

# *Pseudomonas* and other non-fermenters

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# What is this group like?

- Gram-negative rods
- Fail to ferment glucose – need air
- Attack mostly vulnerable people
- Hard to kill them
- Serious resistance is common
- High morbidity and mortality
- Environmental sources
- Biofilm producers

# Fermenters / Non-fermenters



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Strong but primitive

Ugly bruiser

Foul smell

Easy to kill



Weak but tricky

Poisonous beauty

Fancy perfumes

Hard to kill

# ESKAPE

- *Enterococcus faecium*
- *Staphylococcus aureus*
- *Klebsiella pneumoniae*
- *Acinetobacter baumannii* complex
- ***Pseudomonas aeruginosa***
- *Enterobacter* sp.

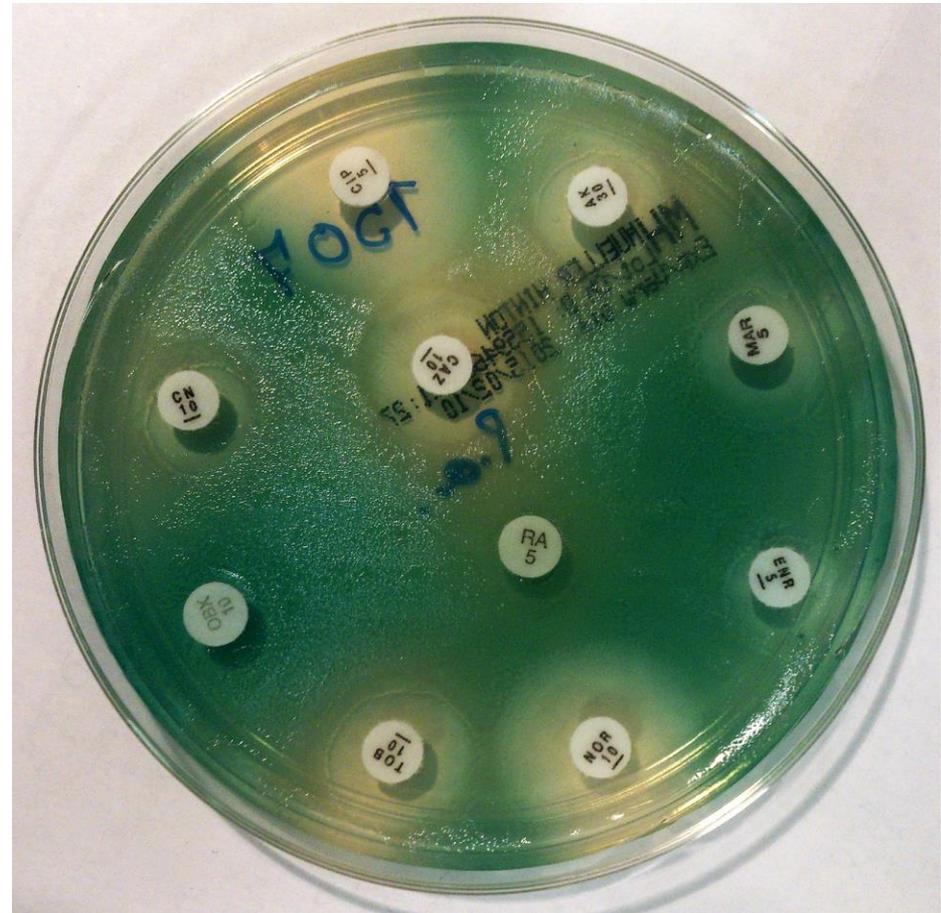
# *Pseudomonas aeruginosa*

- Remember!
  - If you enter a hospital room and you feel a pleasant scent of jasmine or strawberries
  - If you see a green-pigmented wound.
- An important agent of hospital-acquired infections!
  - Contaminates liquids and surfaces

Green, yellow, blue, red or brown  
Flat colonies with rough surface  
Mirror shine

Beta-hemolysis  
Striking scent

Fast test: **oxidase +**  
(lab stripes)



# Infections by PSAE

- Wounds
- Endophthalmitis (!!!!!) DEVASTATING
- Urinary tract infections
- Pneumonia (ventilator-associated!)
- Tracheostomies, catheters, implants
- Swimmer's ear
- BURNS!

# Factors of virulence

- Several types of proteases
- Siderophores pyoverdinin and pyochelin
  - Pseudomonadae are able to duplicate without the presence of iron
- Phospholipase C - hemolysin
- Exoenzyme S – destroys Ig, disrupts cytoskeleton, inhibits macrophages
- Alginate pseudocapsule (protection from dehydration, ATB, phagocytosis)
- Biofilm

# Master of ATB resistance

- *P. aeruginosa* can acquire various genes of resistance and hand them to other bacteria
- Genes often combine and produce unexpected resistance phenotypes
- Empirical therapy in a hospital setting is difficult (impossible)

# ATB therapy

Piperacillin/tazobactam, Ceftazidime, Cefepime – the least toxic

Ciprofloxacin – the only oral antibiotic

Imipenem, Meropenem – for serious cases

Gentamicin, Amikacin – oto/nephrotoxicity  
(combination)

Colistin – toxic (mainly inhalation)

Choose betalac + aminoglycoside

(except urinary infection, aminoglycoside does)

# *Burkholderia cepacia* complex

- Plant pathogen (garlic family)
- Slower growth
- Colonization of the lower respiratory tract
  - Ciliary dyskinesia
  - Cystic fibrosis
  - Other chronic illnesses
- „Cepacia syndrome“ – an uncontrollable condition
  - fever, bronchopneumonia (might be fatal)
- CO-TRIMOXAZOLE

# *Acinetobacter baumannii* complex

- Similar to fermenters, slightly slower growth
- World championship of microbial resistance
  - panresistant strains (PDRAB)
- Very common (gut, skin, environment – long survival)
- Lower respiratory tract, wounds, peritonitis (dialysis)... ventilator-associated pneumonia!
- imipenem/meropenem

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# *Stenotrophomonas maltophilia*

- Environmental bacterium
- Lower respiratory tract, wounds, etc.
- Slower growth
- In vitro and in vivo susceptibility don't match
- #1 treatment: Co-trimoxazole

*Alcaligenes*

*Chryseobacterium*

*Brevundimonas*

*Commamonas*

„*Thismonas*“

„*Thatmonas*“

...

(Not all the -monas are non-fermenters!)

# Case #1

- Sharp injury occurred in a river on Sunday
- Patient coming on Thursday with redness, swelling, white-green discharge and red stripes in proximal direction
- Cultivation:
  - *Staphylococcus aureus* – susceptible to every tested ATB
  - *Escherichia coli* – resistant to ampicillin, otherwise susceptible
  - *Pseudomonas aeruginosa* – susceptible to every tested ATB
  - *Staphylococcus epidermidis* – oxacillin, erythromycin, and clindamycin R
- Which microbe is the key agent? Which one is not?
- Treatment? Procedures?

- Suppurative inflammation
  - Ubi pus, ibi evacua – surgery!
- Lymphangoitis - spreading to the system (stripes)
  - Hospitalization!
- *S. epidermidis* is not a pathogen. The others yes.
- Treatment covering all of them:
  - Piperacillin/tazobactam + gentamicine
    - KIDNEYS!
    - Rather short and aggressive treatment
  - Ceftazidime + co-trimoxazole
    - if the kidneys are not OK to take gentamicine
  - Clindamycine + gentamicine
    - if there is a problem with beta-lactams

# Case #2

- Pain during urination, 2 weeks after surgery
- Mild fever
- The patient is just „unwell“
- Urinalysis:
  - Lots of leucocytes, high pH, cloudy...
- Urine cultivation
  - *Pseudomonas aeruginosa* susceptible to every tested ATB

- Outpatient
- Oral treatment: ciprofloxacin  
(unsure...)
- If the future success of ciprofloxacin is doubtful, parenteral treatment is necessary.
  - Gentamicin once a day is an option  
(Hospitalization or a day care center)

# You need to study ATB!

- Effective through what?
- Bacteriostatic or bactericidal?
- Basic distribution and excretion?
- Adverse effects?
- Choice species / diagnosis
- Empirical / targeted treatment

Treatment after specimen collection!

Done.

Thank you.

Or not. :D