



## Dr. Lucas Onder

Senior Scientist/Post-Doc at Institute of Immunobiology, Medical Research Center, Kantonsspital St. Gallen, Switzerland  
scientist (post doc)  
Institute of Immunobiology · Management

### Contact

Dr. Lucas Onder  
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### Additional Information

Selected Publications:

Onder L et al., Lymphatic Endothelial Cells control Initiation of Lymph Node Organogenesis, *Immunity*, 2017

Novkovic M and Onder L, et al., Topological Small-World Organization of the Fibroblastic Reticular Cell Network Determines Lymph Node Functionality, *Plos Biology*, 2016, PMID: 27415420

Onder L, et al., Alternative NF- $\kappa$ B signaling regulates mTEC differentiation from podoplanin-expressing precursors in the cortico-medullary junction, *European Journal of Immunology*, 2015, PMID: 25973789

Chai Q and Onder L, et al., Maturation of lymph node fibroblastic reticular cells from myofibroblastic precursors is critical for antiviral immunity, *Immunity*, 2013, PMID: 23623380

Onder L, et al., Endothelial cell-specific lymphotoxin- $\beta$  receptor signaling is critical for lymph node and high endothelial venule formation, *The Journal of Experimental Medicine*, 2013, PMID: 23420877

Onder L, et al., IL-7-producing stromal cells are critical for lymph node remodelling, *Blood*, 2012, PMID: 22955921

### Units

Institute of Immunobiology

### Position

Senior Scientist/Post-Doc at Institute of Immunobiology, Medical Research Center, Kantonsspital St. Gallen, Switzerland

## **Former Positions**

2007-2012 Doctoral Student at Institute of Immunobiology

2007-2012 Doctoral Student at Federal Institute of Technology (ETH) Zurich, Switzerland;

Doctoral Thesis: Dissecting the function of lymphoid organ stromal cells in vivo

2001-2007 Master studies in Molecular Biology and Developmental Biology, University of Innsbruck, Austria;

Diploma Thesis: Genetic interactions of pdx1 and hlxb9 in beta-cell formation and regeneration in zebrafish (supervision: Prof. Dirk Meyer, Institute of Molecular Biology)

2006 Trainee at Daniel Swarovski Laboratory, Medical University of Innsbruck, Austria;

Topic: The role of Akt and BRAF in oncogenesis (supervision: Prof. Jakob Troppmair)

## **Profile Function**

scientist (post doc)

## **Research Area**

Immunobiology, Developmental Biology, Stromal cell biology;

Topics: The function and development of secondary lymphoid organs, The role of tumor suppressive stromal cells in the tumor microenvironment;

## **Affiliations**

Swiss Society for Allergology and Immunology (SSAI/SGAI)

## Publications (54)

Onder L, Papadopoulou C, Lütge A, Cheng H, Lütge M, Pérez Shibayama C, Gil Cruz C, De Martin A, Kurz L, Cadosch N, Pikor N, Rodriguez R, Born D, Jochum W, Leskow P, Dutly A, Robinson M, Ludewig B. Fibroblastic reticular cells generate protective intratumoral T cell environments in lung cancer. *Cell* 2024

Pérez Shibayama C, Gil Cruz C, Cadosch N, Lütge M, Cheng H, De Martin A, Frischmann K, Joachimbauer A, Onder L, Papadopoulou I, Papadopoulou C, Ring S, Krebs P, P. Vu V, P. Nägele M, Rosi V, Parianos D, Zsilavec V, Cooper L, Flammer A, Ruschitzka F, Reiner P, Schmidt D, Ludewig B. Bone morphogenic protein-4 availability in the cardiac microenvironment controls inflammation and fibrosis in autoimmune myocarditis. *Nature Cardiovascular Research* 2024; volume 3:301-316.

Pérez Shibayama C, Gil Cruz C, Cadosch N, Lütge M, Cheng H, De Martin A, Frischmann K, Joachimbauer A, Onder L, Papadopoulou I, Papadopoulou C, Ring S, Krebs P, P. Vu V, P. Nägele M, Rossi V, Parianos D, Zsilavec V, Cooper L, Flammer A, Ruschitzka F, Rainer P, Schmidt D, Ludewig B. Bone morphogenic protein-4 availability in the cardiac microenvironment controls inflammation and fibrosis in autoimmune myocarditis. *Nat Cardiovasc Res* 2024; 3:301-316.

Lütge M, De Martin A, Gil Cruz C, Pérez Shibayama C, Stanossek Y, Onder L, Cheng H, Kurz L, Cadosch N, Sonesson C, Robinson M, Stöckli S, Ludewig B, Pikor N. Conserved stromal-immune cell circuits secure B cell homeostasis and function. *Nat Immunol* 2023

De Martin A, Stanossek Y, Lütge M, Cadosch N, Onder L, Cheng H, Brandstadter J, Maillard I, Stöckli S, Pikor N, Ludewig B. Pl16 reticular cells in human palatine tonsils govern T cell activity in distinct subepithelial niches. *Nat Immunol* 2023; 24:1138-1148.

Kahlert C, Nigg S, Onder L, Dijkman R, Diener L, Vidal A, Rodriguez R, Vernazza P, Thiel V, Vidal J, Albrich W. The quorum sensing com system regulates pneumococcal colonisation and invasive disease in a pseudo-stratified airway tissue model. *Microbiol Res* 2022; 268:127297.

Cheng H, Scandella E, Hehlhans T, Pérez Shibayama C, Gil Cruz C, Novkovic M, Onder L, Engetschwiler C, Lütge M, Mörbe U, Ludewig B. Intestinal fibroblastic reticular cell niches control innate lymphoid cell homeostasis and function. *Nat Commun* 2022; 13:2027.

Onder L, Cheng H, Ludewig B. Visualization and functional characterization of lymphoid organ fibroblasts. *Immunol Rev* 2021

Ring S, Spiegl M, Besse A, Bonilla W, Stemeseder F, Schmidt S, Orlinger K, Krebs P, Ludewig B, Wenger R, Hartmann F, Cupovic J, Onder L, Lütge M, Pérez Shibayama C, Gil Cruz C, Scandella E, De Martin A, Mörbe U, Flatz L. Viral vector-mediated reprogramming of the fibroblastic tumor stroma sustains curative melanoma treatment. *Nat Commun* 2021; 12:4734.

Acton S, Onder L, Novkovic M, Martinez V, Ludewig B. Communication, construction, and fluid control: lymphoid organ fibroblastic reticular cell and conduit networks. *Trends Immunol* 2021; 42:782-794.

Cupovic J, Klenerman P, Engeler D, Krebs P, Scandella E, Oxenius A, Flatz L, Provine N, De Martin A, Cheng H, Lütge M, Colston J, Onder L, Ring S, Ludewig B. Adenovirus vector vaccination reprograms pulmonary fibroblastic niches to support protective inflating memory CD8 T cells. *Nat Immunol* 2021; 22:1042-1051.

Prados A, Ludewig B, Koliaraki V, Pérez Shibayama C, Gil Cruz C, Lütge M, Mörbe U, Cheng H, Onder L, Kollias G. Fibroblastic reticular cell lineage convergence in Peyer's patches governs intestinal immunity. *Nat Immunol* 2021; 22:510–519.

Pikor N, Cheng H, Onder L, Ludewig B. Development and Immunological Function of Lymph Node Stromal Cells. *J Immunol* 2021; 206:257–263.

Okreglicka K, Schneider C, Nielsen P, Ludewig B, Kurrer M, Feng Q, Onder L, Pohlmeier L, Iten I, Kopf M. PPAR $\gamma$  is essential for the development of bone marrow erythroblastic island macrophages and splenic red pulp macrophages. *J Exp Med* 2021; 218

Pérez Shibayama C, Gil Cruz C, Colston J, Novkovic M, De Martin A, Ring S, Onder L, Cheng H, Lütge M, Islander U, Ludewig B. Type I interferon signaling in fibroblastic reticular cells prevents exhaustive activation of antiviral CD8 T cells. *Sci Immunol* 2020; 5

Cosgrove J, Uguccioni M, Legler D, Lacey C, Coatesworth A, Polak W, Cupedo T, Manoury B, Thelen M, Stein J, Wolf M, Leake M, Timmis J, Ludewig B, Heller M, Venetz D, Taylor E, Novkovic M, Albrecht S, Pikor N, Zhou Z, Onder L, Mörbe U, Cupovic J, Miller H, Alden K, Thuery A, O'Toole P, Pinter R, Jarrett S, Coles M. B cell zone reticular cell microenvironments shape CXCL13 gradient formation. *Nat Commun* 2020; 11:3677.

Pikor N, Onder L, Linterman M, Nagasawa T, Nombela-Arrieta C, Cheng H, Novkovic M, Pérez Shibayama C, Gil Cruz C, Lütge M, Mörbe U, Ludewig B. Remodeling of light and dark zone follicular dendritic cells governs germinal center responses. *Nat Immunol* 2020; 21:649–659.

Choi S, Jang J, Onder L, Moon J, Jeong H, Adams R, Kim J, Ludewig B, Song J, Lim D, Yang M, Choi J, Bae H, Jeong S, Park I, Cho H, Hong S, Lee D, Lee C, Park J, Suh S, Koh G. YAP/TAZ direct commitment and maturation of lymph node fibroblastic reticular cells. *Nat Commun* 2020; 11:519.

Novkovic M, Onder L, Bocharov G, Ludewig B. Topological Structure and Robustness of the Lymph Node Conduit System. *Cell Rep* 2020; 30:893–904.e6.

Gil Cruz C, Jahns R, Wyss M, Mooser C, Lambrecht B, Maeder M, Rickli H, Flatz L, Eriksson U, Geuking M, McCoy K, Boivin-Jahns V, Slack E, Arnoldini M, Pérez Shibayama C, De Martin A, Ronchi F, Van der Borght K, Niederer R, Onder L, Lütge M, Novkovic M, Nindl V, Ramos G, Ludewig B. Microbiota-derived peptide mimics drive lethal inflammatory cardiomyopathy. *Science* 2019; 366:881–886.

Camara A, Flacher V, Ludewig B, Yagita H, Tanaka M, Asano K, Onder L, Chypre M, Sponsel J, Alloush F, Cordeiro O, Mueller C. Lymph Node Mesenchymal and Endothelial Stromal Cells Cooperate via the RANK-RANKL Cytokine Axis to Shape the Sinusoidal Macrophage Niche. *Immunity* 2019; 50:1467–1481.e6.

Cheng H, Hehlhans T, Rüllicke T, Pfeffer K, Sorg U, Tersteegen A, Miyazaki J, Robinson M, Scandella E, Pikor N, Lütge M, Sonesson C, Novkovic M, Onder L, Ludewig B. Origin and differentiation trajectories of fibroblastic reticular cells in the splenic white pulp. *Nat Commun* 2019; 10:1739.

Onder L, Ludewig B. Redefining the Nature of Lymphoid Tissue Organizer Cells: Response to 'Complexity of Lymphoid Tissue Organizers' by Koning and Mebius. *Trends Immunol* 2018; 39:952–953.

Novkovic M, Onder L, Cheng H, Bocharov G, Ludewig B. Integrative Computational Modeling of the Lymph Node Stromal Cell Landscape. *Front Immunol* 2018; 9:2428.

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| <p>Onder L, Ludewig B. A Fresh View on Lymph Node Organogenesis. <i>Trends Immunol</i> 2018; 39:775–787.</p>   |
| <p>Pérez Shibayama C, Gommerman J, Scandella E, Robinson M, Soneson C, Mack M, Turley S, Buechler M, López-Macías C, Li C, Novkovic M, Mörbe U, Printz A, Onder L, Cheng H, Gil Cruz C, Ludewig B. Fibroblastic reticular cells initiate immune responses in visceral adipose tissues and secure peritoneal immunity. <i>Sci Immunol</i> 2018; 3</p>   |
| <p>Cheng H, Brutsche M, Jochum W, Schneider T, Rodriguez R, Tarantino I, Pikor N, Novkovic M, Bösch M, Cupovic J, Onder L, Ludewig B. CCL19-producing fibroblastic stromal cells restrain lung carcinoma growth by promoting local antitumor T-cell responses. <i>J Allergy Clin Immunol</i> 2018</p>  |
| <p>Bösch M, Knauer M, Ruhstaller T, Jochum W, Gastl G, Sopper S, Mörbe U, Novkovic M, Cheng H, Onder L, Ludewig B. Interleukin 7-expressing fibroblasts promote breast cancer growth through sustenance of tumor cell stemness. <i>Oncoimmunology</i> 2018; 7:e1414129.</p>  |
| <p>Onder L, Scandella E, Sawa S, Mueller C, Gommerman J, Rüllicke T, Waisman A, Becher B, Pfeffer K, Hehlgans T, Cheng H, Novkovic M, Pikor N, Mörbe U, Ludewig B. Lymphatic Endothelial Cells Control Initiation of Lymph Node Organogenesis. <i>Immunity</i> 2017; 47:80–92.e4.</p>  |
| <p>Chung J, Onder L, Yan M, Reddy P, Blazar B, Huang A, Brennan T, Bishop D, Ludewig B, Siebel C, Radtke F, Luther S, Chai Q, Tran I, Ebens C, Perkey E, Radojic V, Koch U, Scarpellino L, Tong A, Allen F, Wood S, Feng J, Friedman A, Granadier D, Maillard I. Fibroblastic niches prime T cell alloimmunity through Delta-like Notch ligands. <i>J Clin Invest</i> 2017; 127:1574–1588.</p> |
| <p>Pikor N, Cupovic J, Onder L, Gommerman J, Ludewig B. Stromal Cell Niches in the Inflamed Central Nervous System. <i>J Immunol</i> 2017; 198:1775–1781.</p>  |
| <p>Novkovic M, Onder L, Bocharov G, Ludewig B. Graph Theory-Based Analysis of the Lymph Node Fibroblastic Reticular Cell Network. <i>Methods Mol Biol</i> 2017; 1591:43–57.</p>  |
| <p>Grebennikov D, van Loon R, Novkovic M, Onder L, Savinkov R, Sazonov I, Tretyakova R, J Watson D, Bocharov G. Critical Issues in Modelling Lymph Node Physiology. <i>Computation</i> 2016; 5:3.</p>  |
| <p>Gil Cruz C, Scandella E, Ikuta K, Cui G, Abe S, McCoy K, Geuking M, Lang P, Novkovic M, Cheng H, Cupovic J, Chai Q, Onder L, Pérez Shibayama C, Ludewig B. Fibroblastic reticular cells regulate intestinal inflammation via IL-15-mediated control of group 1 ILCs. <i>Nat Immunol</i> 2016; 17:1388–1396.</p>   |
| <p>Savinkov R, Kislitsyn A, Watson D, van Loon R, Sazonov I, Novkovic M, Onder L, Bocharov G. Data-driven modelling of the FRC network for studying the fluid flow in the conduit system. <i>Engineering Applications of Artificial Intelligence</i> 2016; 62:341–349.</p>   |
| <p>Novkovic M, Turley S, Bocharov G, Stein J, Scandella E, Cremasco V, Bornze D, Abe J, Cupovic J, Onder L, Ludewig B. Topological Small-World Organization of the Fibroblastic Reticular Cell Network Determines Lymph Node Functionality. <i>PLoS Biol</i> 2016; 14:e1002515.</p>  |
| <p>Cupovic J, Onder L, Gil Cruz C, Weiler E, Caviezel-Firner S, Pérez Shibayama C, Rüllicke T, Bechmann I, Ludewig B. Central Nervous System Stromal Cells Control Local CD8(+) T Cell Responses during Virus-Induced Neuroinflammation. <i>Immunity</i> 2016; 44:622–33.</p>  |

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| <p>Mair F, Joller S, Hoeppli R, Onder L, Hahn M, Ludewig B, Waisman A, Becher B. The NFκB-inducing kinase is essential for the developmental programming of skin-resident and IL-17-producing γδ T cells. <i>Elife</i> 2015; 4</p>   |
| <p>Onder L, Ludewig B. Another TLO in the Wall: Education and Control of T Cells in Atherosclerotic Arteries. <i>Immunity</i> 2015; 42:981-3.</p>  |
| <p>Kislitsyn A, Savinkov R, Novkovic M, Onder L, Bocharov G. Computational Approach to 3D Modeling of the Lymph Node Geometry. <i>Computation</i> 2015; 3:222-234.</p>   |
| <p>Onder L, Waisman A, Becher B, Ledermann B, Mair F, Maier R, Bomze D, Novkovic M, Caviezel-Firner S, Cheng H, Chai Q, Scandella E, Nindl V, Ludewig B. Alternative NF-κB signaling regulates mTEC differentiation from podoplanin-expressing presursors in the cortico-medullary junction. <i>Eur J Immunol</i> 2015</p>                                 |
| <p>Astarita J, Xia L, Mooney D, Carroll M, Weimer R, Ludewig B, Onder L, Gogineni A, Woodruff M, Kondo Y, Song K, Nieves-Bonilla J, Peck J, Darnell M, Fu J, Cremasco V, Turley S. The CLEC-2-podoplanin axis controls the contractility of fibroblastic reticular cells and lymph node microarchitecture. <i>Nat Immunol</i> 2014; 16:75-84.</p>          |
| <p>Fasnacht N, Luther S, Ludewig B, Tacchini-Cottier F, MacDonald H, Pinschewer D, Kallert S, Onder L, Chai Q, Auderset F, Favre S, Koch U, Huang H, Radtke F. Specific fibroblastic niches in secondary lymphoid organs orchestrate distinct Notch-regulated immune responses. <i>J Exp Med</i> 2014; 211:2265-79.</p>                                    |
| <p>Cremasco V, Carroll M, Ludewig B, Wucherpfennig K, Harvey C, Cremasco F, Chang J, Schildberg F, Nieves-Bonilla J, Cupovic J, Onder L, Woodruff M, Turley S. B cell homeostasis and follicle confines are governed by fibroblastic reticular cells. <i>Nat Immunol</i> 2014; 15:973-81.</p>  |
| <p>Pérez Shibayama C, López-Macías C, Isibasi A, Waisman A, Regen T, Scandella E, Onder L, Chai Q, Hisaki E, Cervantes-Barragan L, Pastelin-Palacios R, Gil Cruz C, Ludewig B. IFN-γ-producing CD4+ T cells promote generation of protective germinal center-derived IgM+ B cell memory against Salmonella Typhi. <i>J Immunol</i> 2014; 192:5192-200.</p> |
| <p>Caviezel-Firner S, Engeler D, Bolinger B, Onder L, Scandella E, Yu M, Kroczeck R, Ludewig B. Systemic minor histocompatibility antigen expression in blood endothelial cells prevents T cell-mediated vascular immunopathology. <i>Eur J Immunol</i> 2013; 43:3233-43.</p>  |
| <p>Iolyeva M, Finke D, Chen L, Boyman O, Santambrogio L, Ludewig B, Onder L, Krieg C, Bouchaud G, Häner S, Ecoiffier T, Willrodt A, Proulx S, Aebischer D, Halin C. Interleukin-7 is produced by afferent lymphatic vessels and supports lymphatic drainage. <i>Blood</i> 2013; 122:2271-81.</p>   |
| <p>Chai Q, Hehlgans T, Stein J, Rüllicke T, Thiel V, Luther S, Sparwasser T, Danuser R, Cupovic J, Pérez Shibayama C, Gil Cruz C, Scandella E, Onder L, Ludewig B. Maturation of lymph node fibroblastic reticular cells from myofibroblastic precursors is critical for antiviral immunity. <i>Immunity</i> 2013; 38:1013-24.</p>                         |
| <p>Onder L, Danuser R, Scandella E, Firner S, Chai Q, Hehlgans T, Stein J, Ludewig B. Endothelial cell-specific lymphotoxin-β receptor signaling is critical for lymph node and high endothelial venule formation. <i>J Exp Med</i> 2013; 210:465-73.</p>  |
| <p>Onder L, Coles M, Cupedo T, Westermann J, Kaye P, Richie E, Halin C, Hoorweg K, Iolyeva M, Chai Q, Scandella E, Narang P, Ludewig B. IL-7-producing stromal cells are critical for lymph node remodeling. <i>Blood</i> 2012; 120:4675-83.</p>   |

Firner S, Onder L, Nindl V, Ludewig B. Tight control - decision-making during T cell-vascular endothelial cell interaction. *Front Immunol* 2012; 3:279.

Onder L, Scandella E, Chai Q, Firner S, Mayer C, Sparwasser T, Thiel V, Rüllicke T, Ludewig B. A novel bacterial artificial chromosome-transgenic podoplanin-cre mouse targets lymphoid organ stromal cells in vivo. *Front Immunol* 2011; 2:50.

Kumar V, Scandella E, Danuser R, Onder L, Nitschké M, Fukui Y, Halin C, Ludewig B, Stein J. Global lymphoid tissue remodeling during a viral infection is orchestrated by a B cell-lymphotoxin-dependent pathway. *Blood* 2010; 115:4725-33.

Zinkernagel M, Bolinger B, Krebs P, Onder L, Miller S, Ludewig B. Immunopathological basis of lymphocytic choriomeningitis virus-induced chorioretinitis and keratitis. *Journal of virology* 2009; 83:159-66.

## Projects (3)

### **Systems biology approach to molecularly characterize the lung cancer microenvironment**

*Fundamental Research - Jan 1, 2013 - Dec 31, 2014*

*Completed*

### **Funktionelle Charakterisierung und therapeutische Nutzung des mesenchymalen Tumorstromas**

*Fundamental Research - Mar 1, 2012 - Feb 28, 2014*

*Completed*

### **Examining the function of lymphoid organ structure during antiviral immune responses using microscopic and mesoscopic imaging**

*Fundamental Research - Jun 1, 2009 - Jul 31, 2012*

*Completed*