Title: Aerosol Deposition in the Sinunasal Airways – from the infant to the adult

Type of award: PhD Research Studentship

Department: Mechanical Engineering, Fluids and Aerodynamics Research Group

Scholarship: Minimum £15,285 p.a. subject to confirmation.

Duration: 3.5 years

Eligibility: Home/EU

Start Date: September 2020

PhD Topic Background/Description

The deposition and uptake of micro and nanoparticles in the upper airways is of growing concern. The implications of the mechanisms for deposition, the dose and the location are not readily apparent. For example, whereas the deposition fraction may be low in the sinunasal airways (olfactory cleft and sinuses), these sites provide access to highly vascularised tissue leading to rapid infection rate as well as a more direct route to the brain, with adverse consequences that may be disproportionate to the perceived dose. In this project, the student will study experimentally and computationally how variations of airway morphology and the breathing profile affect the transport of inhaled particles.

The starting point for both experimental and computational studies will be realistic airway geometries derived from pre-existing CT/MRI scan data of the nasal airways. With the aim of understanding how the highly optimised biological design of the sinunasal airways functions, a morphological characterisation will be undertaken. The focus will be on the development from the infant to the adult, to assess changes in airway geometry with age, while enabling also a comprehensive classification of anatomical form and respiratory patterns.

Computational flow modelling will then be applied to relate geometry and flow patterns in realistic airways at different ages. This paves the way for intense data analysis, leading to the design of simplified geometries that provide appropriate experimental test platforms which preserve the essential flow characteristics. The final stage of the project will then quantify how the particular geometry of the sinunasal airways affects deposition rate and the consequent deposition burden of potentially toxic or biologically active inhalants.

The student will join multidisciplinary teams comprising PhD students in computational and
experimental fluid mechanics and airway surgery. They will benefit from close interaction between the different engineering specialities and experts in toxicology and medicine.

Further Particulars

Doing research at the University of Bristol

The quality of research at the University of Bristol places it within the top five Universities in the UK based on the Research Excellence Framework and Times higher Education rankings 2014-15. The PhD candidate will be a part of a friendly and diverse community. The University has a Doctoral College (BDC) which offers approximately 200 courses, interactive workshops and seminars as a part of the University’s Personal and Professional Development Programme for PGR students. The BDC organises University-wide events and provides a hub of information, guidance and resources to help researchers to get the most of their time at Bristol.

Candidate Requirements

Applicants must hold/achieve a minimum of a master’s degree (or international equivalent) in a relevant discipline.

Scholarship Details

Scholarship covers full UK/EU (EU applicants who have been resident in the UK for 3 years prior to 1st September 2020) and PhD tuition fees subject to confirmation.

Informal enquiries

Please email Dr Alberto Gambaruto (alberto.gambaruto@bristol.ac.uk)

For general enquiries, please email came-pgr-admissions@bristol.ac.uk

Application Details

To apply for this studentship submit a PhD application using our online application system [www.bristol.ac.uk/pg-howtoapply]

Please ensure that in the Funding section you tick “I would like to be considered for a funding award from the Mechanical Engineering Department” and specify the title of the scholarship in the “other” box below with the name of the supervisor.

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