

Antibiotic resistance of *Pseudomonas aeruginosa*

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Introduction

Pseudomonas aeruginosa is an aerobic, gram-negative bacillus with unipolar motility (Figure 1). It is known to be a major cause of nosocomial infections and a problematic pathogen due to its low susceptibility to antibiotics.

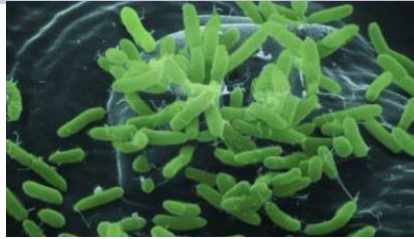


Figure 1. *Pseudomonas aeruginosa*. From [1]

Types of resistances:

- **Intrinsic resistance:** natural presence of mechanisms that confer resistance to drugs (Figure 4).
- **Extrinsic resistance:** high capacity to acquire resistance due to mutations and horizontal genetic material acquisitions.

Intrinsic mechanisms to resist antibiotics

Resistance to aminoglycosides

Bactericidal binds irreversibly to 30S ribosomal subunit, inhibiting the synthesis of proteins.

Intrinsic resistance mechanisms:

- Aminoglycosides modifying enzymes (AME).
- Low membrane permeability.
- Alteration of target site (30S ribosomal subunit) due to methylase enzyme.
- Efflux pumps (Figure 2).

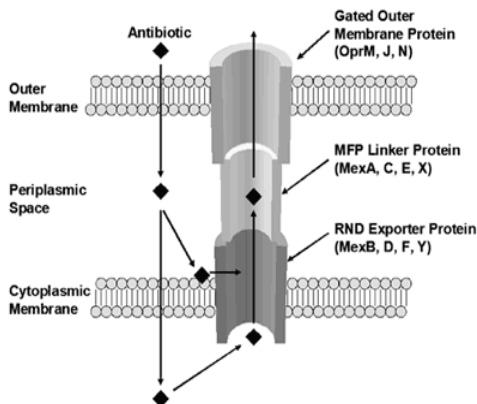


Figure 2. Efflux pumps. From [2]

Resistance to β -lactams

Antibiotic that acts on transpeptidase enzymes, which form the bacterial cell wall.

Intrinsic resistance mechanisms:

- Inhibitory enzymes (β -lactamases) (Figure 3).
- Low membrane permeability.
- Alteration of target site (transpeptidase enzymes).
- Efflux pumps.

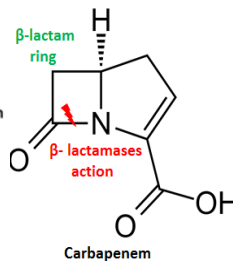


Figure 3. Action site of β -lactamases. From [3]

Resistance to fluoroquinolones

Drug which blocks the supercoiling and catenation-decatenation activities of DNA gyrase.

Intrinsic resistance mechanisms:

- Low membrane permeability.
- Mutation in genes involved in the synthesis of DNA gyrase subunits.
- Efflux pumps.

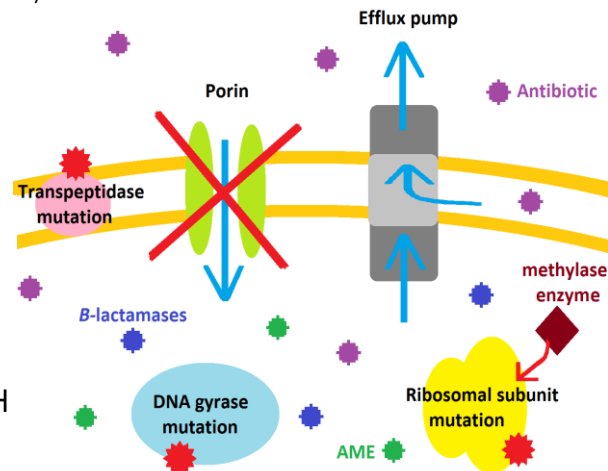
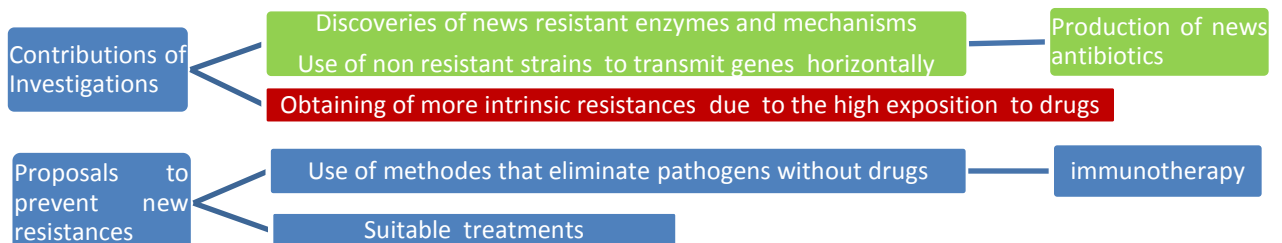


Figure 4. Abstract scheme about resistant mechanisms.

Importance and consequences



References

- [1] From <http://ausubellab.mgh.harvard.edu/cgi-bin/pa14/home.cgi>
- [2] From http://www.medscape.com/viewarticle/458871_2
- [3] From <http://insilicogenomics.in/lactabase-antibiotics-carbapenems.asp>
- [4] Strateva, T. & Yordanov, D. *Pseudomonas aeruginosa* - a phenomenon of bacterial resistance. *J. Med. Microbiol.* **58**, 1133–1148 (2009).
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