ALESSANDRA ASTEGNO

PERSONAL DETAILS
Born in Montecchio Maggiore (VI), Italy, in 1980.

CAREER BREAKS
2015 Maternity Leave, 5 months

EDUCATION AND PROFESSIONAL APPOINTMENTS
- 2011-present: Assistant Professor (ricercatore confermato) in Biochemistry (SSD BIO/10) (Department of Biotechnology, University of Verona).
- 4/5/2019 - 8/6/2019: Visiting scientist presso il presso CIC bioGUNE Research Center (Derio, Spain) nel laboratorio del prof. Alfonso Martínez de la Cruz.
- 2010-2011: Research fellowship in Biochemistry (University of Verona)
- 2009-2010: Master degree cum laude in Agri-Food Biotechnology, University of Verona.
- 2007-2009: PhD in Applied Biotechnologies, University of Verona. Dissertation: Biochemical and Structural Characterization of Calcium/Calmodulin dependent Glutamate Decarboxylase 1 from Arabidopsis thaliana.
- 2005-2006: Research Fellowship, Graduate position (University of Verona).
- 2004: Visiting scholar (University of Manchester, UK).
- 1999-2004: Laurea Degree (vecchio ordinamento) cum laude in Agro-industrial Biotechnology, University of Verona.
- 1999: High school diploma (classical studies), Liceo "G. G. Trissino" in Valdagno (VI).

AWARDS AND QUALIFICATIONS
- 24 September 2018: Qualification as Associate Professor of Biochemistry in Italian Universities.
- 2017: winner of an Italian FFABR ("Fondo per il Finanziamento delle Attività Base di Ricerca", Italian Law 232/2016) research fund. Amount: € 3000.

TEACHING AND SUPERVISION ACTIVITIES
- 2017-present: Taught the Research-inspired laboratory course (1 CFU), Master's degree in Molecular and Medical Biotechnology, University of Verona.
- 2011-present: Taught the Analytical Biochemistry course (4 CFU), Bachelor's degree in Biotechnology, University of Verona.
- March 2014: Lecture series "Recent advances in protein-protein interactions", Master's degree in Bioinformatics and Medical Biotechnology, University of Verona.
- 2007-2009: Teaching assistant in Biochemistry course, Bachelor's degree in Biotechnology, University of Verona, and Production and characterization of recombinant proteins course, Master's degree in Molecular and Industrial Biotechniques, University of Verona.
- 2004-2006: Teaching assistant in Plant Biochemistry and Plant Physiology courses, Bachelor's degree in Biotechnology, University of Verona.

Since 2012 Dr. Astegno supervised 12 bachelor theses in Biotechnology, four master theses in Molecular and Medical Biotechnology and 2 postdoctoral researchers. Since October 2018 she is the tutor of one PhD student in Biotechnology.

INVITED LECTURES/SEMINARS AND ORGANIZATION OF MEETINGS (last 3 years)
- 2018: Member of the organizing committee of the workshop "Protein structure-function relationship: new challenges and advancements". October 19th, Verona.
- 2018: Member of the organizing committee of the Meeting Proteine 2018 (SIB, gruppo Proteine), May 28-30, Verona.
- 2018: Member of the organizing Committee of the Winter School in Applied Bioinformatics, January 21-25, Alba di Canazei (TN).
- 2018: Invited seminar. Meeting Proteine 2018 (SIB, gruppo Proteine), May 28-30, Verona.

- 2018: Invited seminar. Dottorato di Ricerca in Biochimica, Dipartimento di Scienze Biochimiche A. Rossi Fanelli, Università degli Studi di Roma "La Sapienza", March, 16.
- 2018: Invited seminar. 3th International Conference on Enzymology and Molecular Biology, London (UK), March 5-7.
- 2018: Invited seminar. Dipartimento di Bioscienze, Università di Milano, February 15.
- 2017: Invited seminar. 9th International Conference on Structural Biology, Zurich (Switzerland), September 18-20.
- 2017: Invited seminar. "Dal gene alla proteina". Piano Nazionale Lauree Scientifiche (PLS 2016-2017), Verona, March 24.
- 2016: Seminar. Dottorato in Biotecnologie, Università di Verona, October 28.
- 2016: Invited seminar. Convegno nazionale della Divisione di Chimica dei Sistemi Biologici, Verona. September 21-23.

GRANT

Funded projects

- Project PRIN2017 entitled 'Regulatory signals and redox systems in plant growth-defence trade off'. Local project coordinator (Responsabile locale dell'unità di ricerca di Verona). € 136,294. Total amount of the project 1,166,722 € (National project coordinator prof. Giulia De Lorenzo).
- CooperInt grant (funding for international academic mobility, € 1500). Research period (from 4/5/2019 to 8/6/2019) at CIC bioGUNE Research Center (Derio, Spain) in the laboratory of prof. Alfonso Martínez de la Cruz. Project title: Structure-function-activity studies on Toxoplasma gondii transsulfuration enzymes.
- Green Fluorescent Protein-based Biosensor for Multiplexed Detection of Heavy Metals in Natural Waters. Research grant JOINT PROJECT, University of Verona. € 39,600. Starting in Q2/2019. Principal investigator.
- Exploring the natural biodiversity of C–S lyase enzymes in lactic acid bacteria for food and food-related
- Applications. Research grant JOINT PROJECT, University of Verona. € 22,800. Starting 01/01/2021.
- Project "3S-4H–Safe, Smart, Sustainable food for Health". Programma Operativo Regionale (POR), Fondo Europeo di Sviluppo Regionale (FESR), Regione del Veneto. € 231,000. 11/07/2017-09/30/2020. Participant.
- Engineering a fusion enzyme for determination of bioactive amines. Research grant JOINT PROJECT 2015. € 45,750. 01/01/2016- 06/30/2018. Principal investigator.
- Improving wine aroma complexity by directed evolution of non-Saccharomyces yeast enzymes. Research grant JOINT PROJECT. € 46,000. 01/01/2016- 06/30/2018. Participant.
- Engineering volatile thiol release for improved wine aroma: Directed evolution of yeast cystathionine ß-lyase. Research grant JOINT PROJECT. € 42,125. 1/1/2013 -12/31/2014. Participant.

Projects with positive evaluation

- Bando Ricerca di Base, University of Verona, entitled: 'Understanding how calmodulin-like proteins (CMLs) are involved in regulating plant stress responses: biochemical and functional characterization of grapevine CML79'. Principal Investigator. (score referee_1: 100, referee_2: 88, referee_3: 95).
- Project "PhosAgro/UNESCO/IUPAC research grant in green chemistry for young scientists" entitled: 'Novel thermostable transaminases for industrial biotechnology', February 2017 call. Principal Investigator. The proposal has been rated favorably by the PhosAgro/UNESCO/IUPAC International Scientific Jury for Green Chemistry.
- Project PRIN 2015 entitled 'Investigating the role of Arabidopsis calmodulin-like proteins in plant immunity'. Principal Investigator. (score 12/15).
- Project PRIN 2012 (PRIN starting) entitled "Hacking the Serine pathway as a novel antitumor strategy". Participant. The project passed the first selection phase on the local level, and ranked in twelfth place during the second selection phase (MIUR) with a 14/15 score.
- Project PRIN 2010-2011 entitled "Pyridin and flavin enzymes and coenzymes in human neuropatholgies: molecular and cellular approaches for innovative therapies" . Participant. (score 91/100).

- Project PRIN 2009-2010 entitled “Structural and functional investigation of Class2 non-symbiotic hemoglobin: understanding the molecular evolution of oxygen transport in plants”. Participant. (score 56/60).

MEMBERSHIP

2017-present: Member of the Società italiana di Biochimica e Biologia molecolare (SIB).
2016-present: Member of the European Calcium Society (ECS)
2016-present: Member of the Società Chimica Italiana (SCI), Divisione Di Chimica dei Sistemi Biologici (DCSB).

REFEERING

Referee for the following peer-review journals: BBA-Proteins and Proteomics, Biochemistry, PLoS One, Scientific Reports, Biochemical Journal, IJMS, Protein Science.

RESEARCH ACTIVITY

Dr. Astegno research interests concern protein chemistry, including folding, evolution and structure-function relationship of proteins, with particular reference to metallo-proteins and PLP-dependent enzymes. She is also interested in protein-protein interaction and its role in the regulation of protein function.
Dr Astegno principal research projects focused on the biochemical/structural characterization of:

- Calcium-binding proteins: plant calmodulin (CaM) and calmodulin-like proteins (CMLs). Dr Astegno has been systematically cloning and studying the structural, metal and target-peptide binding properties of different member of Arabidopsis CaM/CML protein family (i.e., CaM1, CML14, CML36, CML19) using complementary biophysical and structural approaches. This approach has allowed significant steps forward in the understanding if CMLs act as Ca^{2+} sensors and how they differ from CaM and other Ca^{2+} sensors and therefore contribute to plant Ca^{2+} signaling in distinct ways. In particular, Dr Astegno demonstrated that CML36 is able to interact with the N-terminus of the Arabidospis 2B Ca^{2+}-ATPase isoform 8 (ACA8) activating the enzyme. Moreover, she made substantial contributions to the characterization of the plant CML19-RAD4 complex involved in the nucleotide excision repair pathway by identifying the protein interaction sites and the molecular properties of the association.
- CaM-binding proteins: plant glutamate decarboxylase (GAD) and its interaction with Ca^{2+}/CaM. Dr. Astegno substantially contributed to elucidate the structural basis of the CaM-dependent activation mechanism of plant GAD1 through the characterization of both the unliganded GAD1 enzyme and the CaM-target complex. Dr Astegno identified the key residues in the C-terminal region of GAD1 for regulation by CaM and by pH and the key residues in the N-terminal region for GAD1 oligomerization. She also determined the distinct roles played by the N- and C-domains of AtCaM1 in recognition of GAD1.
- Enzymes of the cysteine biosynthetic pathway, cystathionine beta-lyase (CBL), cystathionine gamma-lyase (CGL), cystathionine beta-synthase (CBS). Dr Astegno coordinates a program aimed at characterizing the structure, function and regulation of the PLP-dependent transsulfuration enzymes in different organisms. She has described the kinetic and biochemical properties of CGL from T. gondii, CBL from C. diphteriae and L. delbrueckii, elucidating the structural determinants of reaction and substrate specificity.
- Plant hemoglobins (AHb). Dr. Astegno participated in the structural and functional characterization of non-symbiotic hemoglobins of higher plants (AHb1 and AHb2 of Arabidopsis thaliana) in order to correlate their chemical reactivity to physiological function. In particular, she substantially contributed to demonstrate that AHb1 and AHb2 exhibit enzymatic behavior as nitrite reductases, showing that this activity is determined not only by heme coordination, but also by a unique distal heme pocket in each AHb.

CITATION METRICS AND PUBLICATIONS

The scientific activity of Dr Astegno is documented by 32 peer-reviewed papers (30 SCOPUS + 2 other). SCOPUS (ID 10140573500) H index=14; citations 437 (Sept 2020).
https://www.scopus.com/authid/detail.uri?authorId=10140573500

- GOOGLE SCHOLAR H index=17; i10-index 21, citations 590 (13, 17, and 442 respectively, since 2015)
  https://scholar.google.it/citations?hl=it&user=1KWW_hoAAAAJ

* = corresponding author

1. Conter C, Fruncillo S, Fernández-Rodríguez C, Martínez-Cruz LA, Dominici P, **Astegno A***. Cystathionine β-synthase is involved in cysteine biosynthesis and H2S generation in Toxoplasma gondii. Sci Rep. 2020 Sep 4;10(1):14657.
2. González-Recio I, Fernández-Rodríguez C, Simón J, Goikoetxea-Usandizaga N, Martínez-Chantar ML, **Astegno A**, Majtan T and Martínez-Cruz LA. Current structural knowledge on cystathionine β-synthase, a pivotal enzyme in the transsulfuration pathway. 2020 Review *Accepted in eLS*
3. Bombardi L, Pedretti M, Conter C, Dominici P, **Astegno A***. Distinct Calcium Binding and Structural Properties of Two Centrin Isoforms from *Toxoplasma gondii*. Biomolecules. 2020 Aug 4;10(8):E1142.
4. Pedretti M, Conter C, Dominici P, **Astegno A***. SAC3B is a target of CML19, the centrin 2 of Arabidopsis thaliana. Biochem J. 2020 Jan 17;477(1):173-189.
5. Fruncillo S, Trande M, Blanford CF, **Astegno A**, Wong LS. A Method for Metal/Protein Stoichiometry Determination Using Thin-Film Energy Dispersive X-ray Fluorescence Spectroscopy. Anal Chem. 2019 Aug 29.
6. Trande M, Pedretti M, Bonza MC, Di Matteo A, D'Onofrio M, Dominici P, **Astegno A***. Cation and peptide binding properties of CML7, a calmodulin-like protein from Arabidopsis thaliana. J Inorg Biochem. 2019 Aug 1.
7. Maresi E, Janson G, Fruncillo S, Paiardini A, Vallone R, Dominici P, **Astegno A***. Functional Characterization and Structure-Guided Mutational Analysis of the Transsulfuration Enzyme Cystathionine γ-Lyase from Toxoplasma gondii. Int J Mol Sci. 2018 Jul 20;19(7).
8. Vandelle E, Vannozzi A, Wong D, Danzi D, Digby AM, Dal Santo S, **Astegno A**. Identification, characterization, and expression analysis of calmodulin and calmodulin-like genes in grapevine (Vitis vinifera) reveal likely roles in stress responses. Plant Physiol Biochem. 2018 Jun 4;129:221-237.
9. La Verde V, Dominici P, **Astegno A***. Towards Understanding Plant Calcium Signaling through Calmodulin-Like Proteins: A Biochemical and Structural Perspective. Int J Mol Sci. 2018 Apr 30;19(5).
10. Rossignoli G, Phillips RS, Astegno A, Menegazzi M, Voltattorni CB, Bertoldi M. Phosphorylation of pyridoxal 5'-phosphate enzymes: an intriguing and neglected topic. Amino Acids. 2018 Feb;50(2):205-215.
11. La Verde V, Trande M, D'Onofrio M, Dominici P, **Astegno A***. Binding of calcium and target peptide to calmodulin-like protein CML19, the centrin 2 of Arabidopsis thaliana. Int J Biol Macromol. 2018 Mar;108:1289-1299.
12. **Astegno A***, Bonza MC, Vallone R, La Verde V, D'Onofrio M, Luoni L, Molesini B, Dominici P. Arabidopsis calmodulin-like protein CML36 is a calcium (Ca(2+))sensor that interacts with the plasma membrane Ca(2+)-ATPase isoform ACA8 and stimulates its activity. J Biol Chem. 2017 Sep 8;292(36):15049-15061.
13. La Verde V, Dominici P, **Astegno A***. Determination of Hydrodynamic Radius of Proteins by Size Exclusion Chromatography, Bio-protocol 7(8, 4/20/2017) (2017).
14. **Astegno A***, Maresi E, Bertoldi M, La Verde V, Paiardini A, Dominici P. Unique substrate specificity of ornithine aminotransferase from Toxoplasma gondii. Biochem J. 2017 Mar 7;474(6):939-955.
15. Allegrini A, **Astegno A***, La Verde V, Dominici P. Characterization of C-S lyase from Lactobacillus delbrueckii subsp. bulgaricus ATCC BAA-365 and its potential role in food flavour applications. J Biochem. 2017 Apr 1;161(4):349-360.
16. Vallone R, La Verde V, D'Onofrio M, Giorgetti A, Dominici P, **Astegno A**. Metal binding affinity and structural properties of CML14 from Arabidopsis thaliana. Protein Sci. 2016 Aug;25(8):1461-71.
17. Kumar N, **Astegno A**, Chen J, Dominici P. Residues in the distal heme pocket of Arabidopsis non-symbiotic hemoglobins: Implication for nitrite reductase activity. Int J Mol Sci. 2016 Apr 28; 17(5).
18. **Astegno A***, La Verde V, Marino V, Dell'Orco D, Dominici P. Biochemical and biophysical characterization of a plant calmodulin: role of the N- and C-lobes in calcium binding, conformational change, and target interaction. Biochim Biophys Acta. 2016 Jan;1864:297-307. [Epub ahead of print].
19. **Astegno A***, Capitani G, Dominici P. Functional roles of the hexamer organization of plant glutamate decarboxylase. Biochim Biophys Acta. 2015 Sep;1854(9):1229-37.

20. **Astegno A***, Maresi E, Marino V, Dominici P, Pedroni M, Piccinelli F, Dell'Orco D. Structural plasticity of calmodulin on the surface of CaF2 nanoparticles preserves its biological function. Nanoscale. 2014 Dec 21;6(24):15037-47.
21. **Astegno A***, Allegrini A, Piccoli S, Giorgetti A, Dominici P. Role of active-site residues Tyr55 and Tyr114 in catalysis and substrate specificity of Corynebacterium diphtheriae C-S lyase. Proteins. 2015 Jan;83(1):78-90.
22. Cellini B, Montioli R, Oppici E, **Astegno A**, Voltattorni CB. The chaperone role of the pyridoxal 5'-phosphate and its implications for rare diseases involving B6-dependent enzymes. Clin Biochem. 2014 Feb;47(3):158-65
23. Marino V, **Astegno A**, Pedroni M, Piccinelli F, Dell'Orco D. Nanodevice-induced conformational and functional changes in a prototypical calcium sensor protein. Nanoscale. 2014 Jan 7;6(1):412-23.
24. **Astegno A**, Giorgetti A, Allegrini A, Cellini B, Dominici P. Characterization of C-S Lyase from *C. diphtheriae*: a possible target for new antimicrobial drugs. *Biomed Res Int.* 2013;2013:701536.
25. Abbruzzetti S, Faggiano S, Spyrakis F, Bruno S, Mozzarelli A, **Astegno A**, Dominici P, Viappiani C. Oxygen and nitric oxide rebinding kinetics in non symbiotic hemoglobin AHb1 from Arabidopsis thaliana. IUBMB Life. 2011Dec;63(12):1094-100.
26. Spyrakis F, Faggiano S, Abbruzzetti S, Dominici P, Cacciatori E, **Astegno A**, Droghetti E, Feis A, Smulevich G, Bruno S, Mozzarelli A, Cozzini P, Viappiani C, Bidon-Chanal A, Luque FJ. Histidine E7 dynamics modulates ligand exchange between distal pocket and solvent in AHb1 from Arabidopsis thaliana. *J Phys Chem B.* 2011 Apr 14;115(14):4138-46.
27. Nienhaus K, Dominici P, **Astegno A**, Abbruzzetti S, Viappiani C, Nienhaus GU.Ligand migration and binding in non symbiotic hemoglobins of Arabidopsis thaliana. *Biochemistry*. 2010 Sep 7;49(35):7448-58.
28. Faggiano S, Abbruzzetti S, Spyrakis F, Grandi E, Viappiani C, Bruno S,Mozzarelli A, Cozzini P, Astegno A, Dominici P, Brogioni S, Feis A, Smulevich G, Carrillo O, Schmidtke P, Bidon-Chanal A, Luque FJ. Structural plasticity and functional implications of internal cavities in distal mutants of type 1 non-symbiotic hemoglobin AHb1 from Arabidopsis thaliana. J Phys Chem B. 2009 Dec 10;113(49):16028-38.
29. Pii Y, Astegno A, Peroni E, Zaccardelli M, Pandolfini T, Crimi M. The Medicago truncatula N5 gene encoding a root-specific lipid transfer protein is required for the symbiotic interaction with Sinorhizobium meliloti. Mol Plant Microbe Interact. 2009 Dec;22(12):1577-87.
30. Gut H, Dominici P, Pilati S, Astegno A, Petoukhov MV, Svergun DI, Grütter MG, Capitani G. A common structural basis for pH- and calmodulin-mediated regulation in plant glutamate decarboxylase. J Mol Biol. 2009 Sep 18;392(2):334-51.
31. Manara A, Lindsay J, Marchioretto M, Astegno A, Gilmore AP, Esposti MD, Crimi M. Bid binding to negatively charged phospholipids may not be required for its pro-apoptotic activity in vivo. BBA Molecular and Cell Biology of Lipids. 2009 Oct;1791(10):997-1010.
32. Crimi M, Astegno A, Zoccatelli G, Esposti MD. Pro-apoptotic effect of maize lipid transfer protein on mammalian mitochondria. Arch Biochem Biophys. 2006 Jan 1;445(1):65-71.

INSTITUTIONAL POSITIONS

- 2013-present: Member of the 'Collegio Didattico di Biotecnologie', Department of Biotechnology, University of Verona.
- 2016-present: Member of the 'Commissione per la valutazione della domande per docenza esterna' Department of Biotechnology, University of Verona.
- 2017-present: Coordinator of two Erasmus Exchanges Programs (bachelor degree in Biotechnology (L2) and master degree in and Molecular and Medical Biotechnology (LM9) with:
    - University of Oldenburg (Germany)
    - University of Castilla-La Mancha (Spain)
- 2018-present: Member of the academic board (collegio docenti) of the PhD in Biotechnology (DOT1340225), PhD School in Natural Sciences and Engineering, University of Verona.
- 2018: Member of the 'Commissione di revisione della laurea in Biotecnologie (L2)', Department of Biotechnology, University of Verona.
- 2019: Member of the 'Commissione FUR/Assegni di ricerca', Department of Biotechnology, University of Verona.