Host plant diet affects growth and induces altered gene expression and microbiome composition in the wood white (Leptidea sinapis) butterfly

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Title

Differential gene expression in two populations, Catalonian and Swedish, of the wood white butterfly (Leptidea sinapis) reared on different host plants *Lotus dorycnium* and *Lotus corniculatus*.

The differential gene expression study is part of a larger study with the objectives to investigate two populations of the wood white butterfly with different hostplant use, by assessing the female host plant preference, larval growth and developmental time, differential gene expression and microbiome diversity and composition. The aim of the gene expression analysis is to explore whether the two populations have different expression profiles in response to the host plants implying local adaptation.

Larvae from four Swedish females and seven Catalonian females were reared on Lotus dorycnium or L. corniculatus in a split brood design experiment. Larvae were collected at two developmental timepoints, instar 3 and instar 5. In instar 5 one larvae of each sex were collected. The study included in total 66 individuals. RNA from the abdomen was extracted with RNeasy mini kit. Sample 67-72 are RNA from gut tissue extracted with Trizol.   
Total RNA-libraries was constructed using TruSeq RNA with poly-A selection for multiplex sequencing on a single Illumina NovaSeq6000 S1 lane with 150 bp paired-end reads at the National Genomics Infrastructure (NGI), Science for Life Laboratory (SciLife) in Stockholm.  
The average coverage was appr 248 X per gene and sample. The raw reads for each individual is included. 

Swedish wood white females preferred L. corniculatus, Catalonian females showed no host plant preference. Larvae from both populations showed longer developmental time and smaller adult size when reared on L. dorycnium. Catalonian larvae showed more differentially expressed genes, compared to the Swedish larvae, and a larger portion of these genes where upregulated in reponse to feeding on L. dorycnium compared to L. corniculatus. The Catalonian larvae also had a difference in the microbiome composition depending on hostplant, which was not observed in the Swedish cohorts.This suggest a higher plasticity in the Catalonian wood whites, potentially as a local adaptation to environmental factors affecting the hostplant suitability. 