Development and Application of a Crosslinked Gelatin Foam Dressing for Wound Recovery

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Abstract

In this study, we developed and characterized a gelatin-based foam dressing for application in the medical device field. We utilized gelatin as the substrate and prepared the dressing through foaming and freeze-drying processes. This dressing exhibited a favorable pore distribution, with an average pore size of approximately 60–70 μm, enabling efficient absorption of wound exudate and promoting wound healing. We conducted cell viability analyses on four cell lines (3T3, L929, Hs68, CG1519) exposed to the fluids released from the crosslinked gelatin foam dressing, with excellent biocompatibility demonstrated across all cell lines. In wound healing studies performed in BALB/cByJNarl mice, the crosslinked gelatin foam dressing exhibited a pronounced effect in promoting functional tissue regeneration and skin repair at the wound site. An analysis of the wound closure rate, based on wound area images acquired during dressing changes, revealed a recovery speed comparable to that observed for a commercially available dressing. Mice treated with the crosslinked gelatin foam dressing consistently demonstrated a stable wound closure rate. Pathological sections of wounds displayed regenerative tissues and epidermal layers, highlighting the wound healing efficacy of our developed dressing. Liver and kidney sections showed no presence of neutrophils or abnormal lymphocyte infiltration, indicating the absence of significant drug toxicity in mice. These findings collectively demonstrate the favorable safety profile of the crosslinked gelatin foam dressing within biological systems. Overall, the crosslinked gelatin foam dressing developed in this study shows promise for use in wound dressing applications.

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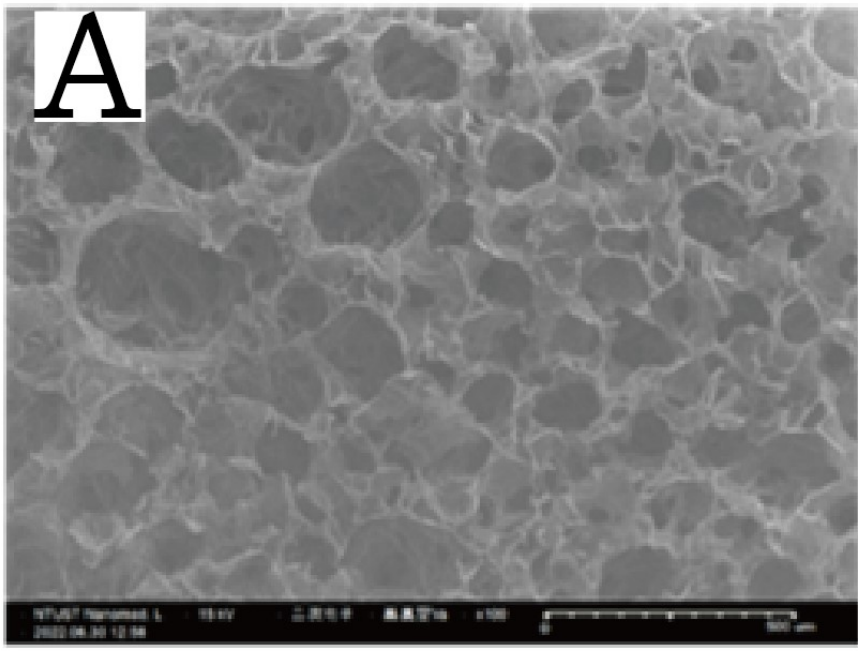

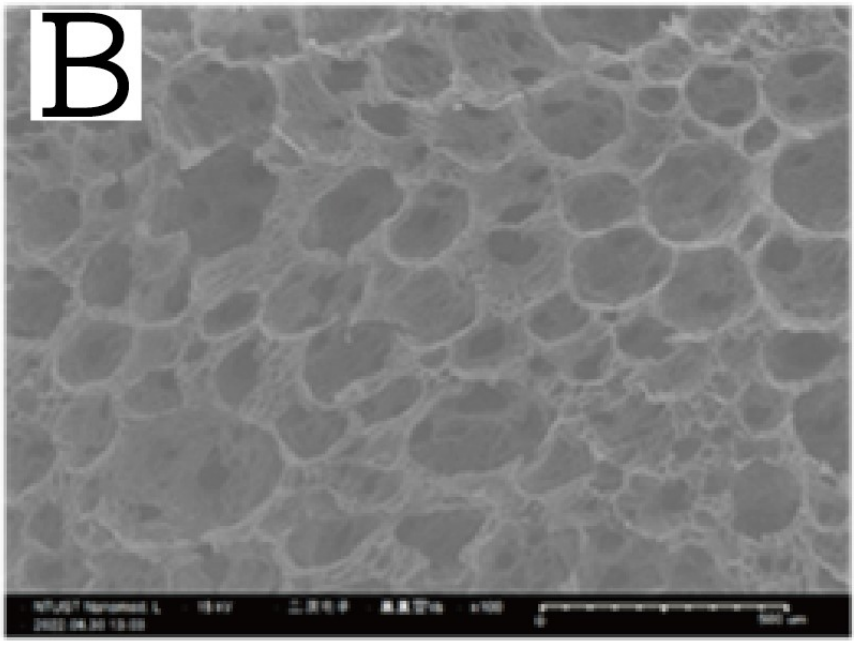

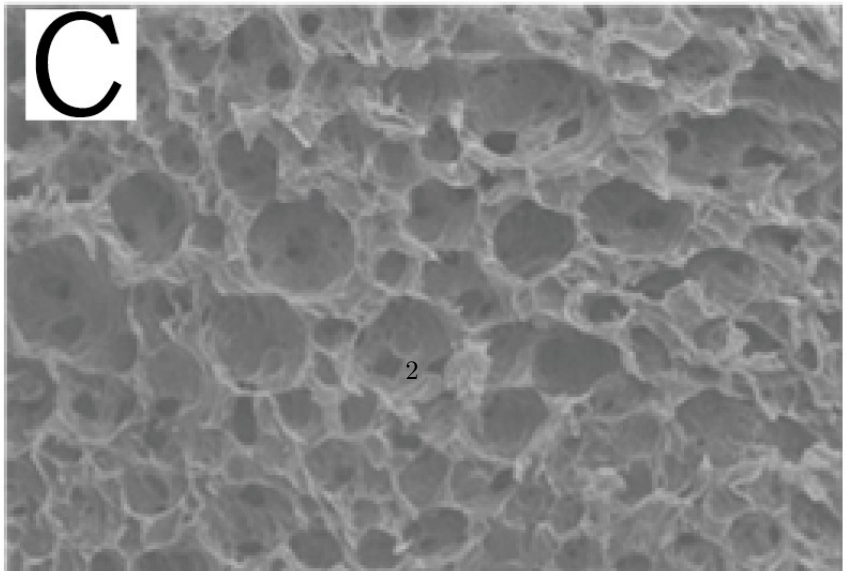

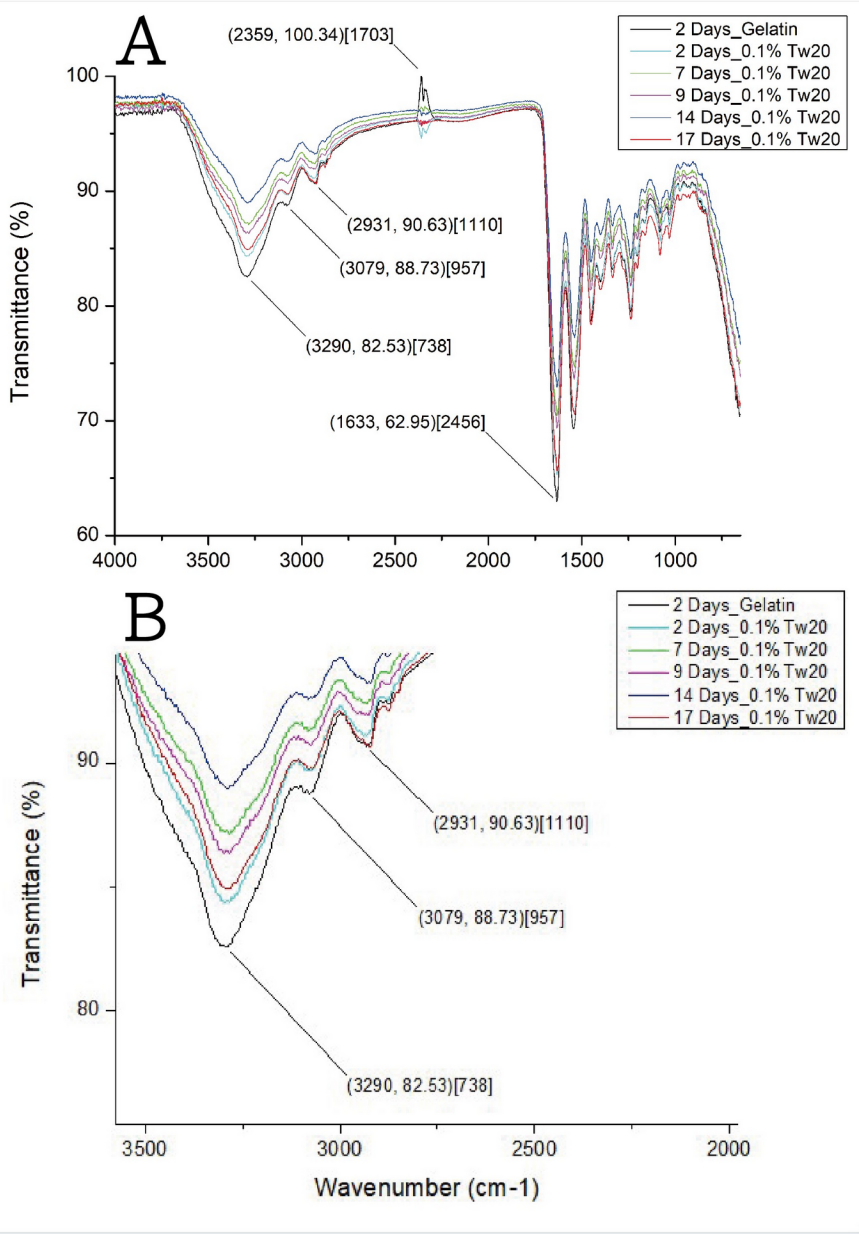

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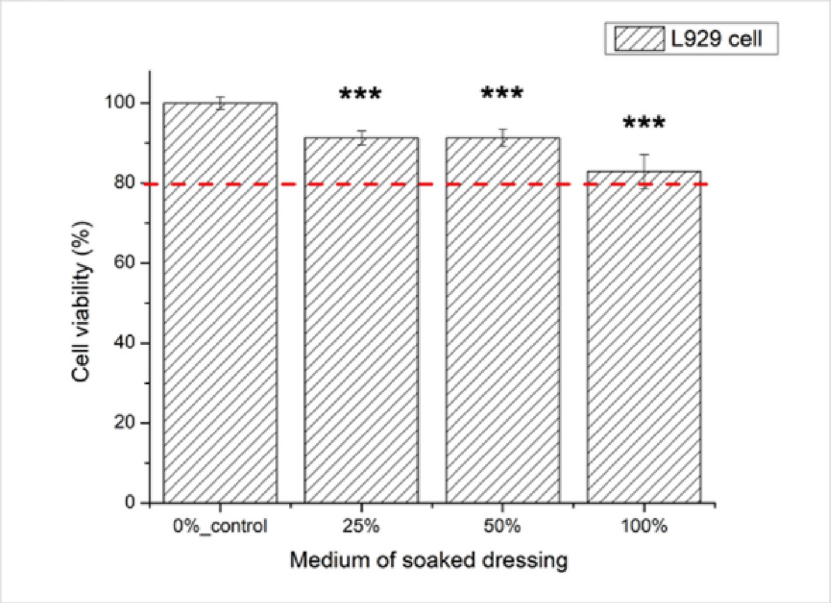

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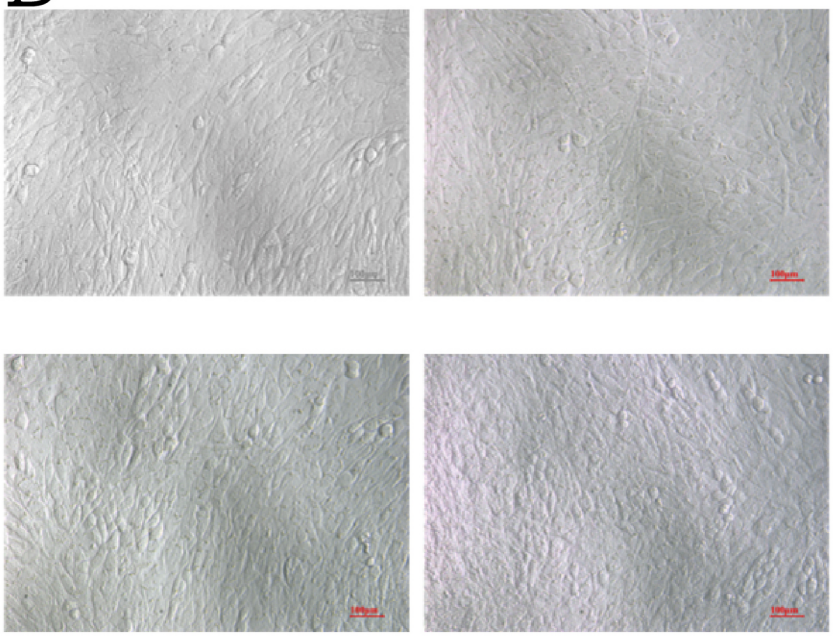

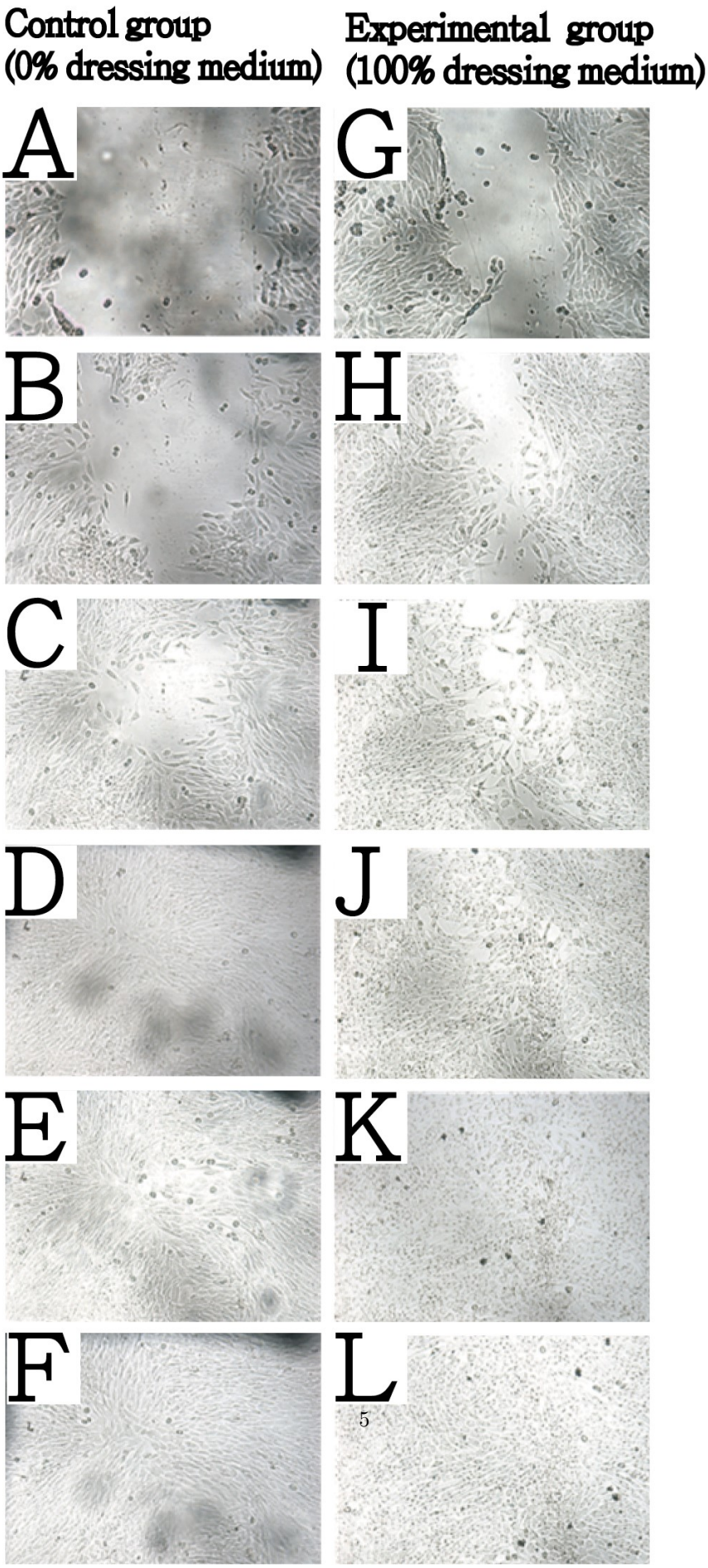

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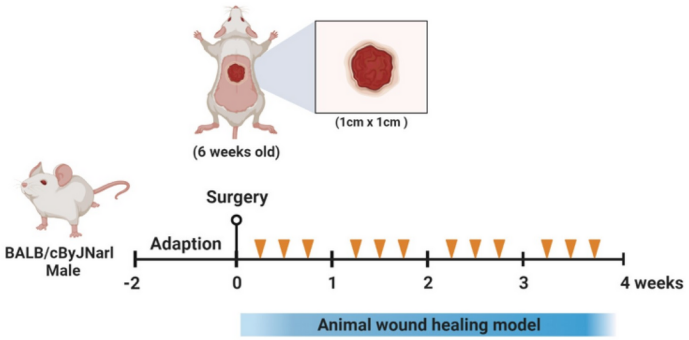

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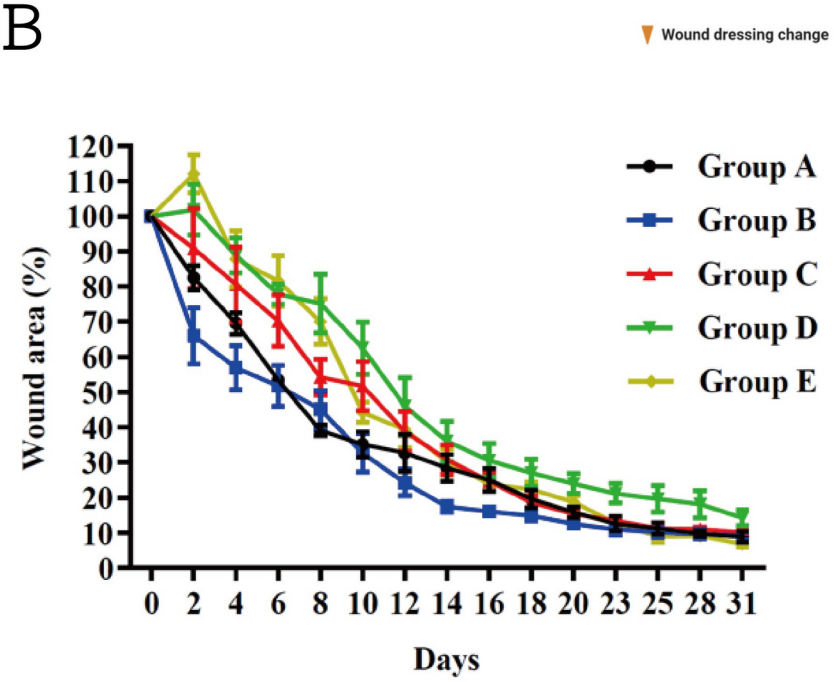

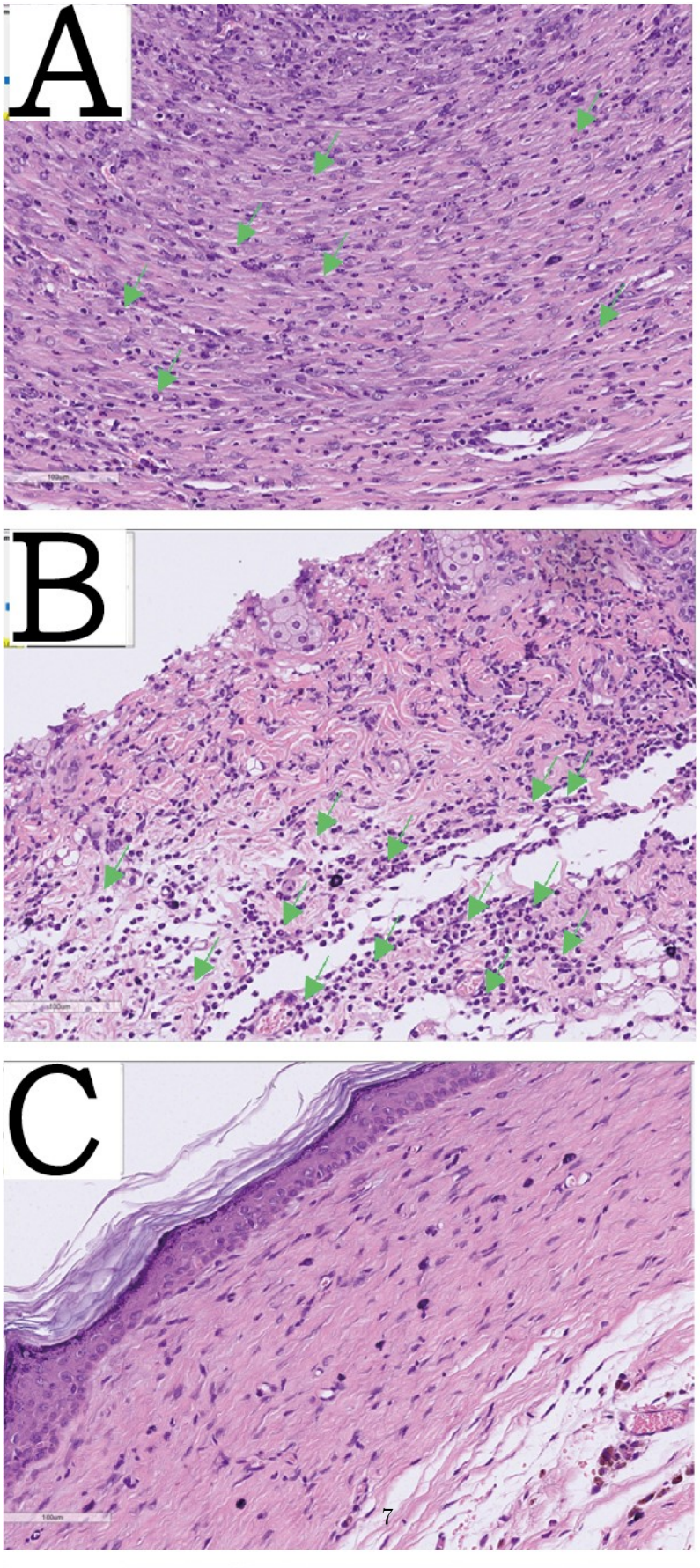

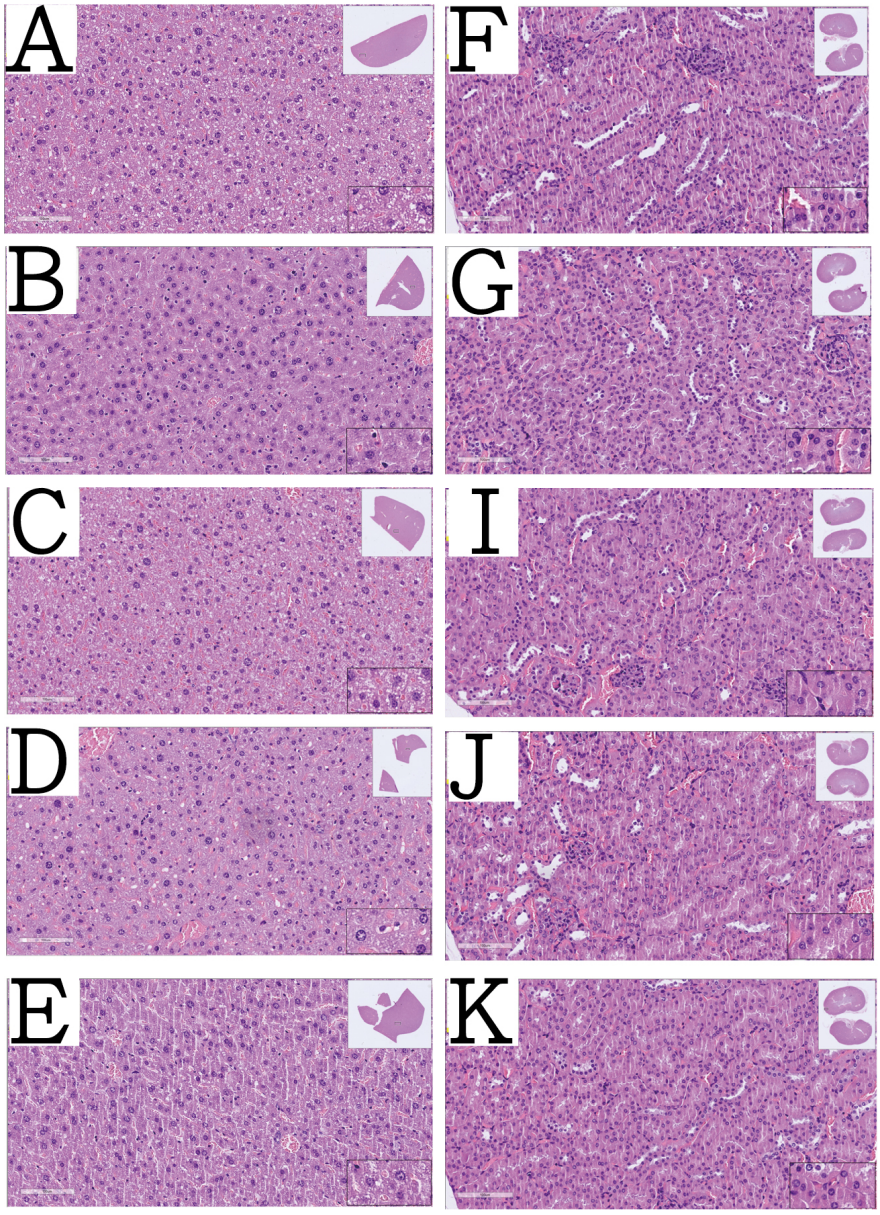

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