Injectable mineralized hydrogels for localized osteogenic and antibacterial bone regeneration

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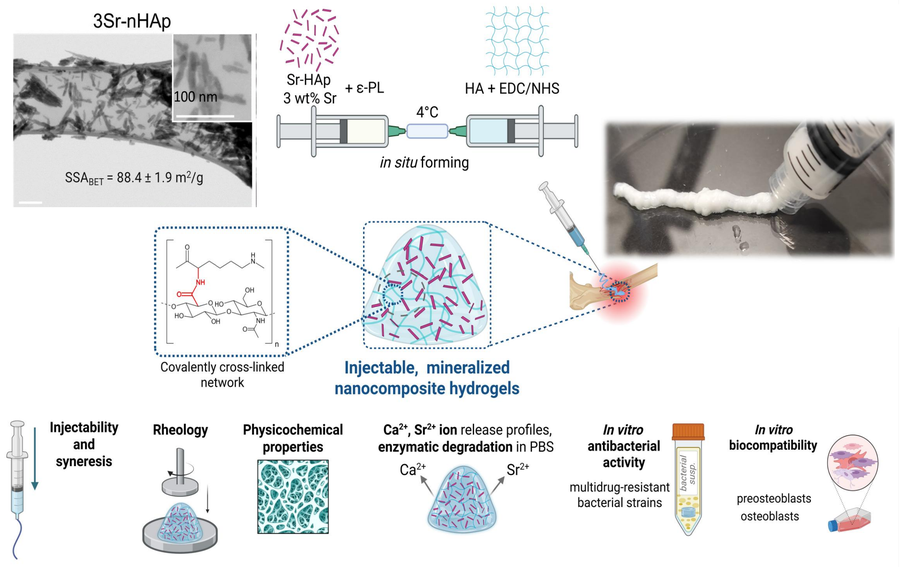
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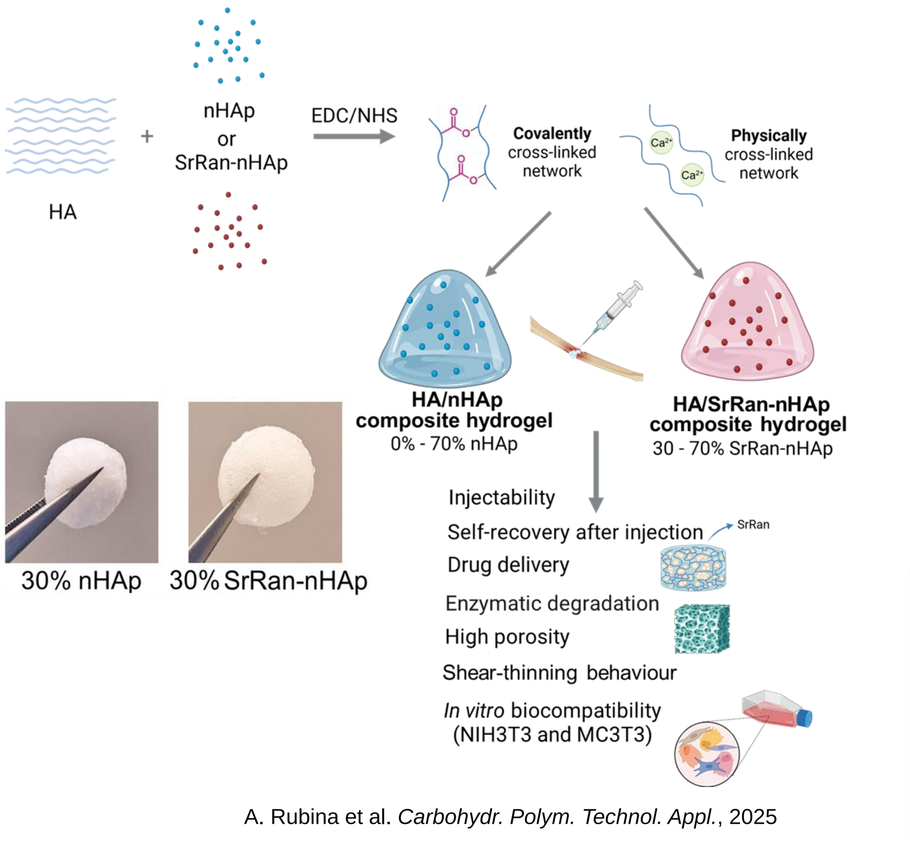
INTRODUCTION

Bone infections remain difficult to treat due to complex pathology and increasing antimicrobial resistance, which reduces the effectiveness of conventional therapies. Current bone graft substitutes are mainly osteoconductive and often rely on antibiotics, limiting long-term outcomes. To address this, we developed non-antibiotic injectable mineralized hydrogels that combine antibacterial activity with osteogenic potential for localized bone regeneration.

MATERIALS and METHODS

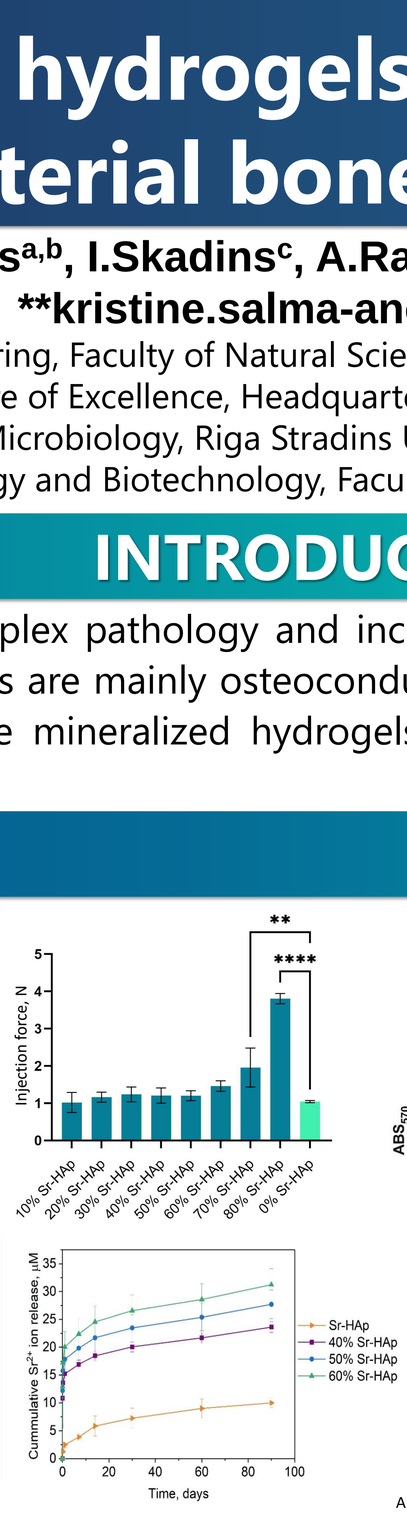


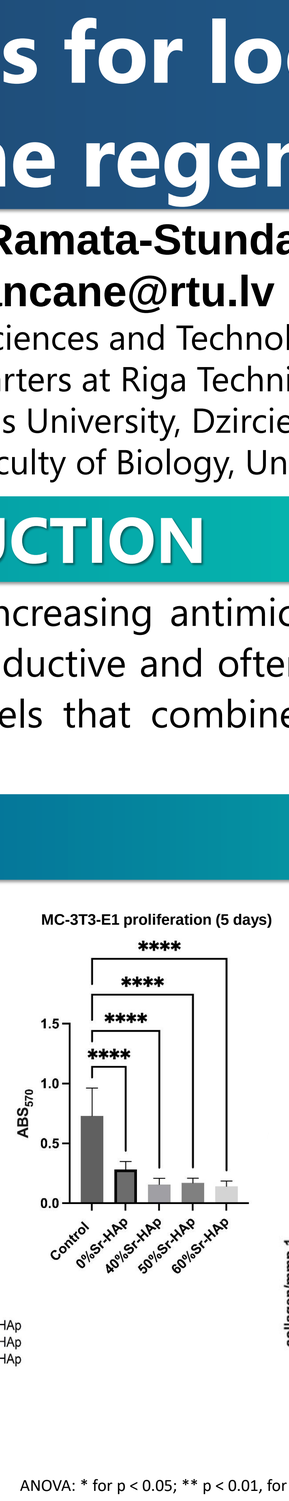
A. Rubina et al. *Int. J. Biol. Macromol.*, 2024

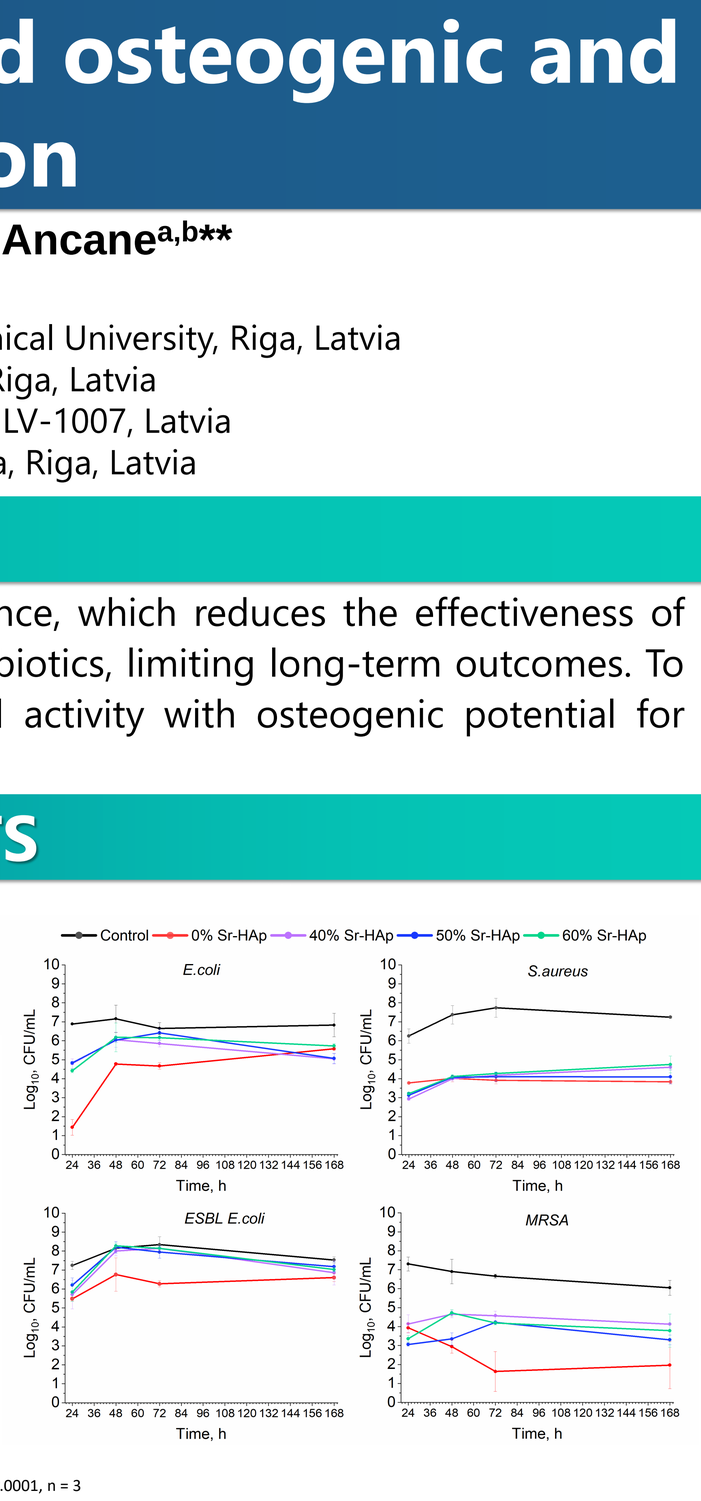


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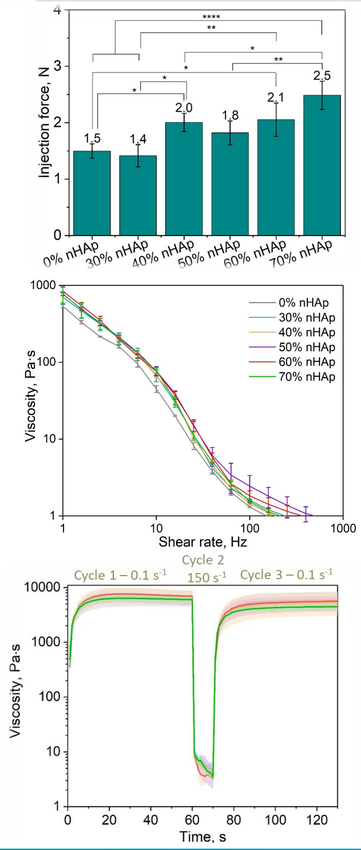
RESULTS

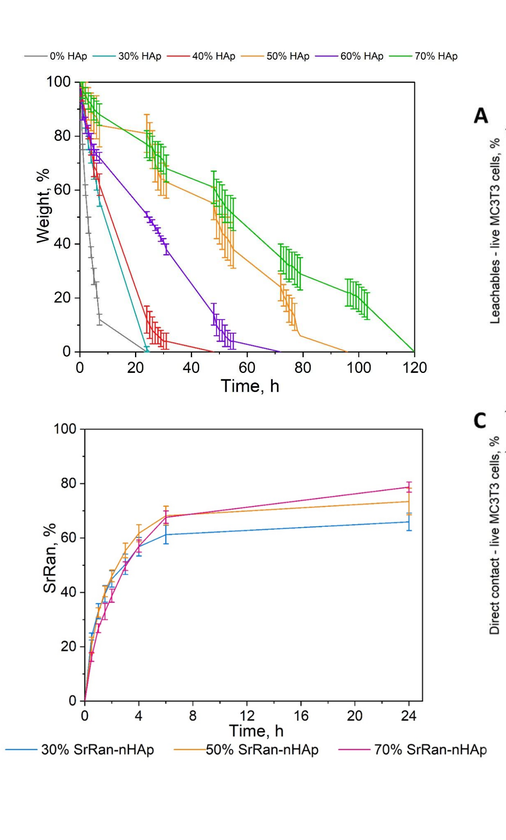


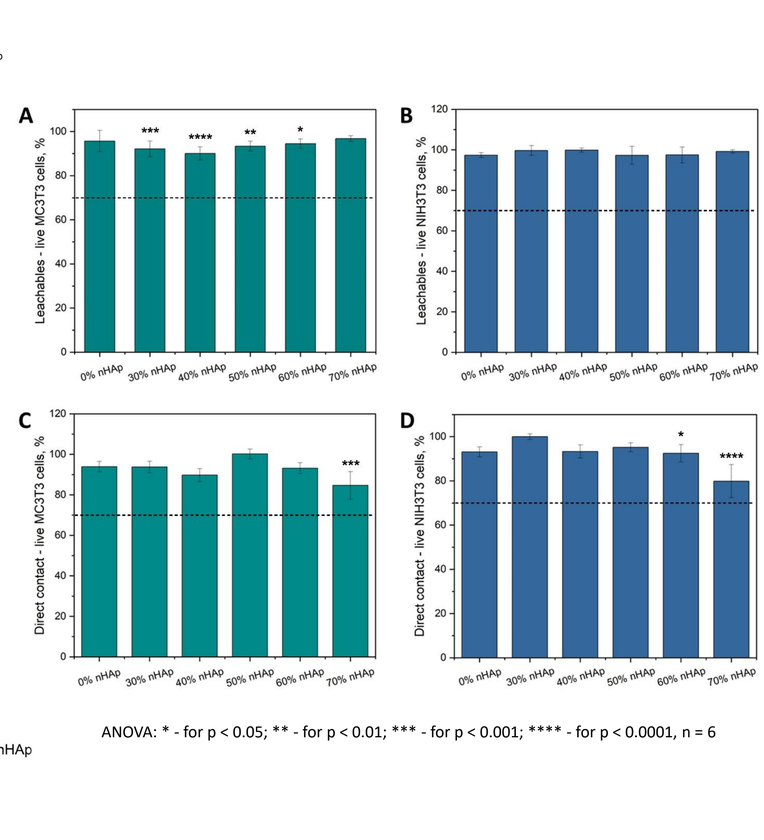




ANOVA: * for $p < 0.05$; ** $p < 0.01$, for *** - for $p < 0.001$, **** for $p < 0.0001$, n = 3







ANOVA: * - for $p < 0.05$; ** - for $p < 0.01$; *** - for $p < 0.001$; **** - for $p < 0.0001$, n = 6

CONCLUSIONS

Mineralized injectable hydrogels demonstrate consistent dual functionality, combining strong antibacterial activity against multidrug-resistant strains with preserved cytocompatibility and osteogenic potential. Incorporation of the mineral phase enables control over mechanical properties, stability, and sustained ion release, supporting bone regeneration. These results establish a robust antibiotic-free injectable platform for localized treatment of infected bone defects.

Baltic Biomaterials Centre of Excellence

Patient needs

Biomaterials development

Preclinical testing

Clinics

Industry

What are we looking for:

- New project partners
- New incoming competences
- Cooperation with other institutions
- Cooperation with industry

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