Termites as a tool to improve lignocellulose biomass valorization: study of enzymatical complex from termites and its common symbionts by comprehensive metabolite profiling.

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One of the main challenges for the lignocellulose biomass conversion is to improve the enzymatic efficiency and reduce costs for industrial application. Termites, notorious for their craving for wood, may provide key to greener fuels and chemicals from cellulosic materials. Up to now, a lot of studies have been done about termites mostly in genetic and microbiology fields. With the emergence of new techniques, there is an interest to extend the investigations to proteomic and metabolomic studies and achieve a functional understanding of the microsymbionts-termite host association to use cellulose from wood.

Comprehensive two-dimensional gas chromatography (GCxGC) coupled to time-of-flight mass spectrometry (TOFMS) is used to study metabolite profiles in termites. The aim of the study is to develop a powerful analytical method to challenge the detection, separation and identification of compounds released in the tiny 1µL termite fluid gut volume.

Reticulitermes santonensis De Feytaud were collected on Oleron Island, France. The culture is maintained in laboratory on wet wood at 27°C and 70% humidity. Only adult workers were selected for experiments and washed in 70% ethanol solution before removing the entire gut. Sets of 1 to 10 guts were collected and homogenized using a potter in methanol/water and kept at -80°C until derivatization step and GCxGC-TOFMS analysis.

Hundreds of peaks were detected with 1µl injection volume of a reduced number of collected guts extract. Metabolites detected with library identification included amino acids, sugars, phosphates, organic acids, fatty acids and urea. Interesting compounds like sugars and reduced sugars were investigated in order to identify and understand metabolic strategy pathways used by termites and its symbionts to produce efficient energy from cellulose.