



Role of the Gut Microbiome in Celiac Disease



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Background

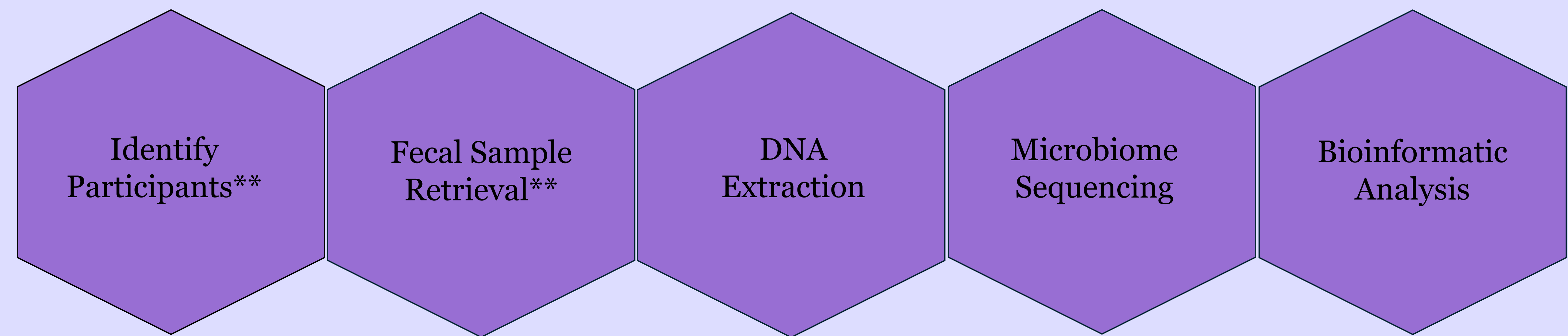
Over the past few decades, Celiac Disease related incidents have been increasing at a rate of over 7.5% each year(King et. Al). Celiac Disease is an autoimmune condition where the body's immune system attacks the gastrointestinal tract, more specifically the mucosal lining of the intestines, after the consumption of gluten(Wu et. al). The prevalence of identifying factors and correlations within those containing Celiac Disease is at a high due to the continuous rise in cases. Studies have shown that this trend has resulted from increases in diet sensitivities via the consumption of more processed foods that go hand in hand with Western Culture(Lerner, A. et al).

Recent studies have shown that there resides a connection between the Gut Microbiome and autoimmune diseases such as Celiac Disease(Rossi, E. R.). Research has also shown that people with Celiac Disease have a degraded intestinal-mucosal lining which leads to inflammation and irritation over time. Attached to this lining are villi that assist nutrient absorption and the damage to this mucosal lining can therefore lead to malabsorption and malnutrition over time. Studies have shown that the Gut Microbiome contributes to a variety of functions within the human body including the strengthening of gut mucosal barriers, protection from the penetration of pathogenic bacteria, inflammation, and synthesis of beneficial metabolites such as short chain fatty acids, and vitamins(Bunyavanich, S. et al). Therefore, there's reason to believe that a connection lies between the Gut Microbiome and Celiac Disease.

References

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- King, J. A., et. al. (2020). Incidence of Celiac Disease Is Increasing Over Time: A Systematic Review and Meta-analysis. *The American journal of gastroenterology*, 115(4), 507–525. DOI: 10.14309/ajg.0000000000000523
- Lerner, A., Matthias, T., (2019). Microbial Transglutaminase is Beneficial to Food Industries but a Caveat to Public Health. *Med One*. 4:e190001. DOI: 10.20900/mo.20190001
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Methods



** Not performed by me

Results

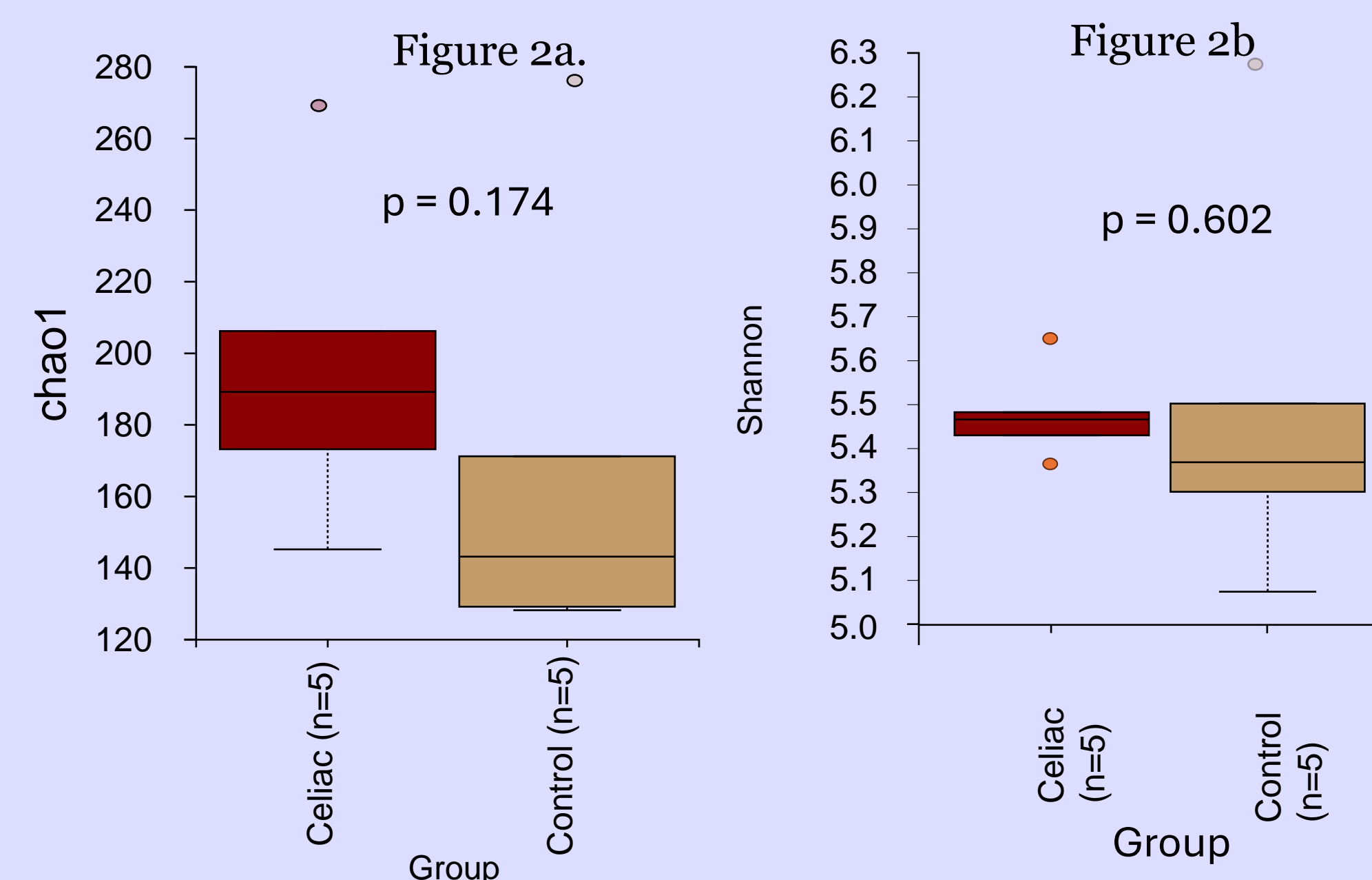
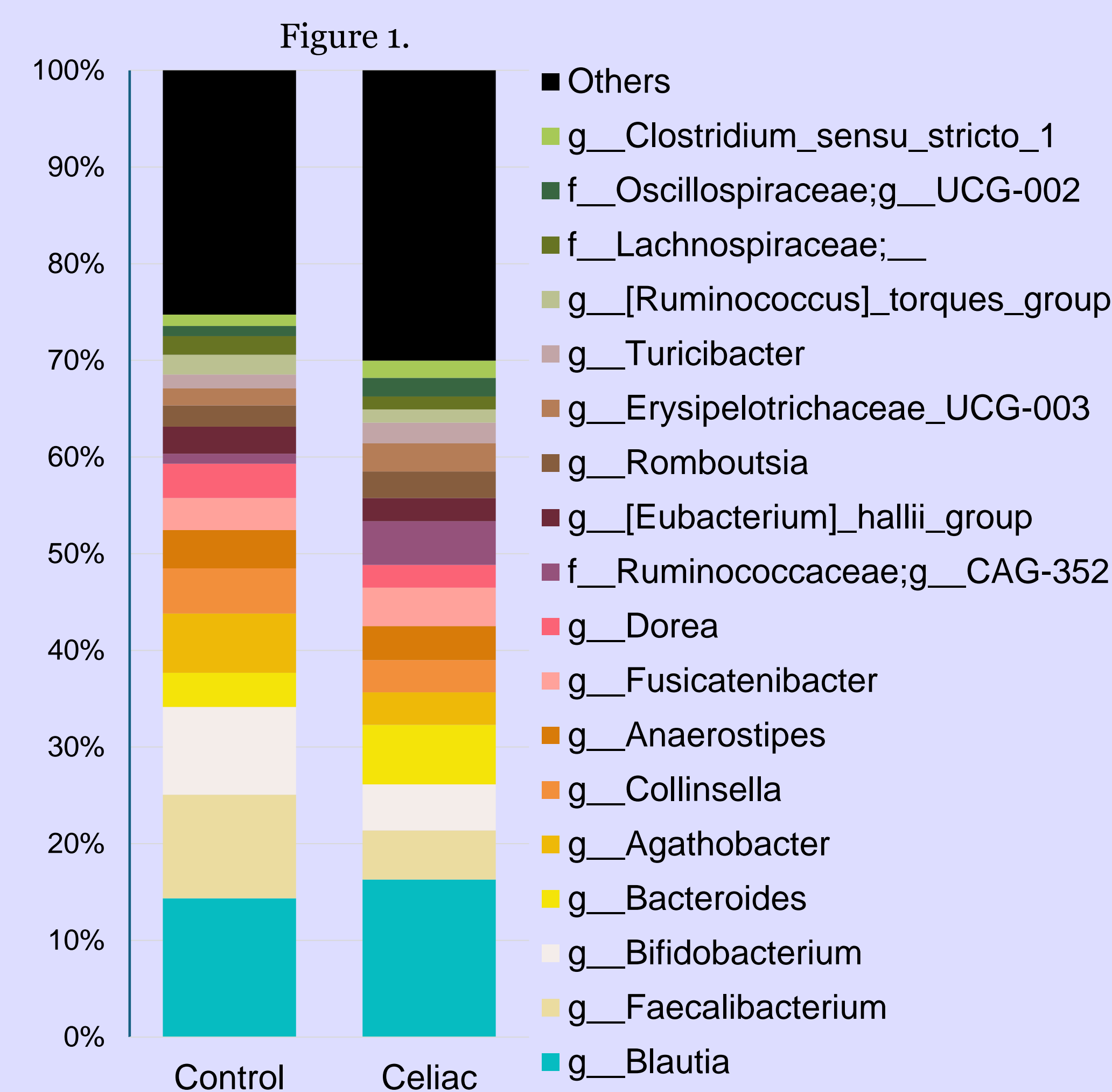


Figure 3a

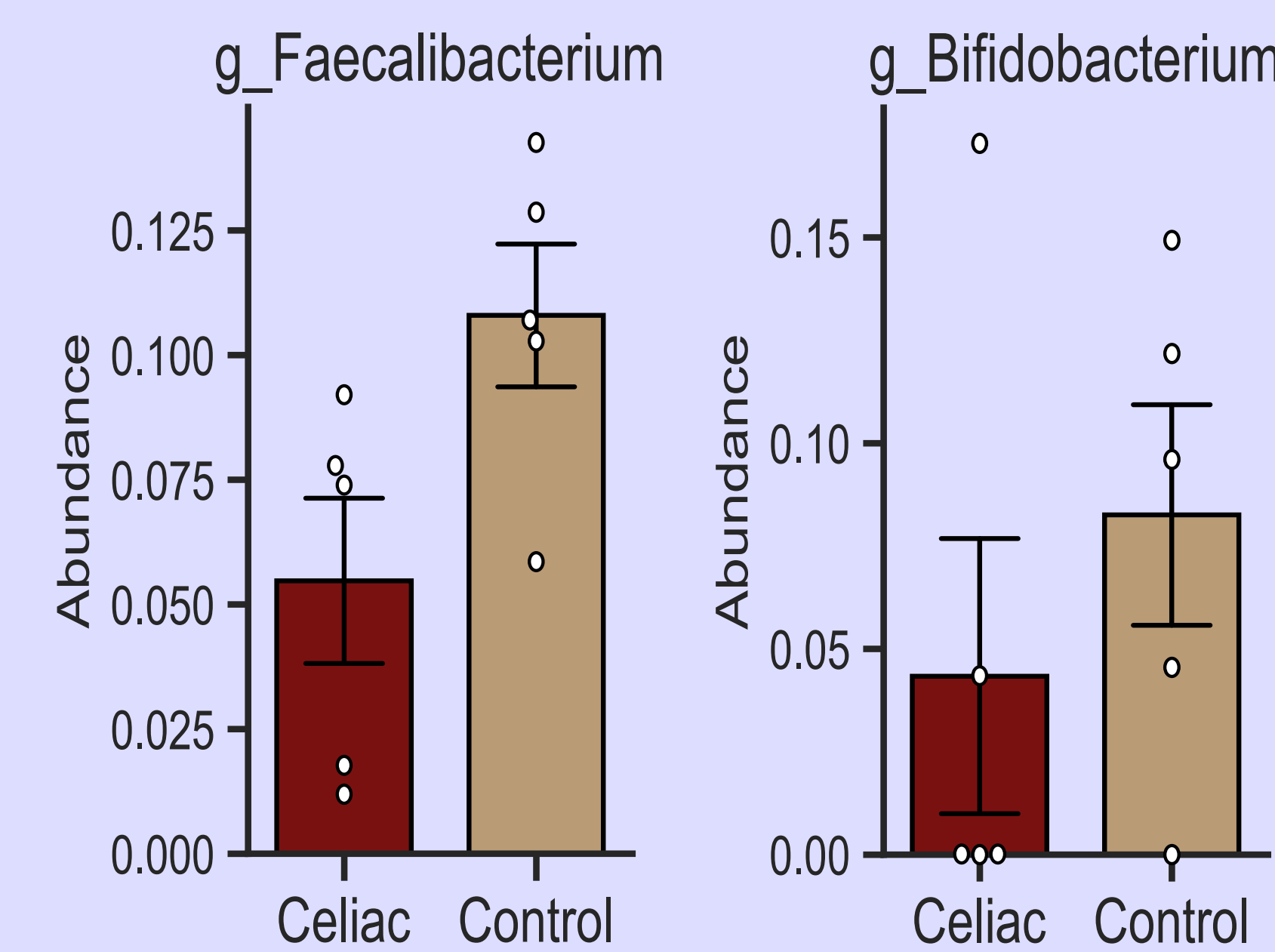
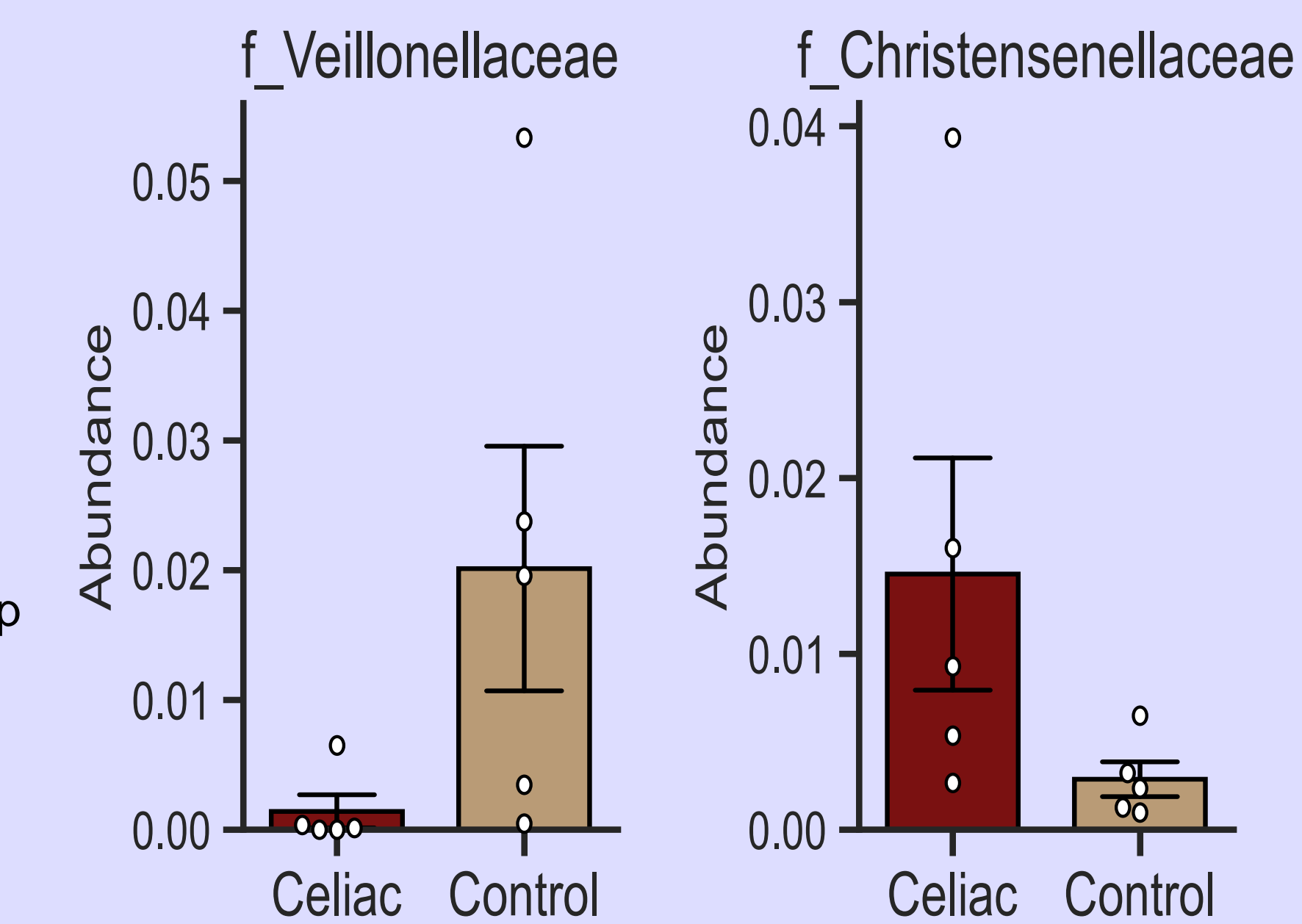


Figure 3b

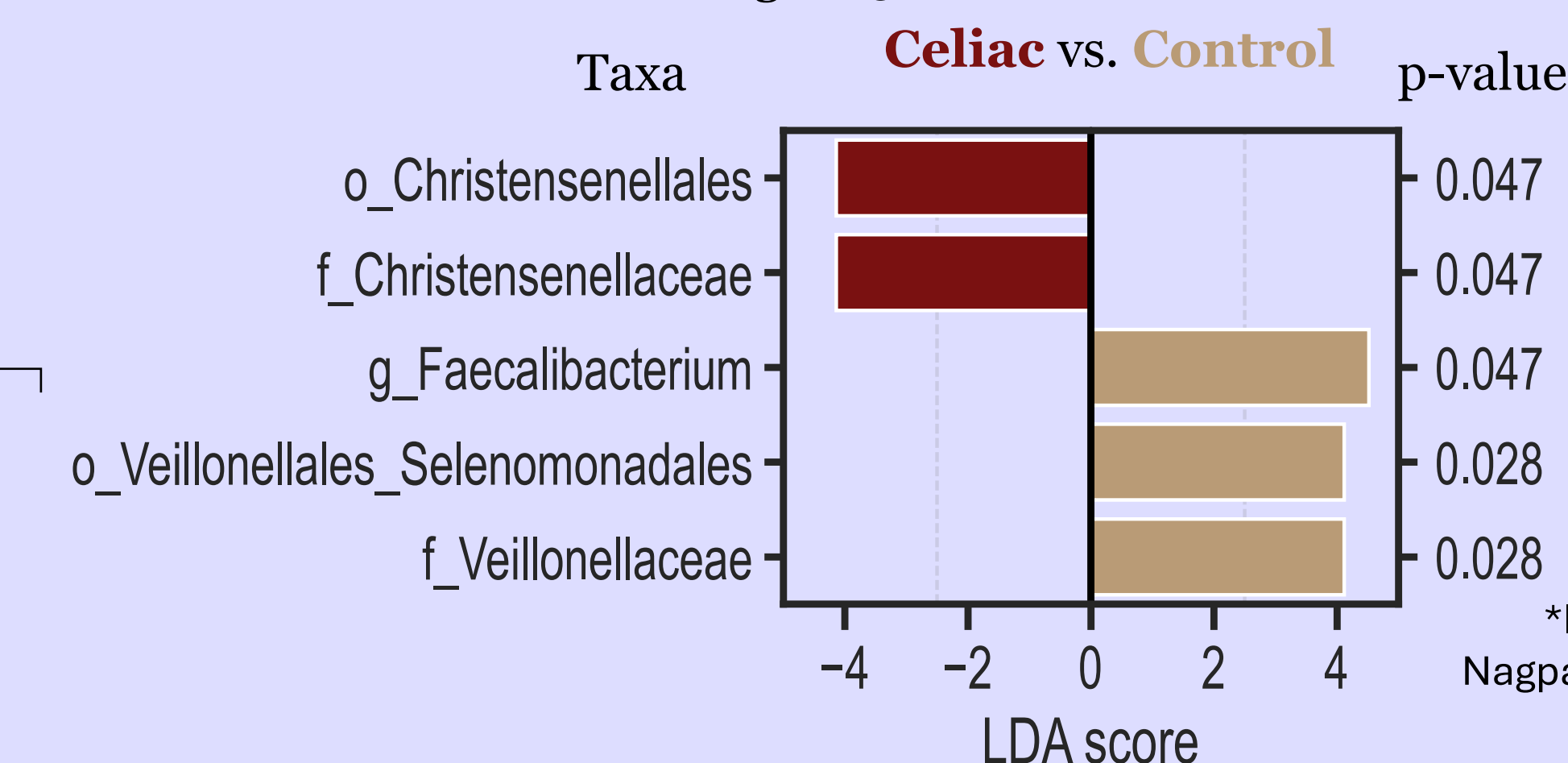


Figure 1. represents the relative abundance for the top 19 most prevalent bacteria, in total, from the entirety of all 10 samples. It compares these bacterial abundance between celiac disease samples versus those without celiac disease. Figure 2a represents the abundance of bacteria and 2b displays the diversity of bacteria within the samples. Figure 3a represents the abundance of certain bacteria which has been shown to have a significant difference in abundance between those in celiac disease versus those without celiac disease. Figure 3b portrays the significance factors for these bacteria families and genera. Bifidobacterium does not have a significant value, but it has a very strong correlation with the onset of symptoms surrounding Celiac Disease

Conclusion/Discussion

Utilizing the data collected, we were able to analyze the microbial composition differences and similarities between College-aged students with Celiac Disease versus those without Celiac Disease. We can notably see the difference in presence of specific microbe genus such as Bifidobacterium and Faecalibacterium. Some bifidobacterium species have anti-inflammatory properties and some Faecalibacterium have properties contributing to fermentation of different molecules, ultimately reducing the development of gastrointestinal inflammation. Our overall goal was to determine a correlation between the Gut Microbiome and Celiac Disease. Even though we can visually identify some differences, we are unable to create a conclusive standpoint at this time due to the insignificant p-values, which represents whether trends in the data occur from chance alone. At this point in time, we can state that this result would most likely be due to the minute sample size. In future progressions of this study, we hope to greatly expand the sample size, to hopefully obtain a significant correlation between Celiac Disease and the Gut Microbiome.

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