



### Research topics

Development of micro- and nanoparticulate inhalable formulations for lung delivery of second line antitubercular drugs.

Lipid microparticle development for pharmaceutical applications.

Nanocarrier development for the improvement of tumor thermoablative therapy.

### Collaborations

Università degli Studi di Perugia, Dipartimento di Medicina Veterinaria

Università degli Studi di Perugia, Dipartimento di Chimica, Biologia e Biotecnologie

Université Libre de Bruxelles, Faculté de Pharmacie

### Last five year publications (2009-2013)

1. S. Giovagnoli, M.L. Marenzoni, M. Nocchetti, C. Santi, P. Blasi, A. Schoubben, M. Ricci, Synthesis, characterization and in vitro extracellular and intracellular activity against Mycobacterium tuberculosis infection of new second-line antitubercular drug-palladium complexes, *J. Pharm. Pharmacol.* 66 (2013) 106-121.
2. P. Blasi, A. Schoubben, G. Traina, G. Manfroni, L. Barberini, P.F. Alberti, C. Cirotto, M. Ricci, Lipid nanoparticles for brain targeting III. Long-term stability and in vivo toxicity, *Int. J. Pharm.* 454 (2013) 316-323.
3. C. Lico, A. Schoubben, S. Baschieri, P. Blasi, L. Santi, Nanoparticles in biomedicine: New insights from plant viruses, *Curr. Med. Chem.* 20 (2013) 3471-3487.
4. P. Blasi, A. Schoubben, G.V. Romano, S. Giovagnoli, A. Di Michele, M. Ricci, Lipid nanoparticles for brain targeting II. Technological characterization, *Colloids Surf B Biointerfaces* 110 (2013) 130-137.
5. P. Blasi, G. Luca, F. Mancuso, A. Schoubben, M. Calvitti, S. Giovagnoli, G. Basta, E. Becchetti, M. Ricci, R. Calafiore, Conformal polymer coatings for pancreatic islets transplantation, *Int. J. Pharm.* 440 (2013) 141-147.

6. S. Stegemann, S. Kopp, G. Borchard, V. Shah, S. Senel, R. Dubey, N. Urbanetz, M. Citterio, A. Schoubben, C. Hippchen, D. Cade, A. Fuglsang, J. Morais, L. Borgström, F. Farshi, K.-H. Seyfang, R. Hermann, A. van de Putte, I. Klebivich, A. Hincal, Developing and advancing dry powder inhalation towards enhanced therapeutics, *Eur. J. Pharm. Sci.* 48 (2013) 181-194.
7. F. Palazzo, S. Giovagnoli, A. Schoubben, P. Blasi, C. Rossi, M. Ricci, Development of a spray-drying method for the formulation of respirable microparticles containing ofloxacin-palladium complex, *Int. J. Pharm.* 440 (2013) 273-282.
8. A. Schoubben, P. Blasi, M.L. Marenzoni, L. Barberini, S. Giovagnoli, C. Cirotto, M. Ricci, Capreomycin supergenerics for pulmonary tuberculosis treatment: preparation, in vitro, and in vivo characterization, *Eur. J. Pharm. Biopharm.* 83 (2013) 388-395.
9. P. Blasi, S. Giovagnoli, A. Schoubben, M. Ricci, Response to Comment on Blasi et al. (2011) "Lipid nanoparticles for brain targeting I. Formulation optimization", *Int. J. Pharm.* 439 (2012) 171-174.
10. A. Schoubben, P. Balsi, P.P. DeLuca, Effect of agitation regimen on the in vitro release of leuprolide from PLGA microparticles, *J. Pharm. Sci.* 101 (2012) 1212-1220.
11. C. Puglia, F. Bonina, L. Rizza, P. Blasi, A. Schoubben, R. Perrotta, M.S. Tarico, E. Damiani, Lipid nanoparticles as carrier for octyl-methoxycinnamate: in vitro percutaneous absorption and photostability studies, *J. Pharm. Sci.* 101 (2012) 301-311.
12. P. Blasi, S. Giovagnoli, A. Schoubben, C. Puglia, F. Bonina, C. Rossi, M. Ricci, Lipid nanoparticles for brain targeting I. Formulation optimization, *Int. J. Pharm.* 419 (2011) 287-295.
13. P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, The real value of novel particulate carriers for sunscreen formulation, *Expert Rev. Dermatol.* 6 (2011) 509-517.
14. A. Schoubben; P. Blasi; S. Giovagnoli; C. Rossi; M. Ricci, Development of a scalable procedure for fine calcium alginate particle preparation, *Chem. Eng. J.* 160 (2010) 363-369.
15. Schoubben; P. Blasi; S. Giovagnoli; M. Ricci; C. Rossi, Simple and scalable method for peptide inhalable powder production, *Eur. J. Pharm. Sci.* 39 (2010) 53-58.
16. P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, Lipid nanoparticles for drug delivery to the brain: in vivo veritas, *J. Biomed. Nanotechnol.* 5 (2009) 344-350.
17. P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, Fighting tuberculosis: old drugs, new formulations, *Expert Opin. Drug Deliv.* 6(9) (2009) 977-993.
18. A. Schoubben, P. Blasi, S. Giovagnoli, L. Perioli, C. Rossi, M. Ricci, Novel composite microparticles for protein stabilization and delivery, *Eur. J. Pharm. Sci.* 36 (2009) 226-234.

Last five year communications (2009-2013)

1. F. Palazzo, S. Giovagnoli, P. Blasi, A. Schoubben, C. Rossi, M. Ricci, Development of inhalable microspheres for the treatment of pulmonary tuberculosis, 3<sup>rd</sup> A.It.U.N. Annual Meeting, March 6-7, 2009 Salerno (SA) Italy.
2. E. De Santis, P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, Lipid nanoparticles for targeted brain drug delivery, 3<sup>rd</sup> A.It.U.N. Annual Meeting, March 6-7, 2009 Salerno (SA) Italy.
3. F. Palazzo, S. Giovagnoli, P. Blasi, A. Schoubben, C. Rossi, M. Calvitti, M. Ricci, Sviluppo di sistemi carrier per la veicolazione polmonare di farmaci antitubercolari di seconda linea, 9<sup>o</sup> corso della Scuola Dottorale per la Formazione Avanzata in Discipline Tecnologico – Farmaceutiche, Cagliari (CA) September 7-9, 2009.
4. P. Blasi, T. Corazzi, S. Genovese, F. Epifano, A. Schoubben, C. Rossi, M. Curini, P. Gresele, M. Ricci, Effect of GOFA nanocrystals on human monocyte cyclooxygenase-2, XXI Simposio ADRITELF, September 10-13, 2009 Cagliari (CA) Italy.
5. A. Schoubben, P. Blasi, S. Giovagnoli, C. Puglia, F. Bonina, C. Rossi, M. Ricci, Production of fine powder for tuberculosis inhalation therapy, XXI Simposio ADRITELF, September 10-13, 2009 Cagliari (CA) Italy.
6. A. Schoubben, E. Cenci, F. Schiaffella, P. Blasi, L. Milanese, C. Rossi, A. Vecchiarelli, M. Ricci, R. Fringuelli, Nanoemulsion formulation of a new *Candida albicans* CYP51 inhibitor, 3<sup>rd</sup> BBBB, International Conference on Pharmaceutical Sciences, October 26-28, 2009 Antalya, Turkey, Eur. J. Pharm. Sci. 38 S (2009) 126-127.
7. S. Giovagnoli, P. Blasi, G. Luca, F. Fallarino, M. Calvitti, F. Mancuso, A. Schoubben, M. Ricci, G. Basta, E. Becchetti, C. Rossi, R. Calafiore, Effect of SOD and KET release from biodegradable microspheres on the in vivo response to implanted ALG-PLO-ALG microcapsules, 3<sup>rd</sup> BBBB, International Conference on Pharmaceutical Sciences, October 26-28, 2009 Antalya, Turkey, Eur. J. Pharm. Sci. 38 S (2009) 131-133.
8. P. Blasi, A. Schoubben, S. Giovagnoli, C. Puglia, L. Barberini, C. Cirotto, C. Rossi, M. Ricci, Colloidal Dispersions for Targeted Brain Drug Delivery, 3<sup>rd</sup> BBBB, International Conference on Pharmaceutical Sciences, October 26-28, 2009 Antalya, Turkey, Eur. J. Pharm. Sci. 38 S (2009) 25-26.
9. A. Schoubben, P. Blasi, S. Giovagnoli, C. Rossi, M. Ricci, Production of capreomycin fine powder and loaded PLGA microparticles for tuberculosis inhalation therapy, 2009 AAPS Annual Meeting and Exposition, November 8-12, 2009 Los Angeles, CA, USA.

10. P. Blasi, E. De Santis, A. Schoubben, S. Giovagnoli, C. Puglia, C. Rossi, L. Barberini, C. Cirotto, M. Ricci, In vivo biocompatibility studies on lipid nanoparticles, 2009 AAPS Annual Meeting and Exposition, November 8-12, 2009 Los Angeles, CA, USA.
11. S. Giovagnoli, F. Palazzo, M. Calvitti, P. Blasi, A. Schoubben, C. Rossi, M. Ricci, Inhalable microparticulate carriers for the treatment of pulmonary tuberculosis, 2009 AAPS Annual Meeting and Exposition, November 8-12, 2009 Los Angeles, CA, USA.
12. P. Blasi, A. Schoubben, S. Giovagnoli, G. Proietti, A. Poletti, C. Rossi, M. Ricci, Liposomal ferulic acid quantification using the Belousov-Zhabotinsky oscillator, 4th A.It.U.N. Annual Meeting, February 26-27, 2010 Napoli, Italy.
13. A. Schoubben, P. Blasi, S. Giovagnoli, C. Rossi, M. Ricci, Preparation of fine calcium alginate particles, Third Biotech Workshop - "Drug delivery systems for biotech products", March 24-25, 2010 Pavia, Italy.
14. P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, Nanoparticle production by a new generation spray-dryer, Third Biotech Workshop - "Drug delivery systems for biotech products", March 24-25, 2010 Pavia, Italy.
15. P. Blasi, A. Schoubben, S. Giovagnoli, L. Barberini, M. Ricci, C. Rossi, C. Cirotto, L'embrione di pollo come modello per la determinazione della biocompatibilità di materiali ad uso farmaceutico, "Gruppo Embriologico Italiano 56° Convegno", June 7-10, 2010 Perugia, Italy.
16. P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, Alginate micro-and nanoparticle production by spray-drying, "Lactose as a carrier for inhalation products", September 26-28, 2010 Parma, Italy.
17. A. Schoubben, M. Marenzoni, P. Blasi, S. Giovagnoli, M. Ricci, C. Valente, C. Rossi, Production and in vitro evaluation of hydrophobic ion pair fine powders for tuberculosis inhalation therapy, "FIP Pharmaceutical Sciences 2010 World Congress in Association with the AAPS Annual Meeting and Exposition", November 14 - 18, 2010 New Orleans, LA, USA.
18. P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, Inhalable peptide powders produced by a Nano Spray Dryer B-90, "FIP Pharmaceutical Sciences 2010 World Congress in Association with the AAPS Annual Meeting and Exposition", November 14 - 18, 2010 New Orleans, LA, USA.
19. S. Giovagnoli, P. Blasi, A. Schoubben, C. Rossi, M. Ricci, Novel ofloxacin and capreomycin sulfate loaded spray-dried composite particles for tuberculosis inhalation therapy, "FIP Pharmaceutical Sciences 2010 World Congress in Association with the AAPS Annual Meeting and Exposition", November 14 - 18, 2010 New Orleans, LA, USA.

20. P. Blasi, M. Andreassi, L. Barberini, A. Schoubben, P. Alberti, M. Ricci, C. Anselmi, C. Cirotto, C. Rossi, L. Andreassi, La vascolarizzazione di derma umano operata dal corioallantoide di pollo, "Gruppo Embriologico Italiano (GEI) - LVII Convegno", June 5-8, 2011, Monteortone (Padova), Italy.
21. P. Blasi, M. Andreassi, L. Barberini, A. Schoubben, P. Alberti, M. Ricci, C. Anselmi, C. Cirotto, C. Rossi, L. Andreassi, Vascularization of human acellular dermis on chick chorioallantoic membrane, "2011 Annual Meeting of the Society for Investigative Dermatology", May 4-7, 2011 Phoenix, Arizona, USA.
22. P. Blasi, A. Schoubben, S. Giovagnoli, C. Rossi, M. Ricci, Rheological behaviour of solid lipid nanoparticles, 2011 AAPS Annual Meeting and Exposition, October 23-27, 2011, Washington, DC, USA.
23. A. Schoubben, M. Marenzoni, P. Blasi, S. Giovagnoli, M. Coletti, C. Rossi, M. Ricci, Aerodynamic assessment and in vitro evaluation of capreomycin oleate fine powder for tuberculosis therapy, 2011 AAPS Annual Meeting and Exposition, October 23-27, 2011, Washington, DC, USA.
24. S. Giovagnoli, M. Nocchetti, P. Sassi, P. Blasi, A. Schoubben, F. Palazzo, C. Rossi, M. Ricci, Physicochemical characterization of new palladium-antitubercular drug complexes potentially useful to improve tuberculosis inhalation therapy, 2011 AAPS Annual Meeting and Exposition, October 23-27, 2011, Washington, DC, USA.
25. E. Casseti, P. Blasi, L. Barberini, A. Schoubben, C. Cirotto, M. Ricci, Preparation, characterization and in vivo biocompatibility of PLGA scaffolds, 6th AItUN Annual Meeting, March 8-9, 2012 Parma, Italy.
26. S. Giovagnoli, A. Schoubben, P. Blasi, M. Ricci, Improvement of drug powder micronization by statistical modeling of a spray drying process, Pharmaceutical Technology Symposium 2012, May 21-24, 2012, Singapore.
27. P. Blasi, L. Barberini, A. Schoubben, M. Ricci, C. Cirotto, Studi di tossicità e teratogenicità in embrione di pollo su nano particelle per applicazioni farmaceutiche e cosmetiche, "Gruppo Embriologico Italiano (GEI) - LVIII Convegno", June 13-15, 2012, Torino, Italy.
28. A. Schoubben, S. Giovagnoli, P. Blasi, M. Ricci, Effect of particle shape on the air jet milling process efficiency, 2012 AAPS Annual Meeting and Exposition, October 14-18, 2012, Chicago, IL, USA.
29. S. Giovagnoli, G. Luca, F. Mancuso, M. Calvitti, M. Piroddi, A. Schoubben, P. Blasi, F. Galli, M. Moretti, E. Becchetti, M. Ricci, R. Calafiore, Sertoli Cells as potential drug carriers: uptake

and stability, 2012 AAPS Annual Meeting and Exposition, October 14-18, 2012, Chicago, IL, USA.

30. P. Blasi, A. Schoubben, S. Giovagnoli, M. Ricci, Freeze-drying and spray-drying of lipid nanoparticle suspensions, *Frontiers in Water Biophysics 2012*, September 23-26, 2012, Perugia, Italy.
31. P. Blasi, A. Schoubben, V. Romano, M. Ricci, Stability of lipid nanoparticles in physiological relevant media, *Frontiers in Water Biophysics 2012*, September 23-26, 2012, Perugia, Italy.
32. A. Schoubben, P. Blasi, S. Giovagnoli, M. Ricci, Pulmonary delivery of capreomycin supergenerics: effects of device and capsule, *PharmaTech 2012, International Conference and Exhibition on Pharmaceutical, Nutraceutical and Cosmeceutical Technology*, November 21-21, 2012, Kuala Lumpur, Malaysia.
33. P. Blasi, A. Schoubben, L. Barberini, S. Levorato, M. Villarini, M. Moretti, C. Cirotto, M. Ricci, On the toxicity of lipid and metal oxide nanoparticles of pharmaceutical and cosmetic interest, *PharmaTech 2012, International Conference and Exhibition on Pharmaceutical, Nutraceutical and Cosmeceutical Technology*, November 21-21, 2012, Kuala Lumpur, Malaysia.
34. S. Giovagnoli, G. Luca, F. Mancuso, I. Arato, G. Falabella, M. Calvitti, M. Piroddi, D. Pietrella, A. Schoubben, P. Blasi, F. Galli, M. Moretti, E. Becchetti, M. Ricci, R. Calafiore, Sertoli cells as potential drug carriers to treat lung infections: a preliminary study, *PharmaTech 2012, International Conference and Exhibition on Pharmaceutical, Nutraceutical and Cosmeceutical Technology*, November 21-21, 2012, Kuala Lumpur, Malaysia.
35. A. Blandino, P. Blasi, C. Lico, L. Barberini, A. Schoubben, S. Baschieri, C. Cirotto, L. Santi, In vivo toxicity and teratogenicity evaluation of plant virus nanoparticles, 7<sup>th</sup> A.It.U.N. Annual Meeting, March 8-9, 2013 Perugia (PG) Italy.
36. B. Albertini, A. Schoubben, E. Casseti, P. Blasi, M. Ricci, Synthesis and characterization of gold nanoparticles, 7<sup>th</sup> A.It.U.N. Annual Meeting, March 8-9, 2013 Perugia (PG) Italy.
37. B. Albertini, E. Casseti, A. Schoubben, P. Blasi, M. Ricci, Sintesi e caratterizzazione di nanoparticelle di oro, XIII Summer School per la Formazione Avanzata in Discipline Tecnologico – Farmaceutiche, Arcavacata di Rende (CS) September 8-12, 2013.
38. A. Schoubben, S. Giovagnoli, P. Blasi, M. Ricci, Production of a capreomycin sulfate inhalable powder by nano spray-drying, *Controlled Release Society Italy Chapter Workshop, Design and Industrial Development of Advanced Drug Delivery Systems*, Pavia November 21-23, 2013.
39. B. Albertini, S.M.L. Greco, E. Casseti, A. Schoubben, P. Blasi, M. Ricci, Gold nanoparticle size evaluation using different methods, *Controlled Release Society Italy Chapter Workshop*,

Design and Industrial Development of Advanced Drug Delivery Systems, Pavia November 21-23, 2013.

40. P. Blasi, A. Schoubben, B. Albertini, M. Ricci, Lipid nanoparticles for targeted brain drug delivery, NanotechItaly 2013, Key Enabling Technologies for Responsible Innovation, Venice November 27-29, 2013.
41. B. Albertini, A. Schoubben, P. Blasi, M. Ricci, Effects of stabilizers on gold nanoparticle native size and stability, NanotechItaly 2013, Key Enabling Technologies for Responsible Innovation, Venice November 27-29, 2013.
42. P. Blasi, A. Schoubben, S. Giovagnoli, G. Proietti, A. Poletti, M. Ricci, Direct chemical quantification using an oscillating reaction, Hands-On Research in Complex Systems, Trieste July 1-12, 2013.
43. A. Schoubben, Inhalation therapy for pulmonary tuberculosis treatment, 2nd Open Forum on Pharmaceutics and Biopharmaceutics, 26-27 April 2012, Istanbul, Turkey.

2013-2014 teaching activity

Biomaterials: Advanced applications and Regulatory aspects for the Master degree in Pharmaceutical biotechnology