

## TEAGASC PHD WALSH SCHOLARS OPPORTUNITY

“Investigation of the sources, concentrations and partition of nitrate, nitrite and nitrosamine residues in Irish milk and dairy powder products”

Walsh Scholar Ref Number 2025040

### Background

Nitrate and nitrite are contaminants present in dairy products, the relative abundance of nitrate being influenced by several factors along the production chain, including seasonally varying levels of nitrate in forages, levels in drinking water and feed and nitric acid or contaminated water use in plant sanitation, whereas nitrite contamination is primarily attributable to microbial reduction of nitrate present in milk, often arising during long powder production runs. High concentrations of these contaminants are of concern for both the cow and humans (particularly infants) consuming milk or milk-derived products. Further conversion of nitrate to nitrite during metabolism can lead to the formation of methaemoglobin, the cause of "blue baby syndrome", in addition to the potential for carcinogen formation through interaction with other compounds. Dairy processing presents several entry points for these contaminants in the manufacture of ingredients such as skim milk powder used in infant milk formula. This project will identify the effect of cow diet and drinking water quality, municipal or demineralised water usage and thermophilic biofilm formation in powder production and nitric acid use in CIP applications on the concentrations of nitrate, nitrite and nitrosamines in milk and dairy products, from commercial samples and samples produced on-site in Teagasc Moorepark under specified conditions. An additional seasonal component is present due to accumulation of nitrate in plants while growth is limited by colder temperatures. Contaminant removal by membrane filtration and microbial reduction methods will also be investigated. Concentrations of nitrate and nitrite will be determined by 2D ion chromatography microwave extraction and nitrosamines will be quantified by GC-MS. This work will help to determine the sources of nitrate, nitrite and nitrosamine accumulation and partitioning throughout the manufacturing process of dairy products such as skim milk powder and whey protein concentrate, while providing recommendations for nitrate and nitrite mitigation to ensure compliance with food residue guidelines defined by the European Food Safety Authority's panel on food chain contaminants and improving the competitiveness of critical Irish export products.

### Requirements

Applicants should have a H1 or 2H1 BSc degree in an appropriate discipline (Food Science, Chemistry, Biochemistry, or related disciplines). Although not a strict requirement, candidates with an MSc qualification and/or previous laboratory experience would have an advantage. The successful candidate should be highly motivated and enthusiastic about developing technical skills across a range of disciplines. Applicants whose first language is not English must show evidence of English proficiency. For details, see [English language requirements | TU Dublin](#).

### Award

This PhD Walsh Scholarship is a joint research project between Teagasc and Technological University Dublin (TU Dublin). The student will be registered at TU Dublin for a 4-year structured PhD programme and will be primarily based in Teagasc Moorepark. As part of the PhD programme, the student will be required to enrol in a total of 40 credits of modules over the course of four years. For details on the modules and their assessments, please visit [Current Students & Supervisors | TU Dublin](#). The student will conduct research under the primary supervision of Dr Jonathan Magan (Teagasc) and Prof Christine O'Connor (TU Dublin), with further supervision provided throughout the course of the project from other subject matter experts in Teagasc. The scholarship will start as soon as possible after the most suitable candidate is selected. The scholarship funding is €31,000 per annum and comprises of University fees of up to a maximum of €6,000 and a flat rate stipend of €25,000 tenable for 4 years.

### Further Information

Contact: Dr Jonathan Magan, Teagasc. Email: [Jonathan.Magan@teagasc.ie](mailto:Jonathan.Magan@teagasc.ie) or [PhD@TUDublin.ie](mailto:PhD@TUDublin.ie)

### Application Procedure

Submit an electronic copy of Curriculum Vitae and a letter of interest to [PhD@TUDublin.ie](mailto:PhD@TUDublin.ie)

### Closing date

7<sup>th</sup> July 2025