- Diet-gut microbiotia-health and disease

- Microbiome composition
  - number of bacteria: 10^3/g stomach - $10^4 - 10^6$/g small intestine - $10^{12}/g$ large intestine
  - bacteriophages – in niches 10x more prevalent than bacteria
  - groups/phyla of bacteria: <u>firmicutes eg lactobacillus, bacteroidetes (make up 90% of microbiome)</u>, proteobacteria eg. E. coli, actinobacteria eg bifidobacterium

Lecture 4 – 29.01 – Microbial growth

- Prokaryotics divide by binary fission
  - 2 daughter cells separated by equatorial septum
  - exponential growth – bacteria growth rate proportional to population size
  - except cyanobacterium – enlarge and suddenly divide many times with separating
  - divide at constant interval (length of interval depends on species, growth medium,pH, temp) = generation or doubling time $N_0 \times 2^n$

- Stages of growth
  - Lag – prepare for growth – time to detect new environment
  - log/exponential – constant maximum rate of growth – metabolites (enzymes) – downshift or upshift
  - late log – growth slows – quorum sensing (sending and receiving signals to detect presence of other cells)
  - stationary – stop growth at 10^9cells/ml–physiological stages (spores, reduce cell size, more resistant)
  - death – toxic products – negative exponential

- continuous culture
  - exponential phase for longer
  - medium constantly added and removed -imput needs to equal output= dilution rate

Examples

- **Clostridium perfringens**
- **E.coli**
- **Helicobacter pylori**