University Academic Curriculum Vitae

Personal information

Name: Federica Piergiacomo

Education since leaving school

- **2020-2023**

PhD in Food Engineering and Biotechnology
Free University of Bolzano-Faculty of Science and Technology
Address: Piazza Università 1, 3900, Bolzano, Italia, 39100 Bolzano (Italia)
City: Bolzano
Country: Italy
Website: https://www.unibz.it/it/
Project title: "Agri-food residues within the circular economy framework: Microbiological assessment of their potential reuse and the associated emerging contaminants under the One-Health vision"
Supervisor: Lorenzo Brusetti
Section: Agricultural Microbiology
Assessment of the impact of the addition of synthetic and compostable microplastic debris and antibiotics to microbial communities in microcosms made of "input" agricultural products (sediments/manure/compost) coming from two different and opposite areas (a cold Alpine and a warm Mediterranean one), through the use of several techniques such as PCR, Real-Time Polymerase Chain Reaction (RT-PCR) and also confocal fluorescence microscopy, genome sequencing and bioinformatic and metabolomic analysis on microcosms samples with a particular interest in the:
1. Taxonomic composition and functional gene diversity of the microbiome, as well as the biofilm formation of mixed microcosms compared to controls and the type of plastic/antibiotic used over time;
2. Qualitative and quantitative changes within bacterial antibiotic resistance genes in mixed microcosms towards control samples and plastic type/antibiotic over time;
3. Abundance of ARGs;
4. The metabolic response to antibiotic/plastic exposure.

Period abroad at Universitet I Oslo (UiO):
Metagenomic sequencing analysis and post processing with a bioinformatic approach and a focus on antibiotic resistance.

Period abroad at Norce Norwegian Research Centre:
Laboratory activities related to antibiotic resistance and microplastic pollution.

- **12/2024**
  IELTS (General) Certificate
  British Council
- **06/06/2022-10/06/2022**

Workshop entitled "Metabarcoding in Microbial Ecology"
Physalia courses
Email: info@physalia-courses.org

Understanding of the concept, potential and limitation of microbial metabarcoding techniques. Learning how to process raw sequencing

reads to obtain meaningful information. Obtaining experience on how to statistically evaluate and visualize data. Being able to make informed decisions on best practices for own data.

- **05/2020-07/2020**

Cambridge English Level 1 Certificate in ESOL International (First)
Cambridge Assessment English

- **2016- 2019**

Master's degree in Agricultural Science and Technology (110/100 cum laude)
University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy).
Address: Via Napoli, 25, 71122, Foggia
City: Foggia
Country: Italy
Website: https://www.agraria.unifg.it/it
Thesis title: "Application of molecular methods for the evaluation of microbial ecology and functionality of nitrogen-cycling microbial populations in the agriculture and environment".
Section: Environmental Microbiology.
Knowledge in food and environmental microbiology, molecular biology and in the field of production of plant-source raw materials and soilless systems, biomass handling for agricultural use and groundwaters systems.
Use of molecular biology methods for the ecological-functional evaluation of the nitrogen cycle microorganisms in agriculture and environment: ARISA, end-point PCR, quantitative real-time PCR, NGS sequencing analysis, data analysis with molecular biology software.
Drafting of the thesis in English.

- **2017-2018**

PEF24
University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy)
PEF24 in the Anthropo-Psycho-Pedagogical disciplines and for the Didactic Methodologies.

- **2014– 2015**

Project of the European Union (Erasmus Plus)
Uniwersytet Przyrodniczy w Poznaniu-Poznan University of life sciences, Poznan (Poland)
Website:www.skylark.up.poznan.pl/en/
Attendance of English courses and acquisition of theoretical and practical laboratory skills in: Bioprocess Engineering, Bioprocess technology, Immunochemical methods in research and food analysis and Computerized control systems in food technology**.**

- **2013-2016**

Bachelor's Degree in Food Science and Technology (106/110)
University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy). Address: Via Napoli, 25, 71122, Foggia
City: Foggia
Country: Italy
Website: https://www.agraria.unifg.it/it
Thesis title: "Management, control and application of microbial crop cultivation in continuous reactors".
Section: Industrial Microbiology.
Knowledge in food and industrial microbiology analysis, industrial

biotechnology and bioengineering. Management of continuous biological reactors and related inoculum, determination of "start up" parameters and monitoring of the efficiency of the anaerobic digestion process and of biological nitrogen removal, through chemical and molecular analyses.
Learning and execution of conventional microbiological and molecular biology techniques for the chemical-physical/ molecular characterization of wastewater, industrial sludge and biomass samples: measurement of total solids and volatile total solids, DNA extraction, end point PCR, spectrophotometric measurement of ammoniacal nitrogen, nitrites and nitrates.
Data analysis

- **2011-2015**

Training course for Volunteers of Italian Red Cross
European First Aid Patent

Present appointment

- **Research Assistant**
- **01/11/2023 – Today**
- **Level: International**
- **Libera Università di Bolzano-Faculty of Agricultural, Environmental and Food Sciences, address: Piazza Universita´ 1, 3900, Bolzano, Italy, 39100 Bolzano (Italia)**

The activity is carried out within the framework of the research program "(ROCK-ME) Response of Rock Glaciers to Global Warming."
Coordinated bioinformatics analysis with the research group and the Fondazione Mach di S. Michele all'Adige (a project partner), aimed at integrating data generated by partners and reconstructing metabolic pathways of fungal and prokaryotic communities in the studied environments. - Bioinformatics analysis of pathways related to heavy metal resistance capabilities and their correlation with antibiotic resistance pathways. - Analysis to establish the possibility of gene transfer of the resistome and to determine potential consequences in terms of biosafety from a OneHealth perspective. - Quantification of bacterial communities and key resistome genes and statistical analysis to integrate data with chemical, biotic, and environmental factors. - Compilation of results and writing of related scientific articles. - Scientific management of the project's work package and interaction with other partners.

Professional experience

From / to	Job title	Name of academic Institution	Academic level	responsibilities
1/11/2023 –Today	**(ROCK-ME) Risposta dei Rock Glaciers al riscaldamento globale**	**Free University of Bolzano-Bozen, Faculty of Agricultural, Environmental and Food Sciences,**	Researcher	Bioinformatic analyses of antibiotic and metal resistomes, metabolic pathways reconstruction and statistical

		Bolzano (Italy)		analysis to integrate data with chemical, biotic, and environmental factors
03/2020 – 05/2020	**Study of biomolecular data and use of bioinformatic methods for the evaluation of anaerobic digestors microbial communities**	**University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy)**	Researcher	Statistical analysis of biomolecular data, microbial communities of anaerobic digestors using several statistical softwares.
12/12/2019 – 12/01/2020	**Study of biomolecular data on faecal indicators and groundwater microbial communities**	**University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy)**	Researcher	Application of molecular methods (in particular ARISA) for the detection of pollutant microbial communities in groundwater, Data analysis
01/08/2019 – 14/11/2019	**Sustainable water management and wetland restoration strategies in northern China, SuWaRest) (TN8203)**	**Free University of Bolzano-Bozen, Faculty of Science and Technology, Bolzano (Italy)**	Researcher	Drafting of a complete scientific paper in English, based on the available data and a draft of the manuscript, to be presented for an international peer-reviewed journal; Drafting of a short communication in English to be submitted to an international journal dealing with environmental microbiology. Data analysis.
1/10/2018 –	**Study of Arisa methods to**	**University of Foggia,**	Researcher	Application of molecular

31/10/2018	**define the impact of pollution on microbial communities of the aquifers**	**Department of Agricultural, Food and Environmental Sciences, Foggia (Italy)**		methods (in particular ARISA) and statistical analysis of the related data to define the impact of pollution on the microbial communities of groundwater wells.

Participation in exhibitions

RotaryEnfasi2019 competition
Project: **EUREKA! Energy Unit (where) Recovering (is the) Key Asset**
team leader: dr. De santo Francesca, dr. Paolo Morisco.
other team members: dr. Piergiacomo Federica, Colucci Donato, D'Amore Saverio, De Matteis Giovanni Pasquale, Macchiarola Ines.
Tutor: Prof. Monteleone Massimo (University of Foggia)
- Amount admitted for financing € 11,000.00

Experience in academic teaching

Postgraduate supervision (PhD level)-Teaching assistant:
03/2021 – Today

Carried out laboratory exercitations regarding environmental microbiology, molecular biology and bioinformatic (32 hours) within the course of "General and agricultural microbiology" among the bachelor course in Agricultural Science and Agricultural Technology at the Free University of Bolzano, Italy.

Postgraduate supervision-Bachelor Thesis in Agricultural, Food and Mountain Environmental Sciences:

Thesis title: “Microplastics increase the bacterial ciprofloxacin resistance in mountain freshwater sediments”. Academic Year: 2023/2024.
Aim: comprehensively investigate the dynamics and the ecological consequences of microbial communities in relation to emerging contaminants through a study case in Alpine rock glacier and its derived freshwater.

Postgraduate supervision- Path for Transversal Skills and Orientation (PCTO) for students of:
-I.I.S.S. “Gandhi” (Merano, Italy)
-Scientific Highschool “E.Torricelli” (Bolzano, Italy)

Research and scholarships

Date granted	Award Holder(s)	Funding Body	Title	Amount received
1/11/2023-31/03/2025	**Federica Piergiacomo**	**Free University of Bolzano-Bozen, Faculty of Agricultural, Environmental and Food Sciences, Bolzano (Italy)**	**(ROCK-ME) Risposta dei Rock Glaciers al riscaldamento globale**	**€ 22.000**
03/2020-05/2020	**Federica Piergiacomo**	**University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy)**	**Study of biomolecular data and use of bioinformatic methods for the evaluation of anaerobic digestors microbial communities**	**€ 2.500**
12/12/2019 – 12/01/2020	**Federica Piergiacomo**	**University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy)**	**Study of biomolecular data on faecal indicators and groundwater microbial communities**	**€ 700**
01/08/2019 – 14/11/2019	**Federica Piergiacomo**	**Free University of Bolzano-Bozen, Faculty of Science and Technology, Bolzano (Italy)**	**Sustainable water management and wetland restoration strategies in northern China, SuWaRest) (TN8203)**	**€ 4.100,00**
1/10/2018-31/10/2018	**Federica Piergiacomo**	**University of Foggia, Department of Agricultural, Food and Environmental Sciences, Foggia (Italy)**	**Study of Arisa methods to define the impact of pollution on microbial communities of the aquifers**	**€ 500**

Publications

- Beneduce, L., ***Piergiacomo, F.***, Sikorska-Zimny, K. 2024. Different Nutritional Regimes in a Tomato Soilless System Affect the Bacterial Communities with Consequences on the Crop Quality. *Agriculture*, *14*(12), 2254. **https://doi.org/10.3390/agriculture14122254**. **IF:3.3**

- Clagnan, E., Petrini, S., Pioli, S., ***Piergiacomo, F.,*** Chowdhury, A. A., Brusetti, L., Foladori, P. 2024. Conventional activated sludge vs. photo-sequencing batch reactor for enhanced nitrogen removal in municipal wastewater: Microalgal-bacterial consortium and pathogenic load insights. *Bioresource Technology*, *401*, 130735. **https://doi.org/10.1016/j.biortech.2024.130735. IF:9.7**

- Beneduce, L., ***Piergiacomo, F.,*** Limoni, P. P., Zuffianò, L. E., Polemio, M. 2024. Microbial, chemical, and isotopic monitoring integrated approach to assess potential leachate contamination of groundwater in a karstic aquifer (Apulia, Italy). Environmental Monitoring and Assessment, *196*(3), 312. **https://doi.org/10.1007/s10661-024-12477-6. IF: 3.1**

- ***Piergiacomo, F.***, Brusetti, L., Pagani, L. 2022. Understanding the Interplay between Antimicrobial Resistance, Microplastics and Xenobiotic Contaminants: A Leap towards One Health? *International Journal of Environmental Research and Public Health*, 20(1), 42. **https://doi.org/10.3390/ijerph20010042. IF:4.614**

- Bellucci, M., Borruso, L., ***Piergiacomo, F.,*** Brusetti, L., Beneduce, L. 2022. The effect of substituting energy crop with agricultural waste on the dynamics of bacterial communities in a two-stage anaerobic digester. *Chemosphere*, *294*, 133776. **https://doi.org/10.1016/j.chemosphere.2022.133776. IF: 8.943**

- ***Piergiacomo, F.,*** Borruso, L., Esposito, A., Zerbe, S., Brusetti, L. 2022. The Geochemical Drivers of Bacterial Community Diversity in the Watershed Sediments of the Heihe River (NorthernChina). *Water*, *14*(12), 1948. **https://doi.org/10.3390/w14121948. IF: 3.530**

- ***Piergiacomo, F.***, Borruso, L., Ciccazzo, S., Rizzi, S., Zerbe, S., Brusetti, L. 2020. Environmental Distribution of AR Class 1 Integrons in Upper Adige River Catchment (Northern Italy). *International journal of environmental research and public health*, *17*(7), 2336. **https://doi.org/10.3390/ijerph17072336**. **IF:4.614**

- Bellucci, M., Marazzi, F., Naddeo, L., ***Piergiacomo, F.,*** Beneduce, L., Ficara, E., Mezzanotte, V. 2019. Disinfection and nutrient removal in laboratory-scale photobioreactors for wastewater tertiary treatment. *Journal of Chemical technology and Biotechnology*. **https://doi.org/10.1002/jctb.6010. IF: 3.709**

Further data

-Abstracts presented to national/international scientific conferences- oral communications:

- ***Piergiacomo, F.,*** Lejzerowicz, F., Tran, T., Chowdury A.A, Beneduce, L., Wikmark, O.G., Pagani, L., Eiler, A., Brusetti, L. 2023. Do microplastics offer a suitable surface for antibiotic resistance spread into the open environment? AGRIFOODPLAST2023-International conference on micro and nano plastics in the agri-food chain. Piacenza (IT). September 10-12, 2023.
- ***Piergiacomo F.,*** Lejzerowicz, F., Tran, T., Chowdury, A.A, Beneduce,

L., Wikmark, O.G., Pagani L., Eiler, A., Brusetti, L. 2023. Do microplastics offer a suitable surface for antibiotic resistance spread into the open environment? 9th Symposium on Antimicrobial Resistance in Animals and the Environment. Tours (FR). 3-5 July 2023.

- ***Piergiacomo, F.,*** Bellucci, M., Borruso, L., Brusetti, L., Beneduce, L. 2021. Effect of a partial substitution of energy crop with agricultural waste on the dynamics of bacterial communities in a two-stage anaerobic digester. 8th International Conference on Sustainable Solid Waste Management. Thessaloniki (GR). June 23-25, 2021.
- ***Piergiacomo, F.,*** Bellucci, M., Gatta, G., Beneduce, L. 2021. Addition of soluble bio-based substances select for Archaeal communities with higher performances in thermophilic Anaerobic digestion processes. 8th International Conference on Sustainable Solid Waste Management. Thessaloniki (GR). June 23-25, 2021.
- **Piergiacomo F.**, Beneduce L., Limoni P.P., Zuffianò L.E., Polemio M. 2019. Health risk assessment of polluted aquifer in agricultural area hosting a landfill site. 2nd International scientific and training conference: Multidimensionality of the health. Faculty of Natural and Technical Sciences PWSZ Skierniewice Poland. December 06-07, 2019.

-Abstracts presented to national/international scientific conferences- poster presentations:

- ***Piergiacomo F.,*** Lejzerowicz F., Tran T., Chowdury A.A, Beneduce L., Wikmark O.G., Pagani L., Eiler A., Brusetti L. 2023. Do microplastics offer a suitable surface for antibiotic resistance spread into the open environment? AGRIFOODPLAST2023-International conference on micro and nano plastics in the agri-food chain. Piacenza (IT). September 10-12, 2023
- ***Piergiacomo F.***, Pagani L., Beneduce L., Russo P., Alkilani S. R., Brusetti L. 2021. Preliminary antimicrobial and multidrug resistance spread assessment in a municipal wastewater treatment plant and soil from the south of Italy. 6th International Conference on Microbial Diversity 2021 “Advances in Microbial Diversity MD2021”, Virtual event 14-15 December 2021. ISBN 9788894301021 pag. 137.
- ***Piergiacomo F.*** 2021. The role of microplastics on ecosystem functioning: a focus on antibiotic resistance spread in input for agricultural purposes. First Virtual Workshop on the Developments in the Italian PhD Research on Food Science, Technology and Biotechnology, Palermo 14-15 September 2020. ISBN 978-88-5509-315-6 pag. 112.
- ***Piergiacomo F.***, Beneduce L., Limoni P.P., Zuffianò L.E., Polemio M. 2019. Microbial molecular indicators as a tool to assess source of contamination of groundwater in an agricultural area potentially threatened by landfill contamination. Microbial Diversity Conference 2019, Catania 15-17 September 2019. ISBN 978-88-943010-1-4 pag. 258-259.
- Beneduce L., ***Piergiacomo F.***, Sikorska-Zimny K. 2019. Effect of different supply of nitrogen and minerals in soilless tomato crop system on the microbial community of the root system and the product quality. Microbial Diversity Conference 2019, Catania 15-17 September 2019. ISBN 978-88-943010-1-4 pag. 368-369.
- ***Piergiacomo F.***, Sikorska-Zimny K., Beneduce L. 2018. Improvement of functional quality of cherry tomatoes after biochar application on soilless tomato crop and consequent shift of microbial communities of the rhizosphere - 1st International scientific and training

conference: Multidimensionality of the health. Faculty of Natural and Technical Sciences PWSZ Skierniewice Poland. October 12-13, 2018.

- Bellucci M., Marazzi F., Naddeo L.S., Beneduce L., ***Piergiacomo F.***, Ficara E., Mezzanotte V. 2018. Disinfection In Lab-Scale Photobioreactors for Wastewater Tertiary Treatment. 7th European Bioremediation Conference & 11th ISEB Conference, Chania, Greece, June 25 – 28, 2018.
- Bellucci M., Borruso L., ***Piergiacomo F.***, Brusetti L., Beneduce L. 2016. Can Ammonia Oxidizing Microorganisms Survive In A Full Scale Two-Stage Anaerobic Digester Fed With Agro-Industrial Wastes? Proceedings of the 10th International Society for Environmental Biotechnology Conference Barcelona, 1-3 June 2016.

-Scientific reviewing activities for peer-reviewed journals: "PloS one", “Microorganisms”, “Sustainability”, “Frontiers in Environmental Science”.

Statement of interest

As a Research assistant involved in a project in Agricultural Microbiology with a master’s degree in Agricultural sciences and Technology, I am deeply interested in the analysis of ecological microbial communities by means of quantitative and qualitative tools and bioinformatic. Hence, my scientific and research activity concerned various areas in the general field of environmental microbiology and biotechnology in different complex environments, as also demonstrated by the scientific papers I published. Indeed, the main lines of my research are the following: 1. Characterization of the structure, diversity and functionality of the bacterial communities of samples of rock glaciers in South-Tyrolean climatic area involved in multiple resistances (e.g. antibiotics, heavy metals) through a One Health and bioinformatic approach. 2. Characterization of the structure, diversity and functionality of the bacterial communities of samples of irrigation water and sediments from a rock glacier stream, compost and manure in different Italian and foreign climatic areas. Also, bacterial communities associated with microplastic pollution and involved in multiple resistances (e.g. antibiotics, heavy metals) through a One Health and bioinformatic approach. 3. Characterization of the structure, diversity and functionality of bacterial communities involved in bioremediation of polluted waters of North China and diversity of their antibiotics and heavy metals resistant behaviors. 4. Characterization of the structure, diversity and functionality of groundwater microbial communities as microbial indicators of metal and fecal pollution. 5. Ecological-functional evaluation of the microorganisms of the nitrogen cycle in agriculture and in the environment. 6. Characterization of the structure, diversity and functionality of microbial consortia of wastewater, industrial sludge and biomass samples involved in the process of anaerobic digestion and biological nitrogen removal following continuous biological reactor operations.

During my academic experiences and the cooperations with other research groups, I had the opportunity to improve and achieve a good knowledge of basic microbiology methods (Isolation and plate count, membrane filters, clone library, pure culture isolation); molecular biology techniques (DNA extraction from cells, plasmids, biofilm, soil, water, sediments, sludge and other environmental matrices - DNA quantification - qualitative and quantitative PCR - Electrophoresis in agarose gel - recovery and purification of DNA fragments from gels of agarose- digestion with restriction enzymes- ARISA- Metabolic

profiling of microbial communities through Biolog Ecoplates); and to also acquire a good familiarity with the use of bioinformatic pipelines including computational softwares for fastQ data pre-processing (quality control, reads filtering and base correction); sequence assembly; annotation (e.g. antibiotic resistant genes prediction, protein prediction, characterization of the microbial resistome and mobilome), profiling (composition and abundance of microbial communities, functionality, taxonomic assignment), and characterization of the metabolic pathways. During my learning experience, I had the opportunity to utilize several molecular biology software and mathematical-statistical analysis programs (R, Qiime2, Mega 11.0, Chromas, Peakscan, Past, GrapPhad) and databases (Pfam, dbCAN, MAR, GTDBK, Sklearn, UNITE, SILVA, BLAST, CARD, GenBank (NCBI), Sequin (NCBI), Qiime2, BacMet 2.0, UniProt, KEGG PATHWAY Database).
I envision my future research to span across some interrelated areas of biological activity and ecosystem health to define the quality of the environment and its sustainable management. Concerning all my recent experiences, my expected contribution to the advertised position at the University of Bolzano is to highlight the data acquired in the research project and increase the scientific publications produced by the university.

Language competence

Mother tongue(s): Italian

Foreign Languages	Understanding	Speaking	Writing
English*	B2	B2	B2
Deutch	A1	A1	A1

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user
Common European Framework of Reference for Languages

*Cambridge English Level 1 Certificate in ESOL International (First) and IELTS (General) Certificate of British Council enclosed.

Driving license

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