Fully funded PhD opportunities in the Djoko Lab, Durham University, UK

PROJECT TITLE

A balancing act: how hosts control metal availability to their microbiota

BACKGROUND

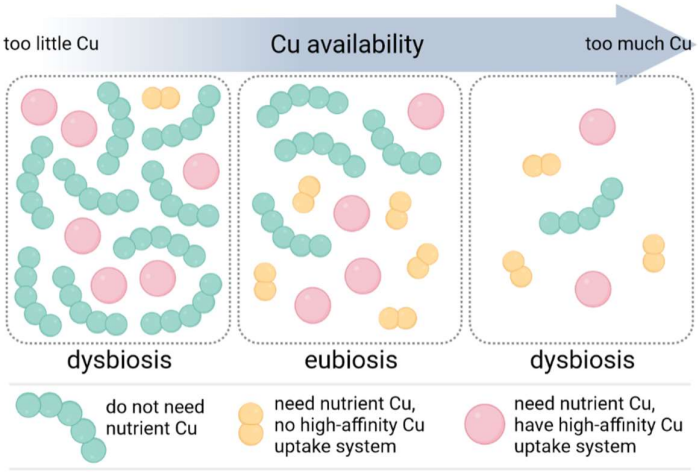
The human mouth is home to diverse resident microbes and up to 100-200 individual species are commonly detected. These resident microbes play a symbiotic role and contribute to oral health.

Despite repeated exposure to new microorganisms from other environments (*eg*. via food) and threats of eradication by personal hygiene measures, the composition of the oral microbiota remains relatively stable. The ecological balance of this community is shaped and maintained, at least in part, by saliva and salivary components, which are constantly refreshed (*ie*. swallowed then replenished). Reduced saliva flow (hyposalivation or dry mouth) is a risk factor for several oral diseases, likely a result of dysbiosis or ecological imbalance within the oral microbiota, which includes disappearance of beneficial microbes, overgrowth of pathogenic microbes, and loss of microbial diversity.

Saliva ensures microbial homeostasis in the mouth *via* multiple overlapping functions. Salivary (glyco)proteins provide a primary nutritional source for oral microbes. Salivary bicarbonates and phosphates buffer pH to within a friendly, neutral range. Salivary antimicrobial proteins and peptides, such as lysozymes, amylases, and histatins exert direct antimicrobial activity. In addition, research from our group and others has revealed a key role of histatins in buffering copper ions that are potentially toxic to microbes.

PROJECT GOAL

You will study the role of histatins, a family of copper-binding salivary peptides, in governing the assembly, dynamics, stability, and vulnerability of the oral microbiota. In particular, you will uncover the influence of nutrient copper availability in driving the host-microbiome relationship.



TRAINING

You will be based at the primary supervisor's laboratory in Durham University and work at co-supervisors' laboratories at Newcastle University to conduct key components of the study.

Training will be provided in techniques and concepts that span the breadth of biosciences, including microbial genetics, molecular microbiology, microbial physiology, recombinant protein production and characterisation, functional analysis of proteins, and biophysical methods for analyses of metal-protein interactions.

FUNDING AVAILABILITY

Three PhD positions are available. Each will focus on distinct aspects of the project. Each candidate will thus have responsibility and ownership of their project, but will collaborate with other group members to achieve the key goals. Funding sources and eligibility for each position are detailed below:

(1) Janet K Stevens Scholarship (4 years). *Open for UK citizens only.* No deadline – applications accepted on a rolling basis.

This funding has been awarded to the Djoko group and therefore is not in competition with other projects. Funding is guaranteed for the successful candidate.

(2) BBSRC Newcastle-Liverpool-Durham Doctoral Training Partnership (4 years). *Open to UK/EU/international citizens.* Formal application deadline to the Partnership 9 January 2023.

This funding is in competition with other projects. Success depends on the quality of the candidate, relative to other candidates who are competing for the same funding source. In the past, the Djoko group has successfully supported two PhD candidates to win this funding.

(3) Chinese Scholarships Council (4 years). *Open to Chinese citizens only.* Formal application deadline to Durham University 15 January 2023.

This funding is in competition with other projects. Success depends on the quality of the candidate, relative to other candidates who are competing for the same funding source.

TO APPLY

This project would particularly suit those who are keen to work at the interface of biology and chemistry. If you are interested, you should first contact Dr Karrera Djoko (karrera.djoko@durham.ac.uk} with your CV and a brief cover letter indicating: (i) why you wish to do a PhD; (ii) why you are interested in the project; (iii) what your career goals are beyond the PhD.