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Introduction

Human-derived biomaterials o er several advantages for tissue engineering applications, including excellent biocompatibility, immunocompatibility, and bioactivity. ese materials closely mimic the native tissue microenvironment, providing structural support and signaling cues that promote cellular adhesion, proliferation, and di erentiation. Moreover, human-derived biomaterials are less likely to elicit adverse immune responses or cause rejection when implanted into the body, making them attractive candidates for regenerative medicine [1,2].

Description

One of the most widely studied human-derived biomaterials in tissue engineering is Decellularized Extracellular Matrix (ECM). ECM is the natural sca old that provides structural support and biochemical cues for cells within tissues. Decellularization techniques remove cellular components while preserving the ECM's composition and architecture, creating a biomimetic sca old for tissue regeneration. Decellularized ECM has been used in various tissue engineering applications, including cardiac, musculoskeletal, and vascular tissue regeneration, demonstrating its ability to promote cell attachment, proliferation, and tissue-speci c di erentiation [3].

Another promising human-derived biomaterial is Platelet Rich Plasma (PRP), derived from the patient's own blood. PRP contains a high concentration of growth factors and cytokines that stimulate tissue repair and regeneration processes. PRP has been incorporated into sca olds or used as a bioactive coating to enhance the regenerative potential of tissue engineering constructs [4,5]. It has shown promising results in promoting wound healing, bone regeneration, and cartilage repair in preclinical and clinical studies [6].

Furthermore, cell-derived biomaterials, such as decellularized cell sheets or Extracellular Vesicles (EVs), have emerged as novel approaches for tissue engineering. Cell sheets are generated by culturing cells on thermo responsive surfaces, allowing for the noninvasive harvesting of intact cell layers rich in ECM proteins and signaling molecules [7]. Similarly, EVs, which are Nano sized membrane vesicles secreted by cells, contain bioactive cargo such as proteins, nucleic acids, and lipids that regulate cellular behavior and tissue regeneration. Cell-derived biomaterials o er the advantage of preserving the native cell-secreted ECM and bioactive molecules, making them promising candidates for tissue engineering applications [8].

Despite the signi cant advancements, challenges remain in the widespread adoption of human-derived biomaterials in tissue

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