

Prof. Marco Terreni
Drug Sciences Department; University of Pavia

CURRENT POSITION

Full Professor at the Faculty of Pharmacy, University of Pavia
Drug Sciences Department
University of Pavia

WEBSITES

<https://scienzedelfarmaco.dip.unipv.it/it/ricerca/aree-di-ricerca/chimica-farmaceutica/laboratorio-di-sintesi-e-sviluppo-di-prodotti>

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PERSONAL

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EDUCATION / AFFILIATIONS / POSTS

Education

1990 Degree in “pharmaceutical chemistry and technology” (110/110 cum laude), University of Pavia, Italy.

1992 Post graduation **Diploma Two years Specialization school in “Chemical Synthesis”, Politecnico of Milano, Italy.** Thesis: “Use of enzymes in organic chemistry”, Tutor: Prof. C. Fuganti, Department of Organic Chemistry, Politecnico of Milano, Italy.

1997 **Ph.D. in “Pharmaceutical Chemistry and technology”, University of Pavia, Italy.** Thesis: “New methodologies for the kinetically controlled synthesis of Ampicillin, Cefazolin and Cefamandole, catalyzed by penicillin acylases”.

Affiliation and Posts

1990-1992. Politecnico di Milano (Italy). Department of organic chemistry, (Prof. C. Fuganti): *chemical and enzymatic synthesis of β -lactamic antibiotics.*

1992-1993. Research institute of pharmacology "Mario Negri", Milano (Italy), Laboratory directed by Dr. R. Fanelli: *Development of methods in GC-MS and HPLC-MS for the Analysis pesticides in environmental samples*

1993-1996 University of Pavia. Pharmaceutical chemistry department. PhD student (Prof. G. Paganì): *Enzymatic synthesis of β -lactamic antibiotics*

1994-1996: Frequency as invited scientist. C.S.I.C., Madrid (Spain). Institute of “Biocatálisis y Petrolquímica”, (Dr. J. M. Guisan): *Development of immobilized biocatalyst and bioprocesses*

Since 1997- University of Pavia, Italy. Faculty of Pharmacy.

- From 1-08-1996 **Assistant professor**
- From 1-10-2001 **Associate Professor**
- From 01-01-2011 **Full Professor**

2017-2019 Frequency as Invited scientist at Sorbonne University, “Istitut Parisien de Chimie Moléculaire” (IPCM); research group GOBS (Yongmin Zhang and Matthieu Sollogoub).

2023-2024 grant as invited professor by the Italian-French University organisation at the University of Paris Cité (French)

RESEARCH ACTIVITIES

The research activity is mainly focused in biocatalysis (development of new bio-catalysts and green bio-processes) for the synthesis of biological relevant molecule and in medicinal chemistry for the design and development of biomolecules (oligosaccharides, glycolipids, glycoconjugated products and new protein based drugs and therapeutic products).

Following are reported the main recent research activities.

Medicinal Chemistry and biotechnology.

Chemo-enzymatic synthesis glycolipids of biological interest as anticancer drugs.

Chemo-enzymatic synthesis of antigeni-immunogenic oligosaccharides and glycoconjugates.

Study of semi-synthetic glycoproteins and new glycoconjugate products as potential vaccines.

Design and development of vaccines against tuberculosis

Nano-biotechnology and Nanomedicine.

Study of glycosylated nano-vaccines

Investigation of bio-material for immobilization of grow factor (for regenerative therapies)

Biocatalysis in organic synthesis and development of new green bio-processes.

Preparation of efficient biocatalyst by immobilization of enzymes

Enzymatic and chemo-enzymatic synthesis on nucleosides and nucleotides with antitumoral or antiviral activity

RESEARCH PROJECTS-FUNDING

Coordination of project financed by public organisations

1) Responsible of the research Unit (university of Pavia) in the project **“Enzyme for Biocatalysis”** financed by *Regione Lombardia* (Regional government of Lombardia). Duration 3 years since 2008, **90.500 Euro**

2) Principal investigator and coordinator of the research unit (university of Pavia): **VATUB-Biotechnological approach for the rational design of a new anti-TB vaccine**. Financed by *Regione Lombardia* (Regional government of Lombardia); *Duration* 24 months; *Start*: 1 December 2010

Financial support received for the project **446.700 Euro**

Financial support received for the University of Pavia **193.900 Euro**

3) Responsible of the research unit for the CLUSTER “Italian Biocatalysts Centre” (University of Pavia and University of Milan) in the project: **“Da antiche colture materiali e prodotti per il futuro” (VeLiCa)**; and aiming the **regeneration of agricultural wastes for production of**

high value products. Financed by *Regione Lombardia* (Regional government of Lombardia);
Duration: 30 months; *Start:* February 2011.

Financial support received for the consortium **IBC 400.000 Euro**

4) Responsible of the research Unit (university of Pavia) in the project ***“Evaluation of the immunological activity of glycosylated proteins as new vaccines against tuberculosis.”***

Financed by the foundation *Banca del Monte*. Duration 18 months Project start: July 2013,
Financial support received **37.500 Euro**

5) Responsible of the research Unit (university of Pavia) in the project ***“BIOFLOW: an innovative platform for the in-flow biocatalytic preparation of high value chemicals”.***

Financed by the foundation Cariplo. Start June 2017; Duration 28 months
Financial support received for the University of Pavia: **58.500 Euro**

6) Since February 2023. Principal investigator and coordinator of the research unit (University of Pavia) for the project financed by the Italian Ministry of health (call for the POS -Piano Operativo Salute- objective 4 *“Biotechnology, bioinformatic and pharmaceutical development”*): ***“ImmunoHUB- Immunoterapia: cura e prevenzione di malattie infettive e tumorali”*** (Immunotherapies: Care and prevention of infective and cancer diseases)

Duration 4 Years

Total financial support received for the project **7.869.000 Euro**

Financial support received for the University of Pavia **2.900.000 Euro**

Participation at other research projects

1) *“Design and Development of a Catalog for New Commercial Biocatalysts”* European Project INTERREG IIC RFO Operation “REGINS” (2006).

2) *“ Integrated platform for the design and production of high throughput enzymes and engineered , peptides. Evaluation of their biological activity towards specific substrates of pharmaceutical interest, mostly for screening of oncological and nutraceutical products”* (PANDA) Financed by Regione Lombardia;

Coordination of project financed by industries

Coordinator of **14 research projects financed by chemical and pharmaceutical industries.**

TEACHING ACTIVITIES

The teaching activity has been performed in the area of medicinal chemistry and biotechnology
Following are reported the main teaching activities.

- Since 2013 course of **Medicinal Chemistry** (9CTS) School of Pharmacy, University of Pavia, Italy
- 2003-2022 Module of **Structure and Activity of biological drugs** (3CTS) responsible of the course in **Biotechnology Drugs** (6CTS) at the School of Pharmaceutical and Medical Biotechnology; University of Pavia, Italy
- 2003-2015 Module of **Biocatalysis** (3CTS), responsible of the course **Design, biosynthesis and analysis of drugs** (9CTS) School of Pharmaceutical and Medical Biotechnology, University of Pavia, Italy.

- From 2016 invited professor responsible of the course (3CTS) in **Advanced Biology**” (since 2022 **“Biomolecules”**); Faculty of Pharmacy University Paris Descart/Paris Cité (Paris; French), Joint International Master in NANOED (Erasmus Mundus).

CONFERENCE ORGANIZATION

1. Italian workshop **Quality of Active ingredients: Technical and Regulatory issues**. 3 October 2008 Pavia (Italy). Organised in collaboration with the consortium IBIOCAT.
2. International meeting **“Active Pharmaceutical Ingredients from Bioprocesses: from research to industrial and regulatory issues” APIB-2009** June 3-6, 2009 Pavia (Italy); Organised in collaboration with EDQM (Council of Europe) and the consortium IBIOCAT.
3. International workshop **“Active Pharmaceutical Ingredients from Bioprocesses: from research to industrial and regulatory issues”” APIB-2011**. June 14-17, 2011 Madrid (Spain);_Organizzato in collaborazione con EDQM (Consiglio D’Europa). Organised in collaboration with EDQM (Concil of Europe) the consortium IBIOCAT and the Spanish Society of Biotechnology (SEBiot).
- 4) . International workshop **Innovation and sustainability in organic synthesis and drug development** Pavia, 16-17 September 2019 Organised in collaboration with the PhD school “Ecole Doctorale de Chimie Moléculaire de Paris-Centre (University Sorbonne-Pierre et Marie Curie).

PROFESSIONAL ACTIVITIES

Council of Europe, Strasburg.

- 2000-2017 Italian delegate at the European Pharmacopea for the "Certification of Suitability"
- 2001-2007 member of the Technical Advisor Board (TAB) for the "Certification of Suitability" at the European Pharmacopea.

June 2011- December 2015 president of the consortium Italian Biocatalysis Center (public privat research consortium)

PATENTS

12 National and/or European and World Patents

PUBLICATIONS (GENERAL)

131 papers peer-reviewed journals, 3 chapters in books (or series),

METRICS

Scopus 128 cited documents: **Citations:** 3057; **h-index:** 31

10 REPRESENTATIVE PUBLICATIONS

1) Hoyos, P., Perona, A., Bavaro, T., F. Marinelli, Terreni, M., Hernáiz, M.J., Biocatalyzed Synthesis of Glycostructures with Anti-infective Activity. *Accounts on Chem. Res*, 55(17), pp. 2409–2424 (2022) <https://doi.org/10.1021/acs.accounts.2c00136>

2) Bavaro, T., Tengattini, S., Rezwan, R., Chiesa E., Temporini C., Dorati R., Massolini G., Conti B., Ubiali D. and Terreni M. Design of epidermal growth factor immobilization on 3D biocompatible scaffolds to promote tissue repair and regeneration. *Scientific Reports* 11, 2629 (2021). <https://doi.org/10.1038/s41598-021-81905-1>

- 3) Li Z., Bavaro T., Tengattini S., Bernardini R., Mattei M., Annunziata F., Cole R. B., Zheng C., Sollogoub M., Tamborini L., Terreni M., Zhang Y. Chemoenzymatic synthesis of arabinomannan (AM) glycoconjugates as potential vaccines for tuberculosis. *European Journal of Medicinal Chemistry*, vol. 204, 112578 (2020) <https://doi.org/10.1016/j.ejmech.2020.112578>
- 4) P. Hoos,; T. Bavaro,; A. Perona,; A. Rumbero,; S. Tengattini,; M. Terreni, M.J. Hernaiz, "Highly efficient and sustainable synthesis of neoglycoproteins using galactosidases" *ACS Sustainable Chem. Eng.*, 8, 6282–6292 (2020) <https://doi.org/10.1021/acssuschemeng.9b07785>
- 5) C. Zheng, R. Huang, T. Bavaro, M. Terreni, M. Sollogoub, J. Xu, Y. Zhang “Design, synthesis and biological evaluation of new ganglioside GM3 analogues as potential agents for cancer therapy” *European Journal of Medicinal Chemistry* 189, 112065 (2020) <https://doi.org/10.1016/j.ejmech.2020.112065>
- 6) Changping Zheng, HuiminGuan, ZhihaoLi, Teodora Bavaro, MarcoTerreni, Matthieu Sollogoub and YongminZhang. “Chemoenzymatically synthesized ganglioside GM3 analogues with inhibitory effects on tumor cell growth and migration” *European Journal of Medicinal Chemistry* 165, 107-114 (2019) <https://doi.org/10.1016/j.ejmech.2019.01.016>
- 7) Francesca Rinaldi, Sara Tengattini, Luciano Piubelli, Roberta Bernardini, Francesca Mangione, Teodora Bavaro, Gregorino Paone, Maurizio Mattei, Loredano Pollegioni, Gaetano Filice, Caterina Temporini, and Marco Terreni; “Rational design, preparation and characterization of recombinant Ag85B variants and their glycoconjugates with T-cell antigenic activity against *Mycobacterium tuberculosis*” *RSC advances* 8(41), 23171-23180 (2018). <https://doi.org/10.1039/C8RA03535K>
- 8) 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 glyco-vaccine for protection against tuberculosis”. *J. Chromatogr. A*, 1367:57-67 (2014). <http://dx.doi.org/10.1016/j.chroma.2014.09.041>
- 9) Teodora Bavaro, Marco Filice, Caterina Temporini, Sara Tengattini, Immacolata Serra, Carlo F. Morelli, Gabriella Massolini, Marco Terreni “Chemoenzymatic synthesis of Neoglycoproteins Driven by the Assessment of Protein Surface Reactivity” *RSC advances*, 4 (99), 56455–56465 (2014). <https://doi.org/10.1039/C4RA11131A>
- 10) Marco Filice, Jose M. Guisan, Marco Terreni and Jose M. Palomo; Regioselective monodeprotection of peracetylated carbohydrates *Nature protocols* 10; 1783-1796 (2012). <https://doi.org/10.1038/nprot.2012.098>