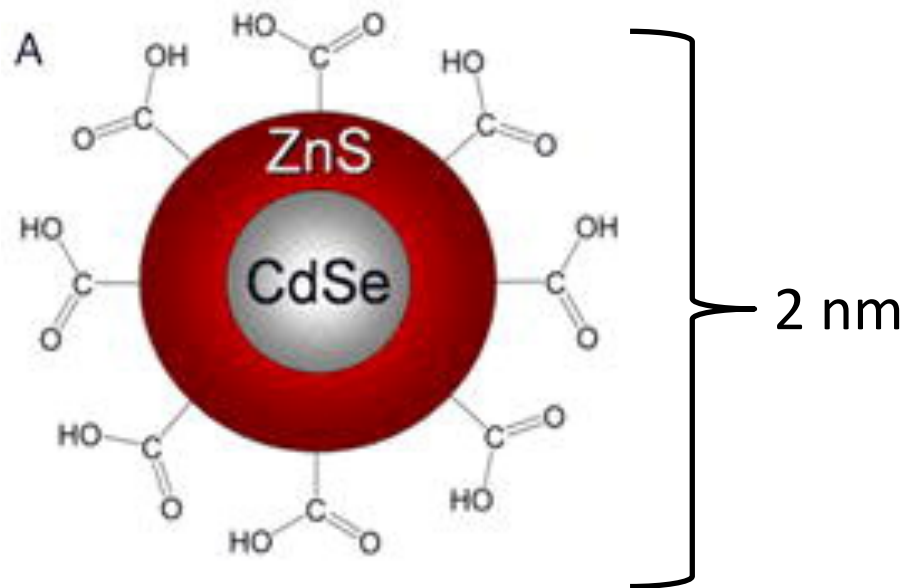
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Hypotheses:

H1: Because fungi target specific compounds for growth and reproduction, we will find differences in the uptake of labeled substrates by leaf litter fungi.

H2: Nitrogen availability will affect the amount and type of substrates utilized by fungi.

Quantum Dots (QDs) are versatile tracers



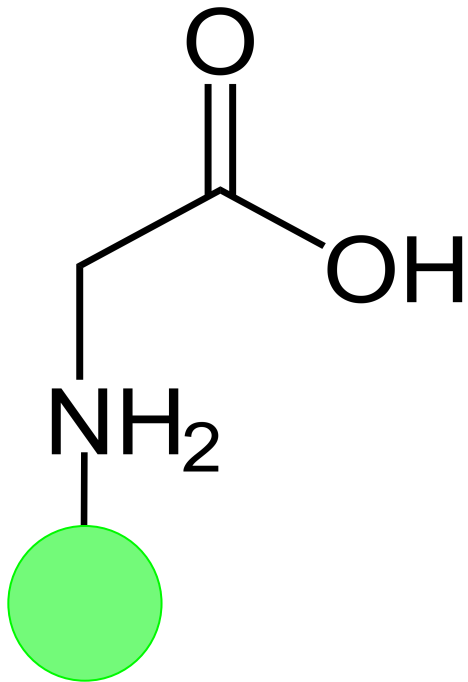
Carboxyl terminals to form amide bonds



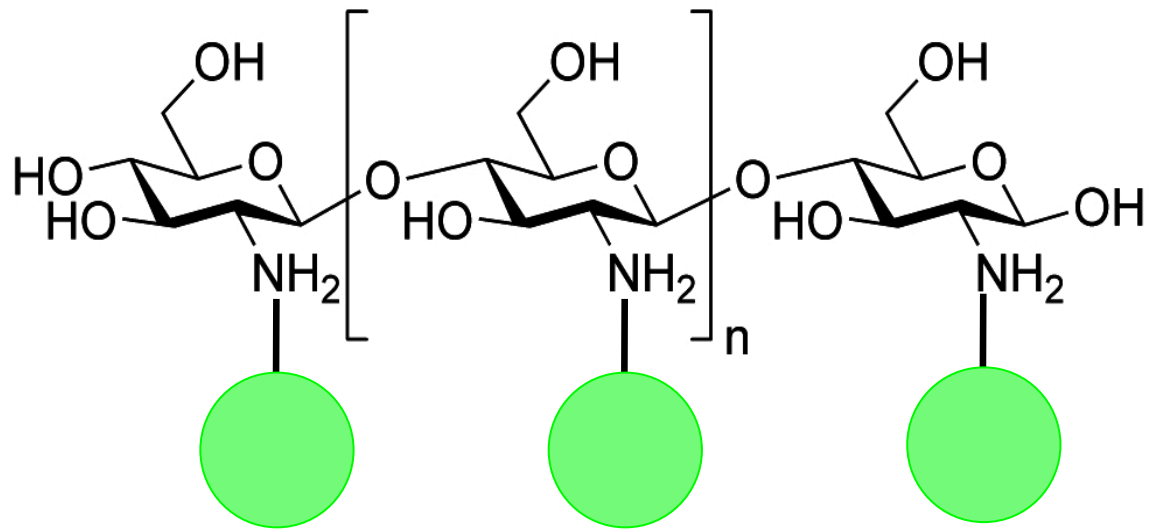
Amino terminals to form carboxyl bonds

We labeled two organic nitrogen sources

Glycine

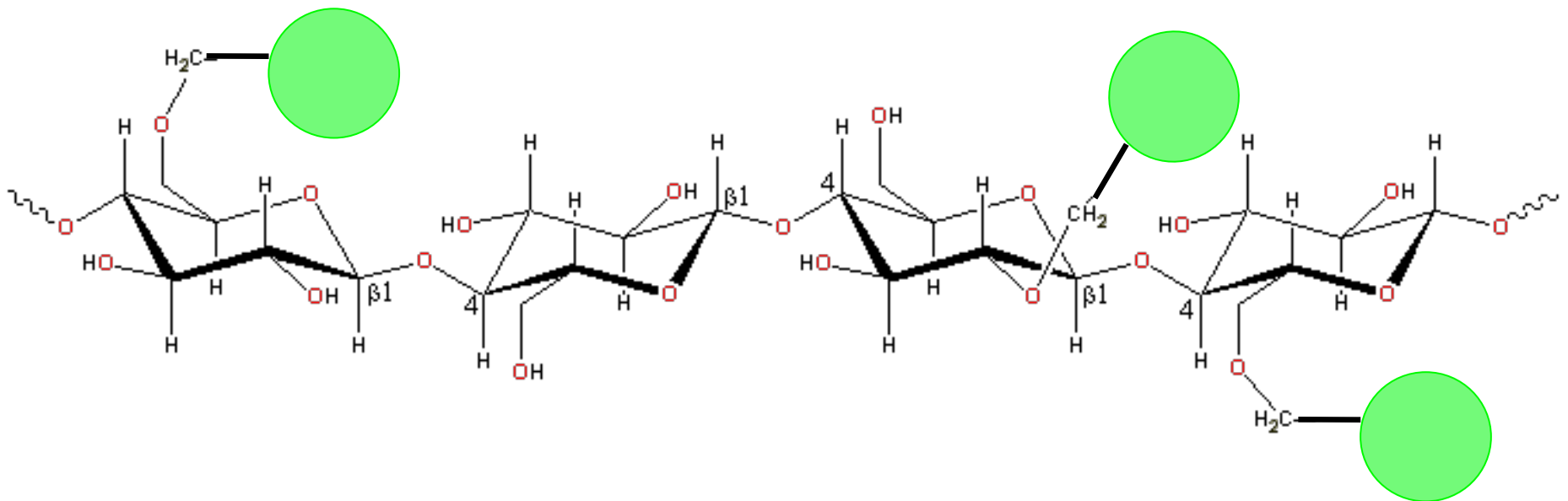


Chitosan



and one carbon source with green QDs

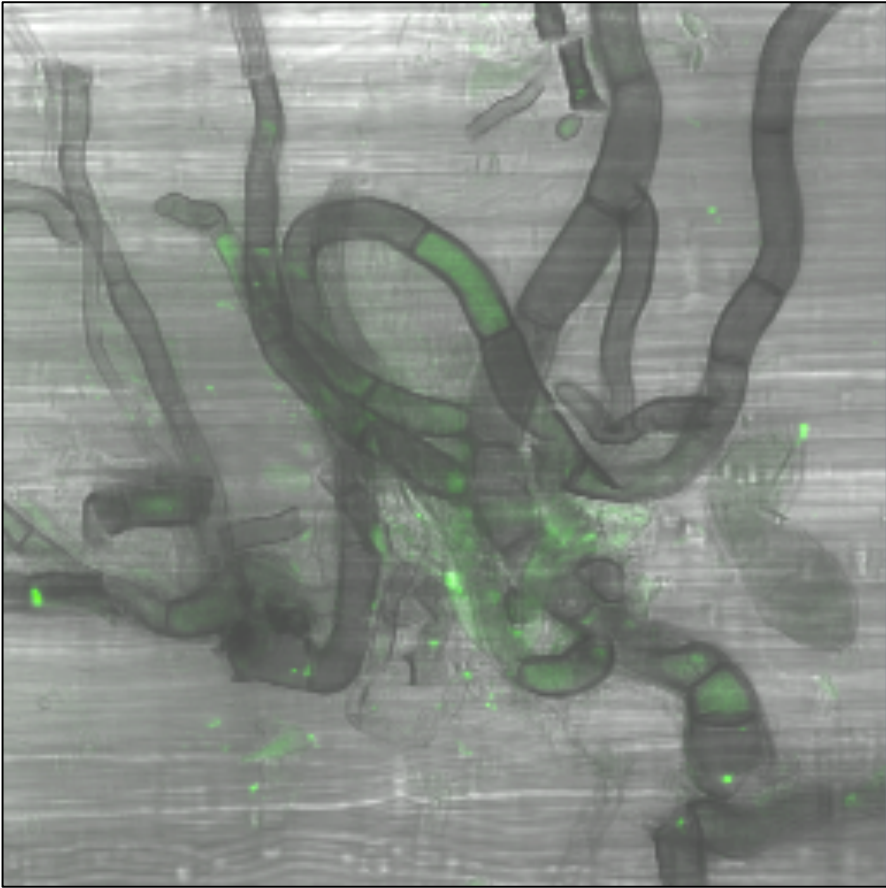
Carboxymethyl cellulose (CMC)



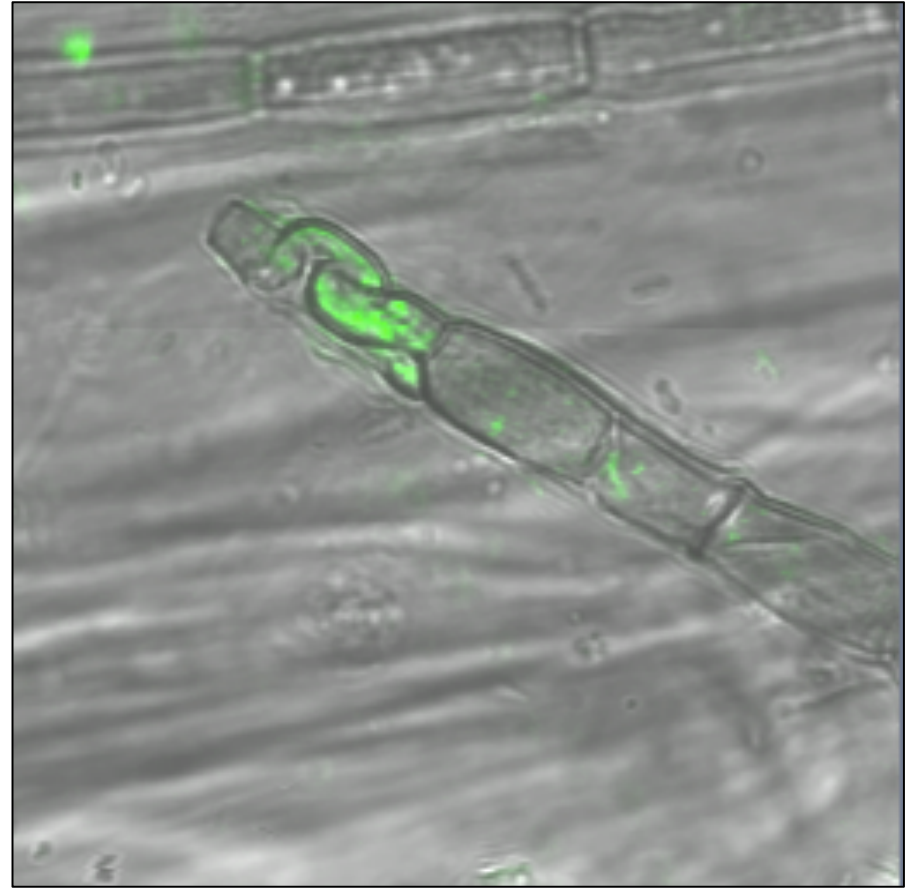
Methods

- Litter treatments were incubated with each labeled substrate for 24 hrs.
- Measured QD uptake for every substrate from 5 replicate litter bags for each of the three nitrogen treatments to litter and microbes and controls.
- Used RICS (Raster Image Correlation Spectroscopy) to quantify uptake.
- Number of QDs per measurement were converted to concentration (μmols).

Chitosan uptake

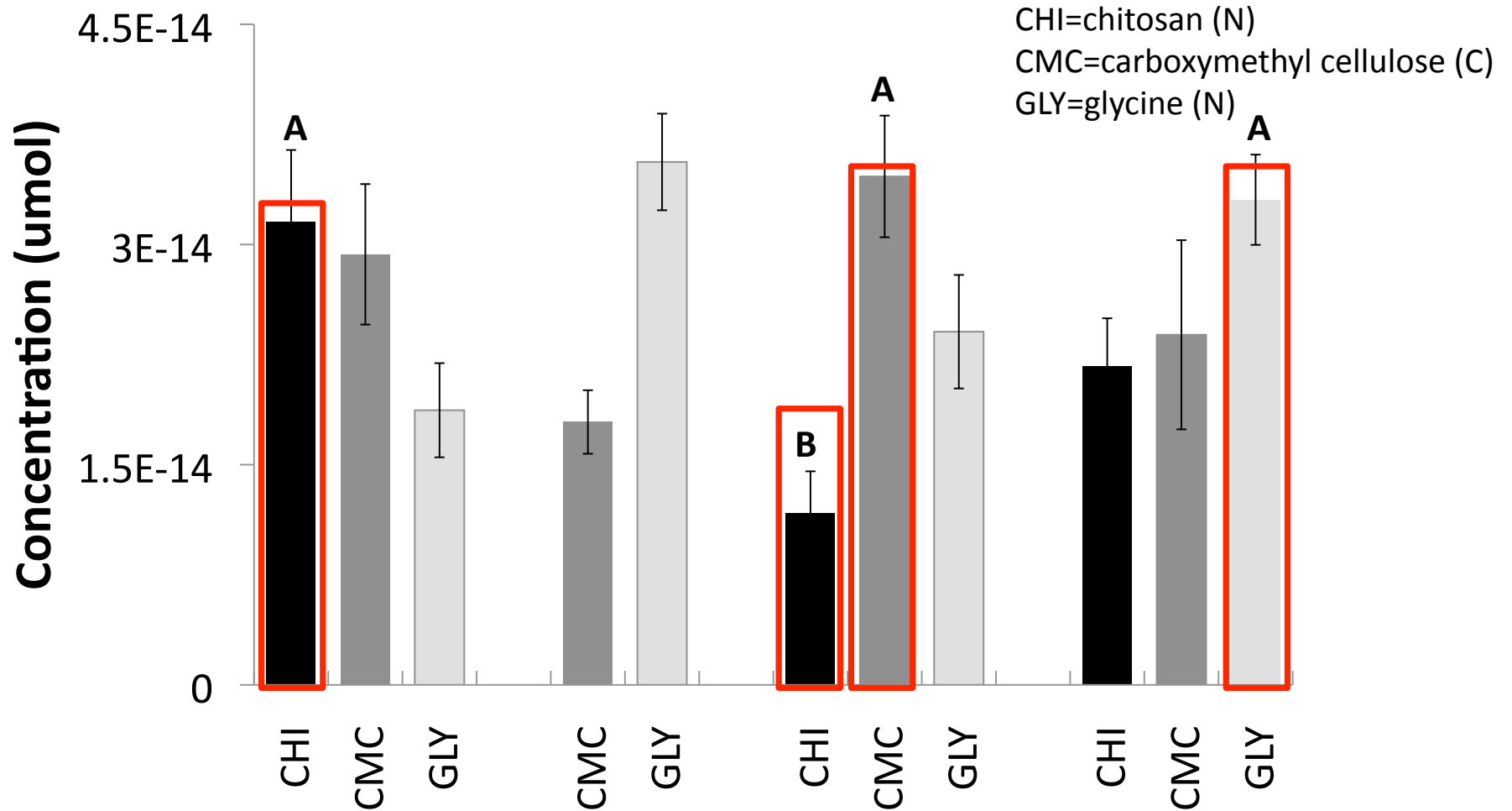


Plus N Litter and Fungi



Ambient

Uptake is Substrate and Environment Dependent



F=2.96 P=0.006

Fungi x Substrate P=0.003

Litter x Substrate P=0.002

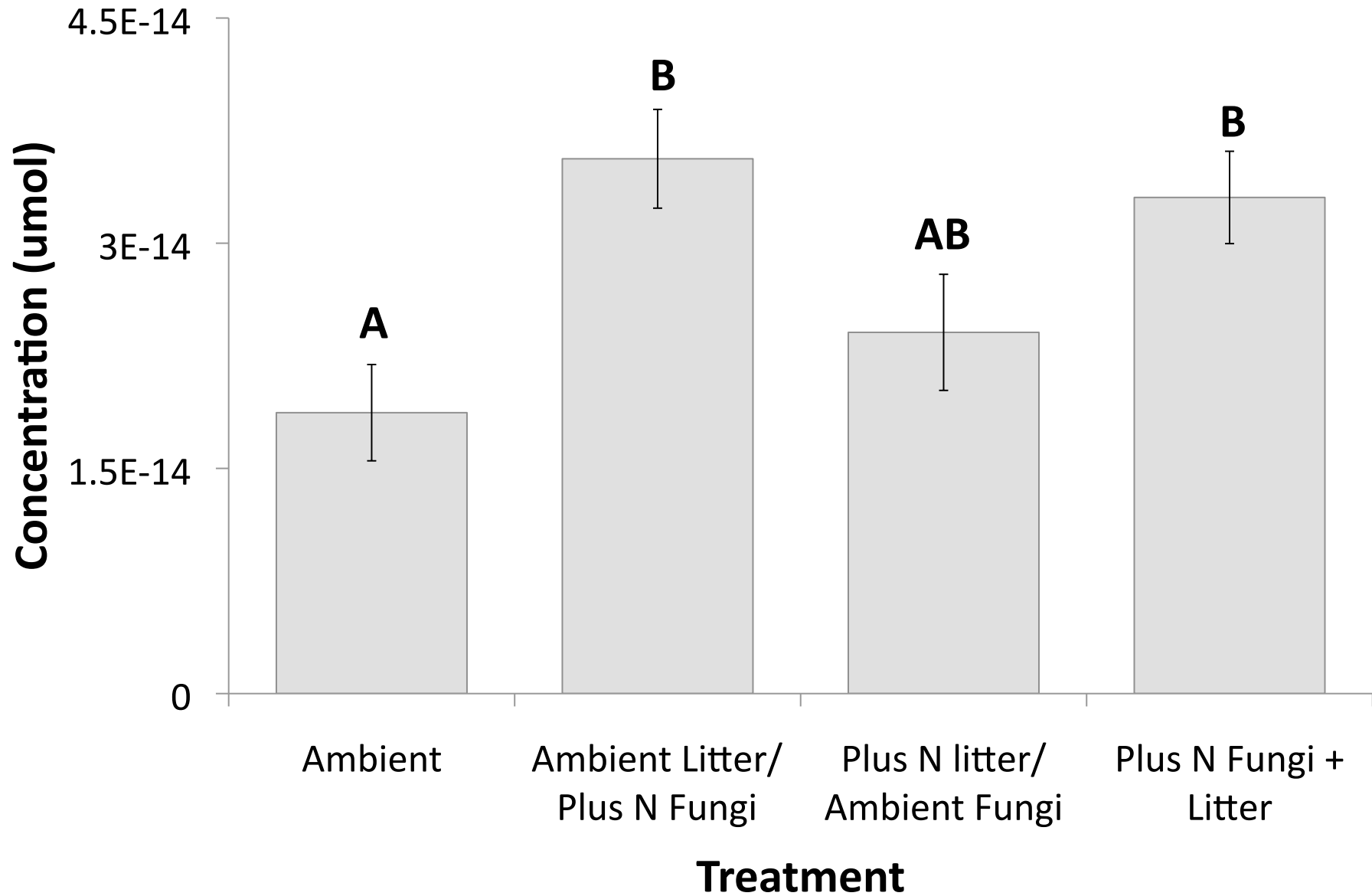
Ambient Litter/
Plus N Fungi

Plus N Litter/
Ambient Fungi

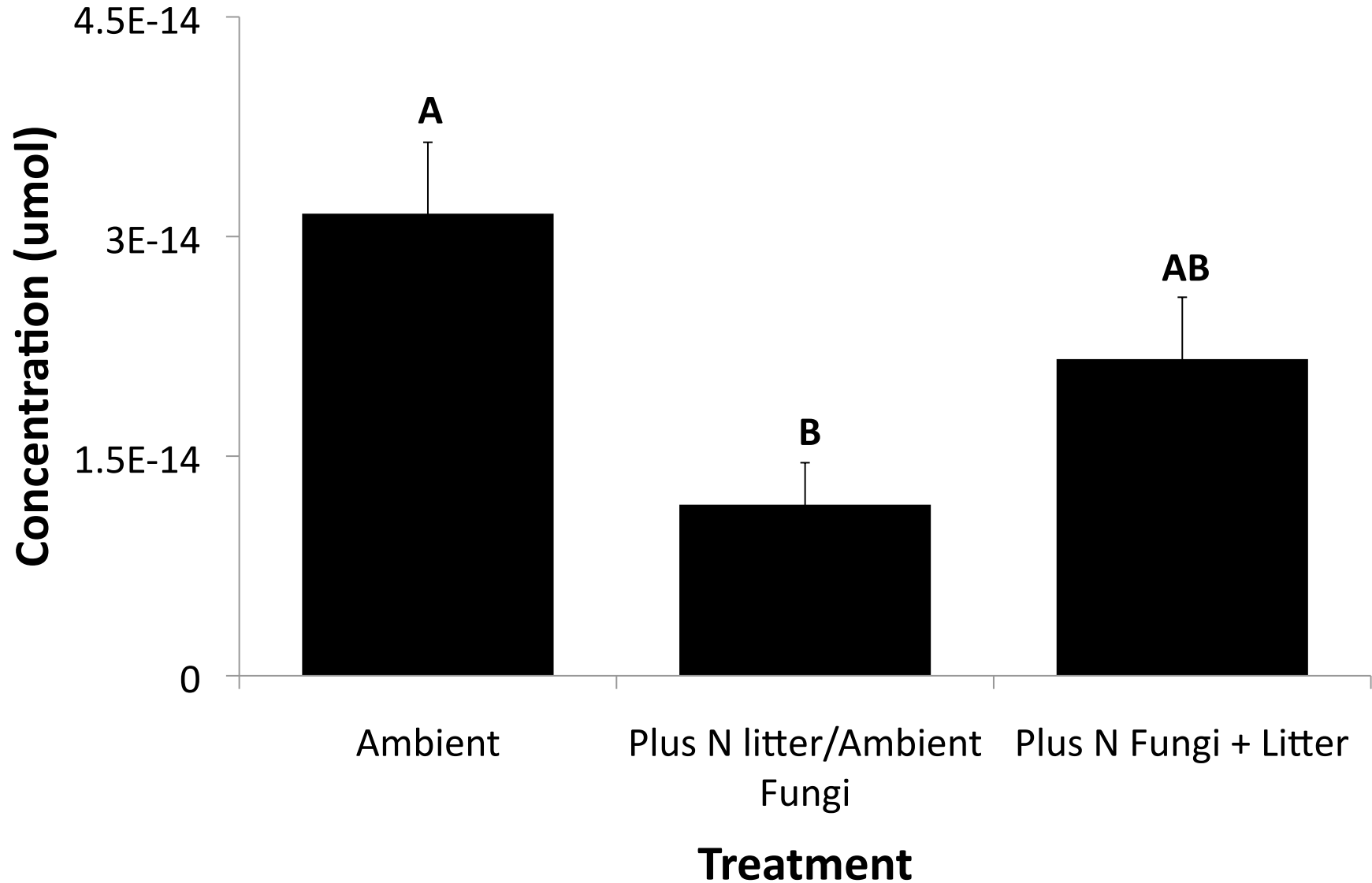
Plus N Fungi + Litter

Treatment and Substrate

Nitrogen Addition to Fungi Increases Glycine Uptake



Nitrogen Addition to Litter Decreases Uptake of Chitosan



Link to Other Experiments

- Community Assembly:
 - Fungi have different preferences for substrates.
 - Changes in the uptake of glycine and chitosan under increased N availability may be driven by changes in fungal community.
- Extracellular Enzymes:
 - +N to fungi increases the uptake of glycine, which may be mirrored in the production of extracellular enzymes such as NAG.
 - +N to the litter decreases the uptake of chitosan which may be reflected in the production of chitinase.
- Carbon Cycling Models:
 - +N does not increase the amount of carbon (cellulose) assimilated by fungi over a 24 hour time frame.