### MEET THE GUT MICROBIOTA

- 39 trillion microbial cells
- 8 million microbial genes
- 1000 unique bacterial species + archaea, fungi, & viruses
- 100 to 1 microbial genes to human genes

### EXERCISE AND THE GUT MICROBIOTA

#### CONTROLLED ANIMAL STUDIES

- In animal models, exercise tends to:
  - Increase microbial diversity
  - Increase butyrate concentrations
  - Increase relative abundance of butyrate-producing taxa
  - Increase other beneficial genera, such as Lactobacillus and Bililobacterium
  - Inconsistencies in animal strain/species used, age of animals, diet, and exercise modality

#### CROSS-SECTIONAL HUMAN STUDIES

- In human cross-sectional studies, athletes have:
  - Increased microbial diversity
  - Increased abundance of Faecalibacterium prausnitzii and Akkermansia muciniphila
  - Higher turnover of carbohydrates, resulting in higher fecal SCFA concentrations
  - Independent effects of exercise still unknown, since athletes tend to eat differently from non-athletes

#### LONGITUDINAL HUMAN STUDIES

Allen et al. MSSE 2018

- Lean or obese, previously sedentary adults (n=32) participated in a 6-week supervised aerobic exercise intervention. Participants trained 3 times per week on a bike or treadmill and progressed from 30 minutes at moderate intensity (60% HRR) to 60 minutes at high intensity (75% HRR). After the exercise intervention, a subset of participants reverted to their sedentary lifestyles. Fecal samples were collected at baseline, after the 6-week exercise period, and after the 6-week washout period for microbiota analysis by 16s sequencing. Diet was controlled before samples.

- Several genera were differentially altered by exercise depending on obesity status.
- In lean participants, exercise increased abundance of butyrate-producing taxa, including Clostridiales, Lachnospira, Roseburia, and Faecalibacterium

### IMPLICATIONS FOR HUMAN HEALTH

- Exercise-induced changes in the gut microbiota and gut barrier may have benefits for colon cancer, diverticulosis, IBS, and IBD.
- Transplant of an exercised microbiota into germ-free mice is protective against colitis
- Ongoing studies will seek to determine if exercise can beneficially modulate the gut microbiota in ulcerative colitis patients
- Exercise-induced changes in the gut microbiota and gut barrier may also benefit the brain, liver, muscle, skin. More research is needed in states of health and disease.