# Production of Graphene Reinforced Polymeric Tissue Scaffolds for Neural Tissue Engineering

Gizem COŞAR, Adil ALLAHVERDİYEV, Melahat BAĞIROVA, Emrah ŞEFİK ABAMOR
*Yildiz Technical University, Department of Bioengineering, Istanbul, Turkey*
*E-mail :*
*gzm.cosar@gmail.com*

Neurodegenerative diseases increase with aging populations in the world and have started to become a major social problem [1]. In recent years, developments in nanotechnology has led to new hope with desirable effects on biological structures. In the 21. Century, graphene is called as a miraculous material and its importance increasing due to the superior electrical characteristics for nerve tissue engineering near ability of promoting adhesion, proliferation, and differentiation of cell cultures. Particularly high electrical conductivity has a key role in the transmission of neural signal processing [2,3]. Up to our knowledge, studies have examined the neural differentiation of MSCs obtained from different sources on graphene containing PCL scaffolds. However, we could not find a study that used the olfactory bulb derived neural stem cells (OBNSCs) in order to develop new tissue engineering product base on graphene containing 3D PCL scaffolds in the literature.

In this study, the differentiation of OBNSCs to nerve cells investigated on graphene reinforced 3D PCL scaffolds. Produced scaffolds were characterized with SEM analysis and neural differentiation capacity of OBNSCs that are seeded on the material were examined with microscopic, flow cytometric, histochemical and biochemical methods.

**References**

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[2] Vashist, Sandeep Kumar, and John HT Luong. "Recent advances in electrochemical biosensing schemes using graphene and graphene-based nanocomposites." *Carbon* 84 (2015): 519-550.

[3] Shah, Shreyas, et al. "Guiding Stem Cell Differentiation into Oligodendrocytes Using Graphene–Nanofiber Hybrid Scaffolds." *Advanced materials* 26.22 (2014): 3673-3680.

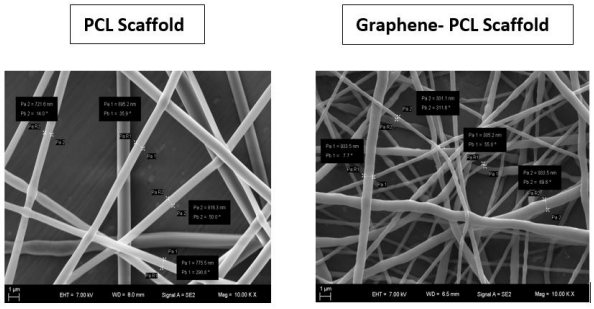


Figure 1: SEM micrographs of PCL scaffold and graphene-PCL scaffold.

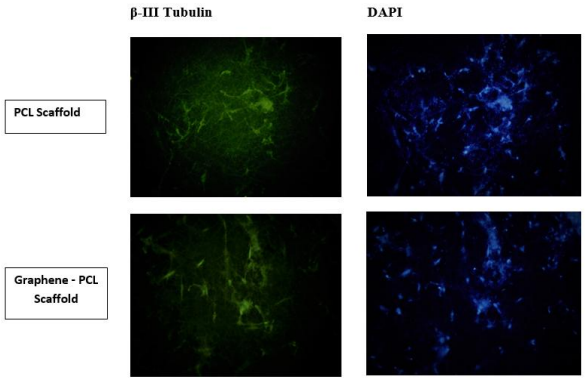


Figure 2: β-III Tubulin and DAPI staining of OBNSCs scaffold cultures after one week differentiation.

The results showed that OBNSCs on the graphene reinforced 3D PCL scaffolds were more proliferated and exhibited faster neural cell lineage differentiation in one week when compared with 3D PCL scaffolds.

In conclusion, developed graphene-PCL 3D scaffolds can be considered as suitable

material for their use in treatment of nerve damage related diseases in the future.