

# Improved Osteogenic Scaffolds via Incorporation of Laponite Nanoclays in Granular Suspensions

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Clays have been utilised as medicinal agents for millennia. In the last decade, Laponite® nanoclays have received widespread attention for their ability to induce osteogenesis in MSCs in 2D culture without addition of exogenous osteo-inductive factors. Simultaneously, microgel-based granular suspension have shown enormous potential in tissue engineering due to their high tunability, modularity, shear-thinning properties, and porosity. The microporous architecture of granular suspensions facilitates enhanced cell migration and spreading, making them a more suitable platform for *in vitro* osteogenic models than bulk hydrogels. This is because cell hypertrophy is a pre-requisite for osteogenesis. Though laponite-based nanocomposite bulk hydrogels exist, laponite incorporation in microgel-based 3D scaffolds has remained unexplored. In this study, we incorporated laponite nanoclays into photo-crosslinkable gelMA microgel-based granular suspensions to evaluate their osteogenic potential on laden MSCs with and without addition of osteogenic factors. We found that although mechanical properties remain unchanged, laponite significantly enhanced late-stage mineralisation in granular suspensions in the presence of osteo-inductive factors only. Furthermore, increased surface area presentation in granular suspensions allowed increased cell spreading, i.e. hypertrophy, and proliferation compared to bulk hydrogels of the same material, leading to enhanced *in vitro* osteogenesis. These findings provide crucial insights towards development of improved scaffolds for bone tissue engineering.