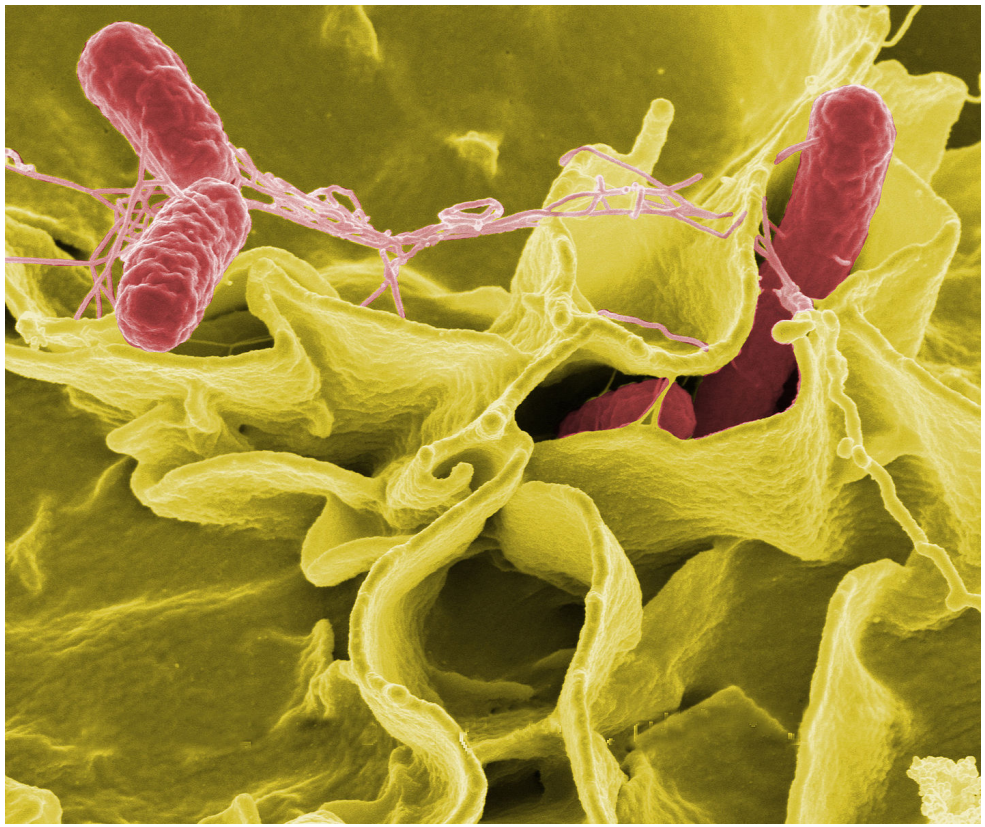
Salmonella Pathogenicity Genes



Credit: Rocky Mountain Laboratories, NIAID, NIH
https://commons.wikimedia.org/wiki/File:SalmonellaNIAID.jpg

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True or False?

- At least half of the cells in your body are bacterial, not human
- Some bacteria can hide ***inside*** your cells
- If you have E. coli in your body, you'd feel very sick
- If you have Salmonella in your body, you'd feel very sick
- Diseases caused by bacteria can be cured by antibiotics
- Handwashing can save lives

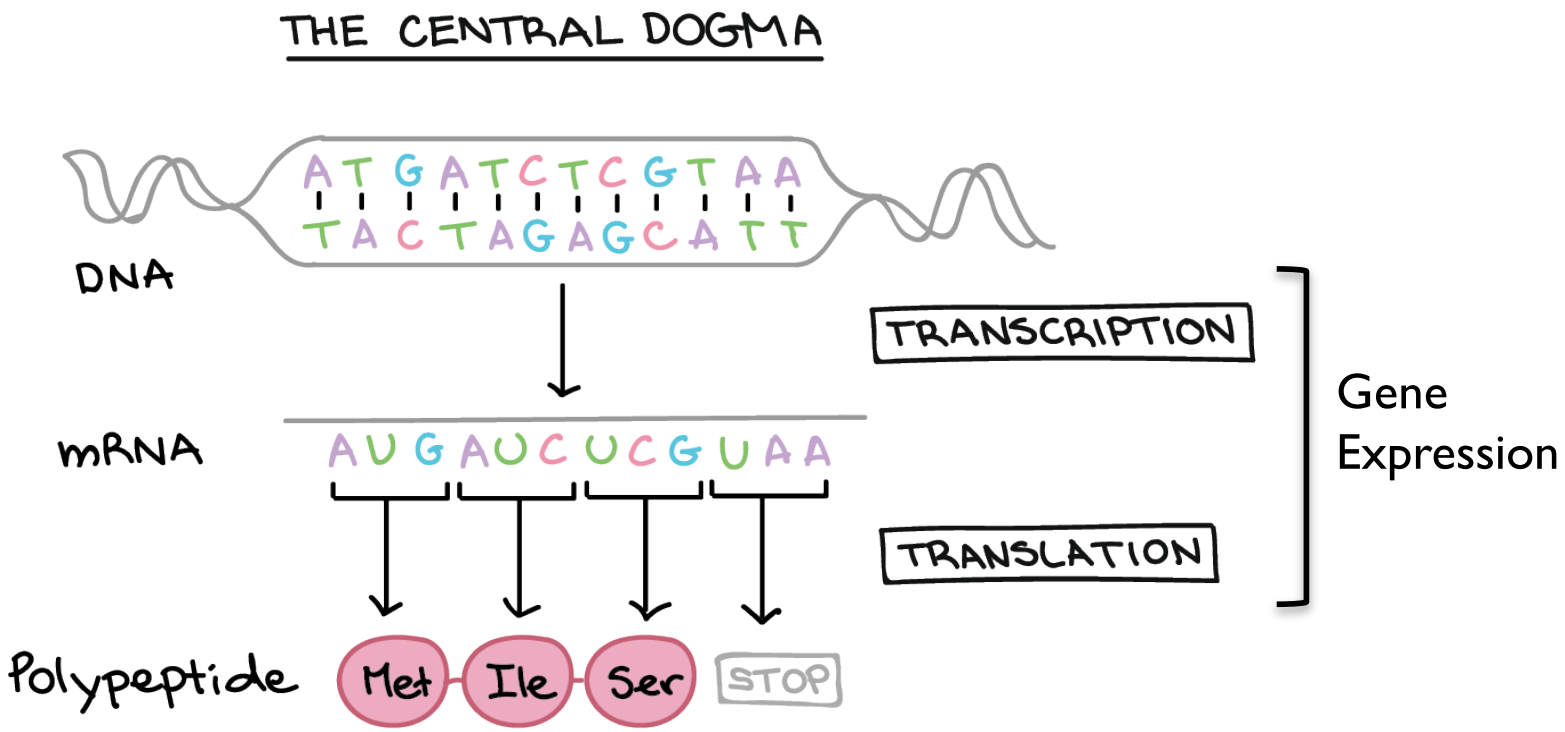
True or False?

- At least half of the cells in your body are bact
- Som our cells
- If yo in your body
- Han

Image: https://en.wikipedia.org/wiki/Mary_Mallon

Central Dogma of Molecular Biology

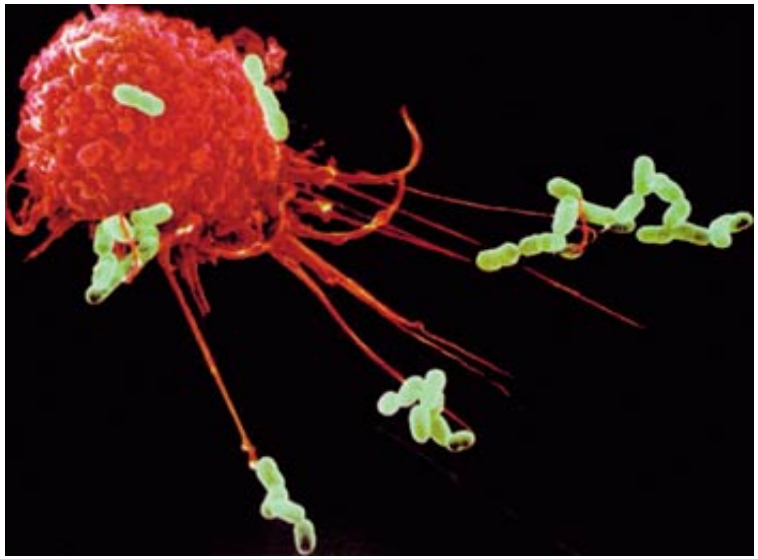
(aka DNA makes RNA makes Protein)



Source: Khan Academy

What do Salmonella need to do to survive?

- Get inside your body
- Survive the stomach environment
- Get inside cells
- Avoid the immune system
- Acquire nutrients
- Reproduce



http://m.harunyahya.com/tr/Books/3752/The-Miracle-In-The-Cell/chapter/4966/The-Cell-Membrane

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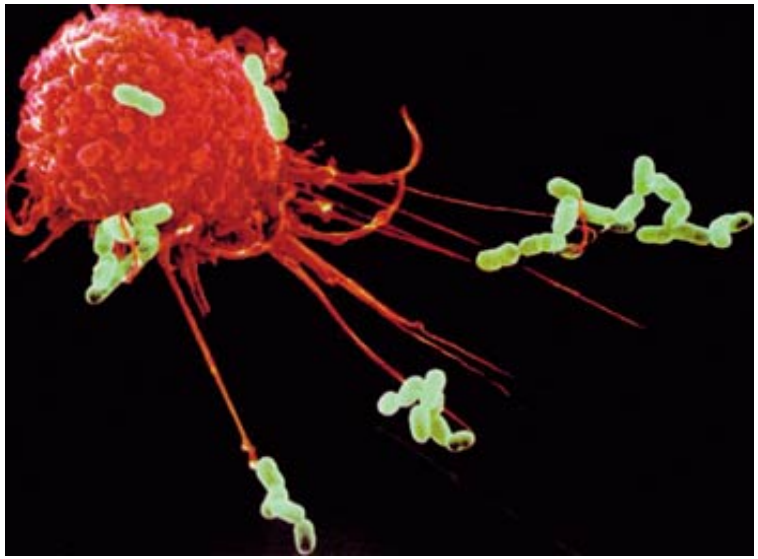

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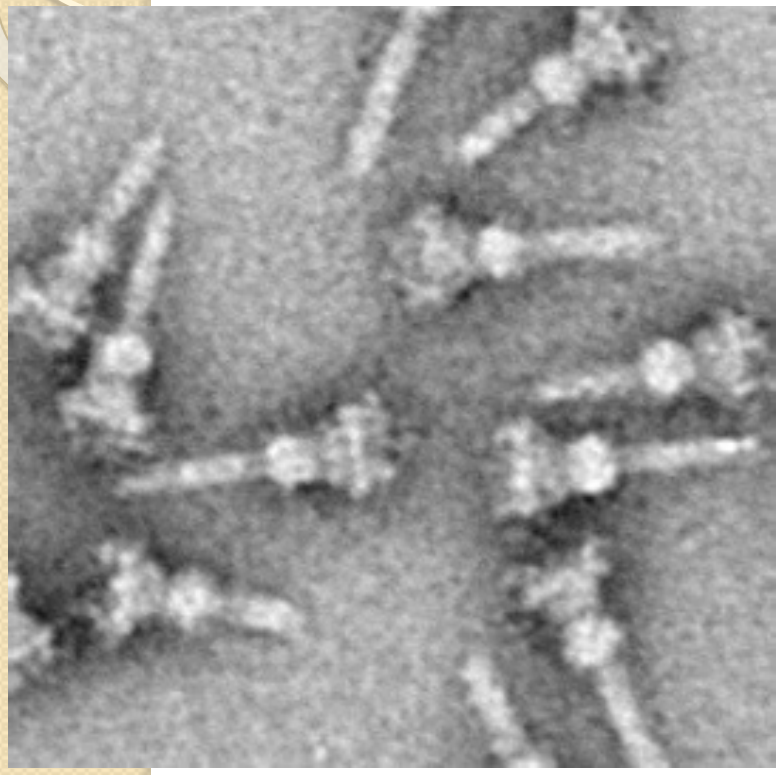
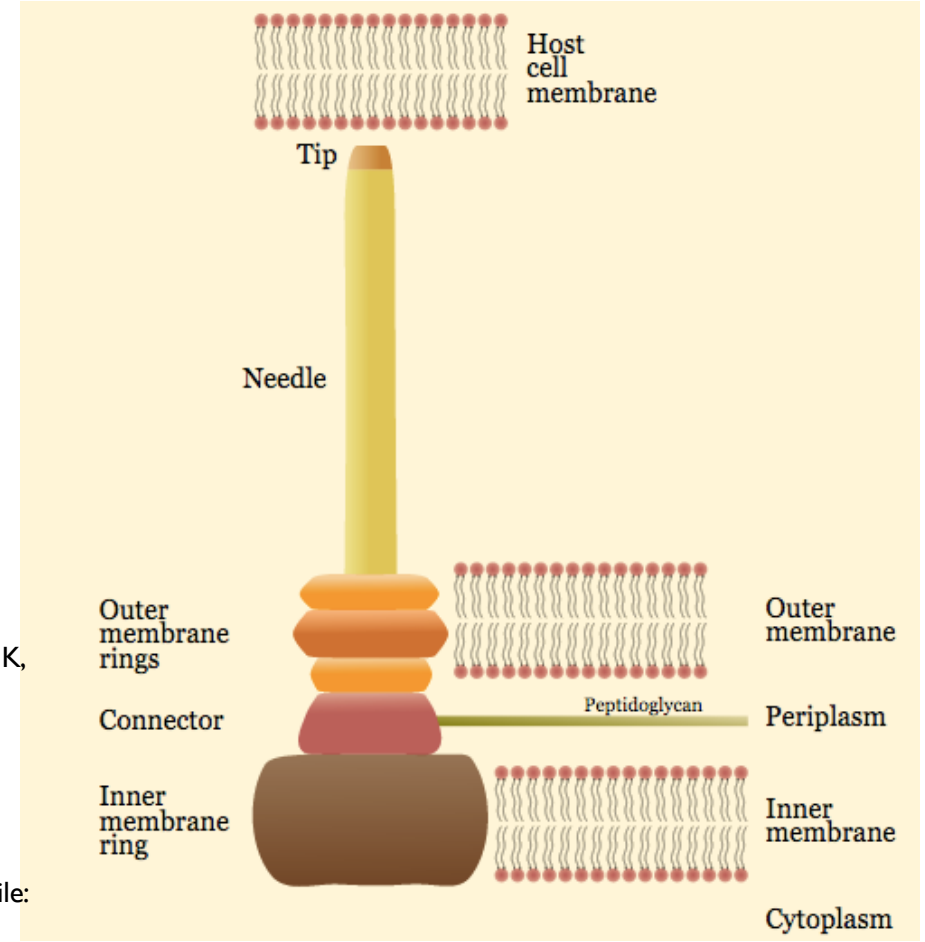
Transmission EM and schematic of T3SS



Transmission EM credit:
Schraidt O, Lefebre MD, Brunner MJ, Schmied WH, Schmidt A, Radics J, Mechtler K, Galán JE, Marlovits TC - Cropped image from Schraidt et al. (2010), Topology and Organization of the Salmonella typhimurium Type III Secretion Needle Complex Components. PLoS Pathog 6(4): e1000824. doi:10.1371/journal.ppat.1000824
Schematic of complex
"T3SS needle complex" by Pixie - Own work. Licensed under CC BY-SA 3.0 via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:T3SS_needle_complex.svg#mediaviewer/File:T3SS_needle_complex.svg



Interpreting Blast: bacteria classifications

Salmonella species: enterica and bongori

subspecies, serovar, serotype (cell surface proteins)

- Typhi, Typhimurium, Enteritidis, Newport, Javiana, Heidelberg

strain, subtype

- DT2, O8-1736, U288

Interpreting Blast: virulence sequences and protein names

- Salmonella Pathogenicity Islands (SPI's)
  - Regions of DNA where several genes essential for virulence are clustered
- Type (I, II, III) Secretion Systems (ex. T3SS)
  - Protein Groups associated with virulence
- Fimbriae, Chaperone, ATP synthase, Protein tyrosine kinase, ABC Transporter
  - Examples of proteins associated with virulence
- GAP, PTP, PTK
  - Examples of protein domains

Protein Blast

Basic Local Alignment Search Tool

BLAST finds regions of similarity between biological sequences. The program compares nucleotide or protein sequences to sequence databases and calculates the statistical significance. Learn more

NEWS

Understanding BLAST+ parameters

Having a basic understanding of BLAST+ parameters is essential to getting the results that meet your needs.
Mon, 28 Jan 2019 17:00:00 EST

More BLAST news...

Web BLAST

Nucleotide BLAST
nucleotide ▶ nucleotide

blastx
translated nucleotide ▶ protein

tblastn
protein ▶ translated nucleotide

Protein BLAST
protein ▶ protein

surface presentation of antigens, partial [Salmonella enterica subsp. enterica serovar Typhimurium]

GenBank: CAA51921.1

Identical Proteins FASTA Graphics

Your turn to Blast

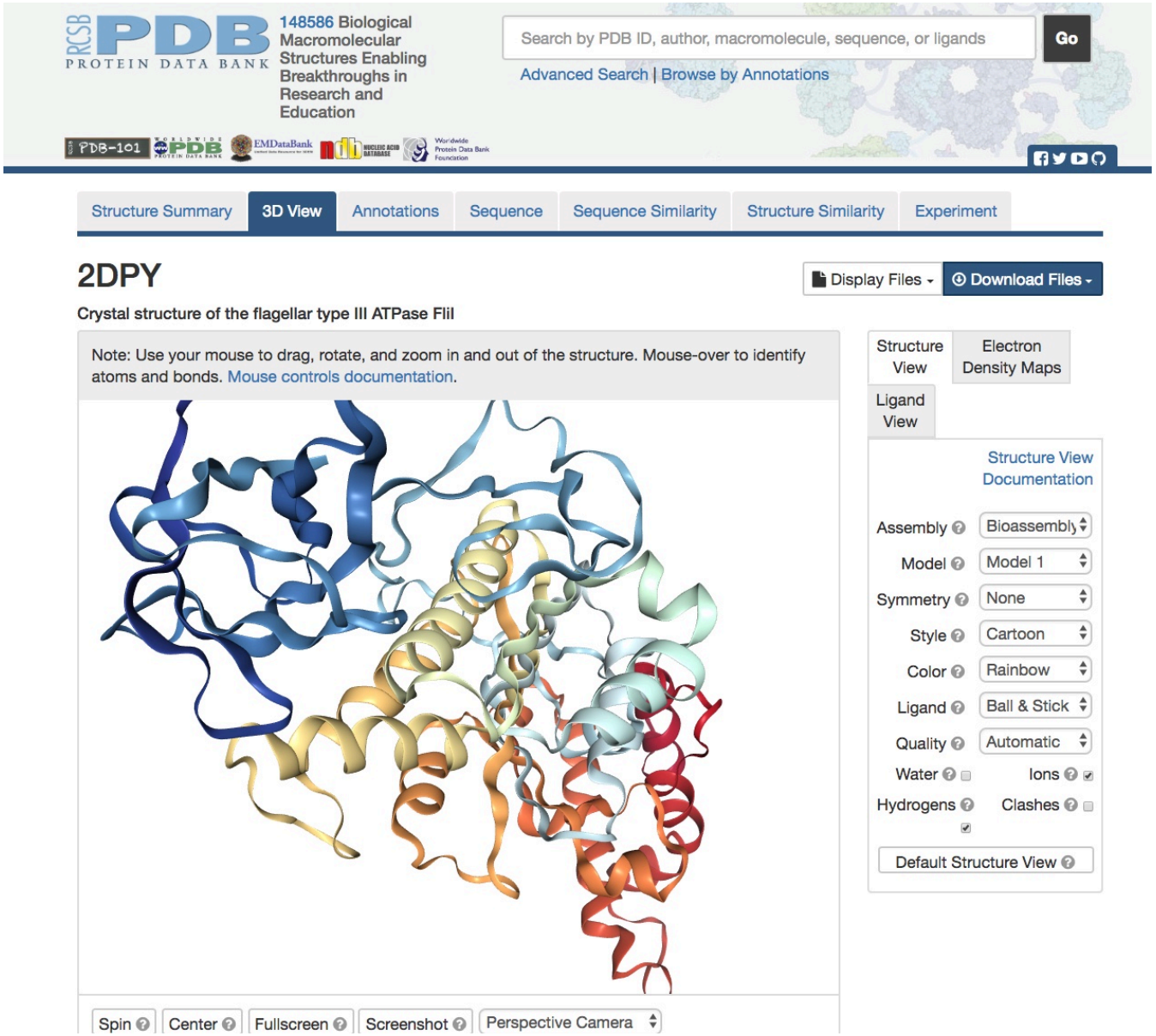
Mystery sequence 1:

You haven't been feeling well lately, and your doctor takes a few cells from you for full genome sequence analysis. In addition to your human cells, the doctor also finds the unknown mystery sequence 1. Should you be concerned about this finding?

Mystery sequence 11:

You want to learn more about your ancestry, and you have your DNA sequenced. You get the result of one of your genes, but it isn't immediately clear what it tells you about your ancestry. Google the gene name (after Blasting to get the name) to see if there is a hint about your ancestry.

Protein Structure: Protein Data Bank



Salmonella virulence factors affect normal cellular pathways and functions

KEGG - Table of Contents

Sources for protein information

- Protein Blast to find related protein sequences (possibly with already known functions)
- Protein Data Bank for structural information
- Kegg database for intracellular pathway information
- PubMed/Google scholar articles for studies published on the protein

Questions?

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