

Steamed broccoli sprouts alleviate DSS-induced inflammation and retain gut microbial biogeography in mice.

Johanna Holman
johanna.holman@maine.edu
(207) 558 - 2634



Johanna M. Holman¹, Lola Holcomb¹, Louisa Colucci³, Dorien Baudewyns¹, Joe Balkan⁵, Grace Chen⁶, Peter L. Moses^{3,7}, Gary M. Mawe⁷, Tao Zhang², Timothy Hunt¹, Benjamin Hunt¹, Marissa Kinney¹, Yanyan Li¹, Suzanne L. Ishaq¹
¹University of Maine, ²Binghamton University, ³University of Vermont, ⁴Husson University, ⁵Tufts University, ⁶University of Michigan, ⁷Finch Therapeutics

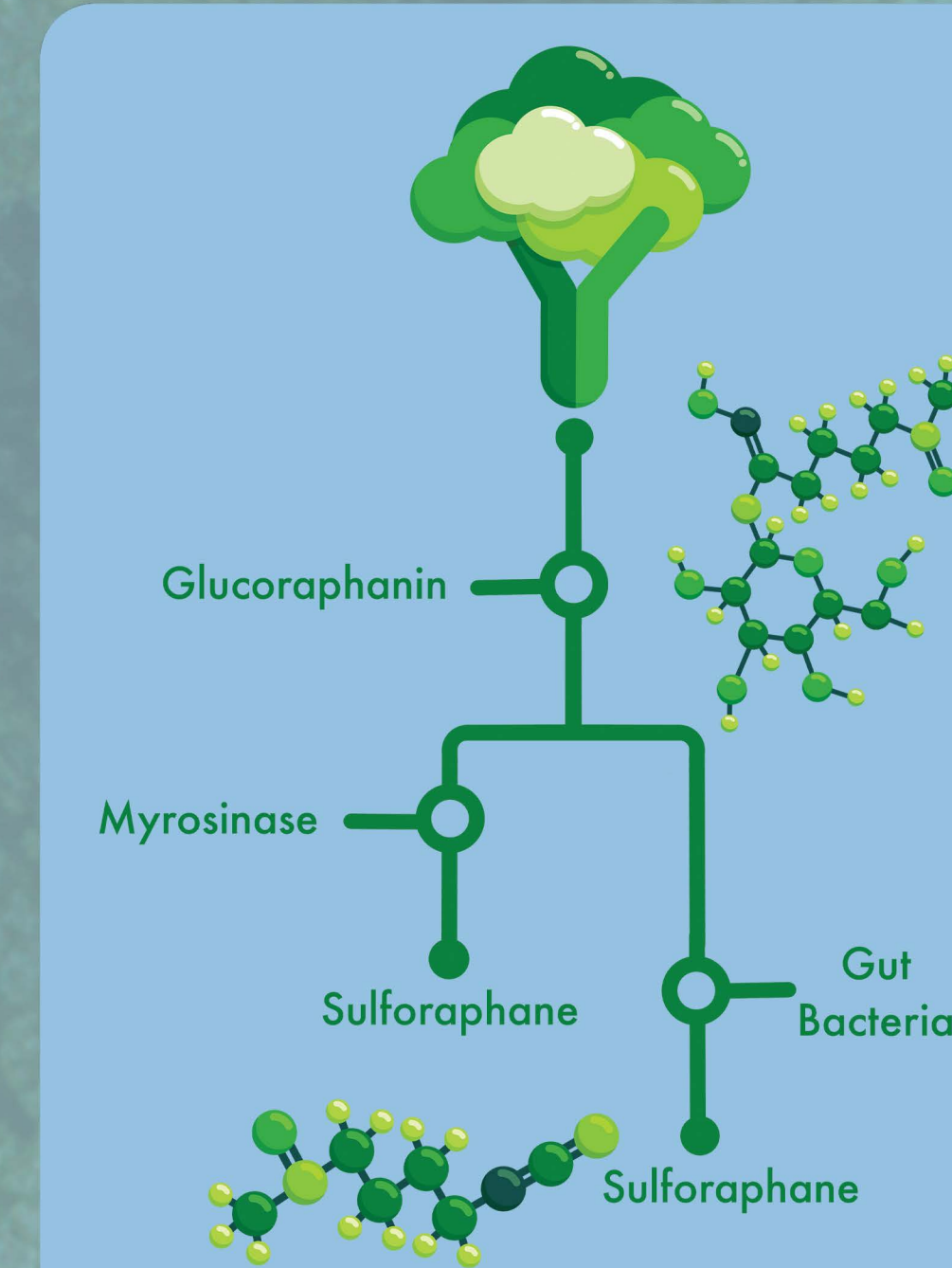
ABSTRACT: Objectives: Inflammatory Bowel Diseases are devastating conditions of the gastrointestinal tract with limited treatments, and dietary intervention may be effective, affordable, and safe for managing symptoms. Ongoing research has identified inactive compounds in broccoli sprouts, like glucoraphanin, and that mammalian gut microbiota play a role in metabolizing it to the anti-inflammatory sulforaphane. The objectives were to identify biogeographic location of participating microbiota and correlate that to health outcomes. **Methods:** We fed C57BL/6 mice either a control diet or a 10% steamed broccoli sprout diet, and gave a three-cycle regimen of 2.5% DSS in drinking water over a 35-day experiment. We monitored body weight, fecal characteristics, fecal lipocalin, and sequenced bacterial communities from the contents and mucosa in the jejunum, cecum, and colon. **Results:** Mice fed the broccoli sprout diet while receiving DSS performed better than mice fed the control diet while receiving DSS for all disease parameters, including significantly more weight gain, lower Disease Activity Index scores, and higher bacterial richness in all gut locations. Bacterial communities were assorted by gut location except in the mice receiving the control diet and DSS treatment. Importantly, our results suggested that broccoli sprout feeding completely abrogated the effects of DSS on gut microbiota, as bacterial communities were similar between mice receiving broccoli sprouts with and without DSS.

Glucoraphanin Hydrolysis

Inactive broccoli compound glucoraphanin (GLR) is converted to bioactive sulforaphane (SFN) by enzyme myrosinase.

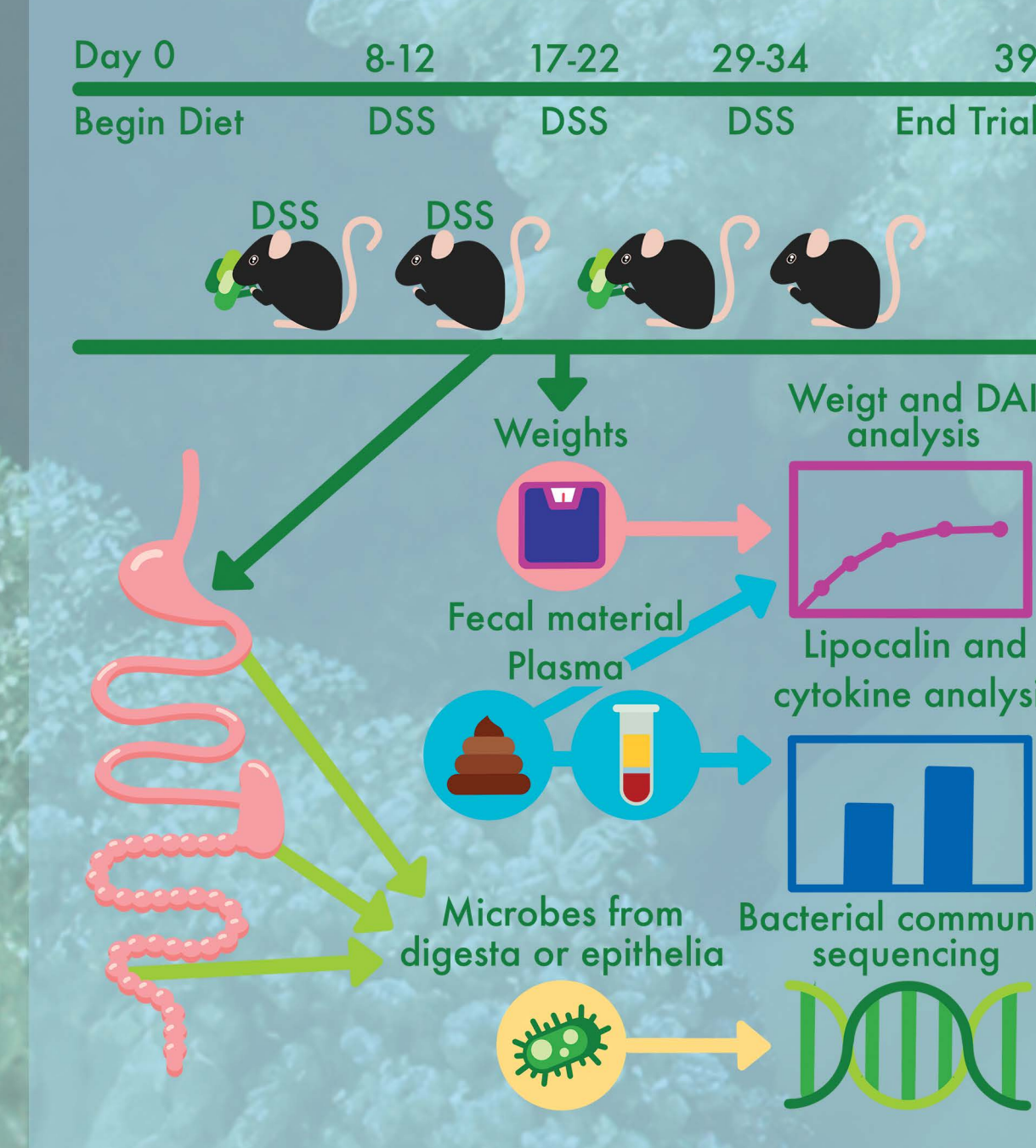
Myrosinase is inactivated by heat such as in cooking.

Gut bacteria can perform GLR hydrolysis to SFN through myrosinase-like enzymatic activity.



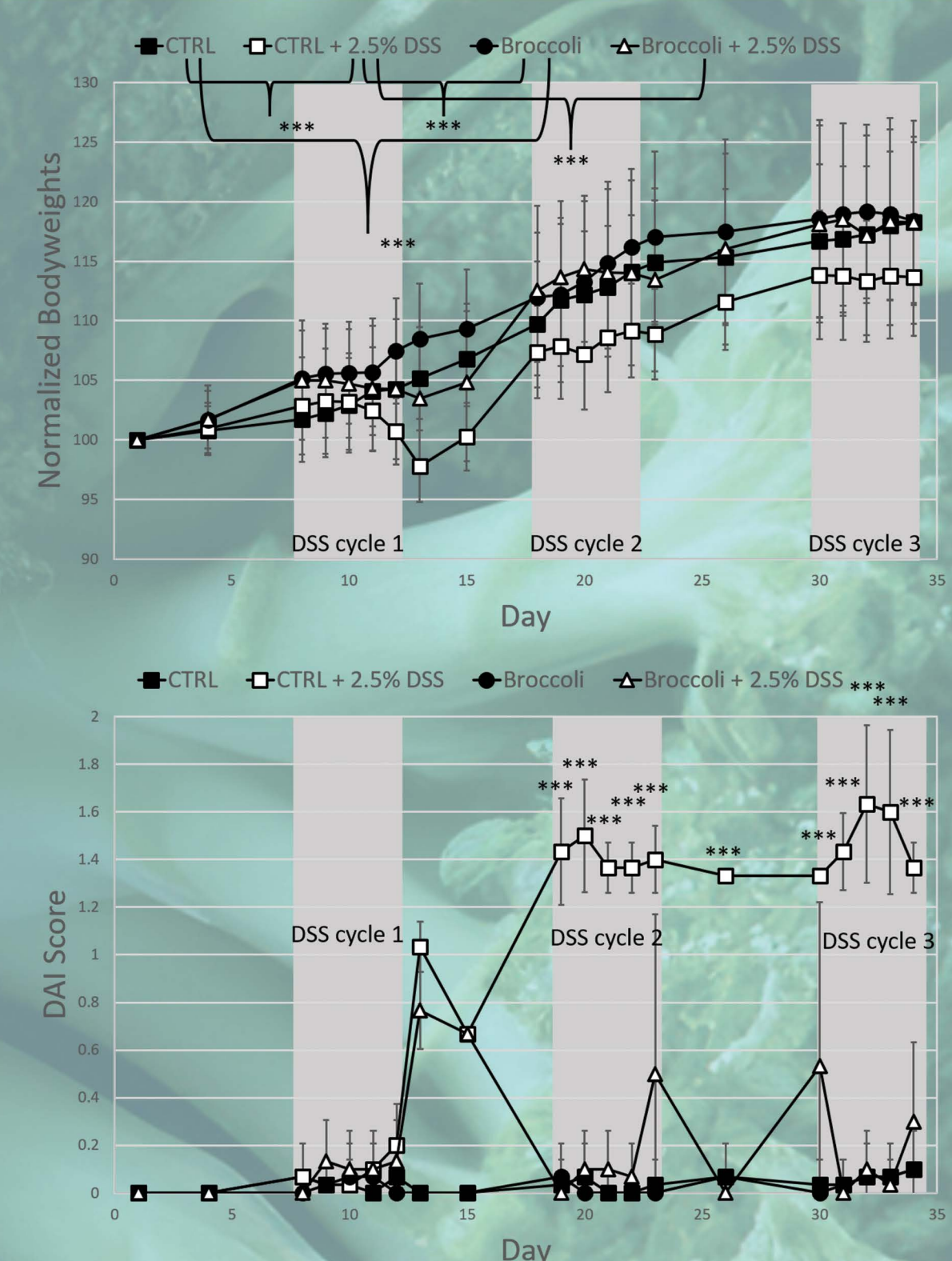
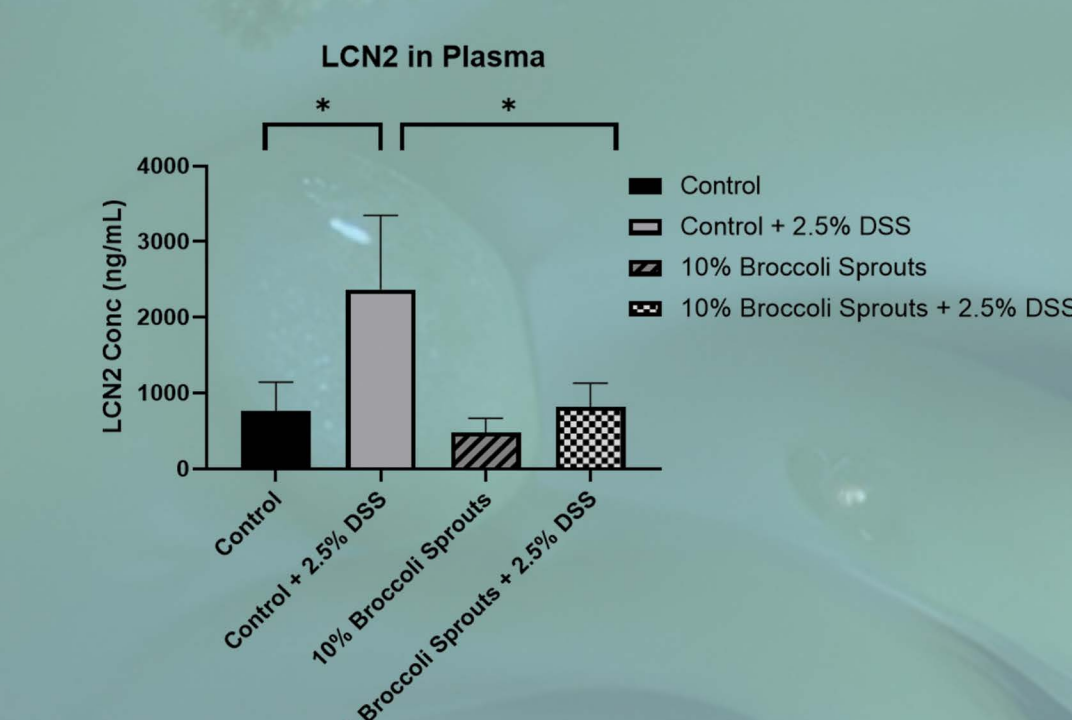
A Mouse Model of Ulcerative Colitis

Forty C57BL/6 mice were randomly assigned to one of 4 experimental groups: control diet without DSS treatment (Control), 10% steamed broccoli sprout diet without DSS treatment (Broccoli), control diet with DSS treatment (Control+DSS), and 10% steamed broccoli sprout diet with DSS treatment (Broccoli+DSS). After 7 days of diet acclimation 2.5% DSS was added to the drinking water for 5 days, followed by a recovery period for 5 - 7 days. This was repeated for a total of 3 cycles to induce chronic colitis. Mice were sacrificed and tissue collected after the third round of DSS, on day 35.



Inflammation Analysis

Inflammation severity was improved in broccoli sprout fed mice by 4 criteria: bodyweights, Disease Activity Index scores, Lipocalin in plasma, and cytokines in plasma.

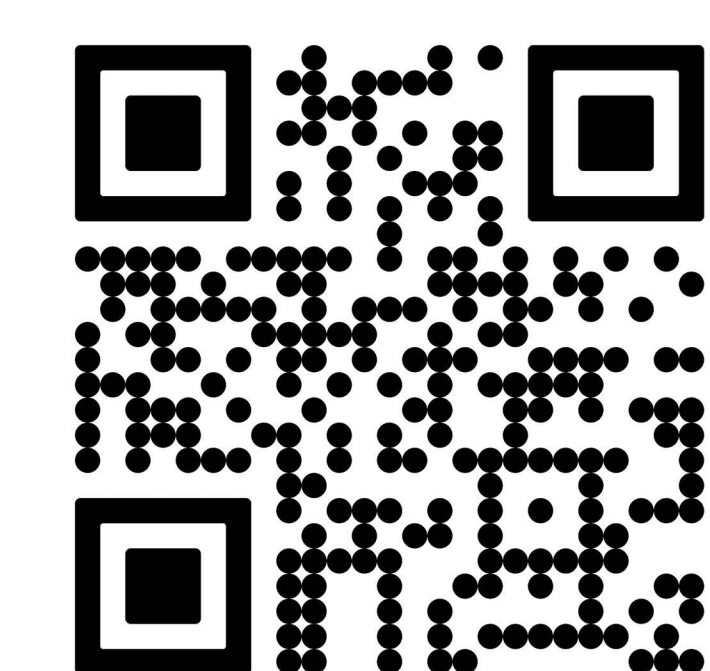


Sulforaphane in Inflammation

Inflammatory Bowel Diseases (IBD) are globally prevalent.

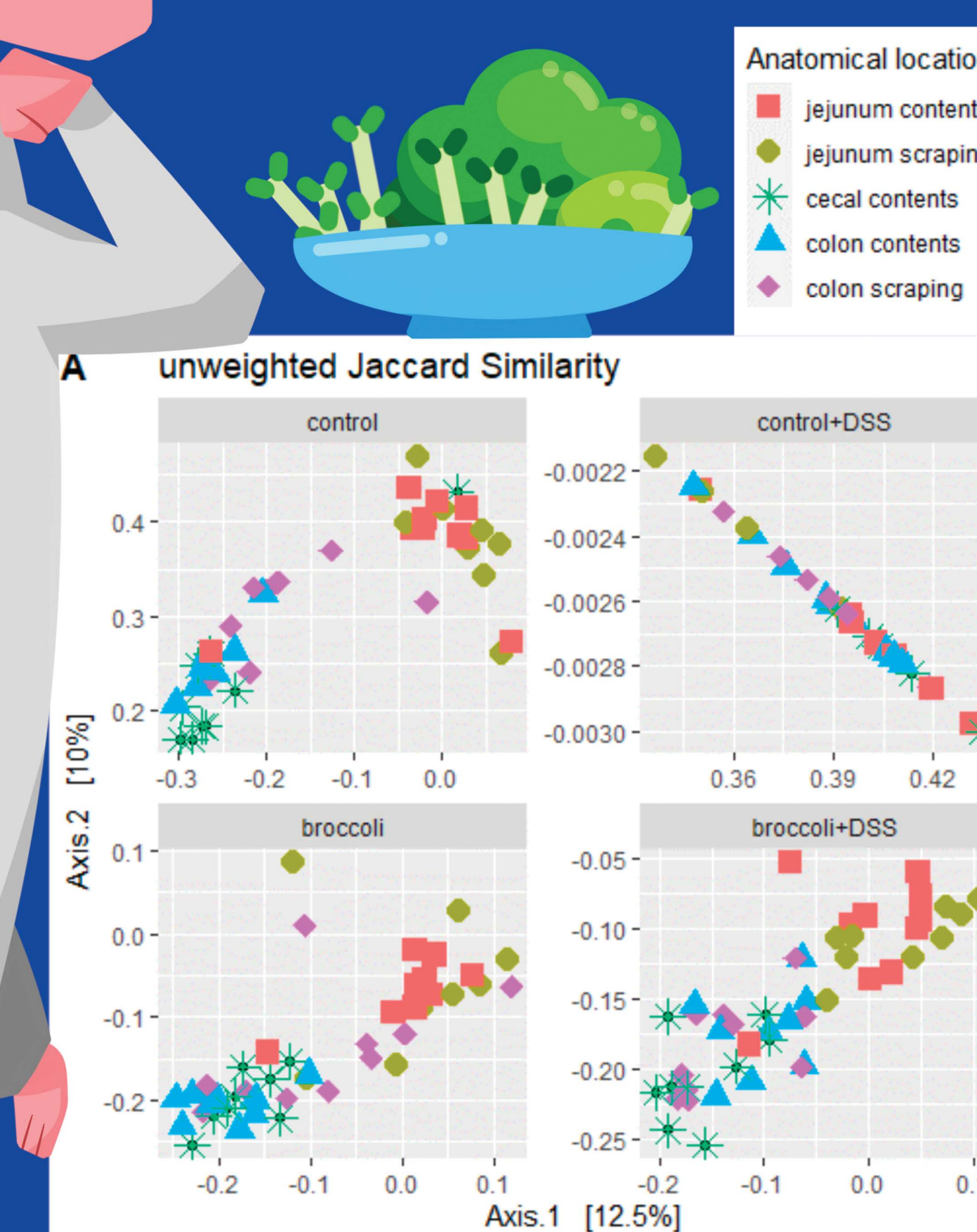
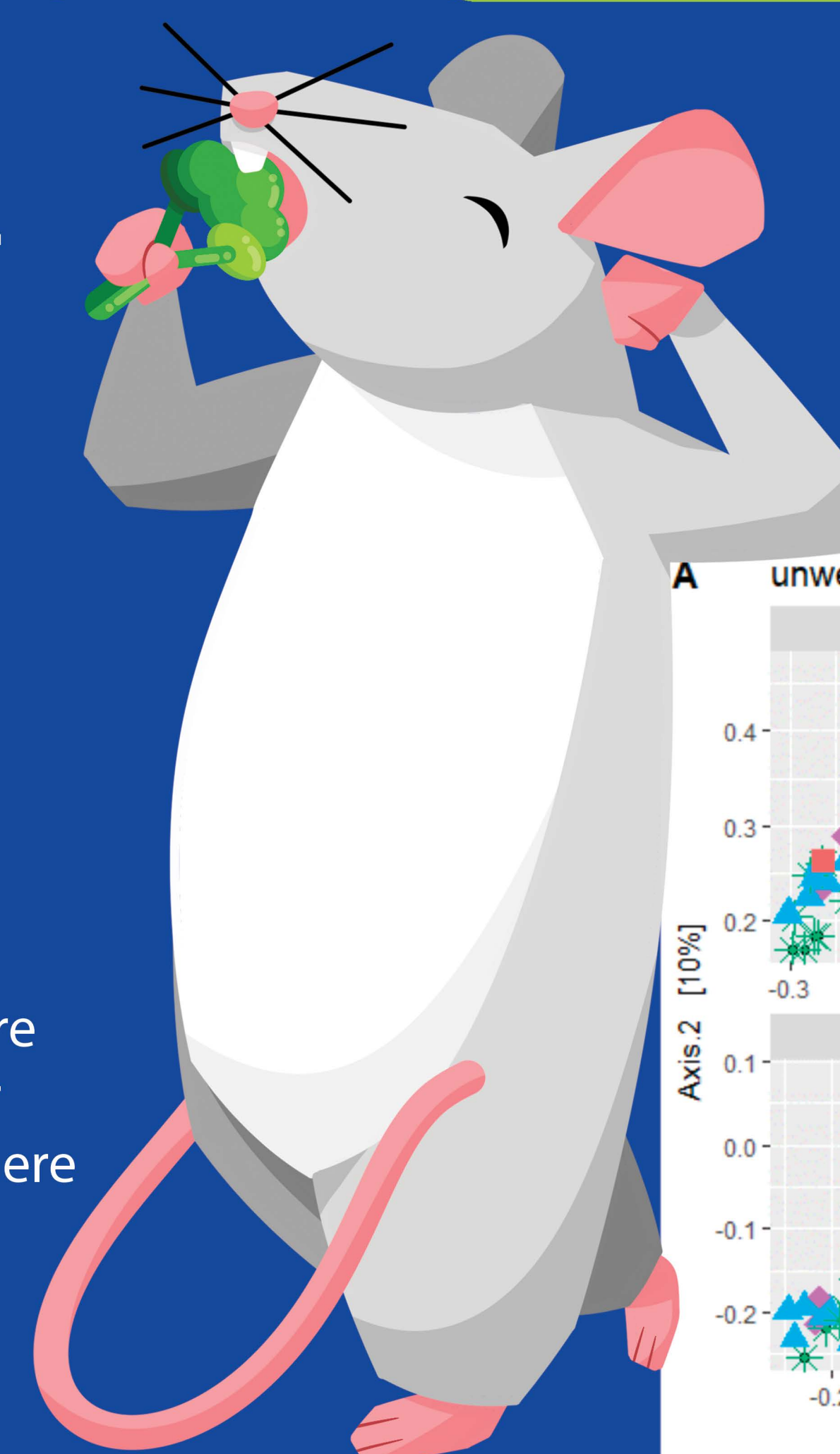
SFN prevents and reduces inflammation in IBD in both animal and human models by inhibiting NF- κ B which is responsible for regulatory control of multiple pro-inflammatory cytokines.

BROCCOLI sprouts in mouse diets protected against DSS-induced changes to gut bacterial communities.



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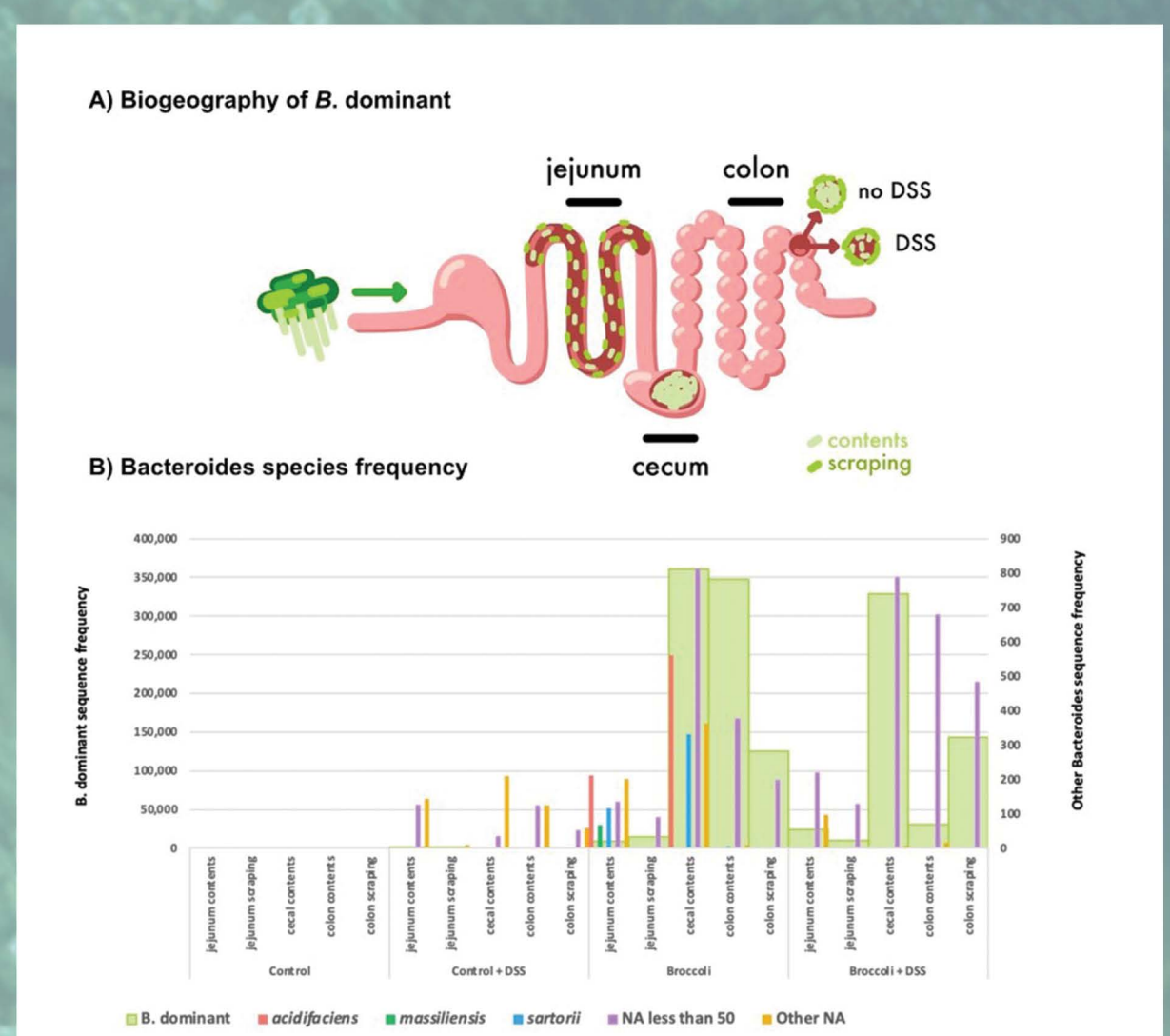
OUR MAIN FINDING



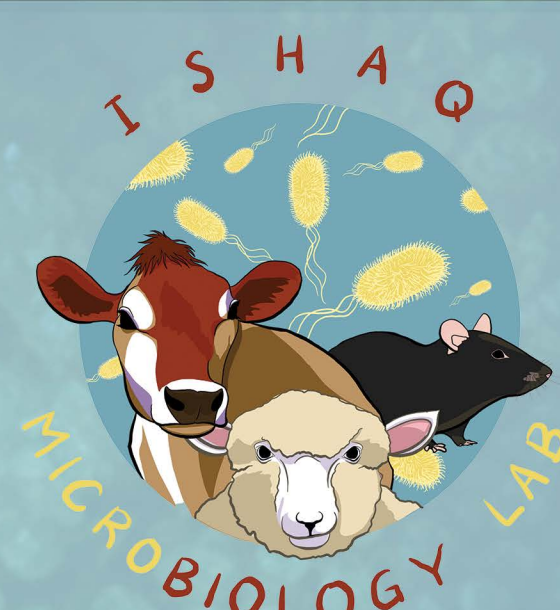
Microbiome Analysis

Broccoli fed mice had greater species richness compared to control diet mice, most strongly seen in the colon.

Broccoli mice had a greater abundance of GLR metabolizers, however gene copies were not uniformly increased.



Microbiome culture work is underway



Acknowledgments

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