Clinical Aspects of Antimicrobial Agents- Biofilms and Antimicrobial Resistance

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Key Points

- Bacteria matter...not just a broken host
- Wound care is successful
- Antimicrobial dressings are important to care
- Little evidence to show that antimicrobial wound dressings cause resistance
Chronic Wounds are Chronic Infections caused by Biofilm

ESC MID* guideline for the diagnosis and treatment of biofilm infections
2014

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Biofilms cause chronic infections...

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Antimicrobial Products Were Main Agents to Heal a Complex Wound

MRSA, Clostridium and Finegoldia

8 weeks of systemic antibiotics

16 weeks of Ag alternating with Iodine

Antimicrobial products were important treatments
In these type of complicated wounds, dressings must be protected from bacteria or else they form biofilm which is harmful and impede the wound healing process.

Wound microbiota and exudate form biofilm on dressings.

Biofilm prevents wound healing.
Silver: a powerful antimicrobial

• **Silver has a long history as a antimicrobial agent**
  • Ag+ ions have broad spectrum antimicrobial activity against
  • bacteria, fungi, and viruses and can rapidly kill
  • microorganisms (microbicidal)

• Silver ions (Ag+) bind to multiple targets on bacterial
  and fungal cells

• Targets are:
  1. Cell wall and membrane disruption
  2. Denature proteins and enzymes
  3. Prevent respiration
  4. Inhibit DNA synthesis

• **More targets...reduced chance of resistance development**
  • Antibiotics mainly have narrow spectrum of activity (against specific types of bacteria) and usually act on 1 target in the cell

• Several formulations of silver are utilized in wound care e.g. silver sulphadiazine (SSD), silver nitrate and ionic silver dressings

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DNA=deoxyribonucleic acid.


Resistance versus Tolerance
Antibiotics versus Antimicrobials

Bowler: Despite the sporadic evidence of bacterial resistance to silver, there have been very few studies undertaken and documented to ascertain its prevalence. The risks of antibacterial resistance developing from the use of biocides may well have been overstated.

Percival: Results suggest that presence of silver resistance genes is rare and that genetic resistance does not necessarily translate to phenotypic resistance to silver.


Clinical Importance of Antimicrobial Products

The Use of Antimicrobial Products:

- Improves outcomes
- Silver/Iodine/PHMB/etc. are Safe and Effective
- Minor risk to future patients or Public

If the Availability of Antimicrobial Products Is Limited:

- Poor outcomes (Reservoir will remain open)
- Increased use of antibiotics