Impact of basal diet on obesity phenotype of recipient mice following fecal transfer from obese or lean human donors

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OBESITY


34%
METABOLIC SYNDROME

- Cluster of physiological and biochemical factors associated with the development of obesity and heart disease.

Central Obesity  
High Blood Pressure  
High Triglycerides  
High Fasting Plasma Glucose

GUT MICROBIOTA

- Our colon is home to about 100 trillion microorganisms
- 400-500 different species
- 2/3 of those bacteria are found in everyone while 1/3 is unique to the individual

Quigley, E. Gastroenterology & hepatology 9.9 (2013): 560-69
Dysbiosis is a condition that favors pathogenic (harmful) bacteria which may precede disease, including metabolic syndrome, inflammatory bowel syndrome and colorectal cancer.
FACTORS IMPACTING MICROBIOME

- Age
- Birth
- Genetics
- Antibiotics
- Diet
- Stress
OBJECTIVE

Determine the contribution of gut microbiota from lean or obese donors on the phenotype of mice fed one of three diets, control (AIN), Western (TWD) or high-fat (DIO).
STUDY

ENDPOINTS

- Body Weight
- oGTT
- Food Intake
- MRI
- Fecal Collection
- Sacrifice
FOOD AND ENERGY INTAKE

**Total food intake (g)**

- **Mixed model main effects**
  - Diet: 0.0090
  - Body type: 0.0490
  - Diet x body type: 0.0080
  - Donor ID[body type]: 0.7502

**Total energy intake (kcal)**

- **Mixed model main effects**
  - Diet: <0.0001
  - Body type: 0.0490
  - Diet x body type: 0.0080
  - Donor ID[body type]: 0.7502
BODY WEIGHT GAIN

Mixed model main effects

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Mixed model main effects

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HCC and PCA for donor and mouse initial

| Source | Bacteroidales S24-7 | Lactobacillaceae | Streptococcaceae | Veillonellaceae | Bifidobacteriaceae | Enterobacteriaceae | Alcaligenaceae | Barnesiellaceae | Verrucomicrobiaceae | Turicibacteraceae | Anaeroplasmataceae | Planococcaceae | Clostridiaceae | Odoribacteraceae | Paraprevotellaceae | Coriobacteriaceae | Porphyromonadaceae | Erysipelotrichaceae | Rikenellaceae | Prevotellaceae | Bacteroidaceae | Lachnospiraceae | Clostridiales unknown | Ruminococcaceae |
|--------|---------------------|-----------------|-----------------|----------------|-------------------|-------------------|----------------|----------------|-------------------|----------------|-----------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|
| Mouse  | L3                  | O5              | O4              | O6              | L1                | L2                | Source         | Mouse pre-AB   | Lean donor       | Obese donor     | Mouse pre-AB   | Lean donor     | Obese donor    | Mouse pre-AB   | Lean donor     | Obese donor    | Mouse pre-AB   | Lean donor     | Obese donor    | Mouse pre-AB   | Lean donor     | Obese donor    | Mouse pre-AB   | Lean donor     | Obese donor    |

PC1 (49.5%)   PC2 (23.3%)
HCC and PCA for post FMT
HCC and PCA for Terminal
CONCLUSION

• Diet plays a larger role on the microbiota composition compared to donor microbiota, suggesting that dietary practices may be the most effective way to change the microbiome.

• Source of fecal transfer (lean vs. obese) did not impact body weight gain, body composition or glucose tolerance in recipient mice.

• As expected, mice fed high fat diet gained excess body weight and fat composition and had impaired glucose tolerance. Mice fed TWD were not statistically different from counterparts fed either AIN or DIO diets.

• The microbiome may be more of a correlative as opposed to a causative factor in the etiology of obesity.
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  - Emily Speas
  - Kimberly Campbell