

# **It's a Jungle Out There: Myoblasts, Matrix, and MMPs**

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## **ABSTRACT**

**Extracellular Matrix:** Mammalian skeletal muscle is notable for both its highly ordered biophysical structure and its regenerative capacity following trauma. Critical to both of these features is the specialized muscle extracellular matrix (ECM), comprising both the multiple concentric sheaths of connective tissue surrounding structural units from single myofibers to whole muscles and the dense interstitial matrix that occupies the space between them. ECM-dependent interactions affect all activities of the resident muscle stem cell population, the satellite cell, from the maintenance of quiescence and stem cell potential to the regulation of proliferation and differentiation. This review will focus on the role of the extracellular matrix in muscle regeneration, with a particular emphasis on regulation of satellite cell activity.

**Cell Invasion:** The twenty-five known matrix metalloproteases (MMPs) and their endogenous inhibitors, tissue inhibitors of metalloproteases (TIMPs), mediate cell invasion through the extracellular matrix (ECM). In a comparative 3D assay, we analyzed human and mouse satellite cells' competence to invade an artificial ECM (collagen I). We identified a single MMP that: 1) is expressed by human muscle satellite cells; 2) is induced at the mRNA/protein level by adhesion to collagen I; and 3) is necessary for invasion into a collagen I matrix. Interestingly, murine satellite cells neither express this MMP, nor invade the collagen matrix. However, exogenous human MMP-14 is not sufficient to induce invasion of a collagen matrix by murine cells, emphasizing species differences.