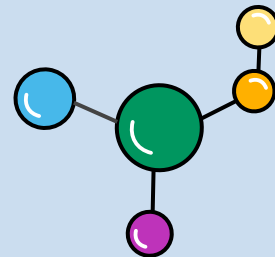
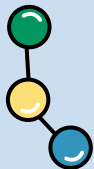


# Mesenchymal Stem cell Loaded Thermosensitive Hydrogel Wound Dressings in Wound Healing



# Wound Healing

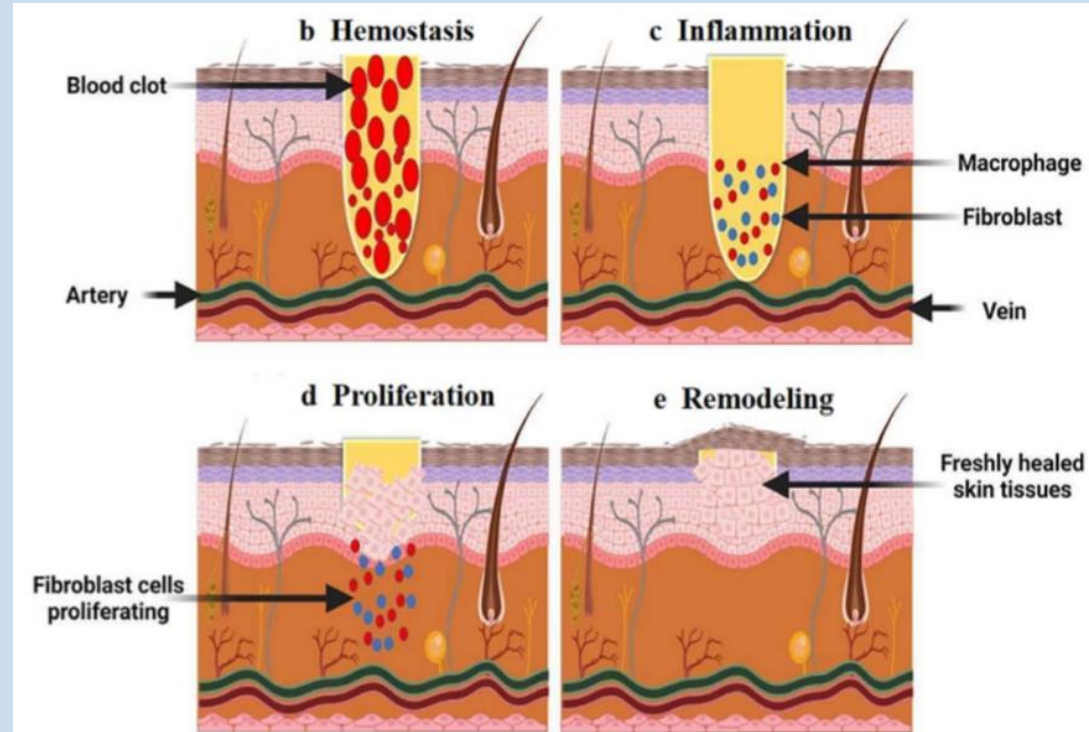
## four stages of wound healing:

1-Hemostasis: to prevent excessive blood loss

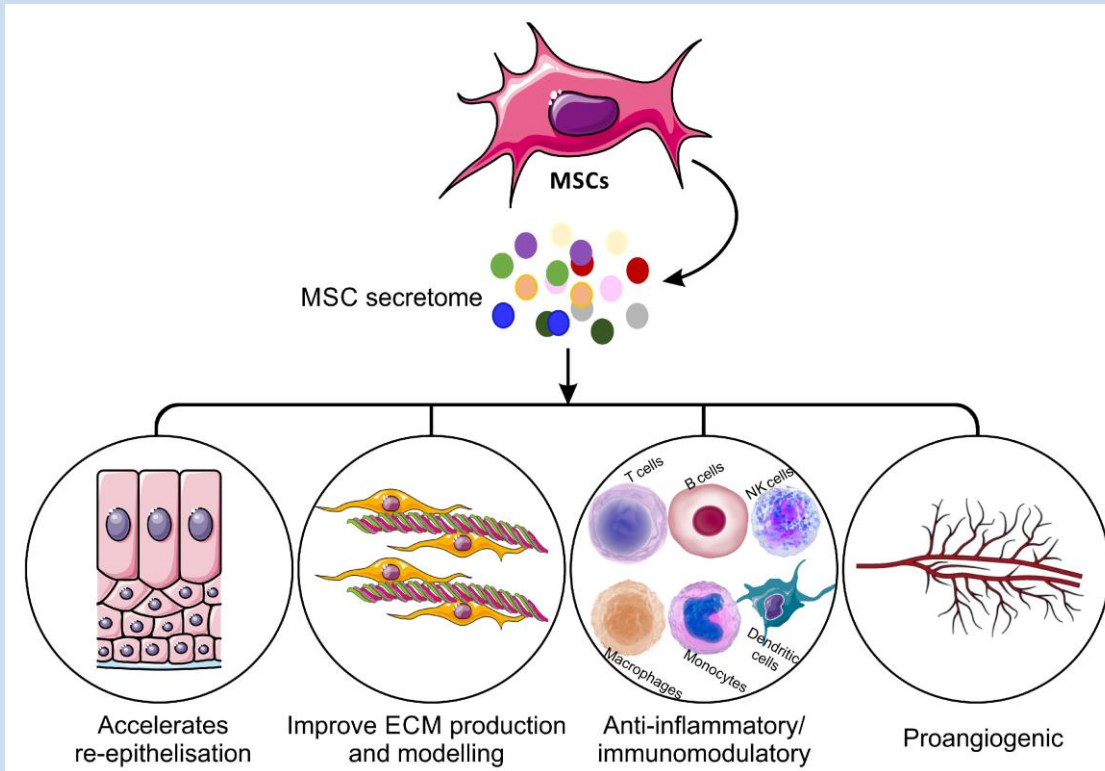
2-Inflammation: to clear debris, pathogens, and dead tissue from the wound

3-Proliferation: formation of new tissue

4-remodeling: collagen fibers are reorganized, and the tensile strength of the new tissue increases



# Mesenchymal Stem Cell in Wound Healing



# Wound dressings

Protection  
from Infection

Moisture  
Management

Temperature  
Regulation

Pain  
Reduction  
and Comfort

Delivery of  
Therapeutic  
Agents

# Hydrogels in Wound Care

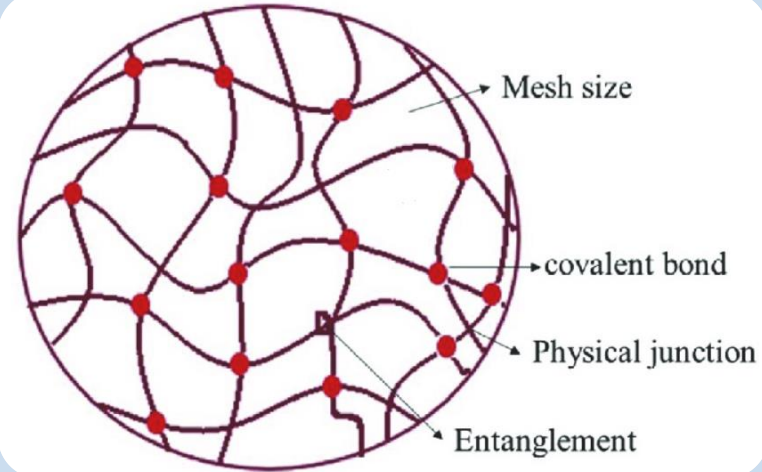
High water content

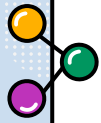
Biocompatibility

Flexibility and conformability

thermosensitivity

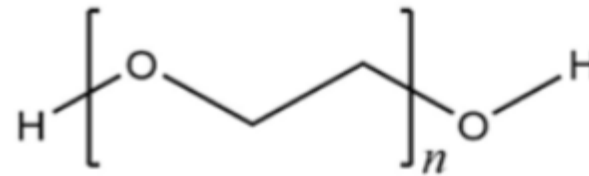
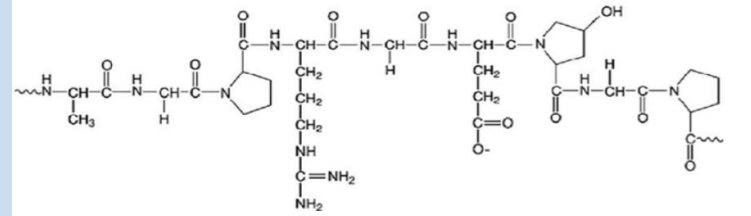
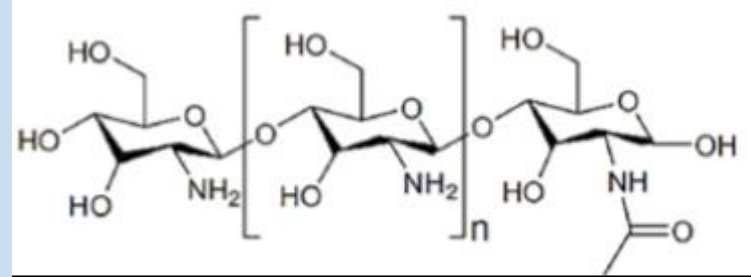
Controlled release of therapeutics



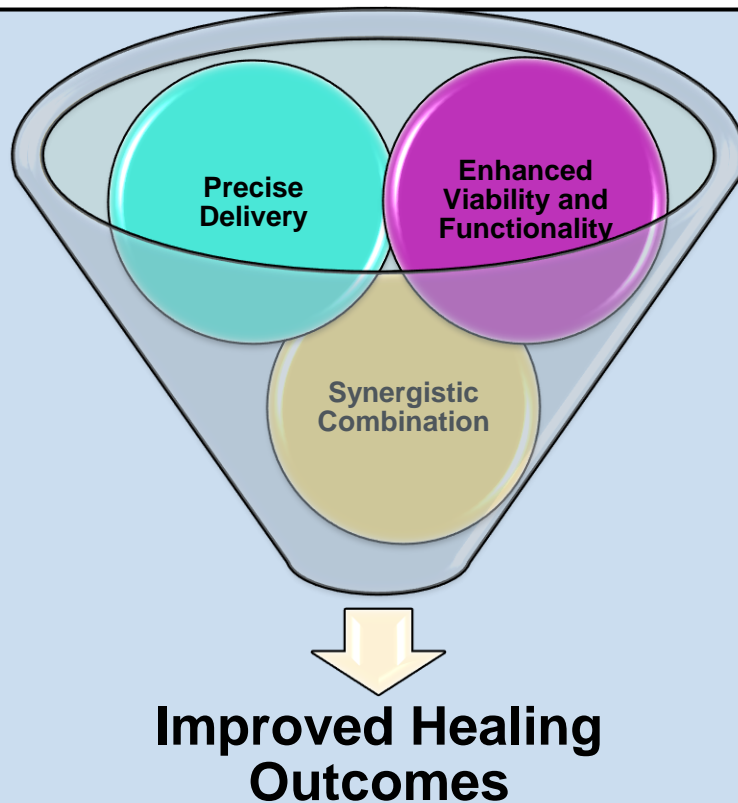


## Thermosensitive Hydrogels Dressings

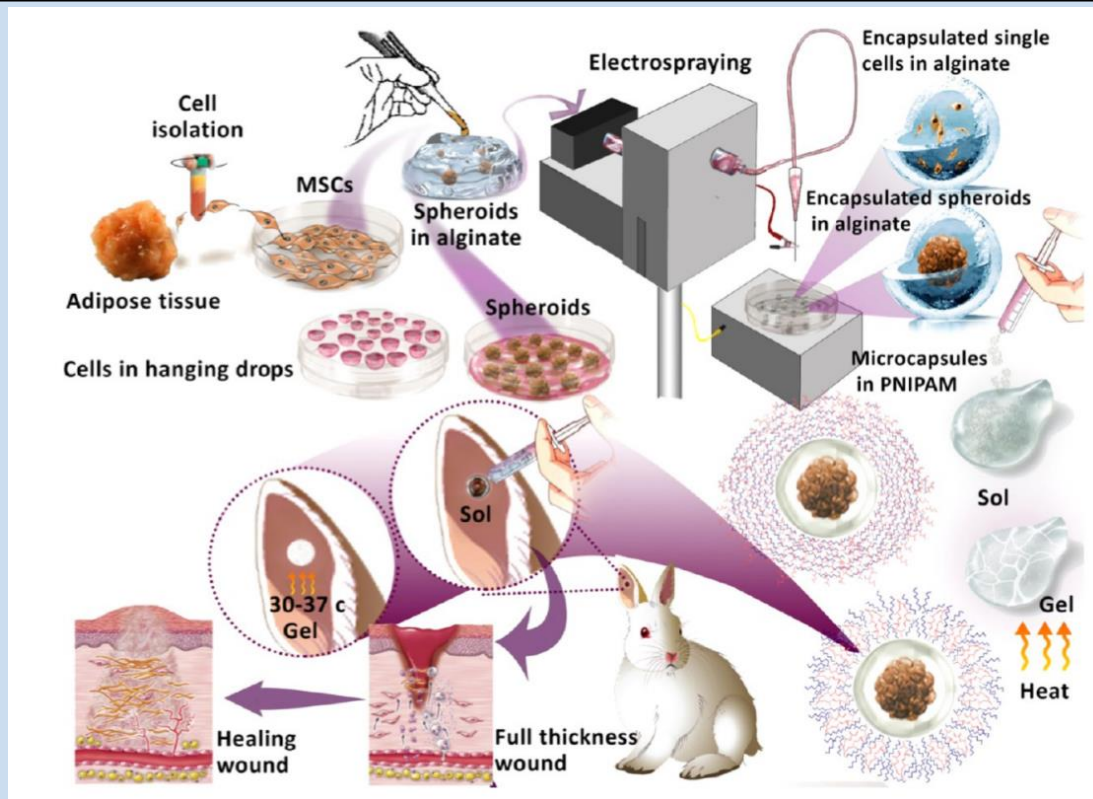
- a class of smart materials that exhibit a phase transition in response to temperature changes
- liquid at lower temperatures and gel at physiological temperatures (around 37°C)
- easily applied in liquid form and then solidify to form a protective gel layer on the wound
- The gelation process can be designed to release therapeutic agents in a controlled manner, enhancing the healing process



## Integration of Stem Cells with Thermosensitive Hydrogels

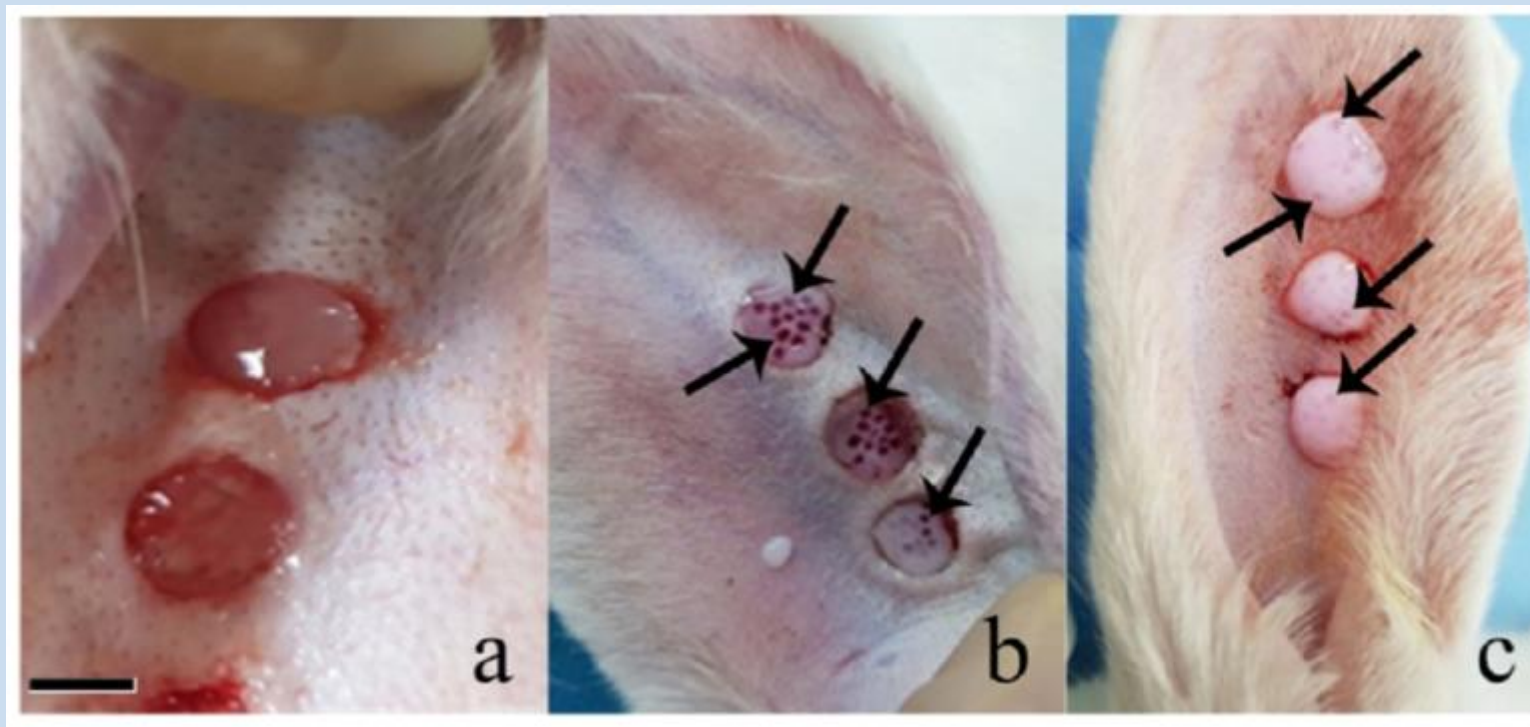


# Mesenchymal Stem Cell Spheroids Embedded in an Injectable Thermosensitive Hydrogel: An In Situ Drug Formation Platform for Accelerated Wound Healing

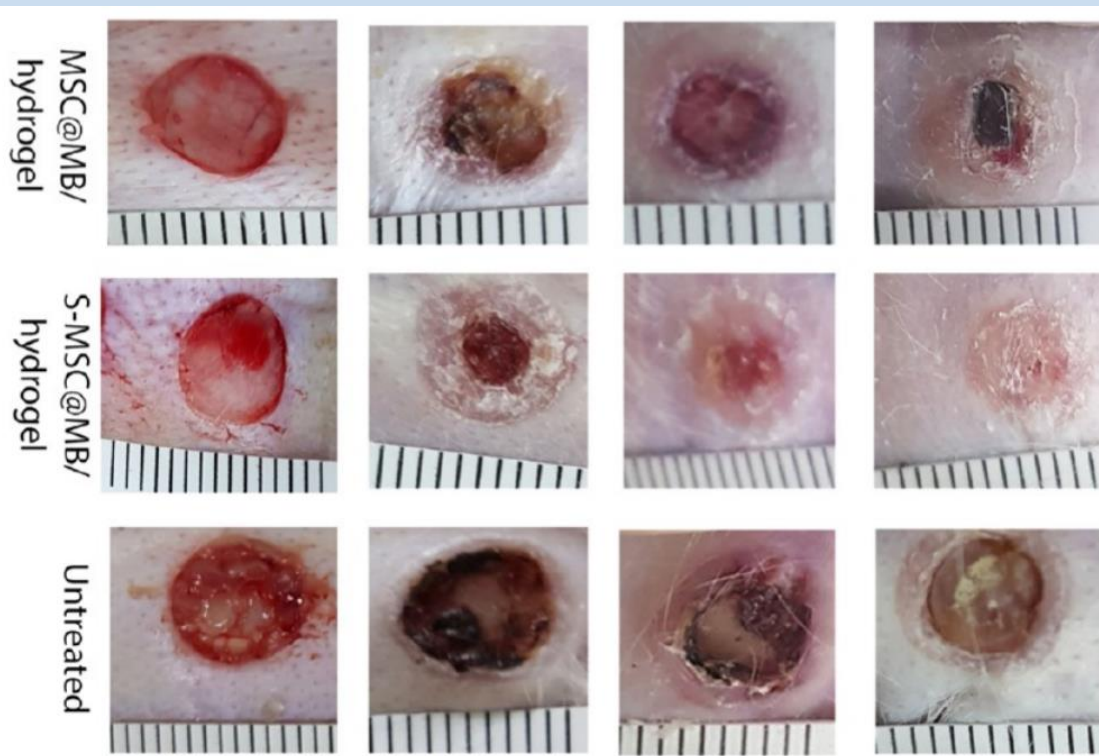




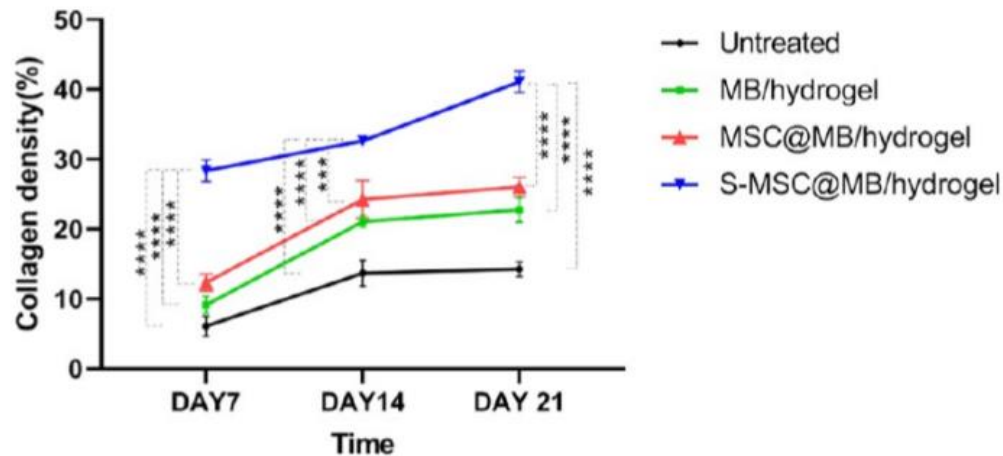
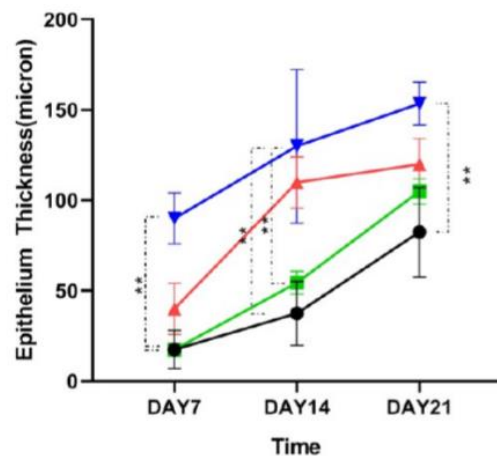
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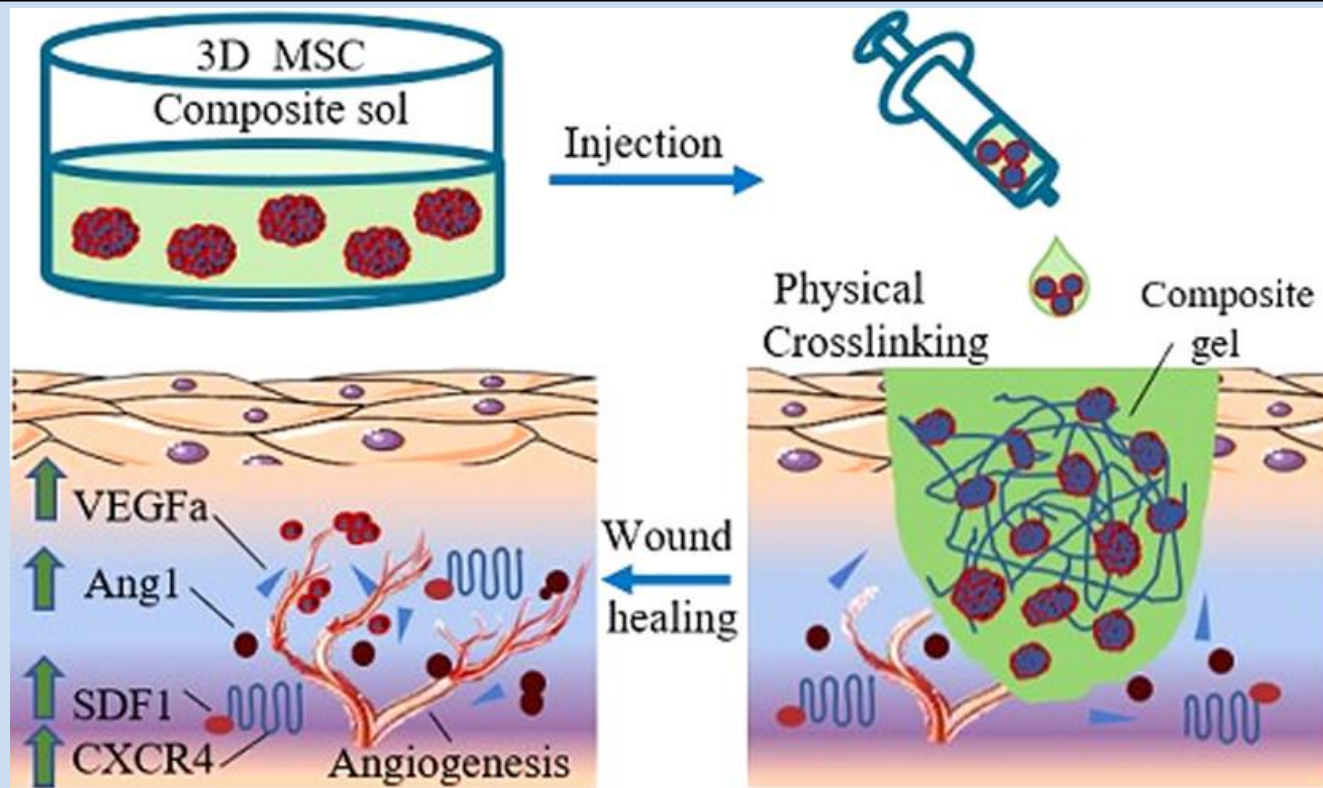
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# Mesenchymal Stem Cell Spheroids Embedded in an Injectable Thermosensitive Hydrogel: An In Situ Drug Formation Platform for Accelerated Wound Healing

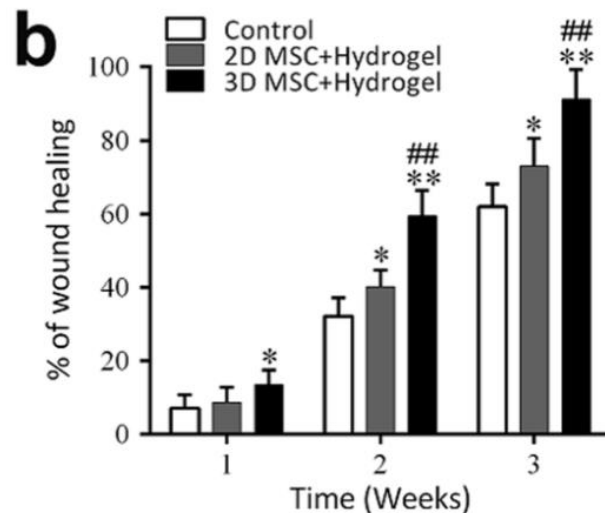
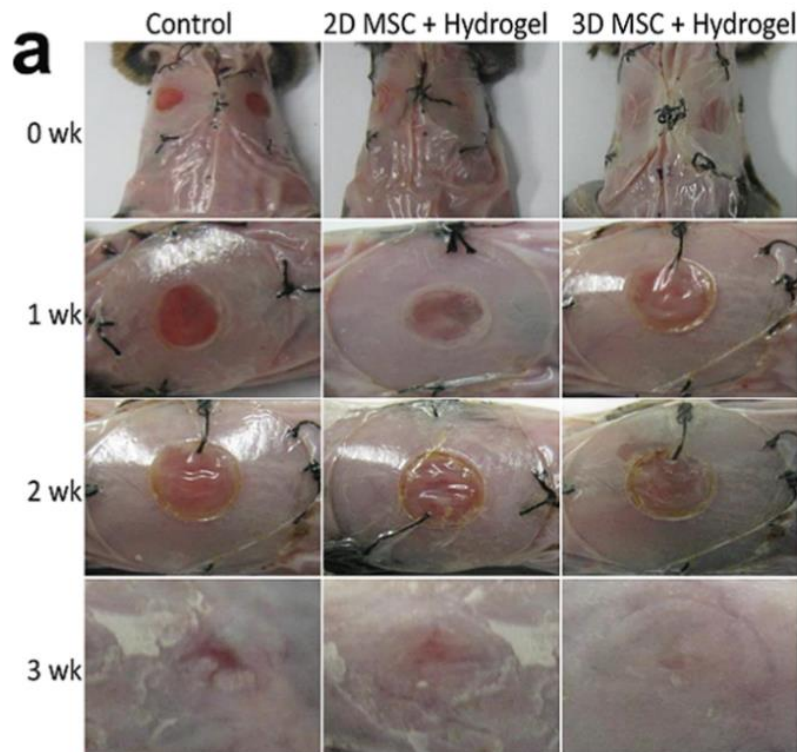


# Thermosensitive Injectable Chitosan/Collagen/ $\beta$ -Glycerophosphate Composite Hydrogels for Enhancing Wound Healing by Encapsulating Mesenchymal Stem Cell Spheroids

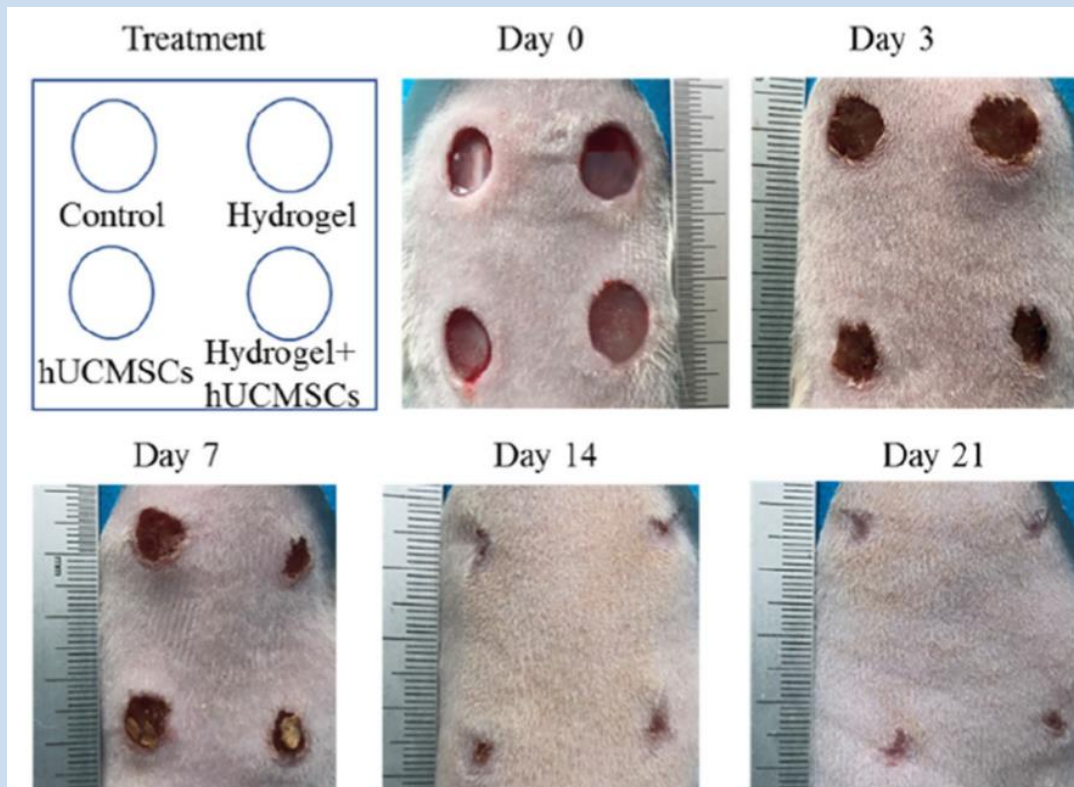




# Thermosensitive Injectable Chitosan/Collagen/ $\beta$ -Glycerophosphate Composite Hydrogels for Enhancing Wound Healing by Encapsulating Mesenchymal Stem Cell Spheroids



# Enhanced cutaneous wound healing by functional injectable thermo-sensitive chitosan-based hydrogel encapsulated human umbilical cord-mesenchymal stem cells





**Thanks for  
your  
attention**

