DISTINCT ANTIMICROBIAL ANALYSIS TO EVALUATE MULTI-COMPONENT WOUND DRESSING PERFORMANCE

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Wounds

Wounds may caused by:

- Trauma
- Cuts
- Surgery
- Burns
- Incisions
- Abrasions
- Lacerations
- Punctures
- Chemicals
Wound healing

Song X, Melro L, Padrão J, Ribeiro AI, He Z., Yu L, Zille A, Nonwoven materials and technologies for medical applications, *in press*
Wound dressing

Ideal wound dressing:
- Sterile
- Provide adequate gas exchange
- Maintain ideal level of moister
- Biocompatible
- Microorganism barrier
- Eliminate excess of exudate
- Enhance wound healing process
- Prevent surface necrosis
- Odour control
- Elastic
- Easily removed
Wound dressing composite

Lint

Animal grease

Honey

https://hornsby-beekeeping.com/honey/


https://www.dreamstime.com/photos-images/tallow-grease.html

https://hornsby-beekeeping.com/honey/
Antimicrobial agents

Dose dependent activity

Antimicrobial agents concentration

Microbial viability & resistance
Nanoparticles

Antimicrobial agents concentration

Microbial viability & resistance

200 nm
Nanoparticles size

- Particles may cross blood-brain barrier
- May cross into cells
- Fish eggs and larvae
- Unicellular marine algae
- Human macrophage
- Alveoli
- Copepod (type of zooplankton)

Nature
Cells uptake

Cells uptake

- 200 nm
- > 200 - 500 nm
- 1 – 5 µm
- < 25 nm

Size is not everything

Factors influencing uptake:
- Receptors
- Charge
- Hydrogen bonding potential
- Lipophilicity
- ...
Choose freedom?

a) Wound dressing

Dermis

Epidermis

Nanoparticles

b) Wound dressing

Dermis

Epidermis

Nanoparticles
Multi-component wound dressing

Alginate

Silver nanoparticles

Mordenite

https://www.chemistryworld.com/podcasts/sodium-alginate/7756.article
Multi-component wound dressing

Polyester → Dielectric barrier discharge plasma → Previous suspension

Padder
Microorganisms

Antimicrobial methods

“Contact killing”

AATCC 100-TM100

Antimicrobial methods

“Shake flask”

ASTM-E2149-01

Interface & vicinity activity
Staphylococcus aureus

a)

![Graph showing log reduction (CFU mL⁻¹) for different treatments: PES+Alginate+AgNPs, PES+Alginate+AgNPs+MOR, PES+Alginate+AgNPs+MOR. The graph compares contact killing and shake flask methods.]
Escherichia coli

b)

![Graph showing log reduction of CFU mL⁻¹ for different conditions: PES + Alginate + AgNPs, PES + Alginate + AgNPs + MOR, contact killing, and shake flask. The graph indicates a significant decrease in log reduction for contact killing compared to shake flask conditions.](image)
MS2 bacteriophage

![Graph showing log reduction of MS2 bacteriophage](chart)

- **Contact killing**
- **Shake flask**
Concluding remarks

- Antimicrobial assays may be valid to assess immobilization
- Mild antibacterial activity, nevertheless potentiated by Mordenite
- No antiviral activity was detected (problem already solved)
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