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OMG...I DIDN'T KNOW THAT!

Osteomyelitis:
Achieving Antibiotic Penetration

PODCAST 21

With Your HOST
DR. JANE CALDWELL

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Adam M. Bressler, MD

Disclosures

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Consulting Fees - Gilead

Speakers Bureau - Cumberland Pharmaceuticals, Gilead

Shareholder - Gilead

Osteomyelitis Incidence

Improved access to imagery such as MRI and scintigraphy has improved diagnostic accuracy in recent years.

Momodu II, Savaliya V. Osteomyelitis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532250/

Osteomyelitis Classification Systems

Lew and Waldvogel

- Classification by duration of illness (acute or chronic) and mechanism (hematogenous or contiguous infection).
- If contiguous, classification occurs based on presence or absence of vascular insufficiency.

Cierny and Mader

- Additional guidance in patient management
- Classified by anatomic and host health status

Anatomic Types

Stage 1: Disease confined to bone medullary
Stage 2: Superficial disease
Stage 3: Localized spread
Stage 4: Diffuse disease

Host Health Status

A: Normal host
Bs: Host with systemic compromising factors
Bl: Host with local compromising factors
Bsl: Host with both local and systemic factors
C: Host for whom treatment of the osteomyelitis is worse than the disease itself.

Momodu II, Savaliya V. Osteomyelitis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK532250/

Osteomyelitis Classification Systems

- With aggressive early treatment, the prognosis of **acute** osteomyelitis is good, though recurrence can occur with re-injury to the area.
- The recurrence rate of chronic osteomyelitis is about 30% at 12 months
  - This rate can increase in cases of *P. aeruginosa* with a recurrence rate as high as 50%.
- Cases involving prosthetic devices are more difficult to treat
  - Often lead to increased morbidity due to the need for more surgical procedures and extended antibiotic courses required for treatment
- Aggressive or biofilm forming bacteria may require longer initial treatment times.

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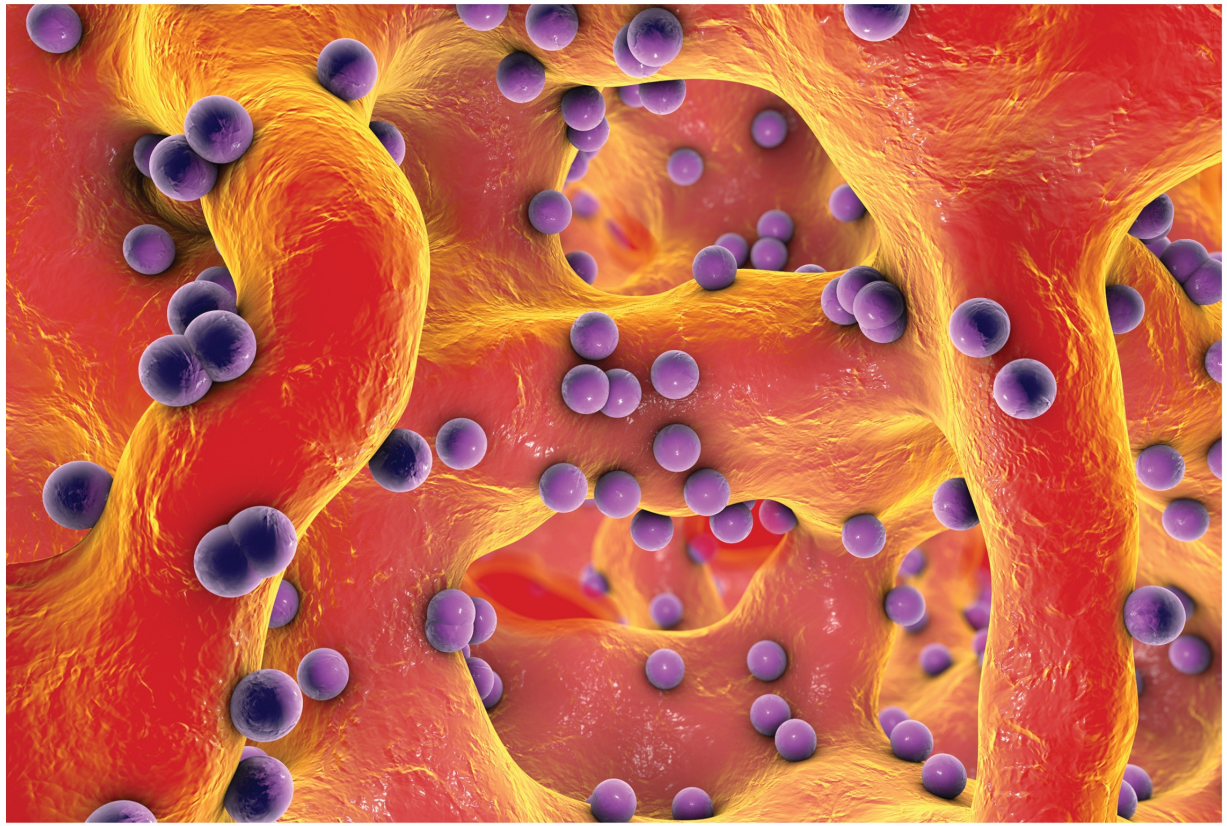
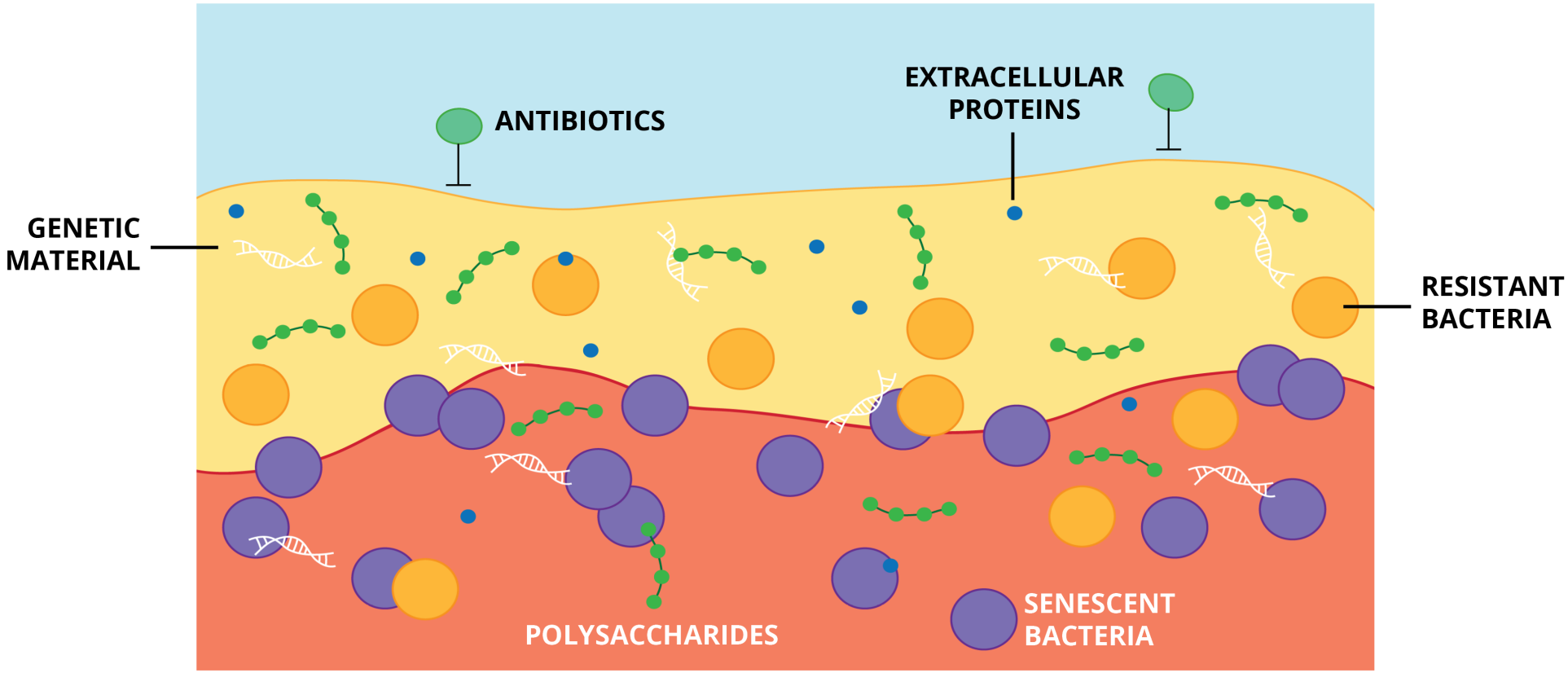
Biofilms



- Biofilms can form micro-environments where colonies of bacteria adhere to tissue.
- A “slime” coat of proteins, genetic material, and polysaccharides form to protect the bacteria from antibiotics and other outside threats.
- Biofilm-forming bacteria in osteomyelitis often lead to resistant infections that require extended courses of antibitoic treatment.

Antibiotics Are Blocked by Biofilm Formation



Rapacka-Zdonczyk A, et al. *Int J Mol Sci.* 2021;22:2224. https://doi.org/10.3390/ijms22042224

Biofilm Characteristics for Antibacterial Avoidance

1. A matrix of polysaccharides, extracellular proteins, and genetic material make up a physical barrier protecting the bacteria (“slime coat”) that prevents penetration of some antibiotics.
2. Bacteria may acquire resistance or tolerance that requires increased dosages, longer treatment duration, or new antibiotics.
3. Persistent bacteria may survive initial treatment due to a transient slowed metabolism, though they may or may not develop resistance.
4. Altered pH of the biofilm environment may impact antimicrobial efficacy.
5. Senescence of bacteria prevents antibiotic mechanisms that involve metabolically active cells.

“New” Antibiotics

Class	Drug
Lipopeptides	• Daptomycin
Glycopeptides/lipoglycopeptides	• Telavancin • Dalbavancin • Oritavancin
Beta lactams	• Ceftaroline
Tetracycline/glycyclcycline derivatives	• Tigecycline • Apocycline • Omadacycline
Oxazolidinones	• Linezolid • Tedizolid

Telavancin Observation Use Registry (TOUR)

- TOUR was a multicenter observational-use registry study conducted at 45 U.S. sites between January 2015 and March 2017.
- Of the 1063 patients enrolled in TOUR with various infection types, 291 had bone and joint infections such as osteomyelitis.
- The most frequent pathogen in those infections was methicillin-resistant *Staphylococcus aureus*.
- **Study findings:**
  - The median telavancin dose was 750.0 mg or 8.2 mg/kg administered for a median of 26 days.
  - At the end of treatment 78.7% achieved a positive clinical response, 9.7% failed treatment, and 11.6% had an indeterminate outcome.
  - Clinicians are using once-daily telavancin with positive clinical outcomes for the treatment of bone and joint infections caused by gram positive pathogens.

https://clinicaltrials.gov/ct2/show/NCT02288234
Bressler A, et al. *Drugs Real World Outcomes*. 2019;6(4):183-91. doi: 10.1007/s40801-019-00165-8.
Sims CR, et al. *Drugs Real World Outcomes*. 2021;8(4):509-18. doi: 10.1007/s40801-021-00255-6.

TOUR Osteomyelitis Findings

Key Points

- Clinicians are using once-daily telavancin with positive clinical outcomes for the treatment of bone and joint infections caused by gram positive pathogens
- Telavancin is generally well tolerated in patients with bone and joint infections
- This subanalysis suggests that telavancin is a promising and viable option for patients with bone and joint infections due to *Staphylococcus aureus* including methicillin-resistant *S. aureus*

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Osteomyelitis Risk Factors

- TRAUMA & INJURY
- DIABETES
- IMMUNOCOMPROMISED
- VASCULAR DISEASE
- OBESITY
- SMOKING
- INJECTION DRUG USE

Multidisciplinary Approach to Osteomyelitis

SURGICAL TEAM

- Podiatry
- Orthopedics
- Vascular Surgery

WOUND CARE TEAM

- Hospital
- Wound Care Clinics
- Long-term Facilities

ANTIBIOTIC TREATMENT TEAM

- Pharmacy
- Home Health
- Infusion Centers

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