

# Stefano Capaldi, PhD

Assistant professor  
Biocrystallography Laboratory  
Department of Biotechnology, University of Verona  
Cà Vignal 1, Strada Le Grazie 15, 37134 Verona, ITALY  
Telephone: +39 045 802.7959  
Fax: +39 045 802.7929  
Email: stefano.capaldi@univr.it

Stefano Capaldi graduated at the University of Milan on 27/10/2000 in Pharmaceutical Chemistry and Technology. He was awarded the Philosophiae Doctor degree in Agroindustrial Biotechnology by the University of Verona on 30/03/2004 with the thesis entitled "The Three Dimensional Crystal Structure Of Carp Fish Egg Lectin" (supervisor Prof. Hugo L. Monaco). From January 2005 to February 2007 he held a Post Doc fellowship at the Biocrystallography laboratory of the University of Verona with the research project: "Structural studies on hydrophobic molecule - binding proteins and fungal lectins". Since March 2008 he is Assistant Professor in Molecular Biology at the Department of Biotechnology of the University of Verona.

## **Employment history:**

**Mar 2008 – present:** Assistant Professor in Molecular Biology, Department of Biotechnology, University of Verona, Italy.  
**Jan 2005 – Feb 2008:** post doc at the Biocrystallography laboratory, University of Verona, Italy.

## **Education & Qualifications:**

**Jan 2001 – Jan 2004:** PhD in Agro-industrial Biotechnology, University of Verona, Italy.  
(Supervisor Prof. Hugo L. Monaco).  
**Oct 1994 – Oct 200:** Master Degree in Pharmaceutical Chemistry and Technology. University of Milan, Italy.

## **Research activities:**

His main research activity is the structure determination of proteins by single crystal X-ray

diffraction. He has extensive experience both in sample preparation (heterologous expression in prokaryotic and eukaryotic systems, protein purification and crystallization) and protein crystallography (data collection, structure solution and refinement). His research work includes structural studies on hydrophobic molecule-binding proteins, fungal lectins and protein-protein interactions in biologically relevant complexes. In the last years he focused on the structural characterization of proteins involved in the bile acid metabolism and transport (Bile Acid-Binding Proteins, BABPs), fungal lectins with antitumoral properties and on the heterologous expression of membrane proteins for structural studies. From 03/04/2010 to 07/31/2010 and from 04/05/2015 to 27/07/2015 he was "visiting scientist" at the MPC (Membrane Protein Crystallization) Group (led by Dr. B. Byrne) at the Imperial College, London, to perform crystallization and structural studies on several membrane proteins.

He is co-author of 30 papers (15 in the last 5 years) in international peer-reviewed journals and 53 structures deposited in the Protein Data Bank (PDB).

#### **Visiting scientist experiences:**

**Nov 06 – Jan 07:** Universidad Nacional de Cordoba (Argentina), Glycobiology laboratory (led by Dr. J.A. Curtino).

**Grant:** Scientific Cooperation Italy-Argentina 2006-2007, Italian Ministry of Foreign Affairs.

**May 10 – Aug 10:** MPC (Membrane Protein Crystallization) Group (led by Dr. B.Byrne), Imperial College, London (UK).

**Grant:** Cooperint 2008, University of Verona.

**May 15 – Aug 15:** MPC (Membrane Protein Crystallization) Group (led by Dr. B.Byrne), Imperial College, London (UK).

**Grant:** Cooperint 2014, University of Verona.

#### **Technical skills and competences:**

Strong expertise in:

- Heterologous protein expression in prokaryotic (*E.coli*) and eukaryotic (*S.cerevisiae*, *P.pastoris*, Baculovirus/insect cells) systems
- Protein purification
- Crystallization and data collection
- Phasing, model building and structure refinement
- Biochemical functional assays

#### **Scientific collaborations:**

- Dr. G. Zanusso, University of Verona, Italy.
- Prof. R. Bassi, University of Verona, Italy.
- Prof. M. Galliano, University of Pavia, Italy.
- Prof. L. Bubacco e Dr. M. Bisaglia, University of Padova, Italy.
- Dr. B. Byrne, MPC group, Imperial College, London, UK.
- Dr. M.E. Carrizo, Universidad Nacional de Cordoba, Argentina.

### **Teaching:**

- Molecular Biology (6 CFU), Degree in Bioinformatics, University of Verona.
- Laboratory of Molecular Biology (2 CFU lectures + 4 CFU practical), Degree in Bioinformatics, University of Verona.

### **Meeting organization:**

- Member of the Organizing Committee of the 41<sup>o</sup> Meeting of the Italian Crystallography Association (AIC), Verona 11-14 Sep 2012.

## **Full List of Publications:**

- 1) **Capaldi S**, Suku E, Antolini M, Di Giacobbe M, Giorgetti A and Buffelli M. Allosteric sodium binding cavity in GPR3: a novel player in modulation of A $\beta$  production. *Sci Rep*. 2018 In press.
- 2) Toloe J, Taschenberger G, Leite K, Stahlberg M, Spelbrink G, Kues J, Munari F, **Capaldi S**, Becker S, Zweckstetter M, Dean C, Bahr M and Kügler S. Pathophysiological consequences of neuronal  $\alpha$ -Synuclein overexpression: impacts on ion homeostasis, stress signalling, mitochondrial integrity and electrical activity. *Front Mol Neurosci*. 2018 Mar 7;11:49.
- 3) D'Onofrio M, Zanzoni S, Munari F, Monaco HL, Assfalg M, **Capaldi S**. The long variant of human ileal bile acid-binding protein associated with colorectal cancer exhibits sub-cellular localization and lipid binding behaviour distinct from those of the common isoform. *Biochim Biophys Acta*. 2017 Sep;1861(9):2315-2324.
- 4) Bongianianni M, Orrù C, Groveman BR, Sacchetto L, Fiorini M, Tonoli G, Triva G, **Capaldi S**, Testi S, Ferrari S, Cagnin A, Ladogana A, Poggi A, Colaizzo E, Tiple D, Vaianella L, Castriciano S, Marchioni D, Hughson AG, Imperiale D, Cattaruzza T, Fabrizi GM, Pocchiari M, Monaco S, Caughey B, Zanusso G. Diagnosis of Human Prion Disease Using Real-Time Quaking-Induced Conversion Testing of Olfactory Mucosa and Cerebrospinal Fluid Samples. *JAMA Neurol*. 2017 Feb 1;74(2):155-162.
- 5) Pinnola A, Staleva-Musto H, **Capaldi S**, Ballottari M, Bassi R, Polívka T. Electron transfer between carotenoid and chlorophyll contributes to quenching in the LHCSR1 protein from *Physcomitrella patens*. *Biochim Biophys Acta*. 2016 Sep 7;1857(12):1870-1878.
- 6) Alguel Y, Amillis S, Leung J, Lambrinidis G, **Capaldi S**, Scull NJ, Craven G, Iwata S, Armstrong A, Mikros E, Diallinas G, Cameron AD, Byrne B. Structure of eukaryotic purine/H(+) symporter UapA suggests a role for homodimerization in transport activity. *Nat Commun*. 2016 Apr 18;7:11336.
- 7) Sadaf A, Mortensen JS, **Capaldi S**, Tikhonova E, Hariharan P, de Castro Ribeiro O, Loland CJ, Guan L, Byrne B, Chae PS. A Class of Rigid Linker-bearing Glucosides for Membrane Protein Structural Study. *Chem Sci*. 2016 Mar 1;7(3):1933-1939.
- 8) Pinnola A, Ghin L, Gecchele E, Merlin M, Alboresi A, Avesani L, Pezzotti M, **Capaldi S**, Cazzaniga S, Bassi R. Heterologous Expression of Moss Light-harvesting Complex Stress-related 1 (LHCSR1), the Chlorophyll a-Xanthophyll Pigment-protein Complex Catalyzing Non-photochemical Quenching, in *Nicotiana glauca* sp. *J Biol Chem*. 2015 Oct 2;290(40):24340-54.
- 9) **Capaldi S**, Faggion B, Carrizo M.E., Destefanis L, Gonzalez M.C., Perduca M, Bovi M, Galliano M, Monaco H.L. Three-dimensional structure and ligand-binding site of carp fishellectin (FEL). *Acta Crystallogr D Biol Crystallogr*. 2015 May;71(Pt 5):1123-35.
- 10) Perduca M, Bovi M, Bertinelli M, Bertini E, Destefanis L, Carrizo ME, **Capaldi S**, Monaco HL. High-resolution structures of mutants of residues that affect access to the ligand-binding cavity of human lipocalin-type prostaglandin D synthase. *Acta Crystallogr D Biol Crystallogr*. 2014 Aug;70(Pt 8):2125-38.

- 11) Plotegher N, Kumar D, Tessari I, Brucale M, Munari F, Tosatto L, Belluzzi E, Greggio E, Bisaglia M, **Capaldi S**, Aioanei D, Mammi S, Monaco HL, Samo B, Bubacco L. The chaperone-like protein 14-3-3 $\eta$  interacts with human  $\alpha$ -synuclein aggregation intermediates rerouting the amyloidogenic pathway and reducing  $\alpha$ -synuclein cellular toxicity. *Hum Mol Genet*. 2014 Nov 1;23(21):5615-29.
- 12) Merlin M, Gecchele E, **Capaldi S**, Pezzotti M, Avesani L. Comparative evaluation of recombinant protein production in different biofactories: the green perspective. *Biomed Res Int*. 2014;2014:136419. Review.
- 13) De Berti FP, **Capaldi S**, Ferreyra R, Burgardt N, Acierno JP, Klinke S, Monaco HL, Ermácora MR. The crystal structure of sterol carrier protein 2 from *Yarrowia lipolytica* and the evolutionary conservation of a large, non-specific lipid-binding cavity. *J Struct Funct Genomics*. 2013 Dec;14(4):145-53.
- 14) Avesani L, Merlin M, Gecchele E, **Capaldi S**, Brozzetti A, Falorni A, Pezzotti M. Comparative analysis of different biofactories for the production of a major diabetes autoantigen. *Transgenic Research*. 2013 Apr;23(2):281-91.
- 15) Bovi M, Cenci L, Perduca M, **Capaldi S**, Carrizo ME, Civiero L, Chiarelli LR, Galliano M, Monaco HL. BEL  $\beta$ -trefoil: a novel lectin with antineoplastic properties in king bolete (*Boletus edulis*) mushrooms. *Glycobiology*. 2013 May;23(5):578-92.
- 16) Chae PS, Rana RR, Gotfryd K, Rasmussen SG, Kruse AC, Cho KH, **Capaldi S**, Carlsson E, Kobilka B, Loland CJ, Gether U, Banerjee S, Byrne B, Lee JK, Gellman SH. Glucose-neopentyl glycol (GNG) amphiphiles for membrane protein study. *Chem Commun (Camb)*. 2013 Mar 21;49(23):2287-9.
- 17) Risso VA, Acierno JP, **Capaldi S**, Monaco HL, Ermácora MR. X-ray evidence of a native state with increased compactness populated by tryptophan-less *B. licheniformis*  $\beta$ -lactamase. *Protein Sci*. 2012 Jul;21(7):964-76.
- 18) Ambrosi E, **Capaldi S**, Bovi M, Saccomani G, Perduca M, Monaco HL. Structural changes in the BH3 domain of SOUL protein upon interaction with the anti-apoptotic protein Bcl-xL. *Biochem J*. 2011 Sep 1;438(2):291-301.
- 19) Bovi M, Carrizo ME, **Capaldi S**, Perduca M, Chiarelli LR, Galliano M, Monaco HL. Structure of a lectin with antitumoral properties in king bolete (*Boletus edulis*) mushrooms. *Glycobiology*. 2011 Aug;21(8):1000-9.
- 20) **Capaldi S**, Saccomani G, Fessas D, Signorelli M, Perduca M, Monaco HL. The X-ray structure of zebrafish (*Danio rerio*) ileal bile acid-binding protein reveals the presence of binding sites on the surface of the protein molecule. *J Mol Biol*. 2009 Jan 9;385(1):99-116.
- 21) Tarter M, **Capaldi S**, Carrizo ME, Ambrosi E, Perduca M, Monaco HL. Crystal structure of human cellular retinol-binding protein II to 1.2 Å resolution. *Proteins*. 2008 Mar;70(4):1626-30.
- 22) **Capaldi S**, Guariento M, Saccomani G, Fessas D, Perduca M, Monaco HL. A single amino acid mutation in zebrafish (*Danio rerio*) liver bile acid-binding protein can change the stoichiometry of ligand binding. *J Biol Chem*. 2007 Oct 19;282(42):31008-18.

- 23) **Capaldi S**, Perduca M, Faggion B, Carrizo ME, Tava A, Ragona L, Monaco HL. Crystal structure of the anticarcinogenic Bowman-Birk inhibitor from snail medic (*Medicago scutellata*) seeds complexed with bovine trypsin. *J Struct Biol.* 2007 Apr;158(1):71-9.
- 24) **Capaldi S**, Guariento M, Perduca M, Di Pietro SM, Santomé JA, Monaco HL. Crystal structure of axolotl (*Ambystoma mexicanum*) liver bile acid-binding protein bound to cholic and oleic acid. *Proteins.* 2006 Jul 1;64(1):79-88.
- 25) Sala A, **Capaldi S\***, Campagnoli M, Faggion B, Labò S, Perduca M, Romano A, Carrizo ME, Valli M, Visai L, Minchiotti L, Galliano M, Monaco HL. Structure and properties of the C-terminal domain of insulin-like growth factor-binding protein-1 isolated from human amniotic fluid. *J Biol Chem.* 2005 Aug 19;280(33):29812-9. **\*co-firs author**
- 26) Zanusso G, Fiorini M, Farinazzo A, Gelati M, Benedetti MD, Ferrari S, Dalla Libera A, **Capaldi S**, Monaco HL, Rizzuto N, Monaco S. Phosphorylated 14-3-3zeta protein in the CSF of neuroleptic-treated patients. *Neurology.* 2005 May 10;64(9):1618-20.
- 27) Carrizo ME, **Capaldi S**, Perduca M, Irazoqui FJ, Nores GA, Monaco HL. The antineoplastic lectin of the common edible mushroom (*Agaricus bisporus*) has two binding sites, each specific for a different configuration at a single epimeric hydroxyl. *J Biol Chem.* 2005 Mar 18;280(11):10614-23.
- 28) Nichesola D, Perduca M, **Capaldi S**, Carrizo ME, Righetti PG, Monaco HL. Crystal structure of chicken liver basic fatty acid-binding protein complexed with cholic acid. *Biochemistry.* 2004 Nov 9;43(44):14072-9.
- 29) Carrizo ME, Irazoqui FJ, Lardone RD, Nores GA, Curtino JA, **Capaldi S**, Perduca M, Monaco HL. Crystallization and preliminary X-ray study of the common edible mushroom (*Agaricus bisporus*) lectin. *Acta Crystallogr D* 2004 Apr;60(Pt 4):718-20.
- 30) Beringhelli T, Goldoni L, **Capaldi S**, Bossi A, Perduca M, Monaco HL. Interaction of chicken liver basic fatty acid-binding protein with fatty acids: a <sup>13</sup>C NMR and fluorescence study. *Biochemistry.* 2001 Oct 23;40(42):12604-11.