

IMMACOLATA SERRA

PH.D. IN BIOMOLECULAR SCIENCES AND BIOTECHNOLOGY

Assistant professor (RTDB) of Chemistry and Biotechnology of Fermentation
(SSD: CHIM/11)

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University of Milano-Bicocca
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EDUCATION

2006-2009 Ph.D. in Biomolecular Sciences and Biotechnology, Institute for Advanced Studies of Pavia (IUSS)

Thesis: Microbial nucleoside phosphorylases for the enzymatic synthesis of nucleoside analogues

2004-2006 Master degree in Medical and Pharmaceutical Biotechnology (110/110 *cum laude*), University of Pavia

2001-2004 Bachelor degree in Biotechnology, University of Pavia

CURRENT AND PAST POSITIONS

2023-Present Assistant Professor (RTDB) of Chemistry and Biotechnology of Fermentation (SSD: CHIM/11), University of Milano-Bicocca, Department of Biotechnology and Biosciences

2021-2023 Assistant Professor (RTDA) of Chemistry and Biotechnology of Fermentation (SSD: CHIM/11), University of Milano-Bicocca, Department of Biotechnology and Biosciences

2014-2020 Post-doc Researcher, University of Milano, Department of Food, Environmental and Nutritional Sciences

2009-2014 Post-doc Researcher, University of Pavia, Department of Drug Sciences

RESEARCH PERIODS ABROAD

September 2007-December 2007: Department of Cell and Organism Biology, Lund University, Sweden

March 2008-June 2008: Department of Cell and Organism Biology, Lund University, Sweden

January 2010-March 2010: Department of Cell and Organism Biology, Lund University, Sweden

March 2014-April 2014: Department of Biology, Lund University, Sweden

TEACHING AND SUPERVISION

Immacolata Serra Ph.D.

2008-present: Co-supervisor of 10 experimental theses within the Bachelor and Master courses of Pharmacy, Industrial Biotechnology and Medical and Pharmaceutical Biotechnology of the University of Pavia. Co-supervisor of 3 experimental theses within the Master courses in Pharmaceutical Biotechnology and Plant, Food and Environmental Biotechnology of the University of Milano. Supervisor of 8 theses within the Bachelor and Master course in Biotechnology of the University of Milano-Bicocca. Co-supervisor of 2 theses within the Bachelor course in Biotechnology of the University of Milano-Bicocca.

2021-present co-supervisor of 5 PhD students in Material Sciences and Converging Technologies for Biomolecular Systems, University of Milano-Bicocca.

2021/2022 and **2022/2023** co-teacher of the laboratory course "Industrial Microbiology", Bachelor degree in Biotechnology of the University of Milano-Bicocca.

2022/2023 and **2023/2024** teacher of the course "Industrial Biotechnology for the Production of Chemicals and Bioenergies", Master degree in Chemical Sciences of the University of Milano-Bicocca.

2022/2023 teacher of the laboratory course Industrial Biotechnology for the Production of Chemicals and Bioenergies", Master degree in Chemical Sciences of the University of Milano-Bicocca.

2018 Seminar "Marine yeasts: how, why and what?" (2 hours) for the master course of Advanced Biotechnology University of Pavia

2018 "Cultore della Materia" SSD CHIM/11, University of Milano

2013/2014 and **2014/2015** seminars (32 hours in total) for the course "Biosynthesis of drugs", Master course in Medical and Pharmaceutical Biotechnology

2016, 2018, 2018, 2020, 2021 seminars (2 hours each) "Production and improvement of biocatalysts" for the course "Biosynthesis of Drugs", Master course in Medical and Pharmaceutical Biotechnology

2010/2011 seminars (5 hours) for the course "Biosynthesis of Drugs", Master course in Medical and Pharmaceutical Biotechnology

2008 "Cultore della Materia" SSD CHIM/08, University of Pavia

AWARDS AND RECOGNITIONS

Best Poster Award for Tengattini S.,* Bavaro T., Massolini G., Piubelli L., Serra I., Temporini C., Terreni M. "Rational design and analytical characterization by mass spectrometry of potential neo-glycovaccines against tuberculosis" DRUG ANALYSIS 2014, 22-25 June 2014, Liege (Belgium)

FEMS bursary by Microbiology Society for the participation to 33rd International Specialised Symposium on Yeasts (ISSY33) with the poster presentation "Marine halotolerant yeasts for selective biotransformations of nitriles", Serra I.,* Capusoni C., Molinari F., Compagno C., 26 - 29 June 2017 Cork (Ireland)

Issue cover of Catalysts (10 (1) 2020) with the publication Robescu, M.S., Serra, I.,* Terreni, M., Ubiali D.,* Bavaro, T. A multi-enzymatic cascade reaction for the synthesis of vidarabine 5'-monophosphate. Catalysts 2020, 10, 60; DOI: 10.3390/catal10010060

National Scientific Habilitation (Associate Professor, SSD CHIM/11) from 10th July 2020 to 10th July 2030

INSTITUTIONAL ACTIVITIES

Immacolata Serra Ph.D.

2018-2020 Representative of Post-doc Researchers of the Department of Food, Environmental and Nutritional Sciences, University of Milano

2021-present Member of the Supervisory Board of the PhD course in Converging Technologies for Biomolecular Systems (TeCSBI), University of Milano-Bicocca

2021-present: Member of the Cost Action “Non-Conventional Yeasts for the Production of Bioproducts” (Yeast4Bio, Action N° CA18229)

2021-present: Member of the Research Consortium Polaris (POLveri in Ambiente e Rischio per la Salute)

2022-present: Member of the management committee of the Next Generation Sequencing interdepartmental facility

COMPETITIVE GRANTS

PRIN 2022. From genome-guided discovery to production of novel glycopeptide antibiotics by an integrative technological platform (DiGlycAn). Role: Leader of UNIMIB Research Unit.

PRIN 2022-PNRR. Production of functional bacterial cellulose by a circular biotechnological platform (FUN CLUB). Role: Principal Investigator.

EDITORIAL ACTIVITY

2023-present: Member of the Editorial Board of FEMS Yeast Research

2020-2021: Topic co-Editor (co-editors Prof. A.R. Alcantara, Prof. C. Compagno, Prof. L. Wilson) for Frontiers in Biotechnology and Bioengineering (IF₂₀₂₀: 5.890) of the Research Topic “Recent Advances in Biocatalysis: Focusing on applications of these processes” (<https://www.frontiersin.org/research-topics/17683/recent-advances-in-biocatalysis-focusing-on-applications-of-these-processes>)

2020-present: Member of the Editorial Board of Catalysts (IF₂₀₂₀: 4,146), section of Biocatalysis

2018-2019: Co-guest Editor (with Prof. D. Ubiali) for Catalysts (IF₂₀₁₉: 3,520) of the Special Issue “Immobilization of Enzymes”

2010-present: *ad hoc reviewer* for: Applied Microbiology and Biotechnology; Catalysis Communications; Molecules; Catalysts; Journal of Chemical Technology and Biotechnology; European Journal of Organic Chemistry; Current Medicinal Chemistry; International Journal of Molecular Sciences

ORAL PRESENTATIONS

1) Serra I. Senatore V.G., Maestroni L., Milanesi R., Cannavacciuolo C., Branduardi P. Engineered *Saccharomyces cerevisiae* for the upcycling of polyethylene terephthalate (PET) monomers. Microbiology 2023, SIMGBM Congress, 21-24 September 2023, Cagliari (Italy)

2) Serra I. Upcycling of polyethylene terephthalate (PET) monomers by yeast fermentation, FEMS conference 2023, 9-13 July 2023, Hamburg (Germany), Invited speaker

3) Serra I., Di Lorenzo R.D., Branduardi P. Production of lactic acid from inulin by combined microbial biotransformation”, Biocat2022, 28 August-01 September 2022, Hamburg (Germany)

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- 4) Serra I., Temporini C., Bavaro T., Tengattini S., Piubelli L., Terreni M. “*M. tuberculosis* antigenic proteins: identity control and optimization of purification by ESI-MS”, XI NATIONAL CONGRESS ON BIOTECHNOLOGY, CNB XI, 27-29 June 2012, Varese (Italy)
- 5) Serra I., Ubiali D., Albertini A., Amati G., Daly S., Terreni M. “Enzymatic synthesis of Vidarabine. 2nd International symposium on active pharmaceutical ingredients from bioprocesses: from research to industrial and regulatory issue, 14-17 June 2011, Madrid (Spain)
- 6) Serra I., Bavaro T., Terreni M. “Biotechnological approach for the rational design of new vaccines for TBC” 5th AITUN MEETING: VACCINES: PREVENTIONS BETTER THAN CURE CURRENT STATUS AND FUTURE PROSPECTS, 11-12 March 2011, Pavia (Italy)
- 7) Ubiali D., Serra I. “New industrial enzymatic catalysts for the functionalization of nucleosides of pharma interest” 14th International Biotechnology Symposium and Exhibition, 14-18 September 2010, Rimini (Italy)
- 8) Serra I., Cecchini D., Temporini C., Ubiali D., Terreni M. Albertini A. M. “PGA immobilized derivatives with improved catalytic properties obtained by rational immobilization and site-directed mutagenesis”, 28th SIMGBM Congress, 11-13 June 2009, Spoleto (Italy)

PUBLICATIONS (N°: 41; H-INDEX: 20, CITATIONS: 819 (SCOPUS, last access 29th September 2023))

*: Corresponding Author

1. Maestroni, L., Butti, P., Milanesi, R., Pagliari, S., Campone, L., Serra, I., Branduardi, Easy Modular Integrative fuSion-ready Expression (Easy-MISE) toolkit for fast engineering of heterologous productions in *Saccharomyces cerevisiae* (2023) ACS Synthetic Biology
2. Di Lorenzo R.D., Serra I., Porro D., Branduardi P. State of the art on the microbial production of industrially relevant organic acids (2022) Catalysts, 12 (2), art. no. 234
3. Donzella S., Serra I., Fumagalli A., Pellegrino L., Mosconi G., Lo Scalzo R., et al. Recycling industrial food wastes for lipid production by oleaginous yeasts *Rhodospiridiobolus azoricus* and *Cutaneotrichosporon oleaginosum* (2022) Biotechnology for Biofuels and Bioproducts, 15(1)
4. Serra, I., Wilson, L., & Alcantara, A. Editorial: Recent Advances in Biocatalysis: Focusing on Applications of These Processes (2022) Frontiers in Bioengineering and Biotechnology, 10
5. Capusoni C., Serra I., Donzella S., Compagno C. Screening for yeast phytase leads to the identification of a new cell-bound and secreted activity in *Cyberlindnera jadinii* CJ2 (2021), 9, art. no. 662598.
6. Robescu M.S., Serra I.,* Terreni M., Ubiali D.,* Bavaro T. A multi-enzymatic cascade reaction for the synthesis of vidarabine 5'-monophosphate (2020) Catalysts, 10 (1), art. no. 60.
7. Serra I., Benucci I., Robescu M.S., Lombardelli C., Esti M., Calvio C., Pregolato M., Terreni M., Bavaro T. Developing a novel enzyme immobilization process by activation of epoxy carriers with glucosamine for pharmaceutical and food applications (2019) Catalysts, 9 (10), art. no. 843.
8. Serra I.,* Capusoni C., Molinari F., Musso L., Pellegrino L., Compagno C. Marine microorganisms for biocatalysis: selective hydrolysis of nitriles with a salt-resistant strain of *Meyerozyma guilliermondii* (2019) Marine Biotechnology, 21 (2), pp. 229-239.
9. Pinto A., Serra I., Romano D., Contente M.L., Molinari F., Rancati F., Mazzucato R., Carzaniga L. Preparation of sterically demanding 2,2-disubstituted-2-hydroxy acids by enzymatic hydrolysis (2019) Catalysts, 9 (2), art. no. 113.
10. Capusoni C., Ariol, S., Donzella S., Guidi B., Serra I., Compagno C. Hyper-osmotic stress elicits membrane depolarization and decreased permeability in halotolerant marine *Debaryomyces hansenii* strains and in *Saccharomyces cerevisiae* (2019) Frontiers in Microbiology, 10 (JAN), art. no. 64.
11. Serra I.,* Ubiali D., Piškur J., Munch-Petersen B., Bavaro T., Terreni M. Immobilization of Deoxyadenosine kinase from *Dictyostelium discoideum* (Dddak) and its application in the 5'-

- phosphorylation of arabinosyladenine and arabinosyl-2-fluoroadenine (2017) *ChemistrySelect*, 2 (19), pp. 5403-5408.
12. Dall'Oglio F., Contente M.L., Conti P., Molinari F., Monfredi D., Pinto A., Romano D., Ubiali D., Tamborini L.,* Serra I.* Flow-based stereoselective reduction of ketones using an immobilized ketoreductase/glucose dehydrogenase mixed bed system (2017) *Catalysis Communications*, 93, pp. 29-32.
 13. Bavaro T., Cattaneo G., Serra I., Benucci I., Pregnotato M., Terreni M. Immobilization of neutral protease from *Bacillus subtilis* for regioselective hydrolysis of acetylated nucleosides: application to capecitabine synthesis (2016) *Molecules*, 21 (12), art. no. 21121621.
 14. Serra I., Guidi B., Burgaud G., Contente M.L., Ferraboschi P., Pinto A., Compagno C., Molinari F., Romano D. Seawater-Based biocatalytic strategy: stereoselective reductions of ketones with marine yeasts (2016) *ChemCatChem*, 8 (20), pp. 3254-3260.
 15. Contente M.L., Molinari F., Serra I., Pinto A., Romano D. Stereoselective enzymatic reduction of ethyl secodione: preparation of a key intermediate for the total synthesis of steroids (2016) *European Journal of Organic Chemistry*, 2016 (7), pp. 1260-1263.
 16. Contente M.L., Serra I., Molinari F., Gandolfi R., Pinto A., Romano D. Preparation of enantiomerically enriched aromatic β -hydroxynitriles and halohydrins by ketone reduction with recombinant ketoreductase KRED1-Pglu (2016) *Tetrahedron*, 72 (27-28), pp. 3974-3979.
 17. Fresco-Taboada A., Serra I., Arroyo M., Fernández-Lucas J., De La Mata I., Terreni M. Development of an immobilized biocatalyst based on *Bacillus psychrosaccharolyticus* NDT for the preparative synthesis of trifluridine and decitabine (2016) *Catalysis Today*, 259, pp. 197-204.
 18. Contente M.L., Guidi B., Serra I., De Vitis V., Romano D., Pinto A., Lenna R., de Souza Oliveira R.P., Molinari F. Development of a high-yielding bioprocess for 11- α hydroxylation of canrenone under conditions of oxygen-enriched air supply (2016) *Steroids*, 116, pp. 1-4.
 19. Contente M.L., Serra I., Brambilla M., Eberini I., Gianazza E., De Vitis V., Molinari F., Zambelli P., Romano D. Stereoselective reduction of aromatic ketones by a new ketoreductase from *Pichia glucozyma* (2016) *Applied Microbiology and Biotechnology*, 100 (1), pp. 193-201.
 20. Contente M.L., Serra I., Palazzolo L., Parravicini C., Gianazza E., Eberini I., Pinto A., Guidi B., Molinari F., Romano D. Enzymatic reduction of acetophenone derivatives with a benzil reductase from *Pichia glucozyma* (KRED1-Pglu): electronic and steric effects on activity and enantioselectivity (2016) *Organic and Biomolecular Chemistry*, 14 (13), pp. 3404-3408.
 21. Carvalho A.C.L.M., Fonseca T.S., De Mattos, M.C., De Oliveira M.C.F., De Lemos T.L.G., Molinari F., Romano D., Serra I. Recent advances in lipase-mediated preparation of pharmaceuticals and their intermediates (2015) *International Journal of Molecular Sciences*, 16 (12), pp. 29682-29716.
 22. Ubiali D., Morelli C.F., Rabuffetti M., Cattaneo G., Serra I., Bavaro T., Albertini A.M., Speranza G. Substrate specificity of a purine nucleoside phosphorylase from *Aeromonas hydrophila* toward 6-substituted purines and its use as a biocatalyst in the synthesis of the corresponding ribonucleosides (2015) *Current Organic Chemistry*, 19 (22), pp. 2220-2225.
 23. Calleri E., Cattaneo G., Rabuffetti M., Serra I., Bavaro T., Massolini G., Speranza G., Ubiali D. Flow-synthesis of nucleosides catalyzed by an immobilized purine nucleoside phosphorylase from *Aeromonas hydrophila*: integrated systems of reaction control and product purification (2015) *Advanced Synthesis and Catalysis*, 357 (11), pp. 2520-2528.
 24. Zambelli P., Serra I., Fernandez-Arrojo L., Plou F.J., Tamborini L., Conti P., Contente M.L., Molinari F., Romano D. Sweet-and-salty biocatalysis: Fructooligosaccharides production using *Cladosporium cladosporioides* in seawater (2015) *Process Biochemistry*, 50 (7), pp. 1086-1090.
 25. Serra I.,* Daly S., Alcantara A.R., Bianchi D., Terreni M., Ubiali D.* Redesigning the synthesis of vidarabine via a multienzymatic reaction catalyzed by immobilized nucleoside phosphorylases (2015) *RSC Advances*, 5 (30), pp. 23569-23577.
 26. Calleri E., Ubiali D., Serra I., Temporini C., Cattaneo G., Speranza G., Morelli C.F., Massolini G. Immobilized purine nucleoside phosphorylase from *Aeromonas hydrophila* as an on-line enzyme reactor for biocatalytic applications (2014) *Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences*, 968, pp. 79-86.

27. Serra I.,* Conti S., Piškur J., Clausen A.R., Munch-Petersen B., Terreni M., Ubiali D.* Immobilized *Drosophila melanogaster* deoxyribonucleoside kinase (*DmdNK*) as a high performing biocatalyst for the synthesis of purine arabinonucleotides (2014) *Advanced Synthesis and Catalysis*, 356 (2-3), pp. 563-570.
28. Fresco-Taboada A., Serra I., Fernández-Lucas J., Acebal C., Arroyo M., Terreni M., De La Mata I. Nucleoside 2'-deoxyribosyltransferase from psychrophilic bacterium *Bacillus psychrosaccharolyticus* - Preparation of an immobilized biocatalyst for the enzymatic synthesis of therapeutic nucleosides (2014) *Molecules*, 19 (8), pp. 11231-11249.
29. Bavaro T., Filice M., Temporini C., Tengattini S., Serra I., Morelli C.F., Massolini G., Terreni M. Chemoenzymatic synthesis of neoglycoproteins driven by the assessment of protein surface reactivity (2014) *RSC Advances*, 4 (99), pp. 56455-56465.
30. Temporini C., Bavaro T., Tengattini S., Serra I., Marrubini G., Calleri E., Fasanella F., Piubelli L., Marinelli F., Pollegioni L., Speranza G., Massolini G., Terreni M. Liquid chromatography-mass spectrometry structural characterization of neo glycoproteins aiding the rational design and synthesis of a novel glycovaccine for protection against tuberculosis (2014) *Journal of Chromatography A*, 1367, pp. 57-67.
31. Bonomi P., Bavaro T., Serra I., Tagliani A., Terreni M., Ubiali D. Modulation of the microenvironment surrounding the active site of penicillin G acylase immobilized on acrylic carriers improves the enzymatic synthesis of cephalosporins (2013) *Molecules*, 18 (11), pp. 14349-14365.
32. Serra I.,* Ubiali D., Piškur J., Christoffersen S., Lewkowicz E.S., Iribarren A.M., Albertini A.M., Terreni, M. Developing a collection of immobilized nucleoside phosphorylases for the preparation of nucleoside analogues: Enzymatic synthesis of arabinosyladenine and 2',3'-dideoxyinosine (2013) *ChemPlusChem*, 78 (2), pp. 157-165.
33. Serra I., Bavaro T., Cecchini D.A., Daly S., Albertini A.M., Terreni M., Ubiali D. A comparison between immobilized pyrimidine nucleoside phosphorylase from *Bacillus subtilis* and thymidine phosphorylase from *Escherichia coli* in the synthesis of 5-substituted pyrimidine 2'-deoxyribonucleosides (2013) *Journal of Molecular Catalysis B: Enzymatic*, 95, pp. 16-22.
34. Serra I., Ubiali D., Cecchini D.A., Calleri E., Albertini A.M., Terreni M., Temporini C. Assessment of immobilized PGA orientation via the LC-MS analysis of tryptic digests of the wild type and its 3K-PGA mutant assists in the rational design of a high-performance biocatalyst (2013) *Analytical and Bioanalytical Chemistry*, 405 (2-3), pp. 745-753.
35. Ubiali D., Serra C.D., Serra I., Morelli C.F., Terreni M., Albertini A.M., Manitto P., Speranza G. Production, characterization and synthetic application of a purine nucleoside phosphorylase from *Aeromonas hydrophila* (2012) *Advanced Synthesis and Catalysis*, 354 (1), pp. 96-104.
36. Tran T.H., Christoffersen S., Allan P.W., Parker W.B., Piškur J., Serra I., Terreni M., Ealick S.E. The crystal structure of *Streptococcus pyogenes* uridine phosphorylase reveals a distinct subfamily of nucleoside phosphorylases (2011) *Biochemistry*, 50 (30), pp. 6549-6558.
37. Serra I., Serra C.D., Rocchietti S., Ubiali D., Terreni M. Stabilization of thymidine phosphorylase from *Escherichia coli* by immobilization and post immobilization techniques (2011) *Enzyme and Microbial Technology*, 49 (1), pp. 52-58.
38. Temporini C., Bonomi P., Serra I., Tagliani A., Bavaro T., Ubiali D., Massolini G., Terreni M. Characterization and study of the orientation of immobilized enzymes by tryptic digestion and HPLC-MS: Design of an efficient catalyst for the synthesis of cephalosporins (2010) *Biomacromolecules*, 11 (6), pp. 1623-1632.
39. Christoffersen S., Serra I., Terreni M., Piškur J. Nucleoside phosphorylases from *Clostridium perfringens* in the synthesis of 2',3'-dideoxyinosine (2010) *Nucleosides, Nucleotides and Nucleic Acids*, 29 (4-6), pp. 445-448.
40. Serra I., Cecchini D.A., Ubiali D., Manazza E.M., Albertini A.M., Terreni M. Coupling of Site-Directed mutagenesis and immobilization for the rational design of more efficient biocatalysts: The case of immobilized 3G3K PGA from *E. coli* (2009) *European Journal of Organic Chemistry*, (9), pp. 1384-1389.
41. Cecchini D.A., Serra I., Ubiali D., Terreni M., Albertini A.M. New active site oriented glyoxyl-agarose derivatives of *Escherichia coli* penicillin G acylase (2007) *BMC Biotechnology*, 7, art. no. 54.

I authorize the handling of personal information in this curriculum, according to D.Lgs n. 196/03 and following modifications and Regulations EU 679/2016 (General Regulations concerning Data Protection or GRDP) and art. 7 of University Regulations concerning protection of personal information.

Milano, 29th September 2023

Immacolata Serra Ph.D.