Sprayable Hydrogels for Antibiotic Delivery to Burn Wounds

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Current burn wound care can be improved

→ 40,000 hospitalizations in US
  • 50% of deaths are infection-related
  • $18 billion spent on specialized burn care in US annually
  • Greater scar tissue formation

→ Current cream and ointment application can be painful

Poloxamers form thermoreversible hydrogels due to micellization at critical temperatures

Poly(EO)$_{100}$–poly(PO)$_{66}$–poly(EO)$_{100}$ ← Poloxamer 407 (Pluronic F127)
Hyaluronic acid and drugs can provide additional functionality to the hydrogels

→ Hyaluronic acid  ●
  • Anti-inflammatory
  • Active healing agent
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→ Hyaluronic acid
  • Anti-inflammatory
  • Active healing agent

→ Drugs
  • Antimicrobial agents
  • Analgesics
Aim to achieve gelation temperature near skin temperature
Ciprofloxacin loaded hydrogels exhibit antimicrobial activity

→ 1: Control (Silvadene cream)
→ 2: 17% F127 + 0.3% ciprofloxacin
→ 3: 20% F127 + 0.3% ciprofloxacin
→ *E. coli* challenge
Spray pattern changes with nozzle

-/- Nozzle

+/- Nozzle

+/- Nozzle

+/- Nozzle

15% 17% 20%
Different spray plumes can be achieved using different nozzle types

+/+ Nozzle spraying water

-/- Nozzle spraying water

*yellow bar = 6 inches
Conclusion

Future studies include testing against more bacterial strains and testing the transport out of the gel and through the skin.