

# rpp2006

Barcelona, September 21-23

A Comparative View on Host Physiology

Organized by:



Pau Ferrer and Antonio Villaverde, Co-Chairs

# Presentation

We are really pleased to welcome you in Barcelona for the 4<sup>th</sup> Recombinant Protein Production Meeting, a Comparative View on Host Physiology. It is an exciting experience for us to hold you in the Casa de Convalescència (Convalescence House), a small but hopefully comfortable Conference Hall annex to the Hospital de Sant Pau (still active as a Hospital). Both buildings are beautiful examples of Catalan Art Nouveau, and symbols of our culture and history that we wish to share and enjoy with you as a meeting place for discussion around the recombinant protein cell factory concept. As in other aspects of life, communication, dialogue, tolerance and exchange of ideas (versus the conflict-based way of acting) should result in gaining knowledge and, consequently, in a better world for the next generations. Art and science could be, among others, nice examples of convergence among countries.

In the biotechnological context, and particularly in emerging fields such as proteomics, functional genomics and structural biology, recombinant protein production is being considered as a pivotal set of technologies that are supporting the increasing and highly pushing demand of proteins for both industry and research. In previous editions of this conference series, focus on the comparative view between potential hosts and host physiology has been pursued. In this Meeting, we have emphasized further such comparative approach by organizing host-focused vertical workshops and transversal, concept-oriented sessions that will hopefully cover all aspects related with protein production. Importantly, the scientific committee has eagerly looked for a well-balanced equilibrium between industry and academia, combining both visions by selecting appropriate topics and long-experienced speakers from both sides, as well as by revising unconventional hosts and production approaches. Finally, we hope that the great attendance success in terms of number of registered attendants, country distribution and the nice combination of senior and young scientists will offer the most appropriate atmosphere for discussing about (and enjoying) Science.

Barcelona, September 2006

Pau Ferrer

Antonio Villaverde

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# Scientific program

THURSDAY, SEPTEMBER 21

- 09:00 – 10:00  
**S1** Opening Ceremony & Keynote Lecture 1  
**The moss bioreactor offers best of both worlds for biopharmaceutical production**  
Eva L. Decker. Plant University of Freiburg, Germany
- 10:00 – 11:30  
SESSION 1 - METABOLIC AND STRESS RESPONSES DURING RECOMBINANT PROTEIN PRODUCTION  
Co-chairs: **D. Mattanovich / M. Saloheimo**
- S5** **The making and breaking of an efficient antibody factory**  
Roberto Sitia. San Raffaele Scientific Institute. Italy
- S4** **The effects of expressing anti-apoptotic genes on mammalian cell survival, physiology, and protein production**  
Mike Betenbaugh. Johns Hopkins University. USA
- S6** **Monitoring the dynamics of transcription and translation within the time course of recombinant *Escherichia coli* cultivations**  
Karin Dürschmid. Department of Biotechnology, University of Natural Resources and Applied Life Sciences, Austria
- S43** **Design of improved membrane protein production experiments in yeast: Quantitation of the host response**  
Roslyn M. Bill. School of Life and Health Sciences, Aston University, U.K.
- 11:30 – 12:00  
Coffee-Break
- 12:00 – 13:00  
WORKSHOP 1 – INDUSTRIAL PROTEIN PRODUCTION (**workshop sponsored by Novozymes A/S**)  
Co-chairs: **I. Diers / H. Huber**
- S27** **High level *Aspergillus* production of proteins**  
Dominique Aubert. Novozymes A/S, Denmark
- S28** ***Pseudomonas fluorescens* - A Robust Expression Platform for Pharmaceutical Protein Production**  
Diana Retallack. The Dow Chemical Company, U.S.A.
- S29** **Enhanced protein expression through strain selection, gene disruption, improved vector design and co-expression of endogenous chaperones**  
Darrell Sleep. Novozymes Delta Ltd, U.K.
- S30** **Impact of high throughput technology on recombinant protein production**  
Jo J. Jones. GlaxoSmithKline, U.K.
- 13:00 – 15:00  
Lunch

15:00 – 16:30

SESSION 2 - INSIGHTS IN VIVO PROTEIN FOLDING

Co-chairs: **A. Villaverde / A. De Marco**

- S7 Targeting expression of expanded polyglutamine proteins to the endoplasmic reticulum or mitochondria prevents their aggregation**  
Anne Bertolotti. Laboratoire de Génétique Moléculaire, CNRS UMR8541, Ecole Normale Supérieure, Paris France (**presentation sponsored by FEMS**)
- S8 Protein quality control systems: Mechanisms and applications**  
Axel Mogk. Zentrum für Molekulare Biologie Heidelberg, Heidelberg, Germany
- S9 Protein aggregation into bacterial inclusion bodies is a specific kinetically driven process**  
Salvador Ventura. Departament de Bioquímica i Biologia Molecular, and Institut de Biotecnologia i de Biomedicina, Universitat Autònoma de Barcelona, Spain
- S10 Kinetics of aggregation and structural properties of proteins in inclusion bodies studied by Fourier transform infrared spectroscopy**  
Silvia Maria Doglia. Dipartimento di Biotecnologie e Bioscienze Università di Milano Bicocca, Milano, Italy
- S11 Investigation of the inclusion body formation process by FTIR spectroscopy**  
Gerd Margreiter. Department of Biotechnology, University of Natural Resources and Applied Life Sciences, Austria

16:30 – 18:00

Coffee-Break and Poster Session

18:00 – 19:00

WORKSHOP 2 - PROTEIN PRODUCTION IN FILAMENTOUS FUNGI  
(**workshop sponsored by Chr. Hansen GmbH**)

Co-chairs: U. Rinas / J.F. Martín

- S31 Industrial scale production of chymosin with *Aspergillus niger***  
Karsten Helmuth. Ch. Hansen GmbH, Germany
- S32 Filamentous fungi as cell factories for protein production**  
Peter Punt. TNO Quality of Life. The Netherlands
- S33 Genome-wide analysis of protein production physiology in the filamentous fungus *Trichoderma reesei***  
Markku Saloheimo. VTT Biotechnology, Finland

FRIDAY, SEPTEMBER 22

- 09:00 – 10:00  
**S2** Keynote Lecture 2  
**Enhanced production of recombinant proteins by systems biotechnological approaches**  
Sang Yup Lee. Korea Advanced Institute of Science and Technology (KAIST)
- 10:00 – 11:30  
SESSION 3 - INTERACTIONS BETWEEN HOST PHYSIOLOGY AND PROCESS TECHNOLOGY  
Co-chairs: **W. Bentley / G. Larsson**
- S12** **Environment matters - An *Escherichia coli* case study. How process technology affects cell physiology and product quality/quantity**  
Ursula Rinas. GBF. Germany
- S13** **Substrate feeding strategies in *Pichia pastoris* fed-batch cultivation processes: Analysis of key parameters influencing recombinant protein production.**  
Francisco Valero. Departament d'Enginyeria Química, Universitat Autònoma de Barcelona, Spain
- S14** **A rational approach to optimize feed profiles for the maximization of productivity of secreted proteins expressed in *Pichia pastoris***  
Michael Maurer. Department of Biotechnology, Institute of Applied Microbiology, University of Natural Resources and Applied Life Sciences Vienna, Austria
- 11:30 – 12:00  
Coffee-Break
- 12:00 – 13:00  
WORKSHOP 3 - PROTEIN PRODUCTION IN YEAST (**workshop sponsored by Novozymes Delta Ltd**)  
Co-chairs: **D. Porro / L. Christensen**
- S34** **Expression efficiency and sequence-based factors: a comparative view on 76 human genes expressed in *Pichia pastoris***  
Christine Lang, TU Berlin. Germany
- S35** **A novel yeast expression system based on a hormone-induced transcriptional cascade**  
Sebastián Chávez. Department of Genetics, Universidad de Sevilla, Spain
- S36** **Use of a “universal“ yeast vector (CoMed™) system for the production of proteins in *Hansenula polymorpha* and *Arxula adenivorans***  
Gerd Gellissen. PharmedArtis GmbH, Germany
- 13:00 – 15:00  
Lunch
- 15:00 – 16:30  
SESSION 4 - METABOLIC AND CELL ENGINEERING FOR PROTEIN PRODUCTION  
Co-chairs: **J.M. Betton / M. Fussenegger**
- S15** **Expression of soluble and membrane proteins in *Escherichia coli***  
A James Link, University of Texas, USA
- S16** **Enhancing Recombinant Glycoprotein Yield and Quality Using Gene Targeted CHO Cells Lines**  
Danny Chee Fung Wong. Bioprocessing Technology Institute, Biomedical Sciences Institutes, Singapore

- S17**      **A novel engineered insect cell line for pro-protein processing and activation**  
 Maria Cristina Sidoli. AXXAM srl, Italy
- S18**      **Antisense RNA based control of detrimental factors for recombinant gene expression in *Escherichia coli* – down-regulation of RNase E**  
 Peter Neubauer. Department of Process and Environmental Engineering, University of Oulu, Finland
- 16:30 – 18:00      Coffee-Break and Poster Session
- 18:00 – 19:00      **WORKSHOP 4 - *PROTEIN PRODUCTION IN BACTERIA***  
 Co-chairs: **J. Shiloach / G. Wegrzyn**
- S37**      **Recombinant protein expression system in cold loving microorganisms.**  
 Angela Duilio. Department of Organic Chemistry and Biochemistry, University Federico II of Naples, Italy
- S38**      **Rapid detection of bacteriophage infection and prophage induction using electric biochips**  
 Marcin Los. Department of Molecular Biology, University of Gdansk, Poland
- S39**      **Nisin Controlled gene Expression (NICE) in *Lactococcus lactis* – versatile applications ranging from membrane proteins to large scale processes**  
 Igor Mierau. NIZO food research, The Netherlands
- 19:00 – 20:00      Microb. Phys. Section Meeting

SATURDAY, SEPTEMBER 23

- 09:00 – 10:00  
**S3** Keynote Lecture 3  
**Industrial aspects of protein production by filamentous fungi**  
Michael Ward. Genencor International, USA
- 10:00 – 11:30  
SESSION 5 - PROTEIN PRODUCTION FOR STRUCTURAL GENOMICS  
Co-chairs: **F. X. Avilés / C. Lang**
- S19** **The first fruits of an HTP membrane platform: Crystal structure of the CorA Mg<sup>2+</sup> transporter**  
Chris Koth. Vertex Pharmaceuticals. USA
- S20** **Highly active membrane proteins produced in a cell-free expression system**  
Jean-Luc Lenormand. European Laboratory HumProTher, Centre Hospitalier Universitaire de Grenoble, France
- S21** **Production, purification and structural analysis of a cation efflux membrane protein from *Thermus thermophilus***  
Olga Kolaj. Department of Chemical and Environmental Sciences, University of Limerick, Ireland
- S22** **An optimized method to produce halophilic proteins in *Escherichia coli***  
Julia María Esclapez. Department of Agrochemistry and Biochemistry, University of Alicante, Spain
- 11:30 – 12:00  
Coffee-Break
- 12:00 – 13:00  
WORKSHOP 5 - PROTEIN PRODUCTION IN ANIMAL AND PLANT SYSTEMS  
Co-chairs: **M. Carrondo / R. Fischer**
- S40** **An integral process for the production of virus-like particles by insect cells**  
Laura A. Palomares, UNAM, Mexico
- S41** **FAST generation of high producer CHO cell lines by an iterative transfection process**  
Nic Mermod. Laboratory of Molecular Biology, University of Lausanne, Switzerland
- S42** **Zera®, a novel technology for stable accumulation and easy recovery of recombinant proteins in eukaryotic protein-production hosts.**  
Dolors Ludevid. Consorci CSIC-IRTA, Spain
- 13:00 – 15:00  
Lunch
- 15:00 – 16:30  
SESSION 6 - ACQUIRING USEFUL PHYSIOLOGICAL KNOWLEDGE  
Co-chairs: P. Ferrer / P. Neubauer
- S23** **Monitoring of stress responses**  
Thomas Schweder. Ernst-Moritz-Arndt-University. Germany
- S24** **Design of transcriptional fusions of stress sensitive promoters and GFP to monitor the overburden of *Escherichia coli* hosts during recombinant protein production**  
Sabine Nemecek. Department of Biotechnology, University of Natural Resources and Applied Life Sciences, Austria

- S25**      **Dynamic optimisation of a recombinant BHK-21 culture based on elementary flux analysis and hybrid parametric/nonparametric modeling**  
Paula Alves. Instituto de Biologia Experimental e Tecnologia/Instituto de Tecnologia Química e Biológica (IBET/ITQB), Portugal
- S26**      **Monitoring of transcript regulation and protein production related stress responses in *Pichia pastoris* secreting Fab antibody fragments**  
Brigitte Gasser. Department of Biotechnology, Institute of Applied Microbiology, University of Natural Resources and Applied Life Sciences Vienna, Austria
- 16:30 – 18:00      Coffee-Break and Poster Session
- 18:00 – 20:00      **INDUSTRIAL ROUND TABLE AND POSTER AWARD (poster award sponsored by Novo- Nordisk A/S)**  
Moderator round table: **K. Hellmuth**  
Chair poster award: **L. Christensen**
- 21:00 -      Meeting Dinner

# Posters

## Session 1: Metabolic and stress responses during recombinant protein production

- P1 Comparative transcriptional profiling of the bacterial stress response in temperature and chemically-induced recombinant *E. coli* processes**  
Daniela Böhm and Ursula Rinas
- P2 FT-IR spectroscopy for the study of bacterial membrane stress induced by recombinant protein production**  
Diletta Ami, Antonino Natalello, Pietro Gatti-Lafranconi, Tina Schultz, Marina Lotti, Ario de Marco and Silvia Maria Doglia
- P3 Regulation of the secretion pathway of CHO cells for altered recombinant Mab production rates during the course of MTX amplification**  
Yuan Sheng Yang, Janet Chusainow, Yan Ying Mao, Steven C.L. Ho and Miranda G.S. Yap
- P4 Microarray-based analysis of recombinant protein production in *E. coli***  
Ronan O'Dwyer, Xuejun Hu, Mattia Pelizzola, Olga Kolaj, Maria Foti, Paola Ricciardi-Castagnoli and J. Gerard Wall
- P5 A sensor of the Unfolded Protein Response to study the stress induced in *Yarrowia lipolytica* strains by the production of heterologous proteins**  
Catherine Madzak and Jean-Marie Beckerich
- P6 Native and heterologous protein oxidation and subsequent degradation in a recombinant filamentous fungus *Aspergillus niger* B1-D**  
Qiang Li, Linda M. Harvey and Brian McNeil

## Session 2: Insights in in vivo protein folding

- P7 Low growth temperatures improve the conformational quality of aggregation prone recombinant proteins in both soluble and insoluble *E. coli* cell fractions**  
Andrea Vera, Núria González-Montalban, Elena García-Fruitós, Anna Arís and Antonio Villaverde
- P8 *Zea mays* L. transglutaminase expression in *Escherichia coli***  
Patricia Carvajal, Enrique Villalobos, Alexandre Campos, J.Ma. Torné, Eduard Barberà and Mireya Santos
- P9 Cellular toxicity triggered by bacterial inclusion bodies**  
Núria González-Montalban, Antonio Villaverde and Anna Arís
- P10 DnaK-J are limiting for proper recombinant protein folding only at low production rates and when the physiological heat-shock stress response is not triggered**  
Mónica Martínez-Alonso, Andrea Vera, Elena García-Fruitós, Núria González-Montalbán, Anna Arís and Antonio Villaverde
- P11 *Potato virus A* genome-linked protein is a natively unfolded protein**  
Kimmo Rantalainen and Kristiina Mäkinen
- P12 RNA Interference mediated knockdown of genes in order to increase protein production using the baculovirus expression system**  
Colin Hebert, Eun Jeong Kim, Shannon F. Kramer, James J. Valdes and William E. Bentley

- P13 Heterologous overexpression of a halophilic  $\alpha$ -amylase**  
Vanessa Bautista, Julia Esclapez, Rosa M<sup>a</sup> Martínez-Espinosa, Francisco Pérez-Pomares, Mónica Camacho and M<sup>a</sup> José Bonete.
- P14 Performance of beta-galactosidase inclusion bodies in enzymatic bioprocesses**  
Elena García-Fruitós, Anna Arís and Antonio Villaverde
- P15 Production of recombinant mink growth hormone in *E. coli***  
Jolanta Sereikaite, Alina Statkute, Mindaugas Morkunas, Vitaliano Borromeo, Camillo Secchi and Vladas-Algirdas Bumelis
- P16 Comparative analysis of *E. coli* inclusion bodies and thermal protein aggregates**  
Núria González-Montalban, Elena García-Fruitós, Salvador Ventura, Anna Arís and Antonio Villaverde
- P17 Point mutation of serine 179 in the human Prolactin (PRL) affects recombinant protein expression, folding and secretion, abolishes PRL nickel (II)-binding and increases heparin binding capacities**  
Eric Ueda, Carlos Soares, Ameae Walker and Paolo Bartolini
- P18 Models for the study of inclusion bodies formation as a function of fermentation conditions and protein sequence**  
Pietro Gatti-Lafranconi, Diletta Ami, Antonino Natalello, Gaetano Invernizzi, Ario de Marco, Silvia Maria Doglia and Marina Lotti
- P19 Addition of repressor in inducible promoter system improves soluble expression of recombinant protein in *E. coli***  
Kyung-Hwan Jung
- P20 Production of proteins in *Bacillus subtilis* can be improved by engineering components affecting posttranslocational protein folding and degradation**  
Marika Vitikainen, Hanne-Leena Hyyryläinen, Anna Kivimäki, Vesa P. Kontinen and Matti Sarvas
- P21 Production of cysteine-rich proteins in *E. coli* – the challenge of Wnts**  
Anu Mursula, Ulf Liebal and Peter Neubauer
- P22 Modulation of inclusion body (IB) formation kinetics by different induction regimes in *E. coli* fed batch cultivations**  
Monika Cserjan-Puschmann, Franz Clementschitsch, Gerald Striedner, Florentiner Pötschacher, Jürgen Kern and Karl Bayer
- P23 Nonclassical inclusion bodies in *Escherichia coli***  
Špela Peternel, Marjan Bele, Vladka Gaberc-Porekar and Viktor Menart
- P97 Kinetics of aggregation and structural properties of proteins in inclusion bodies studied by Fourier transform infrared spectroscopy**  
Antonino Natello, Diletta Ami, Pietro Gatti-Lafranconi, Ario de Marco, Marina Lotti, Silvia Maria Doglia

**Session 3: Interactions between host physiology and process technology**

- P24 Interfacing *Pichia pastoris* cultivation with expanded bed adsorption**  
Mehmedalija Jahic, Josef Knoblechner, Theppanya Charoenrat, Sven-Olof Enfors and Andres Veide
- P25 Human Prolactin (hPRL) and Growth Hormone (hGH) distinct behavior under bacteriophage lambda P<sub>L</sub> promoter control**

Carlos RJ Soares, Eric KM Ueda, Tais L Oliveira, Susana R Heller and Paolo Bartolini

- P26 Two-compartment bioreactor as a scale-down model to study the effect of glucose overflow and anaerobiosis on large-scale recombinant protein production processes**  
Jaakko Soini, Ulla Pajulampi, Janne Sandqvist, Arne Matzen and Peter Neubauer
- P27 Automated fed-batch cultivations using base consumption for real time biomass determination during production of heterologous proteins**  
Markus Ganzlin, Benjamin Gerwat and Philipp Garbers
- P28 Caspase Activation, Sialidase Release and Changes in Sialylation Pattern of Recombinant Human Erythropoietin Produced by CHO Cells in Batch and Fed-batch Cultures**  
Kok Hwee Chuan, Sing Fee Lim, Laurent Martin, Chee Yong Yun, Sophia O.H. Loh, Francoise Lasne and Zhiwei Song
- P29 Set up and optimization of a fermentation protocol for the production of a human antibody fragment (Fab') express in *E. coli*. Pre-pilot and cGMP pilot scale studies.**  
E. Riscaldati, A. Ciabini, A. Baccante, D. Moscatelli, M.F. Errichetti, A. Colagrande, S. Cencioni, F. Marcocci, V. Di Cioccio, L. Di Ciccio, M. Allegretti, F. Martin and G. Maurizi
- P30 Evaluation of antifoams in the expression of a recombinant FC fusion protein in shake flask cultures of *Saccharomyces cerevisiae* and *Pichia pastoris***  
William Holmes, Rodney Smith and Roslyn Bill
- P31 Cloning and overexpression of a yeast phytase gene in *Pichia pastoris***  
Mélanie Ragon, Virginie Neugnot-Roux, Guy Moulin and Héléne Boze
- P32 Optimisation of substrate feeding in shake flask cultures of *Pichia pastoris* for recombinant protein production**  
Monika Bollok, Maria Ruottinen, Mirja Krause, Antti Vasala, Eija-Riitta Hämäläinen, Antje Neubauer, Johanna Myllyharju and Peter Neubauer

**Session 4:** Metabolic and cell engineering for protein production

- P33 Increasing the Ease and Speed of Eukaryotic Protein Expression: A New Cell-Free in Vitro Translation System Based on Sf Insect Cell Extracts**  
Frank Schaefer, Annette Zacharias, Nicole Brinker-Krieger, and Uritza von Groll
- P34 Impact of Apoptosis Gene Targeting on Recombinant Protein Glycosylation**  
Danny Chee Fung Wong, Niki Soo Ching Wong, John Soo Yang Goh and Miranda Gek Sim Yap
- P35 N-glycosylation differences between wild-type and recombinant strains affect catalytic properties of two model enzymes :  $\beta$ -glucosidase and phosphatase**  
Isabelle Mobèche, Mélanie Ragon, Guy Moulin and Héléne Boze.
- P36 Cell engineering of *Pseudoalteromonas haloplanktis* TAC125: construction of a mutant strain with reduced exo-proteolytic activity**  
Ermenegilda Parrilli, Angela Maria Cusano, Maria Giuliani, and Maria Luisa Tutino
- P37 Improvement of the energy metabolism of recombinant CHO cells by cell sorting for reduced mitochondrial membrane potential**  
Georg Hinterkörner, Gudrun Brugger, Dethardt Müller, Friedemann Hesse, Renate Kunert, Hermann Katinger and Nicole Borth

**Session 5: Protein production for structural genomics**

- P38 Production of Membrane Proteins in Yeast**  
Richard A. J. Darby, Mohammed Jamshad, Ljuban Grgic and Roslyn M. Bill
- P39 Fast and efficient generation of influenza A virus like particles from synthetic genes**  
Theresa Schinko, Haruthai Thaisuchat, Hendrik Viljoen, Nisha Padhye and Reingard Grabherr
- P40 Protein expression for structural studies**  
Yoav Peleg, Shira Albeck, Yigal Burstein, Orly Dym, Yossi Jacobovitch, Nurit Levy, Ran Meged, Yigal Michael, Jaime Prilusky, Gideon Schreiber, Israel Silman, Tamar Unger and Joel L. Sussman
- P42 Expression and purification of the D2 dopamine receptor and the Neurokinin A receptor**  
Cédric Fiez-Vandal, Renaud Wagner, Franc Pattus and So Iwata
- P43 Efficient, antibody-mediated allosteric activation of an immobilized, *E. coli* beta-galactosidase recombinant biosensor**  
Rosa M Ferraz, Anna Arís, Gregorio Álvaro and Antonio Villaverde
- P44 Cost-effective production of labeled recombinant proteins in *E. coli* using minimal medium**  
Aleksei Rozkov, Bert Larsson, Robert Björnstedt, Patrik Strömberg, Fredrik Lindqvist and Fritz Schweikart
- P45 Structural Biology of *Helicobacter pylori* Type IV Secretion System**  
Alessandro Angelini, Laura Cendron, Anke Seydel, Nicola Barison, Tommaso Tosi, Roberto Battistutta and Giuseppe Zanotti
- P46 Expression of genes encoding membrane proteins from the hyperthermophilic Archeon *Pyrococcus abyssi* in *Pichia pastoris***  
Cécile Labarre, Karine Blondeau and Herman van Tilbeurgh
- P47 Recombinant expression of disulfide-rich proteins: carboxypeptidase inhibitors as model proteins**  
Laura Sanglas, Sílvia Bronsoms, Joan L. Arolas, Julia Lorenzo and Francesc X. Aviles
- P48 Automated Purification of Soluble Histidine Tagged Integrase of *Tn21* expressed in *E. coli* Cells in Low Amounts**  
Ioana Grigorescu, Anna Andersson, Markus Galin, Anita Jönsson, Anders Molin, Susanne Nyholm-Westin, Carolina Johansson, Lars Sundström, and John Flensburg

**Session 6: Acquiring useful physiological knowledge**

- P49 Transcriptional analysis of protein production and induction of unfolded protein response in *Pichia pastoris* expressing a *Rhizopus oryzae* lipase under the FLD1 promoter**  
David Resina, Monika Bollok, Francisco Valero, Peter Neubauer and Pau Ferrer
- P50 Determination of plasmid content in eukaryotic and prokaryotic cells using Real-Time PCR**  
Adriano Azzoni, Elisabete Carapuça, D. Miguel F. Prazeres, Gabriel A. Monteiro and Filipe Mergulhão

- P51 HYBMFA: a bioinformatics' tool for batch-to-batch bioprocess optimisation supported by elementary flux analysis**  
Ana Teixeira, Carlos Alves, Paula Alves, Manuel Carrondo and Rui Oliveira
- P52 Application of a genome-scale metabolic model to the inference of nutritional requirements and metabolic bottlenecks during recombinant protein production in *Escherichia coli***  
Sónia Carneiro, Isabel Rocha and Eugénio Ferreira
- P53 Analysis of bottlenecks in *Rhizopus oryzae* lipase production in *Pichia pastoris* using the nitrogen source-regulated formaldehyde dehydrogenase promoter (PFLD1).**  
David Resina, Oriol Cos, Brigitte Gasser, Michael Mauer, Hans Marx, Michael Sauer, Francisco Valero, Diethard Mattanovich and Pau Ferrer
- P54 Increasing the quality of recombinant products - Higher attraction of ribosomes leads to suppression of secondary ribosome binding sites**  
Ulf Liebal, Olli Niemitalo, Anu Mursula, André Juffer and Peter Neubauer
- P55 Transcriptional profiling of recombinant CHO cells by a novel inter-species analysis strategy**  
Wolfgang Ernst, Evelyn Trummer, Hermann Katinger, Friedemann Hesse and Dethardt Müller
- P56 Limitations using GFP as a protein expression reporter in *Pichia pastoris***  
Anna Surribas, David Resina, Pau Ferrer and Francisco Valero
- P96 Identifying key signatures of highly productive CHO cells from transcriptome and proteome profiles**  
Arleen Sanny, Yee Jiun Kok, Robin Philip, Song Hui Chuah, Sze Wai Ng, Kher Shing Tan, Lee Yih Yean, Kathy Wong, Hu Weishou, Miranda Yap and Peter Morin Nissom

**Workshop 1: Industrial protein production**

- P57 Cell culture efforts to reduce glycation in recombinant humanized antibody**  
Inn H. Yuk, Hung Huynh, Kimberly Leach, Amy Shen, Boyan Zhang, George Dutina, Patrick McKay, Amy Lim and Brad Snedecor
- P58 Biochemical assay development for drug discovery: a sequential optimization from protein expression to enzymatic activity**  
Cristina Sidoli, Angela Molteni, Beatrice Bellanti, Loredana Redaelli, Lucia Iuzzolino, Mariantonietta Rubino, Patrizia Arioli, Vanessa Nardese and Daniele Carettoni
- P59 Evaluation of the baculovirus and *E.coli*-expressed non-structural (NS) proteins of bluetongue virus (BTV) as antigen in an indirect or competition ELISA to differentiate infected from vaccinated animals**  
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- P60 Automation for Higher Throughput in Protein Expression. Visions, Facts and Fictions**  
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- P61 Potentials and limitations of prokaryotic and eukaryotic expression systems for recombinant protein production – a comparative view**  
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- P62 Production of human  $\alpha_1$  proteinase inhibitor from *Aspergillus niger***  
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- P63 *Kluyveromyces lactis* SSO1 and SEB1 genes are functional in *Saccharomyces cerevisiae* and enhance production of secreted proteins when overexpressed**  
Jaana H. Toikkanen, Lena Sundqvist and Sirkka Keränen
- P64 Antibody production by a protease-deficient strain of methylotrophic yeast, *Ogataea minuta***  
Kousuke Kuroda, Yoshinori Kitagawa, Kazuo Kobayashi, Haruhiko Tsumura, Toshihiro Komeda, Yasunori Chiba and Yoshihumi Jigami
- P65 Heterologous expression of isotopically labeled *Trichoderma reesei* tyrosinase 2 in *Pichia pastoris***  
Ann Westerholm-Parvinen, Maija-Liisa Mattinen, Emilia Selinheimo and Markku Saloheimo
- P66 Secretion of a hybrid *K. lactis* - *A. niger*  $\beta$ -galactosidase**  
Ángel Pereira, Rafael Fernández, María Esperanza Cerdán, María Isabel González Siso and Manuel Becerra
- P67 The first auxotrophic mutant of *Zygosaccharomyces bailii* for recombinant productions: a road to practical applications**  
Paola Branduardi, Laura Dato, Luca Riboldi and Danilo Porro
- P68 Direct and indirect approaches for the improvement of heterologous proteins secretion levels in *Zygosaccharomyces bailii***  
Luca Riboldi, Danilo Porro, Laura Dato and Paola Branduardi
- P69 Disruption of the GAS1 gene of *Pichia pastoris* confers a supersecretory phenotype for *Rhizopus oryzae* lipase, but not for human trypsinogen**  
Hans Marx, Michael Sauer, David Resina, Marina Vai, Danilo Porro, Francisco Valero, Pau Ferrer and Diethard Mattanovich

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- P71 Genomic and proteomics approaches for vaccine development in *Pasteurella multocida***  
Keith Al-Hasani, Victoria McCarl, Stephen Bottomley, Ben Adler and John Boyce
- P72 Stabilization of heterologous transcripts with *hrpA*, mRNA of a type III secretion system component**  
Elina Hienonen, Martin Romantschuk and Suvi Taira
- P73 Over-expression and single-step purification of human IFN $_{\alpha 8}$  and human IFN $_{\alpha 2b}$  reveals the highest antiviral activity of human IFN $_{\alpha 8}$**   
Julio César Sánchez García, Alejandro Miranda Ariza, Alexis Musacchio Lassa, Luis Javier González and Vladimir Besada Perez
- P74 *Bacillus megaterium* as a recombinant protein production host**  
Yang Yang, Marco Malten, Rebekka Biedendieck, Wei Wang, Dieter Jahn and

Wolf - Dieter Deckwer

- P75 Design and production of multi-bioactive recombinant elastin-like polymer: Mimicking the extracellular matrix**  
Alessandra Girotti, F. Javier Arias, Ana M. Testera and J. Carlos Rodriguez-Cabello
- P76 N-terminally acetylated tropomyosin generated in *E.coli* by coexpression of the *S. cerevisiae* NatB acetylation complex shows functional properties *in vitro***  
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- P77 Use of the *tetA*-promoter in fed-batch cultivations: Repeated supply of anhydrotetracycline is necessary for production of tetrameric collagen prolyl 4-hydroxylase in *Escherichia coli***  
Neubauer, A., Soini, J. , Bollok, M. , Zenker, M. , Sandquist, J. , Myllyharju, J. and Neubauer, P
- P78 Monitoring protein expression levels in *E. coli* using a high throughput approach**  
Régis Cébe and Martin Geiser
- P79 Recombinant protein production in cell-free systems: strategies for improving yield and functionality**  
Jan Strey, Michael Gerrits, Stefan Kubick, Helmut Merk, Uritza von Groll, Frank Schäfer and Wolfgang Stiege
- P80 A Regulatory Acceptable Alternative to *E. coli*: High Yield Recombinant Protein Production Using the *Lactococcus lactis* P170 Expression System Combined with “Reverse Electro Enhanced Dialysis” (REED) for lactate control**  
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- P81 A simple emergency procedure to be used if biotechnological protein production is endangered by bacteriophage infection of *Escherichia coli* cultures: effective inhibition of bacteriophage lytic development in infected cultures by removing a carbon source from the medium**  
Grzegorz Wegrzyn, Marcin Los and Peter Neubauer
- P82 A counter-selectable marker for *Bacillus***  
Michael D. Rasmussen, Jan Martinussen, Els Marie Celine Defoor and Gitte Bak Poulsen
- P83 The expression of truncated form of CP4 5-enolpyruvylshikimate-3-phosphate synthase (CP4 EPSPS) from genetically modified plant in *Escherichia coli***  
Stanislav Stuchlík, Satheesh Natarajan and Ján Turňa
- P84 Recombinant lipase immobilised in the cell wall of *Bacillus halodurans* Alk 36 exploiting the FliC protein**  
Michael Crampton, Erika du Plessis, Santosh Ramchuran, Eldie Berger, and Maureen Louw
- P85 Development of an antibiotic-free plasmid selection system based on glycine auxotrophy for recombinant protein overproduction in *Escherichia coli***  
Luis Vidal, Josep López-Santín, Glòria Caminal and Pau Ferrer
- P86 Development of extracellular production system of recombinant proteins in Recombinant *Escherichia coli***  
Jong Hyun Choi, Zhi Gang Qian and Sang Yup Lee
- P87 ColE1 derived RNA I as a key molecule in a novel antibiotic free plasmid addiction system**  
Irene Pfaffenzeller, Gerald Striedner, Karl Bayer and Reingard Grabherr

- P98 Production and purification of high molecular weight oligomers of *Yersinia pestis* F1 capsular antigen released by high cell density culture of recombinant *Escherichia coli* cells carrying the *caf1* operon**  
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- P88 Expression of trehalose-6-phosphate synthase gene from *Arabidopsis thaliana* in transgenic tobacco: a strategy to increase temperature stress tolerance**  
André de Almeida, Enrique Villalobos, Susana Araújo, Luís A. Cardoso, Dulce Santos, José M. Torné and Pedro S. Fevereiro
- P89 Expression of functional recombinant rabies virus glycoprotein in *Drosophila melanogaster* S2 cells**  
Adriana Y Yokomizo, Soraia A.C. Jorge, Renato M. Astray, Mariza A.G. Santos, Irene Fernandes, Orlando G. Ribeiro, Denise S.P.Q Horton, Aldo Tonso and Carlos A Pereira
- P90 Effects of overexpression of X-box binding protein 1 on recombinant protein production in mammalian cells**  
Sebastian Ku, Grace Chong, Maybelline Giam, Miranda G.S. Yap and Sheng-Hao Chao
- P91 Analysis and characterization of different preparations of recombinant human follicle stimulating hormone (hFSH) and of its subunits**  
Maria Teresa CP Ribela, Renan F Loureiro, João E Oliveira, Cristiane M Carvalho, Cibele N Peroni and Paolo Bartolini
- P92 Characterization of *Medicago truncatula* cell suspension cultures producing valuable recombinant proteins**  
Guadalupe Cabral, Ana Sofia Pires, Pablo Gonzalez-Melendi and Rita Abranches
- P93 A novel *in vitro* translation system based on insect cells**  
Stefan Kubick, Helmut Merk, Michael Gerrits, Jan Strey, Uritza von Groll, Frank Schäfer, and Wolfgang Stiege
- P95 Purification of a chimeric virus-like particle from a complex culture medium**  
Luísa Pedro and Guilherme N.M. Ferreira