

BIOGRAPHICAL SKETCH

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|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|---------|------------------------|
| NAME Ulrich H. von Andrian | POSITION TITLE Mallinckrodt Professor of Immunopathology | | |
| eRA COMMONS USER NAME vonandrian | | | |
| 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 |
| Ludwig-Maximilians Univ. Munich, Germany | M.D. | 1989 | Medicine |
| Ludwig-Maximilians Univ. Munich, Germany | Ph.D. | 1992 | Neurology/Neurosurgery |

A. Positions: 1988 – 1989 Internship, Dept. of Surgery, Zentralklinikum Augsburg, Germany; Dept. of Neurology, Univ. of Michigan, Ann Arbor, MI; and Medizinische Klinik I, Klinikum Großhadern, Munich, Germany; 1989 – 1992 Postdoctoral Fellow, La Jolla Institute for Experimental Medicine, La Jolla, CA; 1989 – 1992 Visiting Scholar, Dept. of Applied Mechanics and Engineering Sciences, UCSD, La Jolla, CA; 1992 – 1993 Postdoctoral Fellow, Dept of Pathology, Stanford University Medical Center, Stanford; 1994 – 1999 Assistant Professor of Pathology, Harvard Medical School, and Junior Investigator, CBR Institute for Biomedical Research, Boston, MA; 1999 – 2003 Associate Professor of Pathology, Harvard Medical School, and Investigator, CBRI; 2003 – 06/2006 Professor of Pathology, HMS, and Senior Investigator, CBRI; 07/2006 Edward Mallinckrodt Jr. Professor of Immunopathology, HMS.

Awards: 1989 – 1991 Research stipend of the International Institute for Microcirculation; 1992 – 1994 Research stipend (Forschungsstipendium) of the Deutsche Forschungsgemeinschaft; 1997 Microcirculatory Society Wiederhielm Award; 2004 - Amgen Outstanding Investigator Award (ASIP); 2004 – 2005 Iacocca Faculty Fellow, Joslin Diabetes Center; 2006 - Bowditch Award recipient of the ASP; 2007 BD-Biosciences Award (AAI).

Memberships: 1994 - Member, Microcirculatory Society (MCS); 1998 - Member, American Association of Immunologists (AAI); 1998 - Member, North American Vascular Biology Organization (NAVBO); 2000 - Elected Member, American Association of University Pathologists ("Pluto Society"); 2002 - Member, American Society for Investigative Pathology (ASIP); 2002 - Elected Member, European Academy of Sciences; 2004 - Member, The American Society for Cell Biology (ASCB); 2005 - Member, American Physiological Society (APS).

Editorial Boards: 1999 – 2004 *Microcirculation*; 1999 – 2000 *American Journal of Physiology: Heart Circ Physiol*; 2002 - Advisory Editor, *Journal of Experimental Medicine*; 2004 - *Current Immunology Reviews*; 2005 - Associate Editor, *Immunity*; 2007 – *Journal of Vascular Research*; 2007 – *The Open Microbiology Journal*; 2007 - *The Year in Immunology* (New York Academy of Sciences); 2008 – Board of Reviewing Editors, *Science*; 2009 - *Cell*

B. Selected peer-reviewed publications (in chronological order). (selected from a total of 156):

von Andrian, U.H., Chambers, J.D., McEvoy, L., Bargatze, R.F., Arfors, K.E., and Butcher, E.C. Two step model of leukocyte-endothelial cell interaction in inflammation: Distinct roles for LECAM-1 and the leukocyte B2 integrins in vivo. *Proc. Natl. Acad. Sci. USA* **88**: 7538-42, 1991.

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Weninger, W., Crowley, M.A., Manjunath, N. and von Andrian U.H. Migratory properties of naïve, effector, and memory CD8+ T cells. *J. Exp. Med.* **194(7)**: 953-966, 2001.

Goodarzi, K., Goodarzi, M., Tager, A.M., Luster, A.D., and von Andrian, U.H. Leukotriene B4 and BLT1 control cytotoxic effector T cell recruitment to inflamed tissues. *Nature Immunology* **4(10)**: 965-973, 2003.

von Andrian, U.H. and Mempel, T. Homing and Cellular Traffic in Lymph Nodes. *Nat Rev Imm.* **3**: 867-878, 2003.

Mora, J.R., Bono, R. B., Manjunath, N., Weninger, W., Cavanagh, L., Roseblatt, M., and von Andrian, U.H. Selective imprinting of gut-homing T cells by Peyer's Patch Dendritic Cells. *Nature*, **424**: 88-93, 2003.

Mempel, T.R., Henrickson, S.E. and von Andrian, U.H. T cell priming by dendritic cells in lymph nodes occurs in three distinct phases. *Nature* **427**: 154-159, 2004.

Halin, C., Mora, J.R., Sumen, C. and von Andrian, U.H. In vivo imaging of lymphocyte trafficking. *Annu. Rev. Cell Dev. Biol.* **21**: 581-603, 2005.

Halin, C., Scimone, M.L., Gauguet, J.-M., Mempel, T.R., Quackenbush, E.J., Proia, R., Mandala, S. and von Andrian, U.H. The S1P-analog FTY720 differentially modulates T cell homing via HEV: T cell-expressed S1P1 amplifies integrin activation in peripheral lymph nodes but not in Peyer's patches. *Blood*, **106(4)**: 1314-22, 2005.

Wang, J., Fathman, J.W., Lugo-Villarino, G., Scimone, L., von Andrian, U.H., Dorfman, D.M., and Glimcher,

L.H. Transcription factor T-bet regulates inflammatory arthritis through its function in DCs. *JCI* 116:414-21, 2006.

Mempel, T.R., Pittet, M.J., Khazaie, K., Weninger, W., Weissleder, R., von Boehmer, H., von Andrian, U.H., Regulatory T cells reversibly suppress cytotoxic T cell function independent of effector differentiation. *Immunity*, **25(1)**: 129-141, 2006.

Bonasio, R., Scimone, M.L., Schaerli, P., Grabie, N., Lichtman, A.H. and von Andrian, U.H. Clonal deletion of thymocytes by circulating dendritic cells homing to the thymus. *Nat Immunol* **7**:1192-1100, 2006

Pearce, G., Angeli, V., Randolph, G.J., Junt, T., von Andrian, U., Schnittler, H.-J. and Jessberger, R. Signaling protein SWAP-70 is required for efficient B cell homing to lymphoid organs. *Nat Immunol* **7(8)**:827-834, 2006.

Massberg, S. and von Andrian, U.H. Fingolimod and sphingosine-1-phosphate – modifiers of lymphocyte migration. *New Eng. J. Med.* **355(11)**:1088-1091, 2006.

Krause, D.S., von Andrian, U.H. and Van Etten, R.A. Requirement for CD44 in homing and engraftment of BCR-ABL-expressing leukemic stem cells. *Nature Medicine*, **12(10)**:1175-80, 2006.

Chen, Q., Fisher, D.T., Clancy, K.A., Gauguet, J.-M., Wang, W.C., Unger, E., Rose-John, S., von Andrian, U.H., Baumann, H. and Evans, S.S. Fever-range thermal stress promotes lymphocyte trafficking across high endothelial venules through an IL-6 trans-signaling mechanism. *Nat Immunol* **7(12)**:1299-1308, 2006.

Mora, J.R., Iwata, M., Eksteen, B., Song, S.-Y., Junt, T., Senman, B., Otipoby, K.L., Ricciardi-Castagnoli, P., Rajewsky, K., Adams, D.H. and von Andrian, U.H. Intestinal dendritic cells generate gut-homing IgA-secreting B cells. *Science* **314**: 1157-1169, 2006.

Mempel, T.R., Junt, T. and von Andrian, U.H. Rulers over randomness: Stroma cells guide lymphocyte migration in lymph nodes, *Immunity* **25(6)**: 867-9, 2006.

Friedl, P., Wolf, K., von Andrian, U.H., and Harms, G. Biological second and third harmonic generation microscopy. *Current Protocols in Cell Biology*. 2007 Mar;Chapter 4:Unit 4.15.

Yano, K., Daniel Gale, D., Massberg, S., Cheruvu, P.K., Monahan-Earley, R., Morgan, E.S., Haig, D., von Andrian, U.H., Dvorak, A.M. and Aird, W.C. Phenotypic heterogeneity is an evolutionarily conserved feature of the endothelium. *Blood* **109**:613-615, 2007.

Meuter, S., Schaerli, P., Roos, R.S., Brandau, O., Bosl, M.R., von Andrian, U.H. and Moser, B. Murine CXCL14 is dispensable for dendritic cell function and localization within peripheral tissues. *MCB* **27**:983-992, 2007.

Mitoma, J., Bao, X., Petryanik, B., Schaerli, P., Gauguet, J.-M., Yu, S.-Y., Kawashima, H., Saito, H., Ohtsubo, K., Marth, J.D., Khoo, K.-H., von Andrian, U.H., Lowe, J.B. and Fukuda, M. Critical functions of N-glycans in L-selectin-mediated lymphocyte homing and recruitment. *Nat Immunol* **8(4)**:409-418, 2007.

Nombela-Arrieta, C., Mempel, T.R., Soriano, S.F., Mazo, I.B., Wymann, M.B., Hirsch, E., Martínez, C., Fukui, T., von Andrian, U.H. and Stein, J.V. Analyzing the roles of DOCK2 and phosphoinositide-3-kinase γ during efficient interstitial lymphocyte motility and sphingosine-1-phosphate-mediated signaling important for egress. *J. Exp. Med.* **204(3)**:497-510, 2007.

Worbs, T., Mempel, T.R., Bölter, J., von Andrian, U.H. and Förster, R. CCR7 ligands stimulate the intranodal motility of T lymphocytes *in vivo*. *J. Exp. Med.* **204(3)**:489-95, 2007.

Li, J., Brieher, W.M., Scimone M.L., Kang, S.J., Zhu, H., Yin, H., von Andrian, U.H., Mitchison, T. and Yuan, J. Caspase-11 regulates cell migration by promoting Aip1/Cofilin-mediated actin depolymerization. *Nat. Cell. Biol.* **9(3)**:276-286, 2007.

Henrickson, S.E. and von Andrian, U.H. Single-cell dynamics of T cell priming. *COI* **19**: 249-258, 2007.

von Andrian, U.H. and Sallusto, F. Lymphocyte Activation. *COI* **19**: 247-248, 2007.

Hauser, A.E., Junt, T., Mempel, T.R., Sneddon, M.W., Kleinstein, S.H., Henrickson, S.E., von Andrian, U.H., Shlomchik, M.J., Haberman, A.M. Definition of germinal-center B cell migration *in vivo* reveals predominant intrazonal circulation patterns. *Immunity*, May; **26(5)**: 655-57, 2007.

Park, E.J., Mora, J.R., Carman, C.V., Chen, J.F., Sasaki, Y., Cheng, G., von Andrian, U.H. and Shimaoka M. Aberrant activation of integrin $\alpha 4\beta 7$ suppresses lymphocyte migration to the gut. *JCI*, in press. 2007.

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Junt, T., Moseman, E.A., Boes, M., Fink, K., Shayakhmetov, D.M., Mempel, T.R., Whelan, S.P. and von Andrian, U.H. Subcapsular sinus macrophages in lymph nodes clear lymph-borne viruses and present them to antiviral B cells. *Nature* **450(7166)**:110-114 2007.

Massberg, S., Schaerli, P., Knezevic-Maramica, I., Köllnberger, M., Tubo, N., Moseman A.E., Huff, I.V., Junt, T.,

Wagers, A.J., Mazo, I.B. and von Andrian, U.H. Physiological recirculation of haematopoietic stem and progenitor cells through blood, lymph and extramedullary tissues. *Cell*, November; **131(5)**: 994-1008, 2007.

Tenno, M., Ohtsubo, K., Hagen, F.K., Ditto, D., Zarock, A., Schaerli, P. von Andrian, U.H., Ley, K., Le, D., Tabak, L.A., Marth, J.D. Initiation of Protein O-Glycosylation by Polypeptide GalNAcT-1 in Vascular Biology and Humoral Immunity. *Mol Cell Biol.* **27(24)**:8783-96, 2007.

Iparraguirre, A., Tobias, J.W., Hensley, S.E., Masek, K.S., Cavanagh, L.L., Rendl, M., Hunter, C.A., Ertl, H., von Andrian, U.H. and Weninger, W. Two distinct differentiation states of plasmacytoid dendritic cells induced by influenza virus and CpG1828 oligonucleotide. *J. Leuk. Biol.* 2007 [Epub], PMID: 18029397.

De Paz, J.L., Moseman, E.A., Noti, C., Polito, L., von Andrian, U.H. and Seeberger, P.H. Profiling heparin-chemokine interactions using synthetic tools. *ACS Chem. Biol.* **2(11)**:735-44, 2007.

Swirski, F.K., Berger, C.R., Figueiredo, J.-L., Mempel, T.R., von Andrian, U.H., Pittet, M.J. and Weissleder, R. A near-infrared cell tracker reagent for multiscope in vivo imaging and quantification of leukocyte immune responses. *PLoS ONE* **2(10)**:e1075; 2007 Oct 24;. PMID: 1795725.

Laird, D.J., von Andrian, U.H. and Wagers, A.J. Stem cell trafficking in tissue development, growth and disease. *Cell*, Feb 22;**132(4)**:612-30, 2008

Mora, J.R., von Andrian, U.H. Differentiation and homing of IgA-secreting cells. *Muc. Immunol.* **1(2)**:96-109, 2008.

Henrickson, S.E., Mempel, T.R., Mazo, I.B., Liu, B., Flynn, M., Artomov, M., Junt, T., Wong, H.C., Chakraborty, A.K. and von Andrian, U.H. T cell sensing of antigen dose governs interactive behavior with APC – an integrative mechanism that sets a threshold for T cell activation. *Nat. Immunol.***9(3)**:282-291, 2008.

Zheng H., Jin, B., Henrickson, S.E., Perelson, A.S., von Andrian, U.H. and Chakraborty, A.K. How antigen quantity and quality determine T cell migration patterns in lymphoid tissue. *Mol Cell Biol.* Jun;28(12):4040-51, 2008.

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Kogan, A.N. and von Andrian, U.H. Lymphocyte trafficking (Chapter 10). In: *Microcirculation (2nd Edition)* Tuma, R. Duran, W. and Ley, K. (Eds.). Elsevier, pp. 449-482, 2008.

Alvarez, D., Vollmann, E.H. and von Andrian, U.H. Mechanisms and consequences of dendritic cell migration. *Immunity*, **29(3)**:325-42, 2008.

Mora, J.R. and von Andrian, U.H. Role of retinoic acid in the imprinting of gut-homing IgA-secreting cells. *Sem. Immunol.* **21**: 28-35, 2009.

Imai, Y., Park, E.J., Peer, D., Peixoto, A., Cheng, G., von Andrian, U.H., Carman, C.V., and Shimaoka, M. Genetic perturbation of the putative cytoplasmic membrane-proximal salt bridge aberrantly activates $\alpha 4$ integrins. *Blood*, prepublished online September 22, 2008; DOI 10.1182/blood-2008-03-144543.

Schulz, C., von Andrian, U.H. and Massberg, S. Hematopoietic stem and progenitor cells – their mobilization and homing to bone marrow and peripheral tissue. *Immunological Research* in press, 2009.

Roosendaal, R., Mempel, T.R., Verschoor, A., Barrington, R.A., Schneider, T., Martinez-Pomares, L., Gordon, S., von Andrian, U.H. and Carroll, M.C. Conduits mediate antigen transport to follicular dendritic cells. *Immunity*, **30(2)**: 264-76.2009.

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Research Support

Ongoing Research Support

PO1 HL56949 (Wagner), NIH/NHLBI 09/01/06 – 08/31/11

Adhesion Molecules in Transfusion Biology (Project 3).

The major goals of this project are to dissect the molecular mechanisms of lymphocyte homing to peripheral lymph nodes and of hematopoietic stem cell trafficking into and out of the bone marrow.

PO1 HL56949 (Wagner), NIH/NHLBI (Core B) 09/01/06 – 08/31/11

The Animal Core provides board and breeding facilities for mice required for in vivo studies on lymphocyte homing to lymph nodes and of stem cell migration into and out of the bone marrow.

R01 AI069259 (von Andrian), NIH/NIAID 03/01/06 – 02/28/11

T Cell Activation in Lymph Nodes

The aims described in this grant are: to characterize interactions or 1) naive T cells and 2) central memory T cells with antigen-presenting dendritic cells in lymph nodes *in vivo*

P50-CA086355 (Pittet), NIH-NIC 09/26/06 – 08/31/11

Project 4: Imaging CD8 Immunity in Cancer

The aim of this project is to develop imaging strategies to visualize cytotoxic T cell interactions with antigen-presenting cells in extramyeloid tumors.

R01 AI072252 (von Andrian) NIH/NIAID 02/01/07 – 01/31/12

Differentiation and Regulation of CTL

The aims described in this grant are: 1.) To characterize tumor-antigen specific cytotoxic T lymphocyte (CTL) interactions with Ag-presenting target cells *in vivo* and 2.) To explore the effect of Ag-specific regulatory T cells on CTL differentiation and function.

Vertex-Office of Technology Development, Harvard 01/15/08 – 01/14/11

Analysis of regulatory T cell function, activation and differentiation *in vivo*

The aims of this project are to identify DC populations with maximum tolerogenicity, and execute a direct analysis of Treg activation and differentiation *in vivo*.

PO1 AI1078897 (von Andrian), NIH/NIAID 8/15/08 – 7/31/13

Innate and Adaptive Immune Responses to Lymph-Borne Infections (Project 1)

The specific aims of this project are 1) to explore the cellular mechanisms that determine the fate of lymph-borne viruses in LNs draining a subcutaneous injection site and 2) to analyze where and how follicular B cells are exposed and respond to lymph-borne viruses.

PO1 AI1078897 (von Andrian), NIH/NIAID (Core A) 8/15/08 – 7/31/13

Administrative Core

The specific aim of this project is to provide the Program Director and Co-Director, as well as the individual project and core leaders and co-leaders with the appropriate administrative support to efficiently carry out the scientific goals of the Program.

PO1 AI1078897 (von Andrian), NIH/NIAID (Core B) 8/15/08 – 7/31/13

Intravital Microscopy Core

The specific aims of this project are 1) to provide access and expertise in the conduct of specific experiments utilizing multi-photon microscopy-based recording of intra- and extravascular blood cell adhesion and migration as well as cell-cell and cell-pathogen interactions in as many as six dimensions, 2) to offer a custom-designed environment with appropriate biosafety conditions for the generation, housing and intravital microscopy analysis of virally infected mice, 3) to execute and analyze intravital microscopy-based adhesion and migration studies in murine tissues, 4) to provide assistance in the planning, execution and analysis of blood cell homing *in vivo*, employing defined models of inflammation and infectious diseases and 5) to provide computational resources for the storage, processing and in-depth analysis of digital imaging data.

GSK/IDI (von Andrian) 12/01/08 – 11/31/10

Segmental Specialization of Venular Endothelial Cells

The aim of this grant is to explore segmental differences between microvascular endothelial cells.

PO1 CA71932 (Fukuda) NIH 09/01/08 – 08/31/13

Intravital Microscopy Core

The specific aims of this core are 1) to execute and analyze intravital microscopy-based adhesion and migration studies in murine tissues, 2) to provide access to and expertise for conducting scientific experiments utilizing multi-photon microscopy-based recording of intra- and extravital blood cell adhesion, migration and cell-cell interactions in as many as six dimensions (i.e. space, time, color, fluorescence intensity) and 4) to provide assistance in the planning, execution and analysis of blood cell homing *in vivo* employing defined models of inflammation.