

Institute for In Vitro Sciences, Inc
30 W Watkins Mill Road #100
Gaithersburg, Maryland 20878

Curriculum Vitae
HOLGER P. BEHSING

Education

- 2000** Ph.D. (Pharmacology & Toxicology), University of California, Davis
1995 (Biology & German double major), Georg-August University (Göttingen, Germany)
1994 B.A. (Biology & German double major), University of California, Santa Barbara

Experience

2014 – present Principal Scientist and Study Director - Institute for In Vitro Sciences, Inc.

Reporting to the COO and Vice President, this position has the following responsibilities: Develop and validate a variety of non-animal test methods and endpoints for modeling and predicting various toxicological responses and disease states of mucosal tissues including the respiratory tract. Provide expertise in developing and executing research projects. Conduct commercial contract in vitro safety testing of products and ingredients. Develop and conduct lectures and hands-on training of in vitro test methods for various audiences, including industry, regulatory/governmental and NGO stakeholders. Represent IIVS in workshops and meetings with industry clients, government agencies, universities, etc. that address both scientific and regulatory issues in inhalation toxicology. Develop and organize technical workshops for developing tobacco regulatory testing platforms. Initiating, and/or assisting in the production of, manuscripts detailing IIVS's scientific activities. Preparing and submitting for government grants

2007 – 2014 Senior Scientist and Principal Investigator – Leidos Biomedical Research, Inc. (formerly SAIC-Frederick)

Managerial responsibilities for laboratory operation and ongoing projects; Monitor project status, assess project issues, and develop resolutions to meet productivity, quality, and customer objectives while serving as liaison to the NCI; Responsible for the identification, development, and implementation of novel in vitro assays (with a focus on high content and higher throughput models) as an integral component of the Lab for Investigative Toxicology. Utilized in vitro and/or ex vivo systems included cell and tissue models of liver, bone marrow, lung, heart, kidney, peripheral nervous system, and various cancer lines for toxicity assessment. Notable accomplishments include: 1) Development and qualification of new increased

throughput CD34+ bone marrow progenitor toxicity assay (as replacement for CFU-GM colony based assay), 2) Establishment of primary rat dorsal root ganglion neurotoxicity model using GE In Cell Analyzer 2000 high content analysis platform, 3) Development and implementation of novel devices for organ slice culture (see invention disclosures below), 4) Establishment of intranet based data storage system designed for use in high content analysis data archiving, and as an interface for streamlined data flow and processing among lab members. Responsible for numerous presentations and publications of studies on a diverse set of scientific topics including organ slices, hematopoietic toxicity, and cell based model systems

2006 - present Founder, Advanced In Vitro, LLC, Urbana, MD

Advanced In Vitro, LLC (AIV) was formed to promote in vitro and ex vivo platforms (including organ slices) and novel systems/concepts that would further enhance the utility and strength of predictive in vitro models.

2005 – 2006 Senior Scientist, HepaHope Inc., Irvine, CA

Responsibilities included management and supervision of junior technical staff; Provided input on all aspects of biologics and related support equipment for the development of the bioartificial liver (BAL) and HepaTester™; Interacted with the business unit, collaborators, and outside scientists. Notable accomplishments include: 1) Submission of bioartificial liver (BAL) IND to FDA (in conjunction with senior staff), and 2) Development of prototype HepaTester™

2001 – 2003 Toxicologist and Principal Investigator

Responsible for achieving objectives outlined in the NCI R33 lung grant (~\$1.3 million award over 2 years); Workload first included establishment of human and animal tissue model systems (liver & lung) (two R21 grants) and subsequently, training of new hires and determination of work for technical staff to complete project milestones in both the R33 lung and also R33 liver grants. Presentation of scientific material (as speaker and poster presenter) at internationally recognized meetings. Notable accomplishments include: 1) Development and optimization of human and animal tissue model systems (liver and lung) leading to two R33 fast track grant awards to continue development, 2) Establishment of intranet-based interface for lab members, including experiment tracking, 3) Creation of Excel-Spotfire database interface with WPI II students, 4) Invention disclosures of organ slice hardware.

Professional Memberships

- Society of Toxicology
- Phi Sigma Society
- Science Advisory Board

Selected Scientific Awards and Recognitions

2013	High Content Analysis: Dorsal Root Ganglion Image Display (Academy of Medical Sciences on Portland Place, London)
2005	NorCal SOT/GETA meeting poster award
2003	SRI International - Biosciences Division Spot Award
2001	Ruth L. Kirchstein National Research Service Award
1998-2000	American Heart Association, Western States Affiliate (Predoctoral Fellowship)
1999	UC Davis Graduate Student Travel Award
1996	Jastro-Shields Fellowship

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2000	TX-5-326-626 Enhancing biochemical mechanisms controlling NGF-induced neurite outgrowth.
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Innovation (Invention Disclosures):

2014	E-141-2014 “High Efficiency, Pulse Exposure Capable, Bone Marrow Toxicity Assay Alternative” – A microplate alternative to the validated colony forming unit-granulocyte/macrophage bone marrow toxicity assay. A liquid-based, automated alternative to the semi-solid agarose colony counting assay whereby CD13 antigen detection and a 16-fold increase in tests/plate enables high throughput and substantial cost savings.
2009	E-218-2009 “Organ slice thickness measuring device” (2009) – Development of an organ slice measuring device by modification of a digital micrometer. Capable of accurately measuring organ slices of less than 1 mm in thickness.
2008	E-277-2008 “High oxygen New Brunswick TC-8 modification” – Allows for the safe use of the TC-8 roller drum unit inside of a cell culture incubator containing high oxygen (75%)
2008	E-278-2008 “High capacity roller drum” (2008) – Development of high capacity vial carrier drum, allowing for easier and more efficient vial retrieval, and almost doubling the vial number capacity using the New Brunswick TC-8.
2005	P5227 “Mini roller drum” (2005) – Development of vial carrier drum allowing for easier and more efficient vial retrieval, partitioning of individual treatment groups, and tripling of vial number capacity per incubator.
2004	P5217 “Three- and four-chambered core “sleeve” for Krumdieck slicer” (2004) – Redesign of slicer chamber resulting in the quadrupling of slice production speed.

Peer Review Activities

Journals: Ad-hoc reviewer for Toxicological Sciences, Toxicology and Applied Pharmacology, Plos-One

Grants: Ad-hoc reviewer for Alternatives Research & Development Foundation grant applications

Training

- 2015** Practical Methods for In Vitro Toxicology Workshop IIVS, Gaithersburg, MD, USA
- 2014** Team-Building, Mentoring and Coaching Skills For Managers & Supervisors, Fred Pryor Seminar held at IIVS, Gaithersburg, MD, USA
- 2011** Office/Excel 2010 (custom training) by Software Solutions, SAIC-Frederick, Frederick, MD, USA
- 2010** Manager as Communicator, SAIC-Frederick, Frederick, MD, USA
- 2008** Management Development Program, SAIC-Frederick, Frederick, MD, USA

Oral presentations

Oral presentation (3D Reconstructed Human Airway Models: Effect of Acclimation Conditions on Biomarker and Inflammatory Response Following Tissue Challenge) **H. Behrsing**, H. Raabe, D. Sheehan, E. Sly, R. Curren Tobacco Science Research Conference (TSRC) – September 20-23, 2015, Naples, FL

Oral presentation (Workshop Report: In Vitro COPD Models for Tobacco Regulatory Science - Highlights and Paths Forward, **H. Behrsing** & H. Raabe) – Ancillary Meeting, Society of Toxicology Annual Meeting, March 22-26, 2015, San Diego, CA

Poster (The Use of Precision-cut Lung Slices to Assess Inflammation, Parenchymal Damage, and Collagen Deposition: Three Markers of Tobacco Exposure-induced Pulmonary Toxicity, **H. Behrsing**) – Fraunhofer ITEM workshop – February 5-6th, 2015, Hannover, Germany

Oral presentation (Detection of Inflammation and Parenchymal Damage Using Precision-cut Lung Slices, **H. Behrsing**) – IIVS Workshop: “Assessment of In Vitro COPD Models for Tobacco Regulatory Science” December 8-10, 2014, Gaithersburg, MD

Oral presentation (Etiology of COPD and In Vitro Models, **H. Behrsing**) – IIVS Workshop: “Assessment of In Vitro COPD Models for Tobacco Regulatory Science” December 8-10, 2014, Gaithersburg, MD

Poster (Toxic Insult to Rat Precision Cut Lung Slices Increases Tissue Cytokine Levels and Activation of Macrophages, and Causes Acute Damage, While Prolonged Insult May Lead to Increased

Deposition of Collagen - a Marker of Fibrosis, **H. Behrsing**) – CORESTA congress – November October 12-16, 2014, Quebec, Canada

Poster (The Use of Precision-cut Lung Slices to Assess Inflammation, Parenchymal Damage, and Collagen Deposition: Three Markers of Tobacco Exposure-induced Pulmonary Toxicity, **H. Behrsing**) – Tobacco Science Research Conference (TSRC) – September 28-October 1, 2014, Charlottesville, VA

Poster (Chemotherapeutic Class-Specific Neurotoxic Effects on Rat DRG Cells Using High-Content Analysis., **H. Behrsing**, F. Cutuli, J. Hamre, M. A. Davis, and L. Guo) – Society of Toxicology Annual Meeting, March 23-27, 2014, Phoenix, AZ

Poster (High-Content Analysis of Drug-Specific Neurotoxic Effects on Rat Dorsal Root Ganglion Cells **H. P. Behrsing**, F. M. Cutuli, M. Davis and R. E. Parchment) – Society of Toxicology Annual Meeting, March 10-14, 2013, San Antonio, TX

Poster (Adopting Testing Conditions of the Validated CFU-GM Assay for Hematopoietic Stem Cells in a Microwell Format., **H. Behrsing**, J. Hamre III, M. Davis and R. Parchment) – Society of Toxicology Annual Meeting, March 11-15, 2012, San Francisco, CA

Poster (Retinoic Acid Differentiated H9c2 Rat Cardiac Cells as a model for Toxicity Screening., **H. P. Behrsing**, J. Hamre III, M. J. Furniss, D. Mesa and R. E. Parchment.) – Society of Toxicology Annual Meeting, March 6-10, 2011, Washington D.C.

Poster (The Influence of Phortress on Cytokine Levels and Tissue Viability in Precision-cut Rat Lung Tissue., M. J. Furniss, R. E. Parchment, J. E. Tomaszewski and **H. P. Behrsing**) – Society of Toxicology Annual Meeting, March 7-11, 2010, Salt Lake City, UT

Oral Presentation (Cytokine Levels in Tissue and Medium of Precision-cut Lung Slices During Production and Incubation., **H. P. Behrsing**, M. J. Furniss, J. E. Tomaszewski and R. E. Parchment) – Society of Toxicology Annual Meeting, March 7-11, 2010, Salt Lake City, UT

Poster (Modulation of BCNU Toxicity by O4 Benzylfolic acid in human bone marrow CFU-GM and Tumor Cell Lines., **H. P. Behrsing**, M. Furniss, K. A. Robillard, J. E. Tomaszewski and R. E. Parchment) – Society of Toxicology Annual Meeting, March 15-19, 2009, Baltimore, MD

Poster (In vitro detection of O4 benzylfolate modulated, BCNU toxicity in human bone marrow using CFU-GM and tumor cell lines., **Holger Behrsing**, Michael Furniss, Kristine Robillard, Danielle Mesa, Ryan Richards, John Hamre, Joseph Tomaszewski, and Ralph Parchment) – American Association for Cancer Research Annual Meeting, April 18-22, 2009, Denver, Colorado

Poster (Detection of Indenoisoquinoline-induced Bone Marrow Toxicity and γ H2AX Positive Loci in Mice., **Holger P. Behrsing**, Kristine A. Robillard, William Yutzy, Jiuping Ji, John Carter, Raymond Divelbiss, Melinda G. Hollingshead, Joseph E. Tomaszewski, Ralph E. Parchment) –

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European Society of Toxicology In Vitro (ESTIV), 15th International Congress on In Vitro Toxicology, September 25-28, 2008, Stockholm, Sweden

Poster (Human and Rat Lung Tissue Exhibit Differential Sensitivity to Phortress Toxicity: Use of Precision-Cut Lung Slices., K. Amin, C. Ip, T. Le, J. Tomaszewski, C. Green, C. Tyson, **H. Behrsing**) – Society of Toxicology Annual Meeting, March 5-9, 2006, San Diego, CA

Poster (Demonstration of Differential Toxicity Induced by Aminoflavone Prodrug in Human and Rat Precision Cut Lung Slices., **H. Behrsing**, C. Ip, T. Le, J. Tomaszewski, C. Green, C. Tyson, K. Amin) – Society of Toxicology Annual Meeting, March 5-9, 2006, San Diego, CA

Poster (Liver slice model system for biliary cell effects: changes in clinical chemistry parameters., **Behrsing, Holger P.**, Ip, Carmen, Jimenez, Lucita, Tyson, Charles A.) – Society of Toxicology Annual Meeting, March 6-10, 2005, New Orleans, LA

Poster (Comparison of BCNU and SarCNU toxicity in long-term cultures of precision cut lung slices., Tyson, Charles A., Amin, Khalid, Ip, Carmen, **Behrsing, Holger P.**) – Society of Toxicology Annual Meeting, March 6-10, 2005, New Orleans, LA

Oral Presentation (Precision-cut Slice Systems: Advancements for New Applications, **Behrsing, Holger P.**) – Early Toxicity Screening Meeting, February 21-23, 2005, San Diego, CA

Poster (New uses for precision-cut organ slice systems as toxicology models., **H.P. Behrsing**, K. Amin, C. Ip, and C.A. Tyson) – Tissue Models for Drug Discovery Conference, November 8-9, 2004, Boston, MA

Poster (Induction of fibrosis by bleomycin and carmustine in rat lung slices., **H.P. Behrsing**, K. Amin, C. Ip, and C.A. Tyson) – Society of Toxicology Annual Meeting, March 21-25, 2004, Baltimore, MD

Poster (Response of liver slices to hepatotoxicants assessed using traditional clinical chemistry markers., **H.P. Behrsing** and C.A. Tyson) – Society of Toxicology Annual Meeting, March 9-13, 2003, Salt Lake City, UT

Poster (Potentiation of NGF-induced Neurite Expression by Purinergic Analogs in PC12 Cells., **H. Behrsing** & R. Vulliet) – American Society for Pharmacology and Experimental Therapeutics Annual Meeting, June 4-8, 2000, Boston, MA

Poster (Potentiation of Neurite Outgrowth by Adenosine Analogs in PC12 Cells. Neural Regeneration Symposium, R. Vulliet & **H. Behrsing**) – Neural Regeneration Symposium, December 8-12, Asilomar Conference Grounds, Pacific Grove, CA (1999)

Published manuscripts

1. Facundo M. Cutuli and **Holger P. Behrsing**. Compound-Specific Toxicities Detected in CFU-GM, Rat Kidney NRK Cells, Rat Bladder RBLAK Cells, and Rat Liver Slices following Batracylin or N-Acetyl Batracylin Exposure. *Advances in Toxicology*, Volume 2014 Article ID 283749 (2014)
2. Kaur, G., **Behrsing, H.**, Parchment, R. E., Millin, M. D. and Teicher, B. A. Analyses of the combination of 6-MP and dasatinib in cell culture. *Int J Oncol*, Jul;43(1):13-22 (2013)
3. **Holger P. Behrsing**, Michael J. Furniss, Myrtle Davis, Joseph E. Tomaszewski and Ralph E. Parchment. In Vitro Exposure of Precision-Cut Lung Slices to 2-(4-Amino-3-Methylphenyl)-5-Fluorobenzothiazole Lysylamide Dihydrochloride (NSC 710305, Phortress) Increases Inflammatory Cytokine Content and Tissue Damage *Toxicol. Sci.* 131(2): 470-47(2013)
4. Augusto Pessina, Arianna Bonomi, Loredana Cavicchini, Beatriz Albella, Laura Cerrato, Dominique Parent-Massin, Yann Sibiril, Ralph Parchment, **Holger Behrsing**, Paolo Verderio, Sara Pizzamiglio, Manuela Giangreco, Carolina Baglio, Valentina Coccè, Francesca Sisto, and Laura Gribaldo. Prevalidation of the Rat CFU-GM Assay for In Vitro Toxicology Applications. *ATLA* 38, 105–117 (2010)
5. **Holger Peter Behrsing**, Michael J. Furniss, Kristine A. Robillard, Joseph E. Tomaszewski, Ralph E. Parchment. In vitro comparison of O4-benzylfolate modulated, BCNU-induced toxicity in human bone marrow using CFU-GM and tumor cell lines. *Cancer Chemother Pharmacol*, May;65(6):1083-91(2010)
6. K. Amin, C. Ip, L. Jimenez, C.A. Tyson, and **H.P. Behrsing**. Characterization of ANIT-induced toxicity using precision-cut rat and dog liver slices cultured in a dynamic organ roller system. *Toxicologic Pathology* 34:776-784 (2006).
7. **Holger P. Behrsing**, Jennifer Tam, Brad Gray, Andy Do, Young Park, Hyoung Yun, Delai Zhao, Charles Gropper, Jaeho Jung, Robert G. Gish, Brendan M. McGuire, Angela Panoskaltis-Mortari, George K. K. Lau, Young-Suk Lim, Han Chu Lee, Dong-Jin Suh, Sung-Soo Park. In Vitro Assessment of a Novel Porcine Liver Slice-filled Bio-artificial Liver (BAL) for Dialysis of Liver Failure Patients. Free Paper Session III. *Journal of Gastroenterology and Hepatology* 21 (s2), A88-A92. (2006).
8. **H.P. Behrsing**, K. Amin, C. Ip, L. Jimenez, and C.A. Tyson. In vitro detection of differential and cell-specific hepatobiliary toxicity induced by geldanamycin and 17-allylaminogeldanamycin in rats. *Toxicology In Vitro* Dec;19(8):1079-88 (2005).
9. K. Amin, C. Ip, L. Jimenez, C.A. Tyson, and **H.P. Behrsing**. In vitro detection of differential and cell-specific hepatobiliary toxicity induced by geldanamycin and 17-allylaminogeldanamycin using dog liver. *Toxicological Sciences* Oct;87(2):442-50 (2005).

10. **H.P. Behrsing** and P.R. Vulliet. Mitogen-activated protein kinase mediates purinergic-enhanced nerve growth factor-induced neurite outgrowth in PC12 cells. *Journal of Neuroscience Research* Oct 1;78(1):64-74 (2004).
11. **H.P. Behrsing**, A.E. Vickers, and C.A. Tyson. Extended rat liver slice survival and stability monitored using clinical biomarkers. *Biochemical Biophysical Research Communication* 213, 209-213 (2003).
12. **H.P. Behrsing**. Doctoral dissertation: Enhancing biochemical mechanisms controlling NGF-induced neurite outgrowth. University of California, Davis, archives. December (2000).
13. **H.P. Behrsing** and P.R. Vulliet. Purinergic and calcium-mediated enhancement of NGF-induced neurite expression in PC12 cells. *Proceedings of Western Pharmacology Society* 42, 59-62 (1999). T. Blank, I. Nijholt, U. Teichert, H. Kügler,
14. **H. Behrsing**, A. Fienberg, P. Greengard, and J. Spiess. The phosphoprotein DARPP-32 mediates CAMP-dependent potentiation of striatal N-methyl-D-aspartate responses. *Proceedings of National Academy of Science USA* 94:14859-14864 (1997).