Transformation of chitin and peptidoglycan by microbial communities: Impacts of community adaptation and mineral sorbents

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The influence of minerals (kaolinite and ferrihydrite) on the microbial transformation of chitin, peptidoglycan and glucose was studied by cultivating prairie microbial communities in the artificial broth culture. Greater carbon and nitrogen loss was observed in the presence of either mineral relative to mineral-free system after 26 days of incubation, which indicated that the minerals served to provide a microenvironment conducive to microbial proliferation rather than to exert a protective effect on the biomolecules investigated. Carbon and nitrogen losses from chitin were significantly lower than those from peptidoglycan or glucose, suggesting that fungal chitin was relatively less susceptible to decomposition, or more input by new fungal residues compared with bacterial peptidoglycan. In respect of mineral and mineral-free application, the inconsistence between CO_2 evolution and carbon loss indicated CO_2 is risky to be used as the biomarker for microbial metabolism due to the additional pathway for carbon release, especially in some special environment. Principal component analysis of fatty acid methyl ester (FAME) showed the difference of community structure of microbiota among different substrate treatments and indicated that the fungal chitin as a preferential breeding-ground for fungal group, while bacterial peptidoglycan for bacterial group, particularly for gram-negative bacterial group.