Gut Microbiota
What Are the Luminal Contributors?

- Luminal Changes
  - (Proximal, Middle and Distal Gut)

Nutrients
- Lipids
- Carbohydrates
- Proteins / amino acids

Pancreatic enzymes

Bile acids

Microbiota and metabolic products

- Neuronal
- Hormonal
- Immune

CNS and Systemic Effects
Bile Acids: A Molecular Target for Metabolic Surgery

Kemper, Biochim Biophys Acta, 2011
Bile Acids Regulate Energy Balance

- Bile Acids
- L-Cell Activation
- Food Intake
- Energy Expenditure
- BAT Activation
RYGB Normalizes Post-Prandial Bile Acid Profile

Ahmad NN et al., Intl J Obes 2013
Bile Acid Receptor FXR Required for VSG Action

Wild-type Mice

FXR\textsuperscript{-/-} Mice

Ryan K et al., Nature 2014
Gut bacterial profile differs among lean, obese, and post gastric bypass human patients

Mouse-to-Mouse Microbiota Transfer

1. RYGB → Germ-free
   SHAM → RYGB-R
   SHAM → SHAM-R

2. RYGB → RYGB-R
   WMS → WMS-R

Liou et al., Sci Transl Med 2013
RYGB Microbiota Not Associated with Decreased Food Intake

Liou et al., Sci Transl Med 2013
Human-to-Mouse Microbiota Transfer

Tremaroli et al., Cell Metab 2015
RYGB Microbiota Increases Circulating Bile Acids

Mouse Recipients of Human RYGB Microbiota

Human RYGB Patients

Tremaroli et al., Cell Metab 2015; Ahmad et al., Intl J Obes 2013
Conclusion

• Bariatric surgery has winding path from initial concepts till now
• To continue to grow likely need to focus on metabolic syndrome of which weight is valued no more than other co-morbidities
• Extremely safe but perhaps not safe enough to appeal to a broader audience
• Remains a vehicle for further study and understanding of the mechanism of obesity