**Supervisor(s) names:** Prof. Gail Preston (University of Oxford), Dr. Nicola Holden (James Hutton Institute), Dr. Louise Crozier (Anacail)

**Department(s)/Organisations:** Department of Plant Sciences, University of Oxford; James Hutton Institute; Anacail Ltd

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**Project Title:** Ozone-mediated control of food spoilage and food-borne pathogens

**Brief description of project (no more than 500 words):** Fruits and vegetables that are sold as ready-to-eat are subject to spoilage from bacteria and fungi that associate with the product during growth and harvesting, as well as to contamination by harmful food-borne pathogens. Control of both sets of microbes currently requires implementation of disinfectant steps during food processing and packaging.

Anacail Ltd. (http://www.anacail.com/) and researchers at the James Hutton Institute have previously shown that application of an ‘in-pack’ ozone treatment can reduce the level of microorganisms on the surface of produce. The antimicrobial activity of ozone is in part mediated by free radicals produced through direct peroxidation of fatty acids, and oxidation of proteins, amines and thiols. Ozone is a broad-spectrum anti-microbial, effective against bacteria, fungi and viruses. The application of in-pack ozone has been shown to improve the quality of foods by reducing both food spoilage and food safety organisms. However, little is known about its specific anti-microbial activity, including answers to questions such as: Are some microorganisms more sensitive to ozone treatment than others? How does ozone affect microbial physiology? What factors in microorganisms or their environment contribute to tolerance to ozone treatment? Can ozone be used in combination with other produce sanitation treatments, or do disinfectant treatments make microorganisms more resistant to ozone?

This 4-year DPhil project will combine expertise in the Preston group (Oxford), the Holden group (James Hutton Institute) and Anacail Ltd. (Glasgow) to determine the impact of ozone treatment on the microbiota of fresh produce. We will specifically examine how ozone treatment alters the composition of the microbiome, and its effect on the viability and gene expression of spoilage organisms and the food-borne pathogen *Salmonella enterica* serovar Senftenberg. We will also examine whether produce sanitation treatments have the potential to increase resistance to ozone, or can be used effectively in combination with ozone to improve food safety and shelf-life.

The primary supervisor will be Prof. Gail Preston, with co-supervision by Dr. Nicola Holden (James Hutton Institute) and Dr. Louise Crozier (Anacail). The student appointed to this project will have the opportunity to gain extensive experience in a wide range of techniques, including molecular biology, microbiology, biochemistry and advanced imaging techniques. They will be expected to conduct part of their DPhil research in Oxford, including an initial 3 months training period at the Doctoral Training Centre, and to spend 12-18 months working at the James Hutton Institute. They will also be required
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to undertake a 12 week industrial placement with Anacail Ltd., where they will gain direct insight into the company’s work and experience first-hand the issues facing the food industry.

Attributes of suitable applicants: Applicants should have, or expect to obtain, a first class or strong second class degree (or equivalent) in microbiology, biochemistry or a related discipline, and will be expected to meet the entry requirements for admission to the Oxford Interdisciplinary Bioscience DTP (https://www.ox.ac.uk/admissions/graduate/courses/interdisciplinary-bioscience). As the project involves work in Oxford, Dundee and Glasgow applicants should be willing and able to work in different locations over the duration of the project.

Funding notes: This project is funded for four years by the Biotechnology and Biological Sciences Research Council BBSRC. BBSRC eligibility criteria apply (https://www.ukri.org/files/legacy/news/training-grants-january-2018.pdf). EU nationals who do not meet BBSRC residence criteria are encouraged to contact the programme administrator to check their eligibility for BBSRC funding before submitting a formal application. Successful students will receive a stipend of no less than the standard RCUK stipend rate, currently set at £14,777d per year, which will usually be supplemented by the industrial partner.

This project is supported through the Oxford Interdisciplinary Bioscience Doctoral Training Partnership (DTP) studentship programme. The student recruited to this project will join a cohort of students enrolled in the DTP’s interdisciplinary training programme, and will be able to take full advantage of the training and networking opportunities available through the DTP. For further, details please visit www.biodtp.ox.ac.uk.

Statement of project description approval: I confirm that all parties associated with this project have seen and approved the information provided above and are willing for it to be made publically available for the purpose of recruiting a student to undertake this project.

Name: Gail Preston

Electronic Signature: