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Engineering growth factors to increase their affinity for the extracellular matrix in order to improve tissue regeneration

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Since the discovery of growth factors in the 1950's, safety risks and high cost have presented challenges in the translation of growth factor therapies into clinical applications. While it is known that growth factors under physiological conditions are very effective at low doses, the clinical administration of growth factorsrequires a much higher dose to promote tissue regeneration. However, these high doses, as the Food and Drug Administration has warned, are associated with risks of cancer in patients. In response to this clinical problem, we developed a platform for increasing the affinity of growth factors for the extracellular matrix (ECM) in order to create a sustained release at the injured site and prolonged receptor activation that mimics the physiological delivery of growth factors. We identified a domain from placental growth factor, (PlGF-2123-144), which has high affinity for many ECM proteinsand fused this domain to various growth factors, in particular VEGF-A, PDGF-BB, and BMP-2. We were able to show that the engineered growth factors have a high affinity for ECM proteins and that their administration at low doses exhibits better wound healing in skin and bone defects. We are now expanding this engineering concept to SDF-1α, a potent chemokine involved in the recruitment of progenitor and endothelial cells to ischemic tissues, in the context of cardiac tissue repair after myocardial infarction.

Biography

Emily C Buck is currently working as a student researcher at École Polytechnique Fédérale de Lausanne funded by the Whitaker International Program. In June 2014, she graduated from Drexel University, where she completed both her Bachelors and Masters degrees in Materials Science and Engineering though an accelerated BS/MS program. This fall, she will begin her PhD studies at McGill University where she will work towards the development of graphene hydrogels for orthopedic applications.

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