Curriculum Vitae – Dr Mario Campana – July 2020

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Summary

Having a background in pharmaceutical chemistry and technology, I am a specialized researcher in colloidal and surface chemistry. My PhD focused in studying adsorption of surfactants and biosurfactants at various interfaces, with particular attention to the biologically, industrially and technologically relevant oil-water interface.

I joined Unilever in early 2012 to investigate novel biosurfactants for personal care application, developing and optimizing in-vitro tests to assess mildness to skin models. These tests have now a key role in patent strategies.

I held an industrial post-doc position between 2013 and 2015, a collaboration between Unilever and the University of Manchester, studying novel biomaterials from waste sources and their possible application in personal care products. Within this role, I developed novel methodologies and applied existing ones to study a number of sample environments with high relevance to the personal care industry. At the same time, I further pursued my interest in adsorption at oil/water interfaces by focussing on protein adsorption at fluid/fluid interfaces.

On June 2015 I finally joined the Large Scale Structure group at ISIS as instrument scientist on the Surf reflectometer. By promoting and leading several upgrades and re-designing the maintenance routine, Surf is again a competitive reflectometer. In this role I have had the opportunity to further develop the methodology to probe oil/water interfaces using neutron reflectivity, the methodology has attracted increasing interest and is now routinely used to investigate these systems. Selected collaborations have broadened my interest to systems where my expertise in bio-compatibility, drug delivery and surface science merge together to produce cutting-edge science.

Professional Experience

June 2015 – present: Instrument Scientist at ISIS, Rutherford Appleton Laboratory

- *Instrument responsibility*: I am the main responsible scientist for the reflectometer Surf. On my arrival the instrument was dated and under-performing, while it has now been thoroughly upgraded and is currently a world-class instrument. I have significantly improved both flux and performance of the instrument, making Surf a competitive reflectometer. On top of all relevant software being kept up to date, the sample environment is also constantly being developed to improve the output of the scientific community and enabling new science: this involves both simplifying complex set-ups and broadening the number of experiments that can be performed on Surf. An important part of the role is to promote the instrument among the scientific community at relevant conferences and meetings, which includes attracting new users to the facility. As instrument responsible I am also in charge of the administrative aspects such as instrument scheduling, user support and health and safety aspects. Understanding the users' needs is key to target the instrument performance to their needs, essential to meet the scientists' expectations and maximise the instrument output.
- *Research output*: With my background in pharmaceutical chemistry, colloid science and knowledge of surface characterisation techniques, I aim to link together my different areas of expertise for the benefit of the scientific community and to pursue my personal scientific interest. I regularly advise more expert users on their neutron scattering work and proposal submission. I am often involved with the training of PhD

students to proficiently use the beamline. I am currently directly involved in a number of national and international collaborations where I personally lead the neutron scattering characterisation of the systems under study. **Selected active collaborations**:

- Prof Jian Lu, University of Manchester (UK): *Structural studies of antibodies upon adsorption at oil/water interfaces and their relevance to bioavailability*.
- Dr Ali Zarbakhsh, Queen Mary University of London (UK): *Protein adsorption at oil/water interfaces*; *Nanogel and nanogel/surfactant adsorption at biologically relevant interfaces*.
- Prof Luca Casettari, Università di Urbino and Dr Diego Perinelli, Università di Camerino (Italy): *Investigation of Amino Acid functionalised surfactants self-assembly and interaction with model lipid membranes for drug delivery systems*; *Self-assembly of PEGylated peptides for drug delivery applications.*
- Dr Michela Pisani, Università Politecnica delle Marche, (Italy): *Interaction of lipid nanoparticles with model membranes for targeted drug delivery systems.*
- Prof Kamil Wojciechowski, Warsaw University of Technology, Poland: *Interaction of saponin biosurfactants with model bilayers to assess their biocompatibility for personal care applications*.

April 2013 – June 2015: PDRA at Unilever, Port Sunlight, Wirral, UK and University of Manchester

- *Industrial involvement*: Working together with scientists from different departments, the aim of the project was to assess the suitability of protein-based novel biomaterials as surfactant substitutes in personal care applications. I was in charge of the very broad physico-chemical characterization of biomaterials in presence and absence of surfactants and/or other relevant compounds and advising possible working conditions for application in finished products. Routine Small Angle Neutron Scattering and Neutron Reflectivity experiments had a key role in understanding the behaviour of these systems, helping minimising the production cost whilst maintaining the desired characteristics.
- *Academic research*: As member of the University of Manchester, I initiated a parallel and independent research project, with the aim to characterise the adsorption of standard proteins at the challenging oil/water interface. One PhD studentship stemmed from this project, with the aim to study the technologically relevant adsorption of antibodies to oil/water interfaces. During the Post Doc position I was in charge of the whole team's neutron experiments, supporting 6 PhD students with both performing and planning their work and helping them with targeted data analysis.

February 2012–January 2013: Knowledge Transfer Partnership scheme as part of the PhD project, Unilever, Port Sunlight, Wirral, UK

I investigated the biocompatibility of surfactant mixtures, with focus on the interaction between surfactant-protein and surfactant-lipid bilayers as in-vitro models. The project followed a multi-disciplinary approach to achieve both surface and bulk characterization, using techniques such as zeta potential, surface zeta potential, viscosity and surface tension.

September 2008 – November 2012: PhD student in Physical Chemistry at Queen Mary University of London and ISIS, Rutherford Appleton Laboratory, Didcot, UK

Title of thesis: "*Structural Studies of Surfactants at Interfaces*".

Working under the supervision of Dr Ali Zarbakhsh and Dr John Webster, I used neutron reflectivity to study high complexity multi-component systems using neutron reflectivity. These systems are currently being developed for liquid/liquid extraction procedures for enhanced metal ions recovery. I developed new methodologies to probe for the first time adsorption processes at scientifically challenging interfaces, with particular emphasis on the oil/water and the oil/metal interface. The excellent results obtained have resulted in two follow-up PhD studentships as part of a collaboration between Queen Mary University of London, Cambridge University and BP Oil.

December 2007 – June 2008: Post-Graduate internship awarded by UniPharma Graduates Italian National Grad-Student Competition, Schering Plough, Oss, The Netherlands

Focussing on the area of granulates coating processes for pharmaceutical applications, I developed a model for particle velocity in fluidized bed coaters to study the influence of particle velocity on the coating quality. The study was part of a multi-disciplinary approach and was used in two publications.

October 2000 – February 2007: Master's Degree in Pharmaceutical Chemistry and Technology, Università degli Studi di Urbino, Italy (Final grade: 110/110, equivalent to First class honors, 1st)

Conferences attended and Presentations

- ECIS2023 37th Conference of European Colloid and Interface Society, September 2023, Naples. Title of talk: "Neutron Reflectivity studies of protein adsorption at oil/water interfaces".
- Awarded "*Capolavoro di Ateneo 2020*" from the University of Urbino for post-graduate career.
- Invited speaker at the SIS2020 23rd International Symposium of Surfactants in Solution, June 2020, Lublin, Poland. Conference postponed to 2021.
- Invited speaker at the ILL-ESS user meeting, October 2018, Grenoble. Title of talk: "*Neutron Reflectivity to Study Adsorption at Oil-Water Interfaces, Technical Challenges, Applications and Future Directions*".
- SIS2016 21st International Symposium of Surfactants in Solution, June 2016, Jinan, China. Title of talk: "*Advantages of Using Neutron Reflectivity to Study Surfactant Adsorption at Oil-Water Interfaces*".
- 89th ACS Colloid & Surface Science Symposium, June 2015, Pittsburgh, USA. Title of talk: "*Adsorption of surface active proteins at the oil-water interface*".
- Oral presentation accepted at the ECIS2014 –28th Conference of the European Colloid and Interface Society, September 2014, Haifa, Israel. Participation withdrawn for local safety concern.
- 85th ACS Colloid and Surface Science Symposium, June 2011, Montreal, Canada. Title of the talk: "*The Conformation of Surfactants at the Oil-Water Interface*".
- ISIS Large Scale Structures User Meeting, 1st prize at the Poster session, January 2011.
- QMUL Post-Graduate Symposium, 1st prize at the Poster session, February 2010.

Publications

Below is a list of selected publication. For a full list please follow the link to the Google Scholar account.

- Campana M. et Al., Surfactant adsorption at the metal–oil interface. *Langmuir*, **2011**, 27 (10), 6085–6090.
- Campana M. et Al., Adsorption of bovine serum albumin (BSA) at the oil/water interface: a neutron reflection study. *Langmuir*, **2015**, 31 (20), 5614-5622.
- Campana M. et Al., Structural conformation of lipids at the oil–water interface. *Soft Matter*, **2012**, 8, 34, 8904-8910.
- Campana M. et Al., Structural studies of nonionic dodecanol ethoxylates at the oil–water interface: effect of increasing head group size. *Langmuir*, **2014**, 30 (34), 10241-10247.
- Al-Shatty W. et Al, Interaction of Surface-Modified Alumina Nanoparticles and Surfactants at an Oil/Water Interface: A Neutron Reflectometry, Scattering, and Enhanced Oil Recovery Study. *ACS Appl. Mater. Inter.*, **2022**, 14, 19505-19514
- Ma K. et Al., Strong synergistic interactions in zwitterionic–anionic surfactant mixtures at the air–water interface and in micelles: The role of steric and electrostatic interactions. *J. Colloid Interface Sci.*, **2022**, 613, 294-310
- Wojciechowski K. et Al, Surface-active extracts from plants rich in saponins–effect on lipid mono-and bilayers. *Surface and Interfaces*, **2021**, 27, 101486.
- Perinelli D.R et Al., PEGylation affects the self-assembling behaviour of amphiphilic octapeptides. *Int. J. Pharmaceut.*, **2019**, 571, 118752.
- Lucarini S. et Al., Synthesis, structure–activity relationships and in vitro toxicity profile of lactose-based fatty acid monoesters as possible drug permeability enhancers. *Pharmaceutics*, **2018**, 10 (3), 81.
- Ruane S. et Al., Interfacial Adsorption of a Monoclonal Antibody and Its Fab and Fc Fragments at the Oil/Water Interface. *Langmuir*, **2019**, 35 (42), 13543-13552.
- Pan F. et Al., Interfacial adsorption of monoclonal antibody COE-3 at the solid/water interface. *ACS Appl. Mater. Inter.*, **2018**, 10 (1), 1306-1316.
- Li Z. et Al., Neutron Reflection Study of Surface Adsorption of Fc, Fab, and the Whole mAb, *ACS Appl. Mater. Inter.*, **2017**, 9 (27), 23202-23211.
- Campana M. et Al., Surfactant mixtures at the oil–water interface. *J. Colloid Interface Sci.*, **2013**, 398, 126-133.