Cytomics emerging from cytometry

A. Tárnok* and G. Brockhoff†

*Department of Paediatric Cardiology, Cardiac Centre, University of Leipzig, Germany, †Institute of Pathology, University of Regensburg, Germany

Welcome to Leipzig

Welcome to the 16th Annual Meeting of the German Society for Cytometry, DGfZ

This is the second of the two planned meetings of the DGfZ in Leipzig (the next will be in Regensburg, 2007). It started a number of innovations going beyond the long-standing tradition of our society (Brockhoff *et al.* 2006). They will hopefully create new and prosperous traditions enjoyed by both the 'old guys' and the novices. We were very positively surprised by the high acceptance of the new formats of our last year's meeting. With over 220 participants from more than 20 countries, 24 tutorials with over 60 participants and 17 companies showing their latest developments, this meeting was amongst the most successful in the history of our society. The general concepts (teaching, key note lectures, workshops) were developed during the series of Leipziger Workshops (www.leipziger-workshop.de) (Tárnok & Emmrich 2003; Sack *et al.* 2004; Lenz *et al.* 2005; Tárnok *et al.* 2005).

The basic features of these conferences have always been the personal exchange of scientific results and ideas across various disciplines. It was always an important goal of the society to educate novices in cytometry and make them acquainted with the broad versatility of cytometric technologies and applications. Therefore, in the current program extensive education is provided with tutorials and hands-on practical courses on basic, advanced and clinical cytometry. Also, a platform will be provided for present and future managers of cytometric core facilities. An attractive platform is provided for scientists and company delegates to meet and get acquainted with novel industrial developments including an informal get-together at the opening, Wednesday, October 18 and the dinner party.

This year's meeting will cover the state of the art and actual highlights in the field of analytical and quantitative cytology. Scientists from more than 15 countries will come to Leipzig to present their latest findings, methods, innovative technologies and concepts in the fields of flow, image cytometry and clinical cytometry, and to discuss these topics. Specialists from various fields of research with common interest in the development and application of cytometric technology in medicine, biology, microbiology, bioprocessing and more, will participate to accelerate advances in cytometric research for the benefit of patients and clinical treatment. The list of abstracts enclosed serves to point out once again the core issues of the congress.

Highlighted keynote speakers will focus on cytometry instrumentation for developing countries (Shapiro 2004a, 2004b), tumour invasion (Friedl *et al.* 2005), Cytomics in tumour biology (Kozubik *et al.* 2005; Lottner *et al.* 2005; Vereb *et al.* 2005; Brockhoff *et al.* 2006), integrating Cytomics and next-generation technologies (Bernas *et al.* 2006), advanced *in vivo* imaging technologies (Low *et al.* 2006) including *in vivo* multiphoton imaging in man (Konig *et al.* 2006), biological application of nanocrystals (Arya *et al.* 2005), microbe cytometry (Gogniat *et al.* 2006) and planet cytometry (Sicardy *et al.* 2006).

Correspondence: Prof A. Tárnok, Department Paediatric Cardiology, Cardiac Centre, University of Leipzig, Strümpellstr. 39, 04289 Leipzig, Germany. Tel.: +49-341-8652430; Fax: +49-341-8651143; E-mail: tarnok@medizin.uni-leipzig.de

Members of our society were and are active in very diverse fields of cytometry ranging from microbiology (Achilles *et al.* 2004), plant biology (Galbraith 2004) and lower animals (Ulrich & Tarnok 2005) to vertebrates and humans. Here, basic research and clinical research go hand in hand with clinical questions for example, of cancer (Sarraf 2005), immunology (Barten *et al.* 2006) and others. Members of our society have developed upcoming and innovative concepts for cell systems and their analysis: Cytomics (Cram *et al.* 2004; Valet *et al.* 2004; Bocharov 2005; Valet 2005), tissue cytometry (Ecker *et al.* 2004; Gerstner *et al.* 2004) and Tissomics (Ecker & Tarnok 2005) and the concept of individualized predictive medicine for preventative medicine (Brockhoff *et al.* 2006), for various diseases and treatment strategies (Valet & Hoeffkes 2004; Barten *et al.* 2006; Wilkins 2006). Increased awareness evolved that the development of highly specific therapeutic agents requires a comprehensive knowledge of molecular systems and cellular function. Thus, fluorescence-based innovative cytogenetic studies of primary tissues derived from solid tumours (Ecker & Steiner 2004; Lottner *et al.* 2005) are increasingly complemented by dynamic and functional analysis of molecular systems (Jones *et al.* 2006) and vital cells (Diermeier *et al.* 2005; Vollmann *et al.* 2006). In addition, the demand for systemic analysis of cellular systems became recently evident in the case of regulatory T-cell therapy (Hansen & Buer 2004) and may become relevant in other fields of cellular diagnosis and therapy (Szanislo *et al.* 2004; Scandella & Ludewig 2005). Our Society has its particular strengths in developing new technologies and applications in flow cytometry and image cytometry (Bocsi *et al.* 2004; Lincoln *et al.* 2004; Ulrich *et al.* 2004) and also in quality evaluation and standardization (Hansen *et al.* 2004; Klose *et al.* 2004; Lerner & Zucker 2004; Levering *et al.* 2004).

We would like to acknowledge the great support by Dr Catherine Sarraf, Editor-in-Chief of the boosting journal, *Cell Proliferation*, and in Blackwell Publishing for setting the meeting abstracts of last and this year in print. As a special feature, authors of selected abstracts of high quality will be invited to publish a peer-reviewed manuscript on their presentation that will be published in upcoming issues of *Cell Proliferation*. Numerous sponsors and exhibitors make a valuable contribution to the congress by presenting their practical achievements. We like to warmly thank them for their support that made realization of this congress possible.

Leipzig in the last few years has made great leaps forward to become one of the leading biotechnology centres in Germany and Europe. Leipzig also harbours the biotechnological-biomedical centre (BIO CITY) where industry, science and research live and work together with a unique potential for industrial networking. The newly established Fraunhofer-Institute for Cell-Therapy and Immunology, IZI, in Leipzig will provide an important new platform for technology development and medical application of cell analysis.

The city of Leipzig, availing of the congress centre of the Centre for Environmental Research Leipzig-Halle GmbH, the Kubus, an efficient infrastructure and a cultural versatility, provides an ideal platform for the 16th Annual Meetings of the DGfZ.

The city is proud of its history with its university that will celebrate in 2009 its 600th foundation anniversary. After all, trade shows date back over 800 years here. Names like J.S. Bach, Martin Luther and Goethe are closely associated with the Leipzig area. Museums, galleries, collections of traditional and contemporary art, the German National Library – Leipzig's got the lot!

Welcome to Leipzig – and welcome to the 16th Annual Meeting of the German Society for Cytometry at the Leipziger Kubus. We hope you enjoy your stay and wish you a fruitful and successful congress.

Warmest regards,

Prof. Dr. Attila Tárnok
Conference President
President of the DGfZ

PD Dr. Gero Brockhoff
Vice President of the DGfZ

REFERENCES

- Achilles J, Muller S, Bley T, Babel W (2004) Affinity of single *S. cerevisiae* cells to 2-NBDglucose under changing substrate concentrations. *Cytometry A* **61A** (1), 88–98.
- Arya H, Kaul Z, Wadhwa R, Taira K, Hirano T, Kaul SC (2005) Quantum dots in bio-imaging: revolution by the small. *Biochem. Biophys. Res. Commun.* **329** (4), 1173–1177.
- Barten MJ, Rahmel A, Bocsi J, Boldt A, Garbade J, Dhein S, Mohr FW, Gummert JF (2006) Cytokine analysis to predict immunosuppression. *Cytometry A* **69A** (3), 155–157.
- Bernas T, Gregori G, Asem EK, Robinson JP (2006) Integrating cytomics and proteomics. *Mol. Cell. Proteomics* **5** (1), 2–13.
- Bocharov G (2005) Understanding complex regulatory systems: integrating molecular biology and systems analysis. *Transfus. Med. Hemother.* **32**, 304–321.
- Bocsi J, Varga VS, Molnar B, Sipos F, Tulassay Z, Tarnok A (2004) Scanning fluorescent microscopy analysis is applicable for absolute and relative cell frequency determinations. *Cytometry A* **61A** (1), 1–8.
- Brockhoff G, Muller S, Sarraf C, Tarnok A (2006) Predictive medicine and clinical cytomics research: resume of the 15th Annual Meeting of the German Society for Cytometry (Deutsche Gesellschaft für Zytometrie, DGfZ). *Cell Prolif.* **39**, 75–78.
- Cram LS, Gray JW, Carter NP (2004) Cytometry and genetics. *Cytometry A* **58A** (1), 33–36.
- Diermeier S, Horvath G, Knuechel-Clarke R, Hofstaedter F, Szollosi J, Brockhoff G (2005) Epidermal growth factor receptor coexpression modulates susceptibility to Herceptin in HER2/neu overexpressing breast cancer cells via specific erbB–receptor interaction and activation. *Exp. Cell Res.* **304** (2), 604–619.
- Ecker RC, Steiner GE (2004) Microscopy-based multicolor tissue cytometry at the single-cell level. *Cytometry A* **59A** (2), 182–190.
- Ecker RC, Tarnok A (2005) Cytomics goes 3D: toward tissomics. *Cytometry A* **65A** (1), 1–3.
- Ecker RC, De Martin R, Steiner GE, Schmid JA (2004) Application of spectral imaging microscopy in cytomics and fluorescence resonance energy transfer (FRET) analysis. *Cytometry A* **59A** (2), 172–181.
- Friedl P, Den Boer AT, Gunzer M (2005) Tuning immune responses: diversity and adaptation of the immunological synapse. *Nat. Rev. Immunol.* **5** (7), 532–545.
- Galbraith DW (2004) Cytometry and plant sciences: a personal retrospective. *Cytometry A* **58A** (1), 37–44.
- Gerstner AO, Trumpfheller C, Racz P, Osmancik P, Tenner-Racz K, Tarnok A (2004) Quantitative histology by multicolor slide-based cytometry. *Cytometry A* **61A** (2), 210–219.
- Gogniat G, Thyssen M, Denis M, Pulgarin C, Dukan S (2006) The bactericidal effect of TiO₂ photocatalysis involves adsorption onto catalyst and the loss of membrane integrity. *FEMS Microbiol. Lett.* **258** (1), 18–24.
- Hansen E, Bechmann V, Altmeyden J, Last M, Roth G (2004) Quality management in blood salvage: implementation of quality assurance and variables affecting product quality. *Transfus. Med. Hemother.* **31**, 221–227.
- Hansen W, Buer J (2004) Role of regulatory T cells for the outcome of allo- and autoimmune responses. *Transfus. Med. Hemother.* **31**, 322–331.
- Jones RB, Gordus A, Krall JA, MacBeath G (2006) A quantitative protein interaction network for the ErbB receptors using protein microarrays. *Nature* **439** (7073), 168–174.
- Klose T, Kieseewetter H, Bohnen H, Pruß A, Roth W, Putzker M (2004) Quality assurance for long lasting transports of red blood cell concentrates on extreme environmental demand. *Transfus. Med. Hemother.* **31**, 365–370.
- König K, Ehlers A, Stracke F, Riemann I (2006) *In vivo* drug screening in human skin using femtosecond laser multiphoton tomography. *Skin Pharmacol. Physiol.* **19** (2), 78–88.
- Kozubik A, Horvath V, Svihalkova-Sindlerova L, Soucek K, Hofmanova J, Sova P, Kroutil A, Zak F, Mistr A, Turanek J (2005) High effectiveness of platinum (IV) complex with adamantylamine in overcoming resistance to cisplatin and suppressing proliferation of ovarian cancer cells *in vitro*. *Biochem. Pharmacol.* **69** (3), 373–383.
- Lenz D, Barten MJ, Hiller S, Tarnok A, Sack U (2005) Regenerative and predictive medicine of cardiovascular disease: the 9th Leipziger Workshop and the 2nd International Workshop on slide-based cytometry. *Cytometry A* **64A** (2), 110–114.
- Lerner JM, Zucker RM (2004) Calibration and validation of confocal spectral imaging systems. *Cytometry A* **62A** (1), 8–34.
- Levering WHBM, Sutherland DR, Keeney M, Kraan J, Gratama JW (2004) Haematopoietic stem and progenitor cells: enumeration, phenotypic characterisation, and clinical applications. *Transfus. Med. Hemother.* **31**, 341–352.
- Lincoln B, Erickson HM, Schinkinger S, Wottawah F, Mitchell D, Ulvick S, Bilby C, Guck JR (2004) Deformability-based flow cytometry. *Cytometry A* **59A** (2), 203–209.
- Lottner C, Schwarz S, Diermeier S, Hartmann A, Knuechel R, Hofstaedter F, Brockhoff G (2005) Simultaneous detection of HER2/neu gene amplification and protein overexpression in paraffin-embedded breast cancer. *J. Pathol.* **205** (5), 577–584.

- Low AF, Tearney GJ, Bouma BE, Jang IK (2006) Technology insight: optical coherence tomography – current status and future development. *Nat. Clin. Pract. Cardiovasc. Med.* **3** (3), 154–162.
- Sack U, Bocsi J, Tárnok A (2004) Slide-based cytometry and predictive medicine: the 8th Leipziger Workshop and the 1st International Workshop on Slide-Based Cytometry. *Cytometry A* **60A** (2), 189–205.
- Sarraf C (2005) Emerging themes of cancer stem cells: editorial overview. *Cell Prolif.* **38** (6), 343–345.
- Scandella E, Ludewig B (2005) Dendritic cells autoimmunity. *Transfus. Med. Hemother.* **32**, 363–368.
- Shapiro HM (2004a) The evolution of cytometers. *Cytometry A* **58A** (1), 13–20.
- Shapiro HM (2004b) ‘Cellular astronomy’ – a foreseeable future in cytometry. *Cytometry A* **60A** (2), 115–124.
- Sicardy B, Bellucci A, Gendron E, Lacombe F, Lacour S, Lecacheux J, Lellouch E, Renner S, Pau S, Roques F, Widemann T, Colas F, Vachier F, Martins RV, Ageorges N, Hainaut O, Marco O, Beisker W, Hummel E, Feinstein C, Levato H, Maury A, Frappa E, Gaillard B, Lavyssiere M, Di Sora M, Mallia F, Masi G, Behrend R, Carrier F, Mousis O, Rousselot P, Alvarez-Candal A, Lazzaro D, Veiga C, Andrei AH, Assafin M, Da Silva Neto DN, Jacques C, Pimentel E, Weaver D, Lecampion JF, Doncel F, Momiyama T, Tancredi G (2006) Charon’s size and an upper limit on its atmosphere from a stellar occultation. *Nature* **439** (7072), 52–54.
- Szaniszlo P, Wang N, Sinha M, Reece LM, Van Hook JW, Luxon BA, Leary JF (2004) Getting the right cells to the array: gene expression microarray analysis of cell mixtures and sorted cells. *Cytometry A* **59A** (2), 191–202.
- Tárnok A, Emmrich F (2003) Immune consequences of pediatric and adult cardiovascular surgery: report of the 7th Leipzig workshop. *Cytometry B Clin. Cytometry* **54B** (1), 54–57.
- Tárnok A, Valet GK, Emmrich F (2005) Systems biology and clinical cytomics: the 10th Leipziger Workshop and the 3rd International Workshop on Slide-Based Cytometry, Leipzig, Germany. *Cytometry A* **69A** (1), 36–40.
- Ulrich H, Tárnok A (2005) Quantification of cell-cycle distribution and mitotic index in *Hydra* by flow cytometry. *Cell Prolif.* **38** (2), 63–75.
- Ulrich H, Martins AH, Pesquero JB (2004) RNA and DNA aptamers in cytomics analysis. *Cytometry A* **59A** (2), 220–231.
- Valet G (2005) Cytomics, the human cytome project and systems biology: top-down resolution of the molecular bio-complexity of organisms by single cell analysis. *Cell Prolif.* **38** (4), 171–174.
- Valet GK, Hoeffkes HG (2004) Data pattern analysis for the individualised pretherapeutic identification of high-risk diffuse large B-cell lymphoma (DLBCL) patients by cytomics. *Cytometry A* **59A** (2), 232–236.
- Valet G, Leary JF, Tárnok A (2004) Cytomics – new technologies: towards a human cytome project. *Cytometry A* **59A** (2), 167–171.
- Vereb G, Feuerstein BG, Hyun WC, Fulwyler MJ, Balazs M, Szollosi J (2005) Biphasic calcium response of platelet-derived growth factor stimulated glioblastoma cells is a function of cell confluence. *Cytometry A* **67A** (2), 172–179.
- Vollmann A, Vornlocher HP, Stempf T, Brockhoff G, Apfel R, Bogdahn U (2006) Effective silencing of EGFR with RNAi demonstrates non-EGFR dependent proliferation of glioma cells. *Int. J. Oncol.* **28** (6), 1531–1542.
- Wilkins MR (2006) How proteomics can assist in the detection and avoidance of adverse drug reactions. *Transfus. Med. Hemother.* **33**, 97–105.