

Portland State University, Faculty Enhancement Grant
“Engineered Tissue Development & Cell Population Biomechanics”

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Abstract:

The prevalence of degenerative diseases such as osteoarthritis is substantial, affecting 20 million Americans, while the incidence is increasing with an aging population. The clinical requirements for reparative therapies of damaged tissues will also have to overcome the potentially poor intrinsic healing capacity of aging tissues. Cell and polymer scaffold combinations form a three-dimensional tissue regeneration strategy which offers the potential to engineer functional tissues. In the design and application of engineered tissues, accounting for the material dynamics includes controlling the processes of biomaterial degradation and neotissue accumulation which contribute to a time-dependent mechanical state of the resulting multiphase composite (a combination of the multiple materials). In this project, we propose to validate a mechanical bioreactor which will be used to culture the cell-biomaterial constructs in the production of new tissues. Mechanical stimulation concomitant with biological assessment will lead to a controlled production of engineered tissue equivalents. This mechanical manipulation approach also allows for the measurement of cellular biomechanics, an indicator of cellular health. A Faculty Enhancement Grant is requested to support a pilot study characterizing a bioreactor supplied through a new, but financially limited, research subcontract. The resulting preliminary data will then be used to leverage additional federal funding which will in turn foster an ongoing bioengineering research effort.