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| **\*Title of studentship** | Production of super small nanocrystals for drug delivery to target tissues |
| **Value / what is covered?** | The student will be involved in an exciting project related to the design, formulation and in *vitro/in vivo* characterisation of super small drug nanocrystals with specific surface properties to enhance drug accumulation in target tissues, such as the lymphatic or central nervous systems. This approach will be applied to the treatment of infectious and degenerative diseases. |
| **Awarding body** |  |
| **Number of studentships** | 1 |
| **\*Summary descriptive text / Example of research project** | Nanoparticles have been intensively used for the delivery of drugs to target tissues such as the lymph nodes, brain, liver and tumors. However, the most commonly used nanoparticles require a high amount of carrier materials which hinders their ability to load high doses of drug, limiting their clinical applications. Nanocrystals, on the other hand, are nanoparticles formed only by the drug, which allows to deliver substantially higher drug payloads. In this project, the applicant will use top-down techniques to reduce the particle size of the drug and precisely engineer their surface properties in order to increase drug absorption in target tissues. The formulations will be fully characterised in vitro and successful candidates will be tested in cell cultures and animal models with the aim of evaluating their pharmacokinetics and biodistribution profiles. A strong emphasis will be placed in boosting both the theoretical and technical skills of the student, as well as enhancing their communication and teamwork abilities. All these aspects together will greatly improve the future professional perspective and employability of the candidate. |
| **\*Supervisor(s)** | Supervisor: Dr Alejandro J. Paredes  Co-supervisor: Prof Ryan F. Donnelly |
| **\*Eligibility / residence Status** | UK/EU/International |
| **Country** | Northern Ireland |
| **\*Start date and duration** | October 1st, 2022. Duration of 3 years. |
| **\*Faculty** | MHLS |
| **\*Research centre / School** | Pharmacy |
| **Subject area** | Drug delivery |
| **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, 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** | September 2020 |
| **\*How to apply / contacts** | Postgraduate Research applicants must have applied to Queen’s, via the Direct Applications Portal.  <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 nanocrystals, media milling, infectious diseases, nanoparticle, targeting |
| **Training provided through the research project** | The PhD candidate will be working in a well-funded drug delivery Group with members from 14 nationalities. The student will receive training-through-research in different formulation techniques and processes related to the production of solid drug nanoparticles (nanocrystals) by top-down and bottom-up approaches, with an emphasis in media milling, nanoprecipitation, freeze-drying and spray-drying. Nanoparticle characterisation will cover dynamic light scattering (size and distribution), electronic microscopy (morphology and size), and electrophoretic light scattering (surface charge). The student will perform release experiments using dialysis membranes and Franz cells. Moreover, they will be encouraged to obtain a UK Animal Handling License, which will allow to perform pharmacokinetics and biodistribution experiments in rats. The student will receive solid hand-on training in high-performance liquid chromatography (HPLC) for the quantification of drugs in different biological and non-biological samples.  The student will gradually learn to statistically process and present data to scientific audiences and to communicate information to a broader public, written and orally. |
| **Expected impact activities** | Improving patients’ quality of life by the development of novel optimized therapies for difficult-to-treat diseases like lymphatic filariasis. The interaction with private partners from the pharmaceutical industry will allow the commercial development of nanocrystal-based products. The PhD candidate will improve their CV by receiving training-through-research and presenting their work in major international conferences as well as publishing scientific papers in high-impact journals. |