

**BIOGRAPHICAL SKETCH**

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NAME Klaus Michael Hahn		POSITION TITLE Professor of Pharmacology	
eRA COMMONS USER NAME KLAUS_HAHN			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Pennsylvania	BA	1981	Biochemistry, Philosophy
University of Virginia	Ph.D.	1986	Chemistry
Carnegie Mellon University	Postdoctoral	1987-1991	Chemistry, Cell Biology
The Scripps Research Institute	Sr. Research Fellow	1992-1994	Immunology

**A. Positions and Honors:****Positions and Employment**

1994-1997 Assistant Professor, Department of Neuropharmacology, Scripps Research Institute  
 1997-2000 Assistant Professor, Department of Cell Biology, Scripps Research Institute  
 2000-2004 Associate Professor, Department of Cell Biology, Scripps Research Institute  
 2004-present Thurman Professor of Pharmacology, University of North Carolina, Chapel Hill  
 2004-present Lineberger Comprehensive Cancer Center, University of North Carolina, Chapel Hill  
 2006-present Carolina Cardiovascular Biology Center, University of North Carolina, Chapel Hill  
 2007-present Joint appointment, Department of Medicinal Chemistry, University of North Carolina

**Academic Honors**

1981 Benjamin Franklin Scholar, University of Pennsylvania  
 1984 DuPont Graduate Fellowship, University of Virginia  
 1988 Muscular Dystrophy Association Postdoctoral Fellowship, Carnegie Mellon University  
 1998 National Institutes of Health James A. Shannon Directors Award  
 2004 Ronald Thurman Distinguished Professor of Pharmacology  
 2006 Plenary lecture, International Society for Analytical Cytology, Quebec, Canada  
 2007 Keynote lecture, University of Wisconsin Symposium on Biological Imaging  
 2007 Keynote lecture, NIH Conference on Imaging Probes

**Other Experiences and Professional Memberships**

Study sections and grant review: NIH Biophysics study section *ad hoc* reviewer, 2001; The Research Corporation, 2002; Argonne National Laboratories, 2002; Ecole Polytechnique Federale De Lausanne, 2002; NIH study section: Cellular and molecular imaging methods, 2003; NIH Roadmap study section: Molecular Libraries and High Throughput Screening, 2006; Roadmap initiative formulation—Nanomedicine program, 2006; Roadmap initiative oversight—State of Science: molecular imaging and libraries at NIH, 2006; The Wellcome Trust, England, 2006-present; Italian Association for Cancer Research, 2006-present; NIH Microscopic Imaging study section *ad hoc* reviewer, 2007.

Service at scientific meetings: Organizer: Signal Transduction Targets for Effective Therapeutics, Cambridge Healthtech Institute, 2004; Organizer: Molecular Microscopy of Living Cells, ASCB Annual conference, 2004; Chair, Steelman Invited Lectureship Committee, UNC, 2005-2008; Session Chair: Growth Factor Signaling, Gordon Conference, 2006; Session Chair: NIH meeting on Frontiers in Live Cell Imaging, 2006; Session Chair: Arteriosclerosis, Thrombosis, and Vascular Biology Annual Conference, 2007; Session Chair: European

School of Molecular Medicine Meeting, Milan, 2007; Program Committee, International Society for Analytical Cytology Annual Meeting, 2007; Organizer, ASCB subgroup meeting on High Performance Image Analysis and Photomanipulative Techniques for Cell Biology, 2007

Consulting and advisory boards: Scientific Advisory Board, Q3DM Company, 2001-2003; Consultant, Amersham Corporation, 2002; Scientific Advisory Board, Panomics Company, 2003-present; Sigma Chemical Company biosensor advisory board, 2006-present.

Professional memberships: American Society for Cell Biology, 1987-present; American Chemical Society, 1981-present; International Society for Analytical Cytology, 2006-present; American Association for the Advancement of Science, 1991-present.

## **Patents**

Labeled Peptides, Proteins and Antibodies and Processes and Intermediates Useful for Their Preparation. US 6951947, 2005.

Labeled Peptides, Proteins and Antibodies and Processes and Intermediates Useful for Their Preparation. US 7176037, 2007.

Five additional patents pending.

## **B. Selected peer-reviewed publications:**

Hahn, K.M., DeBiasio, R., and Taylor, D.L. Patterns of elevated free calcium and calmodulin activation in living cells. *Nature*, **359**: 736-738, 1992.

Hahn, K.M., Conrad, P.A., Chao, J., Taylor, D.L., and Waggoner, A.S. A photocrosslinking, fluorescent indicator of mitochondrial membrane potential. *J. Histochem. Cytochem.*, **41**: 631-634, 1993.

Hahn, K.M., DeBiasio, R., Tishon, Lewicki, A.H., Gairin, J.E., LaRocca, G., Taylor, D.L., and Oldstone, M.B.A. Antigen presentation and cytotoxic T lymphocyte killing studied in individual, living cells. *Virology*, **201**: 330-340, 1994.

Knauf, P.A., Law, F.Y., and Hahn, K.M. An oxonol dye is the most potent known inhibitor of band 3-mediated anion exchange. *Am. J. Physiol. (Cell Physiol.)*, **C 1073-C1077**, 1995.

Waters, J.B., Oldstone, M.B.A., and Hahn, K.M. Changes in the cytoplasmic structure of cytotoxic T lymphocytes during target cell recognition and killing. *J. Immunology*, **157**: 3396-3403, 1996.

Cornish, V.W., Hahn, K.M., and Schultz, P.G. Site-specific protein modification using a ketone handle. *J. Am. Chem. Soc.*, **118**: 8150-8151, 1996.

Shelby, R.D., Hahn, K.M., and Sullivan, K.F. Biofluorescent labeling of centromere DNA sequences in human cells. *J. Cell Biol.*, **135**: 545-557, 1996.

Bark, S.J., and Hahn, K.M. Fluorescent indicators of peptide cleavage inside living cells. *Methods*, **20**: 429-435, 2000.

Subauste, C.M., Von Herrath, M., Benard, V., Chamberlain, C.E., Chuang, T.H., Chu, K., Bokoch, G.M., and Hahn, K.M. Rho family proteins modulate rapid apoptosis induced by cytotoxic T lymphocytes and fas. *J. Biol. Chem.*, **275 (3)**: 9725-9733, 2000.

Bark, S.J., Schmid, S., and Hahn, K.M. A highly efficient method for site specific modification of peptides after chemical synthesis. *J. Am. Chem. Soc.*, **122 (15)**: 3567-3573, 2000.

Kraynov, V.S., Chamberlain, C.E., Bokoch, G.M., Schwartz, M.A., Slabaugh, S., and Hahn, K.M. Localized Rac Activation Dynamics Visualized in Living Cells. *Science*, **290**:333-337, 2000.

Weiss, T.S., Chamberlain, C.E., Takeda, T., Lin, P., Hahn, K.M., and Farquhar, M.G. Live-Cell fluorescence resonance energy transfer (FRET) shows Interaction between Gai3 on golgi membranes and the cytosolic pool of calnuc. *Proc. Natl. Acad. Sci., USA*. **98**:14961-14966, 2001.

Del Pozo, M.A., Kiesses, W.B., Alderson, N.D., Meller, N., Hahn, K.M., and Schwartz, M.A. Integrin regulated membrane translocation of GTP-Rac induces localized interaction with effectors due to dissociation of RhoGDI, *Nature Cell Biol.*, **4**:232-239, 2002.

Toutchkine, A., Nalbant, P., and Hahn, K.M. Facile synthesis of thiol-reactive Cy3 and Cy5 derivatives with enhanced water solubility. *Bioconjugate Chem.*, **3**:386-389, 2002.

Katsumi, A., Milanini, J., Kiosses, W.B., del Pozo, M.A., Kaunas, R., Chien, S., Hahn, K.M., and Schwartz, M.A. Effects of cell tension on membrane protrusion through regulation of the GTPase Rac. *J. Cell Biol.*, **158**:1-13, 2002.

Gardiner, E.M., Pestonjamas, N., Bohl, B.P., Chamberlain, C., Hahn, K.M., and Bokoch, G.M.. Spatial and temporal analysis of Rac activation during live neutrophil chemotaxis: Roles in leading edge extension and tail retraction. *Current Biology*, **12**:2029-2034, 2002.

Frosst, P., Guan, T., Subauste, C. Hahn, K., and Gerace, L. Tpr is localized within the nuclear basket of the pore complex and has a role in nuclear protein export. *J. Cell Biol.*, **156**:617-630, 2002.

Tu, S.S., Wu, W.J., Yang, W., Nalbant, P., Hahn, K., and Cerione, R.A. Antiapoptotic Cdc42 mutants are potent activators of cellular transformation. *Biochemistry*, **41**:12350-12358, 2002.

Toutchkine, A., Kraynov, V., and Hahn, K.M. Solvent-Sensitive Dyes to Report Protein Conformational Changes in Living Cells, *J. Amer. Chem. Soc.*, **125**:4132-4145, 2003.

Han, W.G., Liu, T., Himo, F., Toutchkine, A., Bashford, D., Hahn, K.M., and Noodleman, L. A Theoretical Study of the UV Absorption and Emission Solvatochromic Properties of Solvent Sensitive Dyes. *Chem. Phys. Chem.*, **4**:1084-1094, 2003.

Tan, X., Nalbant, P., Toutchkine, A., Hu, D., Vorpagel, E.R., Hahn, K.M., and Lu, H.P. Single Molecule Study of Protein-Protein Interaction Dynamics in a Cell Signaling System. *J. Phys. Chem. B*, **108**: 737-744, 2004.

Liu, T., Han, W., Himo, F., Ullmann, G.M., Bashford, D., Toutchkine, A., Hahn, K.M., and Noodleman, L. Density Functional Vertical Self-Consistent Reaction Field Theory for Solvatochromism Studies of Solvent-Sensitive Dyes. *J. Phys. Chem. A*, **108**: 3545-3555, 2004.

Subauste, M., Pertz, O., Adamson, E., Turner, C.E., Junger, S., and Hahn, K.M. Vinculin modulation of Paxillin-FAK interactions regulates ERK to control survival and motility. *J. Cell Biol.*, **165**:171-181, 2004.

Nalbant, P., Hodgson, L., Kraynov, V., Toutchkine, A., and Hahn, K.M. Activation of Endogenous Cdc42 Visualized in Living Cells. *Science*, **305**:1615-1619, 2004.

Subauste, M., Nalbant, P., Adamson, E., and Hahn, K.M. Vinculin Controls PTEN Protein Level by Maintaining the Interaction of the Adherens Junction Protein  $\alpha$ -Catenin with the Scaffolding Protein MAGI-2. *J. Biol. Chem.*, **165**:371-381, 2005.

Shen, F., Hodgson, L., Rabinovich, A., Pertz, O., Hahn, K.M., and Price, J.H. Functional Proteomics for Cell Migration. *Cytometry*, **69**:563-782, 2006.

Pertz, O., Hodgson, L., Klemke, R., and Hahn, K.M. Spatio-temporal dynamics of RhoA activity in migrating cells. *Nature*, **440**:1069-1072, 2006.

Wong, K., Pertz, O., Hahn, K., and Bourne, H. Neutrophil polarization: spatiotemporal dynamics of RhoA activity support a self-organizing mechanism. *Proc Natl Acad Sci U S A.*, **103**:3639-44, 2006.

Hodgson, L. Nalbant, P. Shen, F., and Hahn, K. Imaging and photobleach correction of Mero-CBD, sensor of endogenous Cdc42 activation. *Methods Enzymol.*, **406**:140-156, 2006.

Van Keymeulen, A., Wong, K., Knight, Z.A., Govaerts, C., Hahn, K.M., Shokat, K.M., and Bourne, H.R. To stabilize neutrophil polarity, PIP3 and Cdc42 augment RhoA activity at the back as well as signals at the front. *J. Cell Biol.*, **174**:437-445, 2006.

Shen, F., Hodgson, L. and Hahn, K.M.. Digital autofocus methods for automated microscopy. *Methods Enzymol.*, **414**:620-632, 2006.

Nakamura K, Uhlik MT, Johnson NL, Hahn KM, G. L. Johnson. PB1 Domain-Dependent Signaling Complex Is Required for Extracellular Signal-Regulated Kinase 5 Activation. *Mol Cell Biol.*, **26**(6):2065-79. 2006.

Birkenfeld, J., Nalbant, P., Bohl, B.P., Pertz, O.P., Hahn, K.M., and Bokoch, G.M. GEF-H1 modulates localized RhoA activation during cytokinesis under the control of mitotic kinases. *Developmental Cell*. **12**:699-712, 2007.

Toutchkine, A., Dan-Vinh Nguyen, D., and Hahn, K.M. Merocyanine dyes with improved photostability. *Org. Lett.* **9**: 2775-2777, 2007.

Hodgson, L., Chan, E.W.L., Hahn, K.M., and Yousaf, M.N. Combining Surface Chemistry with a FRET-Based Biosensor to Study the Dynamics of RhoA GTPase Activation in Cells on Patterned Substrates. *J. Am. Chem. Soc.* **129**:9264 - 9265, 2007.

Principal Investigator/Program Director (Last, First, Middle): Hahn, Klaus M.

El-Sibai, M., Nalbant, P., Sarmiento, C., Macaluso, F., Cammer, M, Condeelis, J.S., Hahn, K.M. and Backer, J.M. Cdc42 is Required for EGF-Stimulated Protrusion and Motility in Carcinoma Cells. *J. Cell Science*. **120(Pt 19)**:3465-74, 2007.

Frantz, C., Karydis, A., Nalbant, P., Hahn, K. M., and Barber, D. L. Positive feedback between Cdc42 activity and H<sup>+</sup> efflux by the Na-H exchanger NHE1 for polarity of migrating cells *J. Cell Biol.* **179**: 403-410, 2007.

Healy, K.D., Hodgson, L., Kim, T.Y., Shutes, A., Maddileti, S., Juliano, R.L., Hahn, K.M., Harden, T.K., Bang, Y.J., Der, C.J. DLC-1 suppresses non-small cell lung cancer growth and invasion by RhoGAP-dependent and independent mechanisms. *Mol Carcinog.* 2007 Oct 11; [Epub ahead of print].

Toutchkine, A., Han, W.G., Ullmann, M., Liu, T., Bashford, D., Noodleman, L., and Hahn, K.M. Experimental and DFT studies: novel structural modifications greatly enhance the solvent sensitivity of live cell imaging dyes. *J Phys Chem A.* **111**:10849-60, 2007.

Garrett, S.C., Hodgson, L., Rybin, A., Toutchkine, A., Hahn, K.M., Lawrence, D.S., Bresnick, A.R. A Biosensor of S100A4 Metastasis Factor Activation - Inhibitor Screening and Cellular Activation Dynamics. *Biochemistry*, in press.