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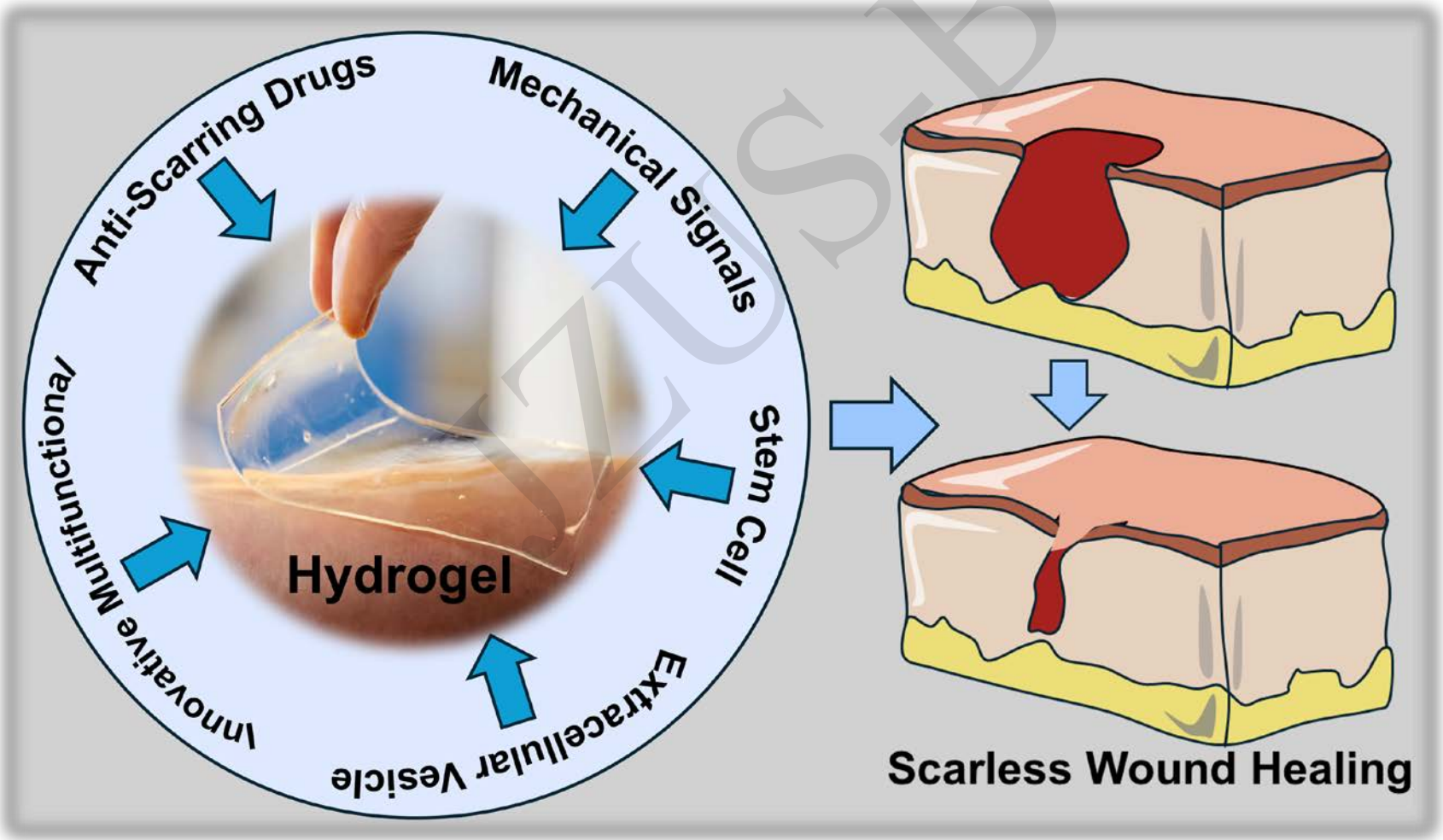
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Promoting skin regeneration: research progress on hydrogel wound dressings related to scarless healing

Key words: Hydrogel; Wound dressings; Scarless healing; Tissue regeneration; Scars

Research Summary

This review details the concept and mechanisms of scarless healing and explores the application of hydrogel dressings loaded with anti-scarring drugs, stem cells, and extracellular vesicles in scarless wound healing.



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Innovation points

1. **Photoreactive Hydrogels**: Hydrogels like HAMA/Lap that rapidly form in situ, adapt to wound shapes, and release bioactive molecules to promote scarless healing.
2. **Mechanical Signal Modulation**: Hydrogels with YAP inhibitors (e.g., Verteporfin) that reduce scar formation by inhibiting the Hippo/YAP signaling pathway.
3. **Tension-Reducing Hydrogels**: Dressings that contract at body temperature to reduce skin tension and minimize scarring.
4. **Stem Cell-Loaded Hydrogels**: Incorporating stem cells into hydrogels to enhance tissue regeneration and scarless healing.
5. **Extracellular Vesicle-Loaded Hydrogels**: Using EVs to promote wound healing and reduce scarring through controlled release.
6. **Multifunctional Hydrogels**: Combining antibacterial, anti-inflammatory, and regenerative properties in a single hydrogel system.
7. **Advanced Drug Delivery**: Hydrogels with liposomes or photo-responsive elements for precise and controlled drug release.
8. **Regeneration-Directed Artificial Skin**: DNA-based hydrogels that simulate natural skin and promote scarless healing and appendage regeneration.

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