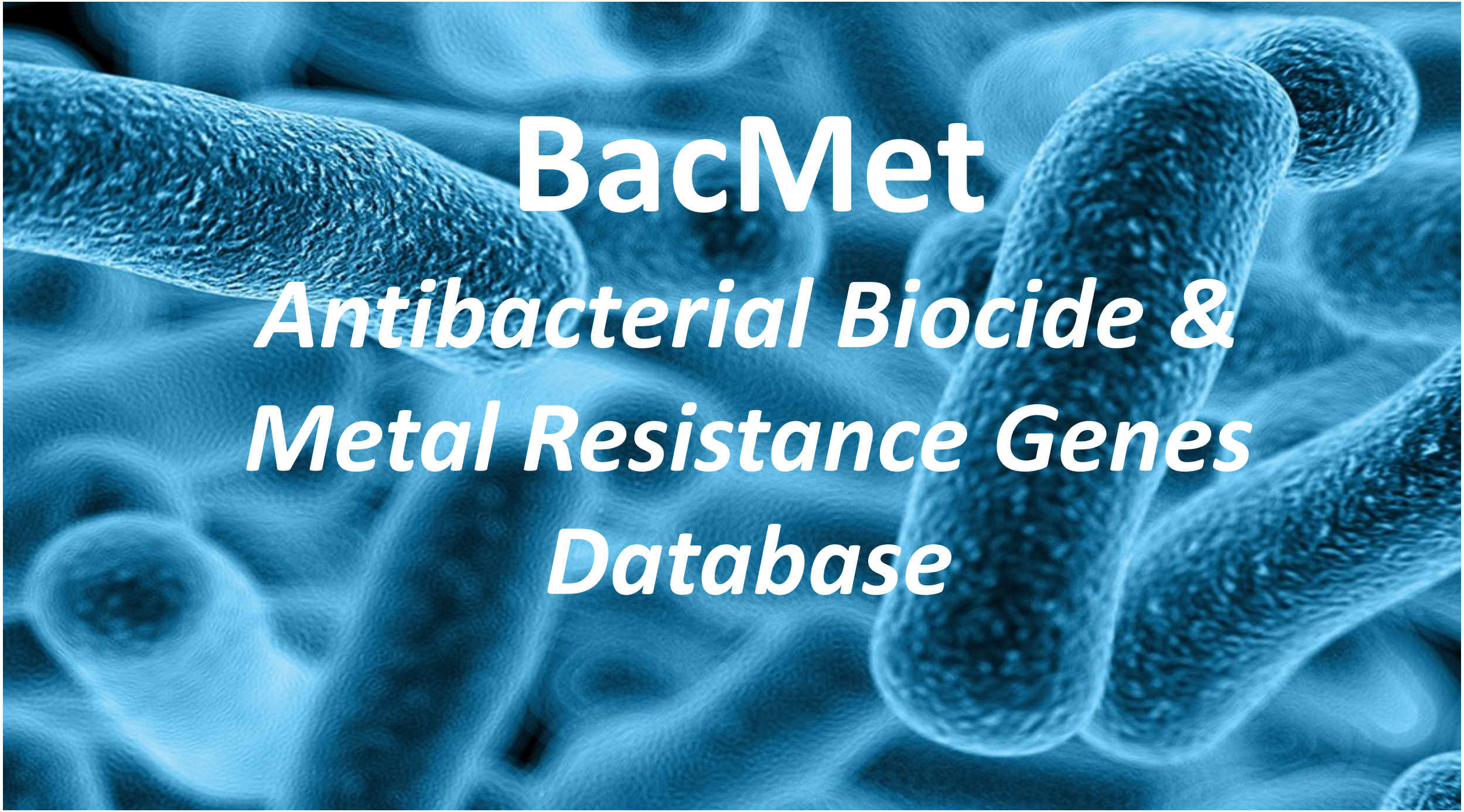
BacMet
Antibacterial Biocide &
Metal Resistance Genes
Database

About BacMet

- Collection of bacterial genes that confer resistance to metals and antibacterial biocides
- Biocides and metals used in antibacterial agents (disinfectants, household products, pesticides, fertilizers)

if bacteria develop biocide and metal resistance

It will increase their resistance to antibiotic as a side effect

- Some examples: COPPER, SILVER, ZINC, MERCURY, ARSENIC
- Data collection: - TCDB (Transporter Classification Database)
  - UniprotKB
  - NCBI GenBank

- Maintained at the University of Gothenburg, Sweden:

  → directed by *Joakim Larsson*

  → Research group: - understand the flow of resistance genes from the diverse environmental reservoir that are recruited into the human microbiota
  - exploring the role of environmental transmission routes of resistant pathogens

- Version v.1.0: November 2013 (**470** confirmed genes) → Version v.2.0: November 2018 (**753** confirmed genes)

- Updated through:
  - literature searches
  - Reviewed user-suggestions

Data collection

EXPERIMENTALLY CONFIRMED RESISTANCE GENES

- If MUTATION or INSERTION of a single gene into the genome or into plasmid decreases or increases RESISTANCE

PREDICTED RESISTANCE GENES

- BLAST confirmed genes to NCBI database
- FILTERING:
  - E-value cutoff of < 0.01
  - Coverage cutoff of 80%

- Gene annotation mapping file
- Sequence FASTA files

About dataset:

Confirmed gene dataset: (tot 753)

BacMet_ID	Gene_name	Accession	Organism	Location	Compound
BAC0001 abeM	Q5FAM9	Acinetobactertbaumanni	Chromosome	4,6-diamidino-2-phenylindolet(DAPI)t	
BAC0002 abeS	Q2FD83	Acinetobactertbaumannii	Chromosome	BenzylkoniumtChloridet(BAC)t[class:t	
BAC0758 abuO	B0VDE7	Acinetobactertbaumannii	Chromosome	Acriflavinet[class:tAcridine],tEthid	

UniprotKB entries

Predicted gene dataset: (tot 155,512)

GI_number	GenBank_ID	Gene_name	Organism	Compound	NCBI_annotation
500050596	WP_011730513.1	ctpD	Mycobacterium smegmatis	Cobalt (Co), Nickel (Ni)	heavy metal translocating P-type
489993744	WP_003896801.1	ctpD	Mycobacterium smegmatis	Cobalt (Co), Nickel (Ni)	heavy metal translocating P-type
959690420	WP_058126902.1	ctpD	Mycobacterium smegmatis	Cobalt (Co), Nickel (Ni)	heavy metal translocating P-type
1115591804	OKH66118.1	ctpD	Mycobacterium sp. SWH-M5	Cobalt (Co), Nickel (Ni)	metal ABC transporter AT
907610391	WP_049745192.1	ctpD	Mycobacterium goodii	Cobalt (Co), Nickel (Ni)	heavy metal translocating P-type
1180112495	WP_083631880.1	ctpD	Mycobacterium sp. SWH-M5	Cobalt (Co), Nickel (Ni)	cadmium-translocating P-
1056401922	WP_067844445.1	ctpD	Mycobacterium wolinskyi	Cobalt (Co), Nickel (Ni)	cadmium-translocating P-type ATP
1184578829	WP_085144107.1	ctpD	Mycobacterium wolinskyi	Cobalt (Co), Nickel (Ni)	cadmium-translocating P-type ATP

sequence record processed by NCBI

information about the protein

Database statistics:

Total experimentally confirmed resistance genes	753
GENES:	
Biocide resistance genes	268
Metal resistance genes	420
Biocide and metal resistance genes	65
LOCATION:	
Total genes inserted into chromosome	550
Total genes inserted into a plasmid	203
ORGANISMS:	
Staphylococcus aureus	24
Clostridium difficile	1
Streptococcus	8
COMPOUNDS:	
Chemical classes	43
Antibacterial biocides	58
Metals	23

Goal of the database:

- First collection of experimentally confirmed and predicated bacterial resistance genes to **biocides AND metals**

DIFFERENT from

  - Databases of antibiotic resistance genes
  - Databases of biocide resistance genes in animals and plants

A database that could help:

- Microbiologists and toxicologists to address antibiotic resistance development in a more comprehensive way
- Biocide manufacturing companies to understand the development of tolerance mechanisms to their products

References:

- Pal, C., Bengtsson-Palme, J., Rensing, C., Kristiansson, E., Larsson, DGJ. (2014) BacMet: antibacterial biocide and metal resistance genes database, *Nucleic Acids Res.*, **42**, D737-D743. doi: 10.1093/nar/gkt1252