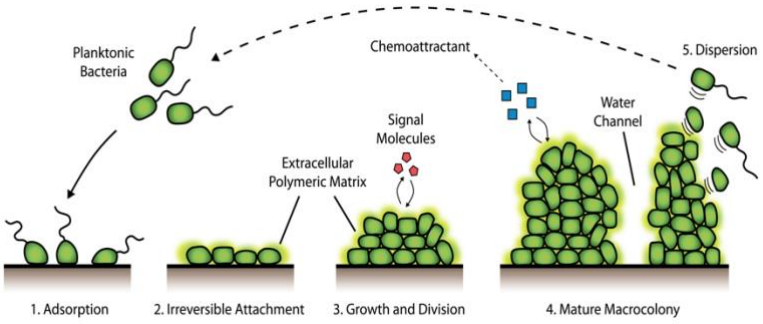
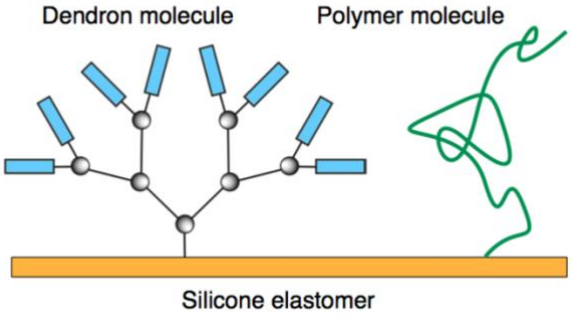
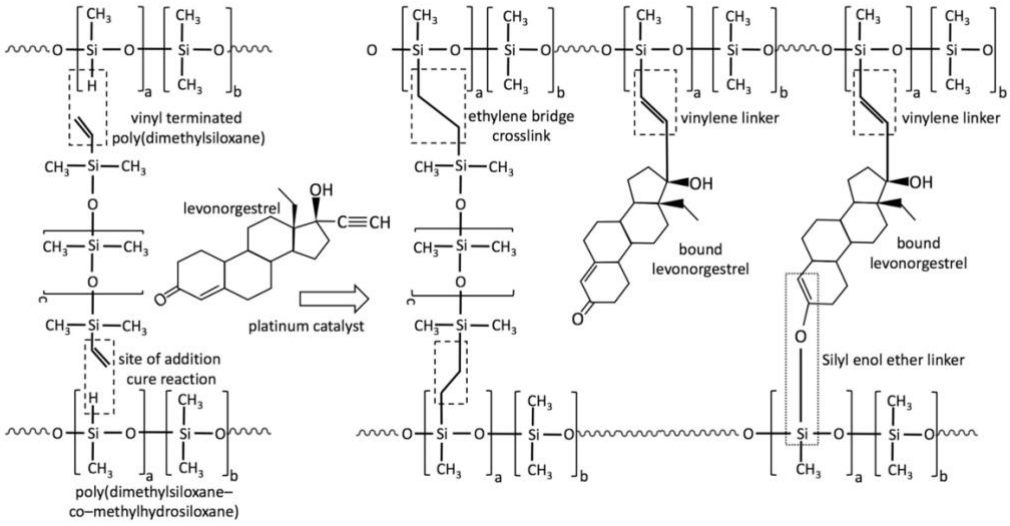
***Title of studentship**	Surface-modified silicone elastomer for medical and drug delivery devices with reduced bacterial adherence and biofilm formation
Value / what is covered?	
Awarding body	
Number of studentships	
***Summary descriptive text / Example of research project**	All implanted medical devices, including those fabricated from silicone elastomers, are susceptible colonisation with communities of microorganisms that colonise the surface of the device and rapidly establish biofilm populations. This has serious consequences for the patient, as it is a prelude to both clinical infection, and device failure. Critically, at least half of all cases of hospital-acquired infections (HAIs) are associated with the use of implanted medical devices.  The stages in bacterial biofilm formation Numerous strategies have been investigated, with limited success, for reducing bacterial adherence and biofilm formation at the surface of polymeric drug delivery and medical devices. In this project, we aim to exploit our detailed understanding of the chemistry of silicone elastomers to develop a new method for grafting protective molecules to the surface of pre-fabricated medical and drug delivery devices to reduce bacterial adherence and biofilm formation when inserted *in vivo*. We have previously reported that drug molecules having certain chemical functional groups are able to chemically and irreversibly bind to the most common type of silicone elastomer (known as an addition-cure silicone elastomer). Briefly, drugs with certain unsaturated moieties are able to react with the highly reactive hydrosilane groups contained in the silicone elastomer, in competition with the normal silicone elastomer crosslinking reaction. This reaction is a hindrance to drug product development, since the bound drug can no longer be released from the device.

	However, it may be possible to exploit this reaction to purposefully attach modifying groups to the surface of silicone elastomer devices. In particular, this may prove a viable and practical strategy for modifying the surface of the device in order to reduce bacterial biofilm formation. A particularly interesting concept would involve the grafting of specially-functionalised polymers and dendron molecules to the silicone elastomer surface in a bid to significantly modify the surface characteristics of the silicone elastomer and to create an effective barrier to incoming proteins and microorganisms, with the aim of developing materials offering resistance to bacterial attachment and subsequent biofilm formation.  The cross-disciplinary project will provide an excellent opportunity for extensive training in a diverse range of scientific disciplines, including basic chemistry, polymer science, microbiology, advanced analytical methods and medical device fabrication. 
***Supervisor(s)**	Prof. Karl Malcolm and Dr. Louise Carson
***Eligibility / residence Status**	
Country	Northern Ireland
***Start date and duration**	1 October 2020

***Faculty**	MHLS
***Research centre / School**	Pharmacy
Subject area	drug delivery; medical device; drug formulation; silicone elastomer; biofilm formation;
Candidate requirements / Key skills required for the post	Applicants should have a 1st or 2.1 honours degree (or equivalent) in a relevant subject. Relevant subjects include Pharmacy, Molecular Biology, Pharmaceutical Sciences, Biochemistry, Biological/Biomedical Sciences, Chemistry, Engineering, or a closely related discipline. Students who have a 2.2 honours degree and a Master's degree may also be considered, but the School reserves the right to shortlist for interview only those applicants who have demonstrated high academic attainment to date
***Deadline for applications**	
***How to apply / contacts**	Postgraduate Research applicants for Pharmacy who are interested in applying for a fully funded DFE studentship must have applied to Queen's, via the Direct Applications Portal, and submitted all required supporting documents by the closing date, which will be announced later in the Academic year. https://dap.qub.ac.uk/portal/user/u_login.php
Relevant links / more information	http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/PostgraduatePositions/ http://www.qub.ac.uk/schools/SchoolofPharmacy/Research/
Keywords for search filters	drug delivery; medical device; drug formulation; silicone elastomer; biofilm formation
Training provided through the research project	PhD programmes at Queen's University Belfast are intended from the outset to include extensive training in modern research methods, and students are encouraged to make good use of the many excellent courses run by the University. This project will help the student develop the key skills and knowledge commonly sought for a successful career in the pharmaceutical industry.
Expected impact activities	The student will be trained in a multidisciplinary environment and follow a personal development plan (PDP) that will make them highly attractive for employment in the medical device industry. The student will be provided with the opportunity to disseminate their work through high quality journal outputs, and by participation at national and international conferences.