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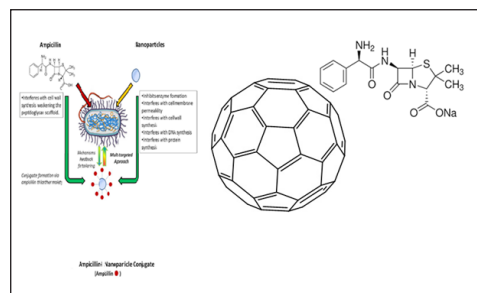
Next generation nano-enabled antibiotics

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The objective of was to design, synthesize and tailor a nanoparticle-antibiotic conjugate capable of a multi-targeted approach to MDR pathogenic bacterial infections. Post-synthesis the mechanisms of interaction between the conjugate and the bacteria will be elucidated, to allow for refinement and optimization of the multi-targeted approach. This work developed new methodologies and standards for testing the antimicrobial properties of novel nanomaterials. The design and characterization of a novel coordination complex between Buckminsterfullerene (C₆₀) and Ampicillin (AMP) was conducted. The resulting complex was characterized via Ultraviolet-Visible Light Spectroscopy (UV/Vis), Infrared Spectroscopy (IR), Raman spectroscopy, Dynamic Light Spectroscopy (DLS), Scanning Electron Microscopy (SEM) and Zeta potentiometric analysis. The antimicrobial capability of the complex was tested against 15 isolates of *Escherichia coli*, 10 Multi Drug Resistant (MDR) and 5 reference strains. Minimal Inhibitory Concentrations (MIC) was established, using the ampicillin as a reference. The presence of π electrons of the fullerenes and those of the phenyl ring of ampicillin results in π - π stacking which forms a stable C₆₀-AMP complex. This was verified by the spectroscopic techniques. The antimicrobial capability of the complex was also tested against all 15 isolates. The C₆₀-AMP complex also reduced the quantity of antibiotic required to inhibit bacterial growth by 25% for the reference strains as compared to the ampicillin only. The complexes synthesized both acted as more efficient antibiotic delivery systems. However, no effect was observed in the MDR isolates.



Biography

Martin Quirke has B.Sc. in Science and Nanotechnology majoring in Physics at Dublin Institute of Technology. His focus of study is the antimicrobial capabilities of water stable C60 fullerenes and whether they can act as a viable drug delivery system to treat pathogenic MDR bacteria, such as *E. coli* and MRSA. He is currently pursuing his PhD studies.

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