Adipose Stem Cell Culture Efficacy on Graphene-Polymer Composite Substrates by Nidhi V Suthar

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It is hypothesized that graphene can influence stem cell attachment, proliferation, and differentiation towards osteoblasts. This property is highly desirable since it may promote faster healing and reconstructions of bone defects.

In addition, graphene polymer composites can facilitate cell growth and differentiation of the cells depending on specific cell-to-substrate stiffness interaction. An attractive of these types of composites is that the graphene material properties can be tailored with polymers to yield scaffold properties can be tailored with polymers to yield scaffold properties desirable for tissue engineering, while at the same time retain high strength, which is important for musculoskeletal application.

While graphene-polymer composites are promising for tissue engineering, there are nonetheless concerns about its toxicity. In this research, canine adipose-derived mesenchymal stem cells were seeded on a Graphene-polymer (biodegradable poly-L-lactic acid/PLA) composite scaffold to test for viability and proliferation.

Our results show that both Graphene-PLA composite and PLA-only scaffolds had lower viability and proliferation than the control. The viability was 95.7%, 54.4% and 79.4%, respectively for control, Graphene-PLA and PLA. Similarly, the cell growth or the proliferation was 106.9%, -59.6% and -35.1% for control, Graphene-PLA and PLA, respectively, which indicated loss of proliferation for both the composite and PLA-only groups.

It can be concluded that at present both graphene-PLA and PLA-only that we utilized may contain cytotoxicity components that compromised cell viability and growth. Care in raw materials selection is thus needed to ensure that these materials have undergone processing to evacuate potentially harmful substance to living cells and tissues. Additionally, more comprehensive sterilization (e.g. ethylene oxide gas) of raw materials can be added to the protocol to minimize cytotoxicity effects. Implementation of these precaution is currently being incorporated into on-going investigation in our laboratory.