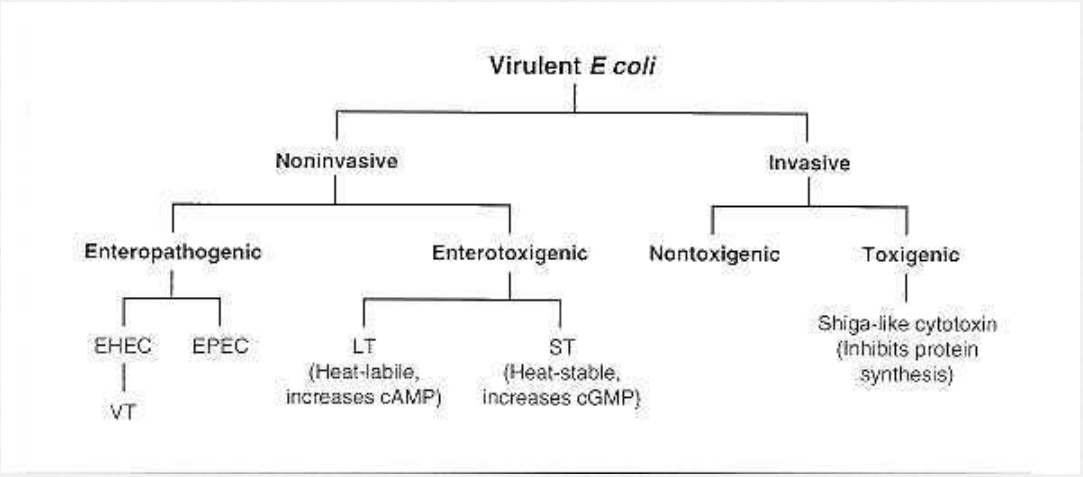
E.Coli vs. Arsenic

E.Coli

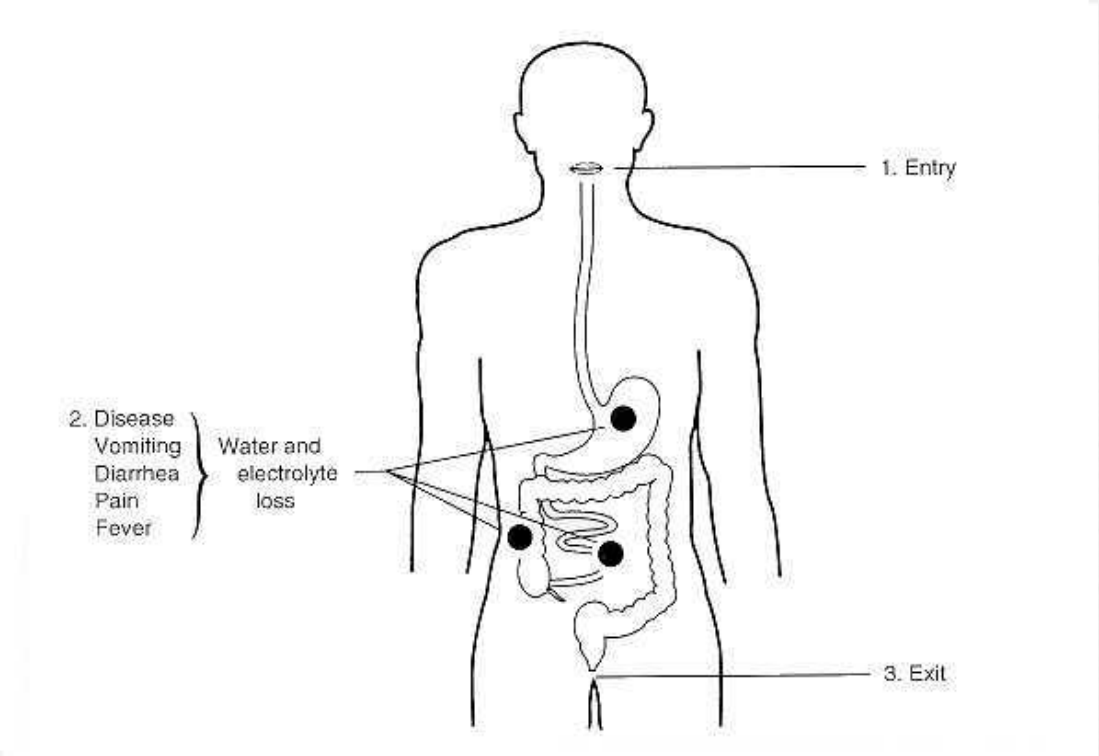
- E.Coli is a gram-negative bacteria of the coliform family, found in the intestinal tract.
- It is the most studied free-living organism
- Mostly harmless, but some strains can cause human diseases by expressing virulence factors.
- As it does not live long outside of an organism, it is often used as indicator of the overall microbiological safety

Pathogenic E.Coli

- Transmitted via oral absorption of fecal-contaminated water for example
- The STEC strain produces the Shiga toxin and other virulence factors that are toxic for humans



Clinical manifestations



Arsenic

- Arsenic exists as pure elemental crystal or conjugated with sulfur and metals.
- It is poisonous, although some bacteria can use it as respiratory metabolite.
- Arsenic compounds are used in agriculture, medicine, industry and military, but can be found in groundwater and soil too.

Arsenic compounds

- Oxidized form of Arsenic, e.g. As_2O_3, are the most found compounds, as they are produced in great quantities by industry (precursor for pharmaceuticals, electronics, …).
- Due to its solubility in water, As_2O_3 (or arsenic trioxide) is one of the most toxic one.
- Almost all As compounds are toxic, especially the inorganic ones.

As & health

- Arsenic compounds block the Krebs cycle by inhibiting PYR conversion to A.CoA.
- Lethal dose for adults: 70-200 mg or 1 mg/kg/day,
- Limit concentration recommended (WHO): 0.01 mg/L (10ppb) [based on the limit of detection available]

Acute vs. Chronic toxicity

- Arsenic poisoning mostly occurs by ingestion (of contaminated food or water) or inhalation of arsenic trioxide and other arsenicals.
- Acute intoxication shows important symptoms in a short period of time (few minutes to several hours), causing vomiting, diarrhea, damage of the intestinal tract, dehydration.
- Chronic intoxication shows insidious progression with uncharacteristic symptoms that can last many years after end of exposure.

Detection of E.Coli & As

E. Coli

- Four main steps:
  - Sample collection
  - Capture of organism (PCR + surface recognition, enzyme/substrate or nucleic a. detection methods)
  - Detection (fluorimetry, cytometry, electrochemical signal, and more)
  - Data transfer and real-time access

As

- Colorimetric Test Kits
- Arsenic bioreporter
- Arsenic-binding aptamer (peptide molecule that bind to a specific target)

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