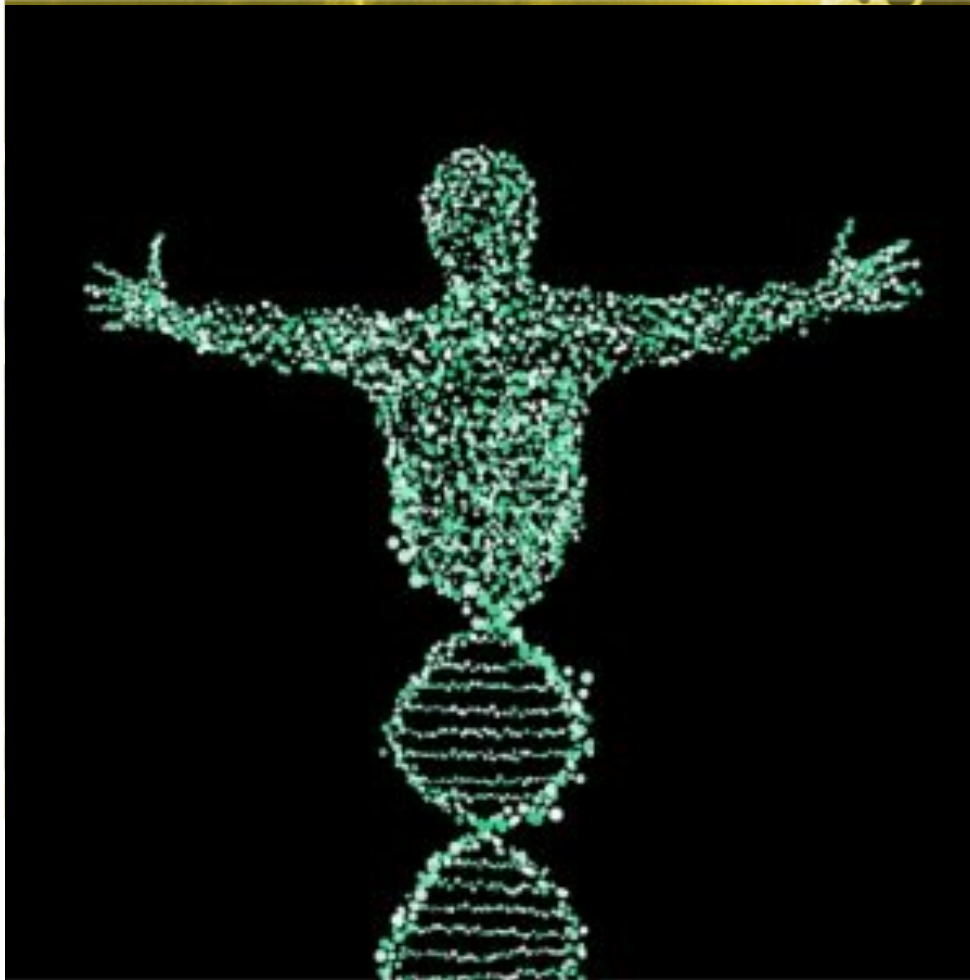
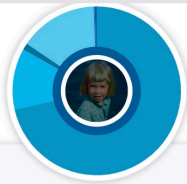


# Salmonella Pathogenicity Genes



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**Joanne Pratt**

**100%**

**European 100.0%**

- British & Irish 71.4% ▼  
United Kingdom, Ireland
- French & German 11.7% ▼
- Scandinavian 1.3% ▼
- Broadly Northwestern European 14.9% ▼
- Broadly Southern European 0.3% ▼
- Broadly European 0.3% ▼



**Joanne Pratt**  
Ethnic Makeup

**European**

- British Isles 100%
- Scandinavia 88%
- East Europe 23%
- 9%

[collapse all](#)

**myORIGINS**  
[Back to myTDNA](#)

**England, Wales & Northwestern Europe 53%** >

**Ireland & Scotland 37%** >

**Sweden 10%** >

**Migrations**

- New England Settlers** >  
From your regions: England, Wales & Northweste...
- Massachusetts, Vermont & New Hampshire Settlers

[See other regions tested](#) 350+

# How an Unlikely Family History Website Transformed Cold Case Investigations

Fifteen murder and sexual assault cases have been solved since April with a single genealogy website. This is how GEDmatch went from a casual side project to a revolutionary tool.

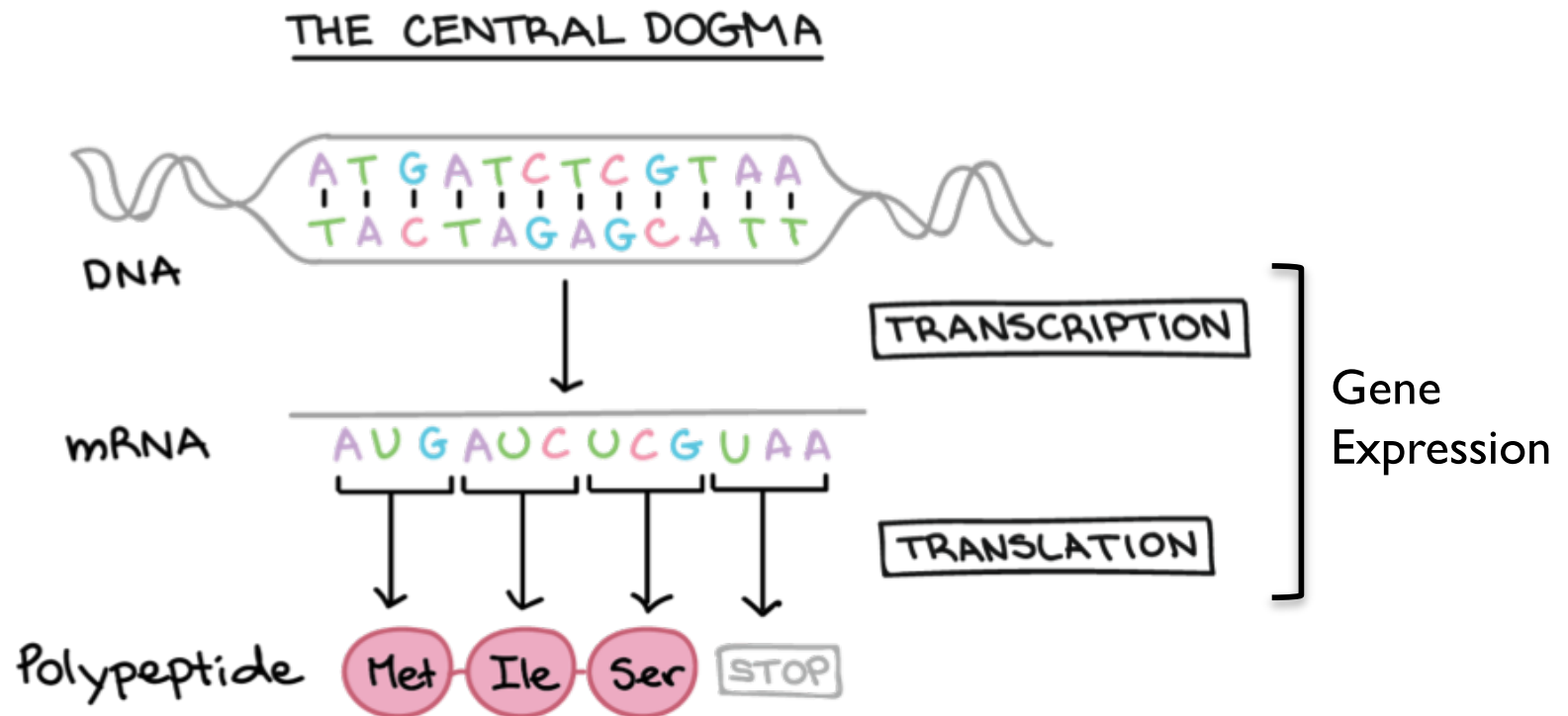
# True or False?

- At least 100 billion bacteria in your body are
- Some of these bacteria live in our cells
- If you have a fever, it's because of bacteria in your
- Hand



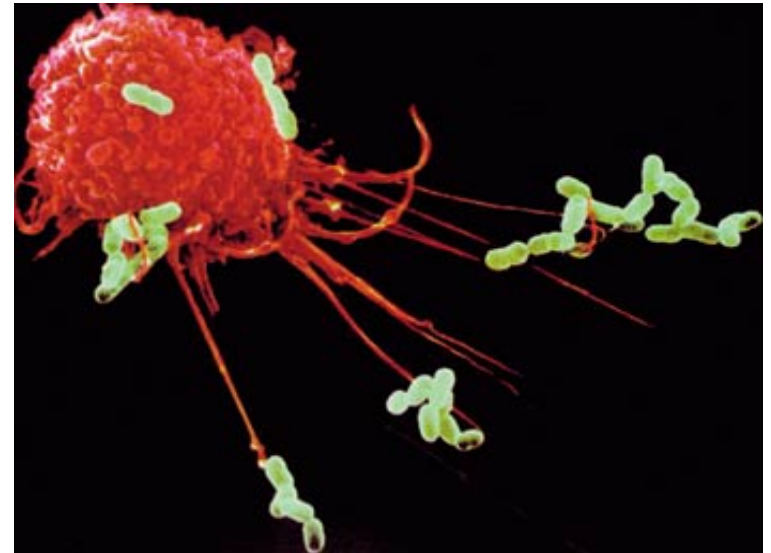
# Central Dogma of Molecular Biology

(aka DNA makes RNA makes Protein)

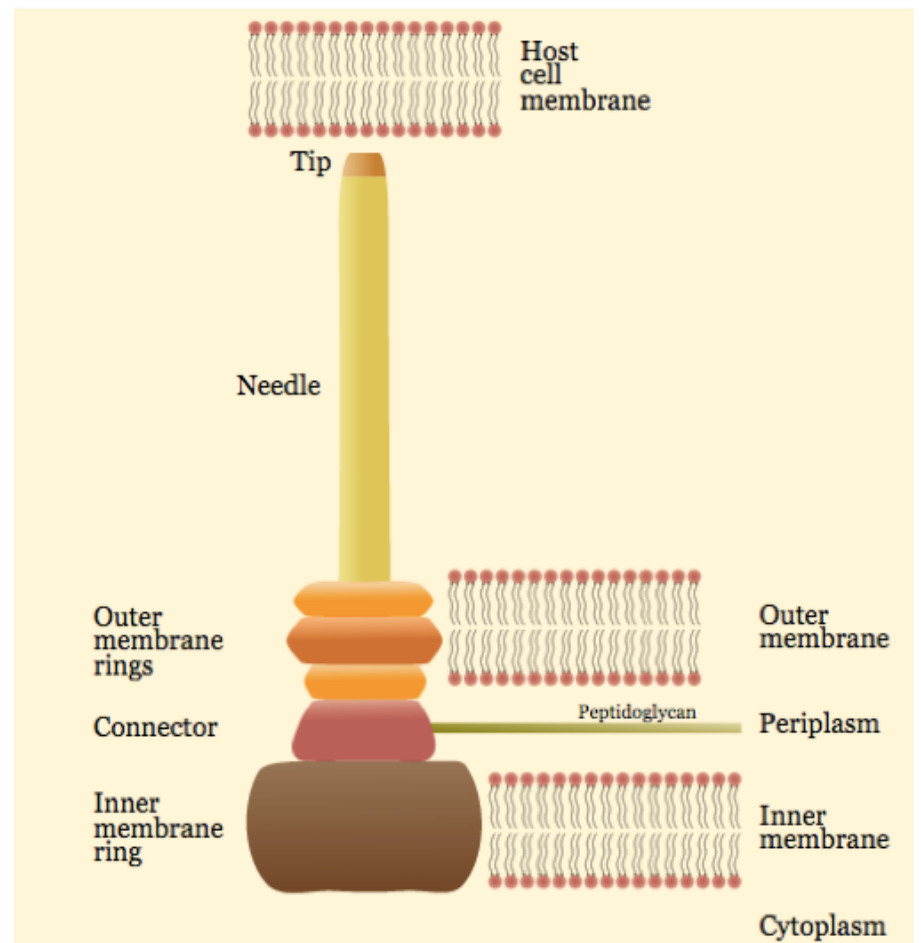
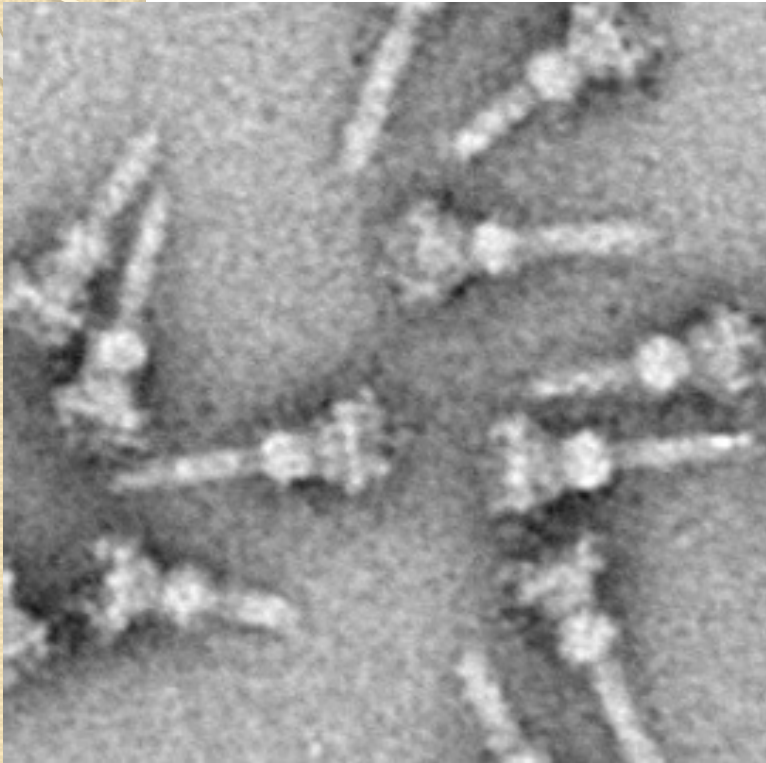


# What do Salmonella need to do to survive?

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



# Transmission EM and schematic of T3SS





# 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

# Blast DNA or protein sequences

## 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](#)

#### 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

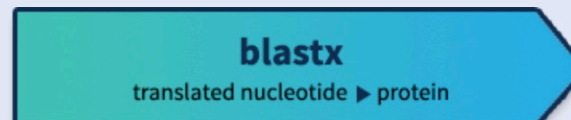
[More BLAST news...](#)

### Web BLAST



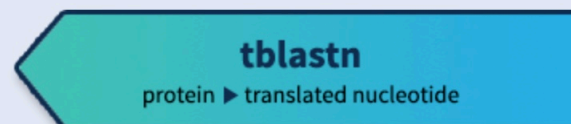
**Nucleotide BLAST**  
nucleotide ► nucleotide

The graphic features a teal background with a white DNA double helix structure. The text 'Nucleotide BLAST' is in large, bold, white letters, with 'nucleotide ► nucleotide' in smaller white text below it.



**blastx**  
translated nucleotide ► protein

The graphic is a blue arrow pointing to the right. It contains the text 'blastx' in bold white letters and 'translated nucleotide ► protein' in smaller white text below it.



**tblastn**  
protein ► translated nucleotide

The graphic is a blue arrow pointing to the left. It contains the text 'tblastn' in bold white letters and 'protein ► translated nucleotide' in smaller white text below it.



**Protein BLAST**  
protein ► protein

The graphic features a blue background with a white protein ribbon structure. The text 'Protein BLAST' is in large, bold, white letters, with 'protein ► protein' in smaller white text below it. Chemical symbols like H<sub>3</sub>C, S, NH<sub>2</sub>, and OH are also visible.

# Protein Blast



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

GenBank: CAA51921.1

[Identical Proteins](#)   [FASTA](#)   [Graphics](#)

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# Your turn to Blast

## Mystery sequence I:

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 I. Should you be concerned about this finding?

## Mystery sequence II:

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.



# Blat

- Alternative to Blast created at UCSC
- Faster due to the database that is queried

# Protein Structure: Protein Data Bank

RCSB **PDB** PROTEIN DATA BANK 148586 Biological Macromolecular Structures Enabling Breakthroughs in Research and Education

Search by PDB ID, author, macromolecule, sequence, or ligands **Go**

[Advanced Search](#) | [Browse by Annotations](#)

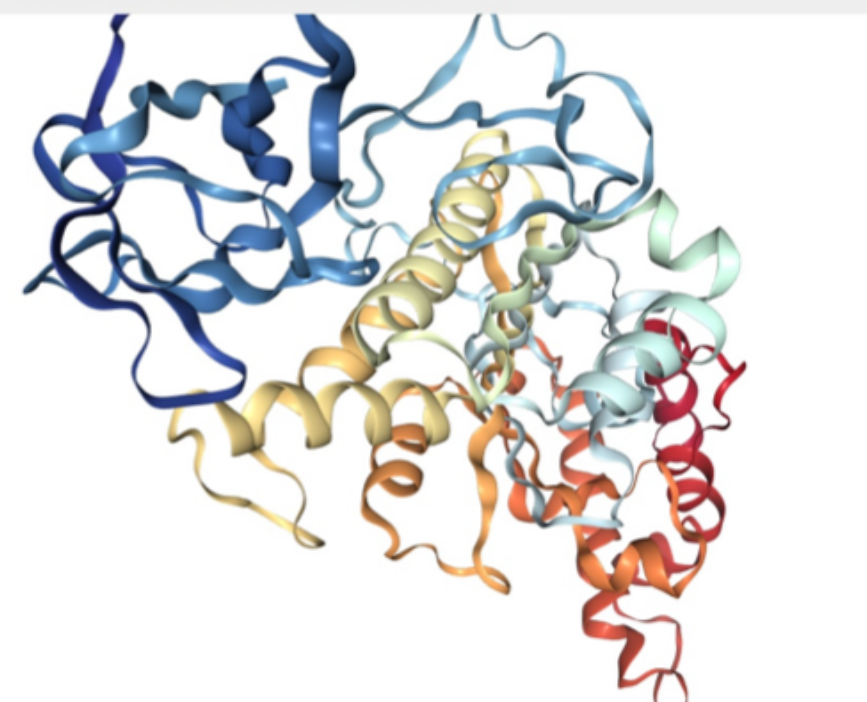
PDB-101 CPDB EMDatabank

Structure Summary **3D View** Annotations Sequence Sequence Similarity Structure Similarity Experiment

**2DPY** [Display Files -](#) [Download Files -](#)

Crystal structure of the flagellar type III ATPase FilI

Note: Use your mouse to drag, rotate, and zoom in and out of the structure. Mouse-over to identify atoms and bonds. [Mouse controls documentation](#).



Structure View Electron Density Maps

Ligand View

Structure View Documentation

Assembly  Model  Symmetry  Style  Color  Ligand  Quality  Water  Ions  Hydrogens  Clashes

# Salmonella virulence factors affect normal cellular pathways and functions



**KEGG - Table of Contents**



# Sources for protein information

- Protein Blast (or Blat) 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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