



Infants Born to Mothers with Inflammatory Bowel Disease Exhibit Distinct Microbiome Features That Persist up to 3 Months of Life

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Background and goals

- Studies have demonstrated dynamic changes in the microbiome during pregnancy coinciding with changes in immune status, and maternal health status has been shown to influence the newborn's microbiome development. Women with Inflammatory Bowel Disease (IBD) exhibit immunological and gut microbiota alterations.
- No data exist on the effect of IBD on the microbiome during pregnancy, and its role on the infant gut microbiota composition.
- The “Exploring **ME**chanisms **O**f disease **tr**ansmission **I**n **U**tero through the **M**icrobiome” (MECONIUM) Study is a prospective study that recruits pregnant women with and without IBD and their offspring. **The overall goal of the MECONIUM study is to explore the role that IBD plays in the composition of the maternal and infant microbiome.**

Methods

From 125 pregnant women (43 with IBD; 22 Crohn's disease/21 Ulcerative colitis), 148 stool samples and 45 placenta samples were collected during pregnancy and at delivery, respectively. 245 serial stool samples were collected from 79 of their newborns (26 born to mothers with IBD) up to 90 days of life. The microbial composition was surveyed using 16S rRNA sequencing. QIIME was used to compare the overall microbiota diversity, and the LefSe method was used to find differential taxa features.

Results

Among all babies, 35.4% were born via C-section and 96% were full-term. 74% of women with IBD were in remission throughout pregnancy.

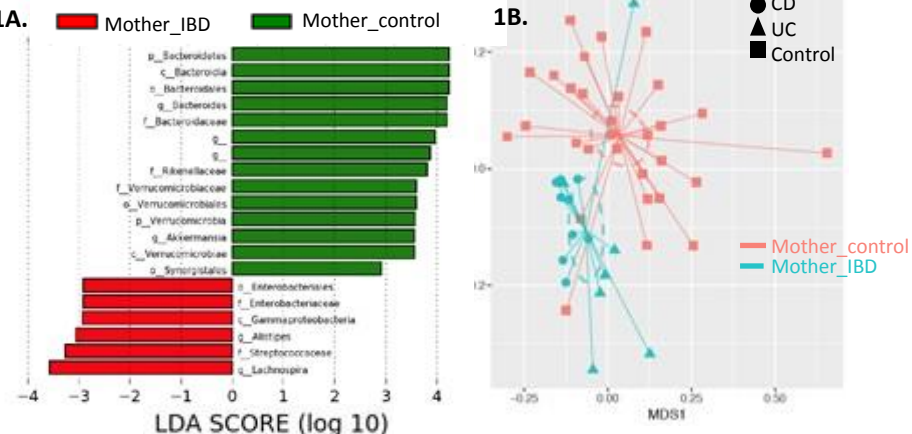
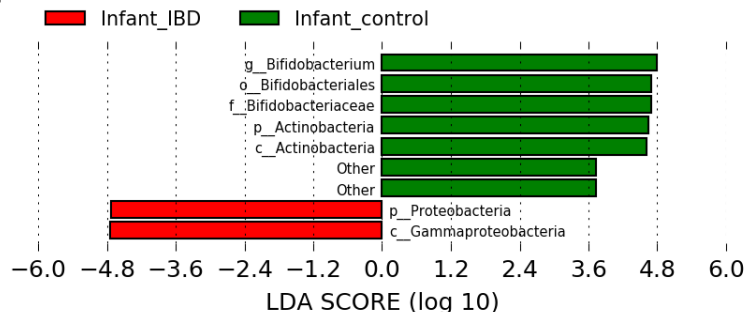


Figure 1. (A) Top discriminative bacteria in stool collected during pregnancy as determined by LefSe analysis. Pregnant women with IBD present an enrichment in bacteria from the *Gammaproteobacteria* class, and a decrease in bacteria from the *Bacteroidetes* phylum, as compared to women without IBD. **(B)** Beta-diversity of placenta samples ($p=0.001$, Permanova, unweighted Unifrac distances). Women with and without IBD exhibit distinct placental microbiota composition.

2A.



2B.

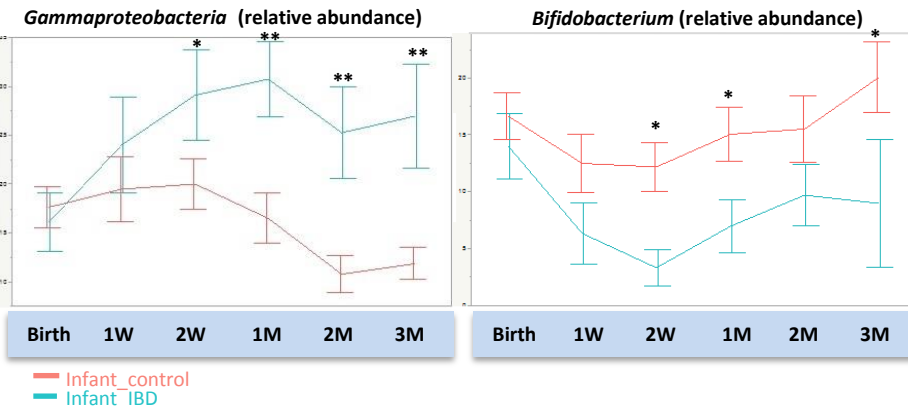


Figure 2. (A) Top discriminative bacteria in stool collected from babies during the first three months of life, as determined by LefSe analysis. Babies born to women with IBD present an enrichment in bacteria from the *Gammaproteobacteria* class and a decrease in bacteria from the *Actinobacteria* class, as compared to babies born to control women. Adjusted for delivery type. **(B)** Plots show relative abundance of *Gammaproteobacteria* and *Bifidobacterium* in the stool of babies born to mothers with and without IBD, over the course of the first three months of life (* $p<0.05$, ** $p<0.001$, Wilcoxon).

Conclusions

- Women with IBD maintain profound dysbiosis in their gut microbiota during pregnancy, and present IBD-associated placental microbiome.
- Babies born to mothers with IBD demonstrate differential stool microbial composition that persists for up to 3 months of life, independent of the mode of delivery.
- These findings suggest that maternal IBD status strongly affects the microbiome composition in their offspring, which could contribute to future disease.