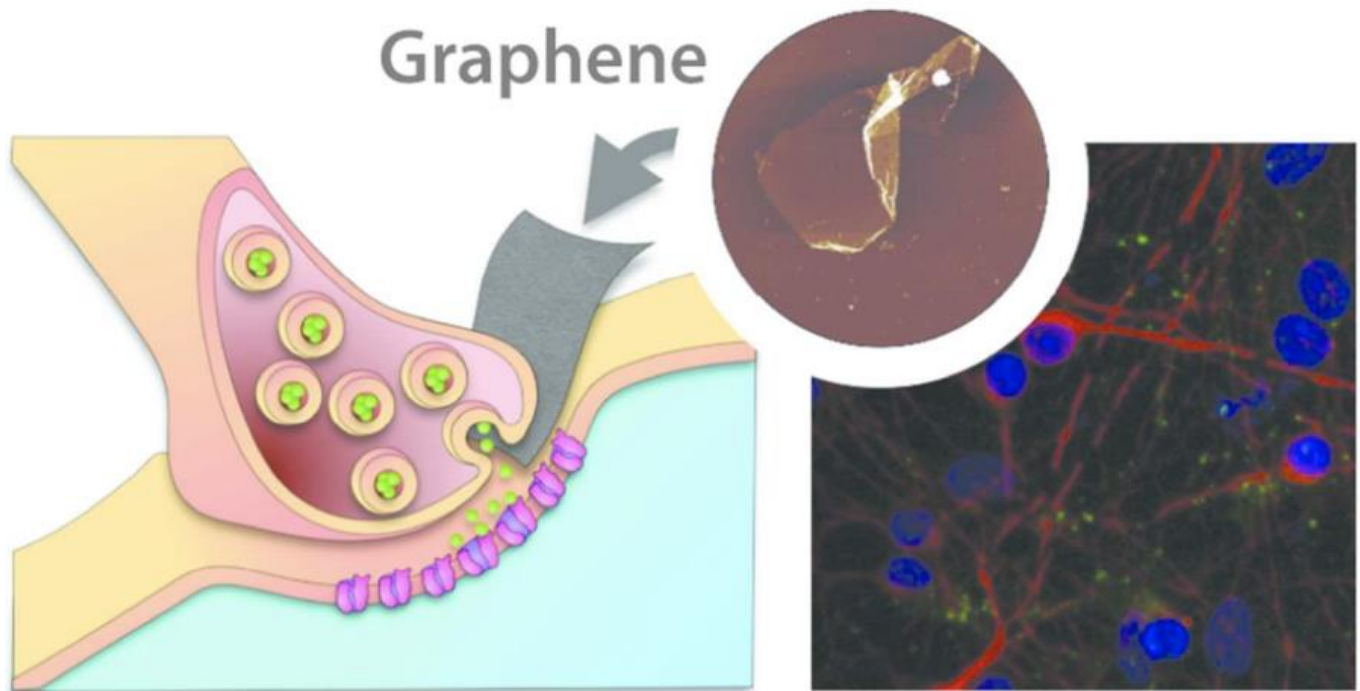


Interaction of graphene oxide with brain cells

July 13, 2021 [mikandersen](#) 3 comments



Reference

- Rauti, R.; Lozano, N.; Leon, V.; Scaini, D.; Musto, M.; Rago, I.; Ballerini, L. (2016). Graphene Oxide Nanosheets Reshape Synaptic Function in Cultured Brain Networks = Graphene Oxide Nanosheets Reshape Synaptic Function in Cultured Brain Networks. ACS Nano, 10(4), p. 4459-4471. <https://doi.org/10.1021/acsnano.6b00130>

Facts

- The authors conclude that the larger graphene oxide flakes used in their brain cell experiment were unequivocally cytotoxic and harmful.
- Another important statement is that to date (2016), the reaction of glial cells to graphene oxide « GO » had not been studied, which means that it is a very recent, experimental line of research.
- Experiments carried out on brain cell cultures showed obvious problems with cell death, raising concerns about the safety and nanotoxicity of the material. In fact, the following is reported: « 6 days of exposure of cultures to equal amounts of dispersed GO induced an unequivocal loss of hippocampal cells, both neuroglia and neurons, thus hindering any further evaluation of membrane/flake interactions ». In fact, other researchers (Mendonça, MCP; Soares, ES; de Jesus, MB; Ceragioli, HJ; Batista, Â.G.; Nyúl-Tóth, Á.; da Cruz-Hofling, MA 2016) reach the same conclusion, even if the GO is covered with a protective layer of Polyethylene Glycol, also known as PEG (Polyethylene glycol), referring to the following «*PEGylation of nanomaterials and therapeutics is currently considered one of the most promising approaches to reduce toxicity and obtain favorable pharmacokinetic results. However, deleterious effects and death have been observed in different types of cells treated with PEGylated nanoparticles, mainly through the induction of oxidative stress, which corroborated the results of the present experimental design*».
- The researchers noted that the ability to damage brain cells could be used in the field of neuropharmacology in cases where it is desired to reduce or modulate the synaptic capacity of the brain. This is so due to the properties of GO to regulate glutamate, which is a neurotransmitter necessary for the regulation of brain synaptic activity.

- The authors reach the conclusion that the shape of the graphene nanoparticles, their physical-chemical characterization, geometry and properties largely determine the possibilities of applying graphene in biology.

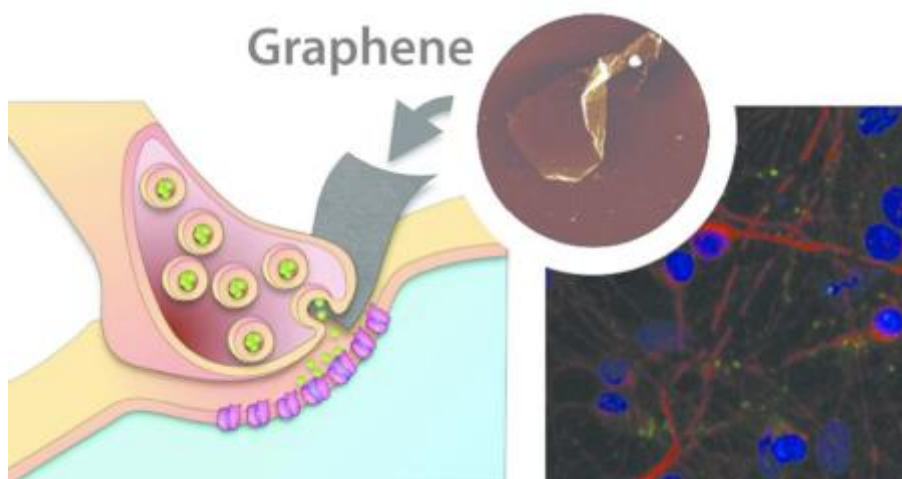


Fig.1. Graphene oxide nanosheets interacting with neurons in the brain. (Rauti, R.; Lozano, N.; León, V.; Scaini, D.; Musto, M.; Rago, I.; Ballerini, L. 2016)

Opinions

- Graphene oxide GO can be neurotoxic, depending on the size of the graphene particles or flakes, their geometry and physical-chemical properties, as indicated by the researchers, as well as their degree of saturation in applications. The authors acknowledge the concern and dangers of using these types of materials.
- A vaccine with graphene oxide GO is potentially dangerous for brain tissues, since it could cause the loss of cells in the hippocampus and neurons, hypothetically causing neurodegenerative diseases.

Bibliography

1. Mendonca, MCP; Soares, ES; de Jesus, MB; Ceragioli, H. J.; Batista, Â.G.; Nyúl-Tóth, Á.; da Cruz-Hofling, MA (2016). PEGylation of Reduced Graphene Oxide Induces Toxicity in Cells of the Blood–Brain Barrier: An in Vitro and in Vivo Study. *Molecular Pharmaceutics*, 13(11), p. 3913-3924. <https://doi.org/10.1021/acs.molpharmaceut.6b00696>
2. Rauti, R.; Lozano, N.; Leon, V.; Scaini, D.; Musto, M.; Rago, I.; Ballerini, L. (2016). Graphene Oxide Nanosheets Reshape Synaptic Function in Cultured Brain Networks = Graphene Oxide Nanosheets Reshape Synaptic Function in Cultured Brain Networks. *ACS Nano*, 10(4), p. 4459-4471. <https://doi.org/10.1021/acsnano.6b00130>