Project: Correlative 3D Cryo-Imaging of Microorganisms for Understanding Anti-Microbial Agents

University: Imperial College London
Supervisor: Prof Alexandra Porter (a.porter@imperial.ac.uk)
Industry partner: P&G

Abstract: With the continuing COVID-19 global outbreak, disruptive research is needed to develop novel formulations that give the surfaces in your home, work and public places fast-acting protection, preventing the spread and growth of pathogens. Fast action requires finding the right combination of antimicrobial agents (AMA) that delivers multi-pronged attack on the cells. This research will employ high spatiotemporal correlative 3D cryo-imaging to understand how individual AMA affect the cell and to identify the best combination for fast kill. Cryo-FIB/SEM/TEM at Imperial and at the electron BioImaging Centre (eBIC) and cryo-Soft X-ray Tomography (SXT)/cryo-Structure Illumination Microscopy (SIM) at Diamond Light Source will be employed to understand how AMA:

a) Disrupts the cell wall/membrane via peroxidation, lipid plasticisation, chelation of multivalent cations
b) Denatures/destroys the cytoplasmic components (proteins, cytoskeleton, DNA, RNA)
c) Leads to resistance by producing chemicals/structures
d) Kinetics of action via time lapse cryo imaging

P&G is world leader in the sector and partnership with Imperial's AMC CDT will result in profound impact in the development and manufacturing of fast-acting disinfectant formulations. This project will also deliver significant scientific, societal, and economic impact, both from the fundamental understanding of cell-AMA interaction and from the use of the insights gained for the development of new technologies with outstanding antimicrobial properties across sectors e.g. pharmaceutical, agrichemicals, paint and food industries. This programme will offer excellent training opportunities to the PhD student to become "future formulators" based on fundamental science, collaborating across academic and industrial R&D.