



SOFIA MELCHIOR

Assistant professor (RTD-a)

Personal information and contact details

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ResearchGate: <https://www.researchgate.net/profile/Sofia-Melchior>

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Work experiences

December 2023-now: Assistant professor (RTD-a), University of Udine (Italy)

July 2022-November 2023: Post-Doctoral Research fellow, University of Udine (Italy)

July 2021-June 2022: Post-Doctoral Research fellow, Joint Research Centre (Ispra) and University of Udine (Italy)

January 2021-June 2021: Post-Doctoral Research fellow, University of Udine (Italy)

November 2017- December 2020: Ph. D. student, University of Udine (Italy)

January 2020-March 2021: Visting Ph.D. Student, University of Minho (Braga, Portugal)

Education

20 May 2021: Ph.D. *cum laude* in Food and Human Health, University of Udine (Italy)

3 April 2017: Master's degree *cum laude* in Food Science and Technology, University of Udine (Italy)

14 July 2014: Bachelor's degree in Food Science and Technology, University of Udine (Italy)

Personal skills

Mothertongue: Italian

Other languages:

✓ English: B2

Publications

Author/coauthor of over 15 scientific publications on international journals indexed by Scopus relevant to the SC 07/F1 - SSD AGR/15 or related.

Author/coauthor of 3 chapters in books with international circulation

Research activity

From 2017 to the present, S. Melchior has carried out continuous research activities on various topics related to food science and technology. Initially, S. Melchior's work was focused on the effect of the structure of starch-based products on the glycemic index, studied through *in vitro* digestion systems. Subsequently, during the Ph.D., the research activity was focused on studying the impact of food structure on nutritional, health, and technological functionalities. In the post-doctoral period, these experiences were exploited for the development and characterization of lipid-based nanostructures for the delivery of bioactive compounds. The main research topics are described in detail below.

Design and characterization of delivery systems

The research aims to develop delivery systems for bioactive compounds and probiotic microorganisms. Particular attention was directed towards the so-called emulsion-based delivery systems, which are differently structured emulsions formulated to protect probiotic microorganisms or bioactive compounds in food while simultaneously delivering them to specific target sites in the gastrointestinal tract. Among these systems, S. Melchior has worked on the development of structured emulsions, solid lipid nanoparticles, lipid nanocarriers, nanoemulsions, and liposomes.

Regarding the delivery of probiotic microorganisms, studies have shown that structured emulsions with monoglycerides can protect these microorganisms during formulation, processing, storage, and gastrointestinal transit. The most promising systems have also been employed in a food prototype (ricotta cheese).

Research on the delivery of bioactive compounds was focused on developing systems for the delivery of quercetin as a compound with antitumor activity. Nanoscale liposomes and emulsion-based delivery systems were produced using innovative technologies such as high-pressure homogenization. To address the current legislative and methodological gap regarding potential food applications, during the research period at JRC, nanostructured systems were characterized using the approach commonly used in the pharmaceutical field. Specifically, the physicochemical characteristics of the delivery systems were evaluated at various levels of organization, from macro- to nanoscale, using innovative and advanced analytical methods (e.g., analytical ultracentrifugation, asymmetric flow field-flow fractionation, transmission electron microscopy).

To assess the physiological output of the developed delivery systems, great attention was paid to liposomes delivering quercetin. These demonstrated higher toxicity against colon cancer cells than free quercetin as well as liposomes alone. This activity was conducted in collaboration with the Department of Medical Area of the University of Udine.

Application of technological interventions for improving the functionalities of biopolymers

Several non-thermal and sustainable technologies, such as high-pressure homogenization, pulsed electric fields at moderate intensity, and supercritical carbon dioxide, have been exploited as potential strategies to modify the structure and the technological (i.e. solubility, emulsifying, foaming, gelling) and nutritional (digestibility) functionalities of various matrices. Among these, particular attention has been given to starch, fibres, and plant proteins.

In addition, enzymatic hydrolysis was used to produce bioactive peptides with enhanced technological functionalities from animal and plant proteins.

Development of an *in vitro* digestion method simulating elderly conditions

Considering the expertise in simulating the digestive process, S. Melchior collaborated in developing an *in vitro* digestion protocol to simulate the physiological conditions of the elderly. In particular, various plant protein concentrates (pea, rice, and wheat) and whey proteins, selected as reference animal proteins, were *in vitro* digested to simulate the physiological conditions of adults and the elderly. The results demonstrated that the developed method is capable of discriminating between different physiological conditions since all the considered proteins were found to be less digestible in the elderly with the only exception of wheat.

Conferences

S. Melchior participated in several national and international conferences with oral contributions held in first person (4) and poster presentation (7).

Teaching activities

AA 2022/2023 e 2023/2024 Lecturer of the module "Food Technologies" (SSD 07/F1 - AGR/15) (2 CFU) of the course "Food Science" of the Bachelor's Degree course "Prevention techniques in the environment and in the workplace" (University of Udine and Trieste).

Since 2018, S. Melchior has been conducting seminars and practical exercises for students in the bachelor's and master's courses in "Food Science and Technology" at the University of Udine (SSD 07/F1 - AGR/15).

Supervisor and Co-supervisor of master's theses and internship reports of students of the bachelor's and master's courses in "Food Science and Technology" of the University of Udine (SSD 07/F1 - AGR/15).

Awards

In 2022, S. Melchior was awarded the "PhD award" by the University of Udine for the best doctoral thesis in the agri-food sector.

In the same year, S. Melchior was selected at the national level and subsequently at the European level, to present her doctoral work at the "15th European PhD Workshop on Food Engineering and Technology" held in Uzwil, Switzerland. For this purpose, S. Melchior also received a scholarship.

Institutional activities

2023 – present: Member of the program board of the Bachelor's Degree course "Prevention techniques in the environment and in the workplace". (University of Udine and Trieste).

2024: Organizing committee of the admission tests to the degree courses of the Department of Agricultural, Food Environmental and Animal Sciences of the University of Udine, Italy

2022-2023: Representative of the research fellows of the Department of Agricultural, Food, Environmental and Animal Sciences of the University of Udine, Italy

2018 - 2020: Representative of the PhD students of the Department of Agricultural, Food, Environmental and Animal Sciences of the University of Udine, Italy

2018 – 2019: Student Advisor and prospective student guidance for the Bachelor's and Master's Degree Courses in Food Science and Technology, University of Udine, Italy

Autorizzo il trattamento dei miei dati personali ai sensi dell'art. 13 D. Lgs. 30 giugno 2003 n°196 – “Codice in materia di protezione dei dati personali” e dell'art. 13 GDPR 679/16 – “Regolamento europeo sulla protezione dei dati personali”

Data, 21/02/2024

A handwritten signature in blue ink, appearing to read "Sofia Melchior". The signature is written in a cursive style and is contained within a light blue rectangular box.