Graphene oxide interaction with model and cell membranes

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The evaluation of toxicity for the proper use of graphene oxide (GO) in biomedical applications involving intravenous injections is crucial but the GO circulation time and blood interactions are largely unknown. It is thought that GO may cause physical disruption of red blood cells (RBC), haemolysis. The aim of this work is to characterize the interaction of GO with model membranes and use this knowledge to improve the haemocompatibility of GO with human RBC. We have shown that GO interacts with both, neutral and negatively-charged lipid membranes; binding is decreased beyond a certain concentration of negatively-charged lipids, and favored in high-salt buffers. After this binding occurs, some vesicles remain intact, while others are disrupted and spread over the GO surface. Neutral membrane vesicles tend to break down and extend over the GO, while vesicles with negatively-charged membranes are mainly bound to the GO without disruption. GO also interacts with RBC, and causes haemolysis in human RBC; haemolysis is decreased when GO is coated with lipid membranes, particularly with pure PC vesicles.