Application of Medicinal Chemistry for non-covalent functionalisation of graphene nanomaterials: potential application in screening 'drug-graphene' interactions and tracking drug delivery.

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Abstract (300 word limit)

Graphene is a two-dimensional nanomaterial, whose unique morphological, mechanical, electrical and chemical properties offer tremendous potential for applications in biomedicine [1, 2] ranging from possible use in biosensors, molecular diagnostics and prosthetics to implants and drug delivery. However, realising the full potential of graphene is blocked by poor understanding of the nature and detail of its noncovalent interactions with biological molecules and by inability to prepare pristine graphene without use of chemicals (organic solvents, surfactants) and their graphene modifications (oxidants) toxic to biology [2]. Our research aims to understand the structural features of molecules vital for avid and reversible interactions with graphene, to establish design criteria both to produce graphene in biocompatible dispersions and to use graphene to deliver drugs and regenerate tissue. This is achieved by identifying the principal mechanisms and structural rules underlying aromatic interactions of molecules with the graphene monolayer. An analytical, biophysical, and computational chemistry along with NMR spectroscopy will be combined to characterise the structure, stability, and dynamics of aromatic interactions with graphene [3-5]) involved in almost all its bimolecular interactions (with drugs, peptide, nucleic acids). Our research project offers an interdisciplinary environment at the interface of molecular delivery, biophysics, analytical and computational chemistry (e.g., molecular simulation and quantum mechanical calculations) with biomedical science.

References:

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Photograph



Biography (150 word limit)

Budoor Al Umairi is currently a PhD student at university of Manchester, under the supervision of Dr. Elena Bichenkova and Prof. David Clark. Her research interest in her PhD study focused in the potential application in screening `drug-graphene` interactions and tracking drug delivery. She received her Bachelor's in chemistry from Sultan Qaboos University, and her master in Drug Discovery and Medicinal Chemistry, from University of Birmingham. In her master research study Budoor investigated the interaction and the therapeutic efficacy between Graphene Oxide (GO) and anticancer drugs in vitro in 2D monolayer cell culture and in multicellular tumour spheroids (MCS). Before her PhD, Budoor worked as lecturer in college of science at Sultan Qaboos University (2012-2018).

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Notes/Comment