Evaluation of Resistant Starch action on microbiome in 5/6 nephrectomy model of Chronic Kidney Disease

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INTRODUCTION

- Chronic kidney disease (CKD) affects approximately 10% of the worldwide population.
- Inflammation is a major driver of CKD progression, which is partly mediated by the altered gut microbiota and intestinal barrier disruption.
- Certain fibers can promote gut health and function, by increasing a gut microbiota population that dampens gut permeability and limits damage to the mucus layer caused by utilization of host glycans.

BUT!

- Specific fiber can promote gut health and function, by increasing a gut microbiota population that dampens gut permeability and limits damage to the mucus layer caused by utilization of host glycans.

RESULTS

Phenotype induced by resistant starch in chronic kidney disease (CKD) rats is well-defined by metaproteomics data. Left heatmap, cecal content protein abundance values were averaged across three different labeling-free methods: PEAKS spectral counting, MaxQuant spectral counting and intensity based quantification. The averaged values were log-transformed and normalized and plotted using ComplexHeatmaps/R/Bioconductor package. 506 proteins, deemed significant by MaxQuant and by PEAKS are shown (p<0.01). CKD and CKDRS phenotypes are indicated by blue and red colors on the top heatmap annotation bar. Distribution properties are shown in BOX plots for each of the animals at the bottom, indicating similar distributions between different animals. The raw annotation bar is adjacent to the right edge of the heatmap – “host” indicates rat proteins by black color, and microbial proteins by grey color.

Methods and Materials

Animal use protocol:
- Sixteen C57BL6 mice were randomly divided into two different groups after an initial week of acclimatization: CKD group and healthy control group.
- Mice in the CKD group underwent a two-step surgical process (cortical electrococculation of 80% of the right kidney followed two weeks later by a left kidney total nephrectomy), to establish a reduced renal mass and induce CKD.
- Both CKD and healthy groups of mice were divided further into those receiving a pelleted low-fiber diet control diet containing normal diet or a high-fiber diet containing 59% high amylose maize resistant starch, creating four final groups: (1) a healthy control group; (2) a healthy treatment group; (3) a CKD control group; and (4) a CKD treatment group.

Mass-spectrometry was performed by the UAMS Proteomics Core. Standard proteomics core protocols were adapted for this study.

REFERENCES

- “Metaproteomics Reveals Potential Mechanisms by which Dietary Resistant Starch Supplementation Attenuates Chronic Kidney Disease Progression in Rats”, Zyballov et al.
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