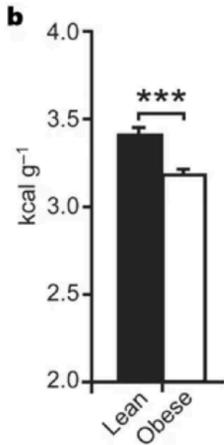


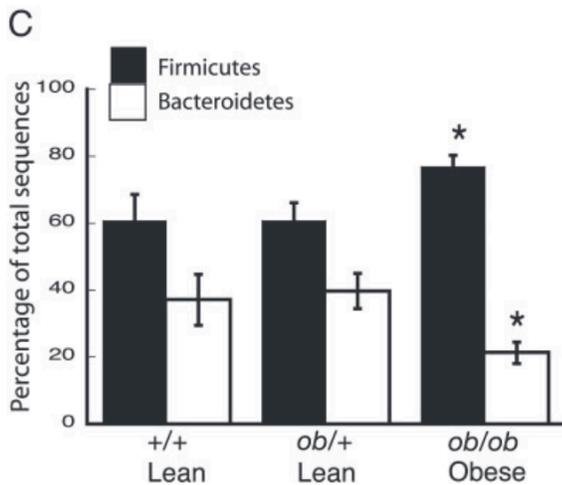
## Microbiomes and human health and nutrition

Researchers suspected that differences in the energy-harvesting capacity of the gut microbiome could contribute to obesity. They measured the caloric content of **feces** produced by obese and lean mice and observed the following results:



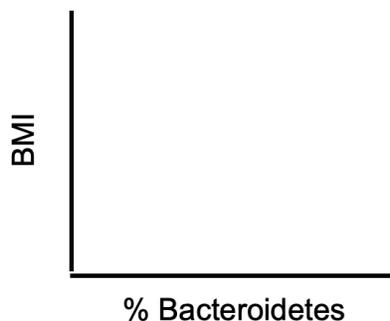
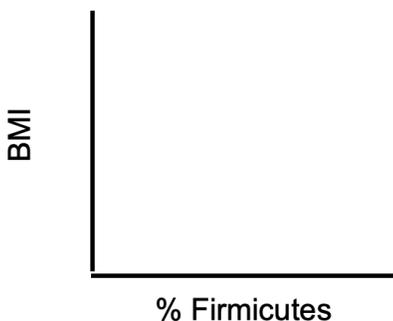
- Which mice extract more energy from their food and why?
- What might be different about the microbiome between lean and obese mice to cause this difference?
- Would you predict that the species composition of the two microbiomes is the same or different?

Researchers isolated gut microbiome from mice with or without a mutation that leads to obesity and analyzed which types of bacteria were represented when the mice were all fed the same food

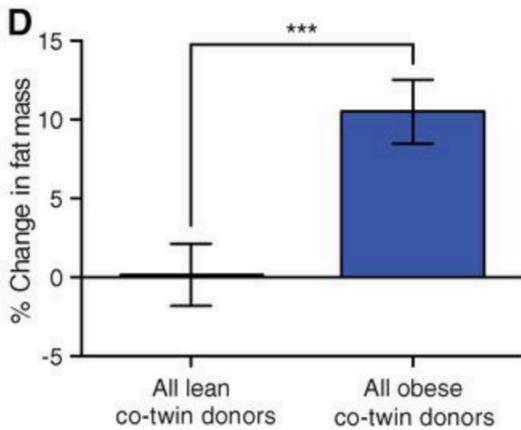


- What is different about the bacterial composition of obese mice?
- Which type of bacteria do you predict is better at helping absorb calories from food?
- Do genetics influence the microbiome?

In humans, how would you predict the % of firmicutes and bacteroidetes is related to Body Mass Index? (higher BMIs are more obese)



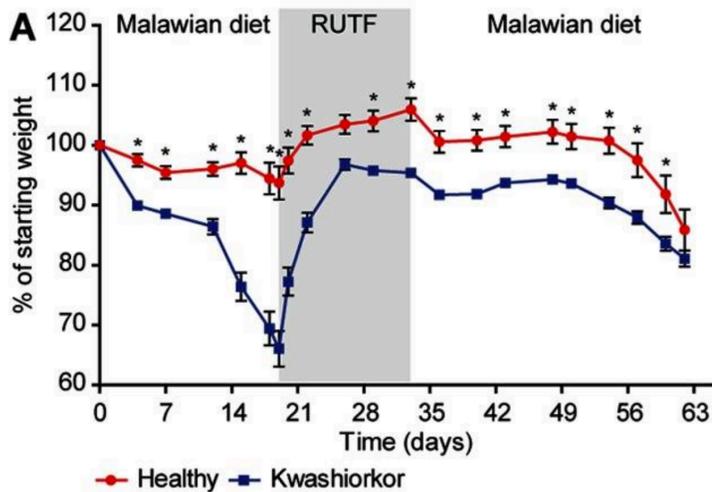
Researchers isolated fecal bacteria from **human** twin pairs in which one twin was obese and the other was lean. They transplanted the bacteria into normal mice and observed the following results (see other side):



g) What happened to the mice that received bacteria from obese and lean donors?

h) How does this add to your model from the first two sections?

In parts of Africa, a form of severe malnutrition called Kwashiorkor afflicts some children. Researchers collected fecal bacteria from children who did or did not suffer from kwashiorkor. They transplanted these bacteria into mice, and then fed the mice the equivalent of a Malawian diet. They then changed the diet to *RUTF*, a nutritionally rich food composed of peanut paste, sugar, vegetable oil and milk. *RUTF* is the first line of treatment for severe malnutrition. They then changed the diet back to Malawian diet. Throughout the experiment, they tracked the weight of the mice.



i) What is different about mice inoculated with healthy donor bacteria and those inoculated with Kwashiorkor microbiomes?

j) What is the interaction between each type of gut bacteria and diet?

k) What does this suggest about the treatment for Kwashiorkor?

l) What do you want to know next?

m) What have you learned about the microbiome, genetics, and nutrition?