

**BIOMEDICAL & VETERINARY SCIENCES
GRADUATE PROGRAM**



ANNOUNCES

The Doctor of Philosophy Seminar and Examination of

Leila Abdelhamid

**“Mechanistic Insights on the Immunomodulatory
Functions of Diverse Environmental Factors on
Systemic Autoimmunity.”**

Wednesday, October 20, 2021

2:00 pm

VMCVM -Phase 2, Classroom 121

<https://virginiatech.zoom.us/j/82012918856?pwd=M2hQWWtIRjIMNFZFRDVsS1A0UDZaQT09>

Bio



Dr. Leila Abdelhamid grew up in Egypt. She attended the College of Veterinary Medicine, Alexandria University, Egypt, and graduated with her BVSc degree in 2011. Then, she has served as lecturer assistant of immunology, at the Department of Microbiology of the same institute. In 2013, she moved to the Ohio State University, USA, where she received research training in transplant immunology. In 2017, she obtained a Master's degree in Veterinary Medical Sciences; specializing in immunology. Dr. Abdelhamid joined the Virginia-Maryland College of Veterinary Medicine, Virginia Tech, in January 2018. Her doctoral research unravels the complex cellular and molecular mechanisms that regulate systemic inflammatory and autoimmune responses. She has published several original research manuscripts at state-of-the-art scientific journals such as *Frontiers in Immunology*. While being a wife and a mom to 3 boys, Dr. Abdelhamid has also received different awards, including the Outstanding Doctoral Student of VMCVM and the Nutrients Travel Award in Nutritional Immunology for 2021. Following graduation, she will move to Maryland, where she seeks to receive postdoctoral training at the Center for Cancer Research, National Cancer Institute.

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Lay Language Abstract

The immune system is efficiently toned to discriminate between friends and foes. It effectively protects against a wide array of pathogens while at the same time avoids attacking self-tissues. The inability of immune defenses to achieve this optimal discrimination could lead to the breakdown of tolerance to self in a wide range of autoimmune conditions. Diverse genetic susceptibilities are implicated in the development of autoimmunity. In parallel, during the recent decades, the tremendous increase in the prevalence of autoimmune conditions coincides with evolving dietary and hygiene styles in Westernized societies. This suggests a strong influence of environmental factors such as dietary and hygienic components on the way that the immune system works. Therefore, the current research investigates whether diet and hygiene modulate the immune dysregulations of lupus disease as a model for systemic autoimmunity; and if so, whether such effects are tissue- and/or disease stage-specific. We utilized different mouse models to delineate the mechanisms by which essential nutrients such as vitamin A (VA) and widely used disinfectant compounds known as quaternary ammonium disinfectants (QACs) modulate the systemic autoimmunity in lupus disease. We found that these modulators influence various aspects of the cellular immune responses including (1) leukocyte activation and subsequent expansion of pathogenic (disease contributing) lymphocytes, production of antibodies directed against self-tissue molecules (i.e., autoantibodies), and production of inflammatory mediators (i.e., cytokines and chemokines); (2) cell trafficking and their infiltration into the tissues; (3) signal transduction pathways that modulate cell fate (e.g., PD-1: PD-L1 signaling).

Importantly, environmental modulation of autoimmunity during different stages of autoimmune development could significantly impact the disease outcome. VA treatment, for example, differentially modulates the progression of kidney inflammation when given during the initiation vs. progressive disease stages. Similarly, VA deficiency has the most prominent effects on worsening kidney inflammation under genetically prone conditions when the deficiency is initiated early and at the prenatal stage. In parallel, the effects of environmental factors are also tissue-specific. For example, ambient exposure to QAC-based disinfectants exerted immunosuppressive effects on lupus-associated inflammation of lymphoid tissues with no change in circulating autoantibodies or the severity of kidney inflammation.

Collectively, the findings of this doctoral research delineated the cellular mechanisms through which environmental factors could shape autoimmune responses. Further studies will dig into the underlying molecular pathways. Ultimately, our research emphasizes the strong influence of exogenous factors on immunity and will pave the way for more effective healthcare management plans and benefit vulnerable populations affected by autoimmune conditions such as lupus.

Publications

1. **Leila Abdelhamid**, Xavier Cabana-Puig, Jing Zhu, Ran Lu, Yaqi Li, A. Catharine Ross, Thomas E. Cecere, Christopher M. Reilly and Xin M. Luo. Vitamin A deficiency during maternal-neonatal stages drives severe lupus nephritis through targeting B cell autoreactivity. (Under reviewing)
2. **Leila Abdelhamid** and Xin M. Luo. Diet and Hygiene in modulating Autoimmunity During the Pandemic Era. (Under reviewing)
3. **Leila Abdelhamid**, Xavier Cabana-Puig, Jing Zhu, Brianna K. Swartwout, Catharine Cowan, Margaret A. Nagai-Singer, Irving Allen, S Ansar Ahmed, and Xin M. Luo. NLRP12 deteriorates lupus nephritis through potentiating B cell autoreactivity in male lupus-prone mice. (In progress)
4. Brianna Kendall Swartwout, Quiyana M Murphy, Kaitlin A Read, Michael Richard Edwards, **Leila Abdelhamid**, Xavier Cabana-Puig, Ken Oestreich, Stanca M Ciupe, and Xin M Luo. TCDD alters follicular homeostasis and aggravates autoimmunity in adult lupus mice. Submitted to Front. Immunol.
5. Brianna K. Swartwout, Grace Lee, Qinghui Mu, **Leila Abdelhamid**, Xavier Cabana-Puig, Michael Edwards, Jee-Hwan Oh, Kate Hardin, James Testerman, Christopher M Reilly, Jan Peter van Pijkeren, Caroline M Leeth, Xin M Luo. Limosilactobacillus reuteri strain variability modulates IgA induction through control of B cell differentiation by TLR2. Submitted to Front. Immunol.
6. Xavier Cabana-Puig, Jacob M. Bond, Zhuang Wang, Rujuan Dai, Ran Lu, Amy Lin, Vanessa Oakes, Amy Rizzo, Brianna Swartwout, **Leila Abdelhamid**, Jiangdi Mao, Meeta Prakash, Constanza Sangmeister, Nathaniel Cheung, Catharine Cowan, Christopher M. Reilly, Sha Sun, S. Ansar Ahmed, Xin M. Luo. Phenotypic drift in lupus-prone MRL/lpr mice: Potential roles of microRNAs and gut microbiota (Under review).
7. Xavier Cabana-Puig, **Leila Abdelhamid**, Brianna K. Swartwout, Jing Zhu, Xiaofeng Liao, Qinghui Mu, Chris M. Reilly, and Xin M. Luo. Roles of CX3CR1 and probiotic lactobacilli on the development of autoimmunity in MRL/lpr mice. (In progress).

8. **Leila Abdelhamid**, Xavier Cabana-Puig, Qinghui Mu, Maryam Moarefian, Brianna Swartwout, Kristin Eden, Prerna Das, Ryan P. Seguin, Libin Xu, Sarah Lowen, Mital Lavani, Terry C. Hrubec, Caroline N. Jones, and Xin M. Luo (2020). Quaternary Ammonium Compound Disinfectants Reduce Lupus-Associated Splenomegaly by Targeting Neutrophil Migration and T-Cell Fate. *Front. Immunol.* 21 October 2020

<https://doi.org/10.3389/fimmu.2020.575179>

9. **Leila Abdelhamid**, Xavier Cabana-Puig, Brianna Swartwout, Jiyoung Lee, Song Li, Sha Sun, Yaqi Li, A. Catharine Ross, Thomas E. Cecere, Tanya LeRoith, Stephen R. Werre, Haifeng Wang, Christopher M. Reilly, and Xin M. Luo (2020) Retinoic Acid Exerts Disease Stage-Dependent Effects on Pristane-Induced Lupus. *Front. Immunol.* 20 March 2020

<https://doi.org/10.3389/fimmu.2020.00408>

10. Qinghui Mu, Brianna Swartwout, Michael Edwards, Grace Lee, Kristin Eden, Xavier Cabana-Puig, Dylan McDaniel, Jiangdi Mao, Yun Lian, **Leila Abdelhamid**, Rebecca Brock, Quan-Zhen Li, Irving Allen, Christopher Reilly, and Xin M. Luo. Regulation of neonatal IgA production by the maternal microbiota. *Proceedings of the National Academy of Sciences (PNAS)* Mar 2021, 118 (9) e2015691118; DOI: 10.1073/pnas.2015691118

11. Eric Panther, Xavier Cabana Puig, Jingjing Ren, Xiaofeng Liao, Brianna Swartwout, Miranda Vieson, **Leila Abdelhamid**, Ashton Shiraz, Xin Luo, Christopher M. Reilly (2020). The Effect of Dietary Fiber Intake on Systemic Lupus Erythematosus (SLE) Disease in NZB/W Lupus Mice. *J Clin Cell Immunol*, Vol.11 Iss.3 No:1000590.

12. Qinghui Mu; Xavier Cabana-Puig; Jiangdi Mao; Brianna Swartwout; **Leila Abdelhamid**; Thomas E. Cecere; Haifeng Wang; Christopher M. Reilly; Xin M. Luo (2019). Pregnancy and lactation interfere with the response of autoimmunity to modulation of gut microbiota. *Microbiome* volume 7, Article number: 105 (2019)

13. **Abdelhamid L**, Luo XM (2018). Retinoic Acid, Leaky Gut, and Autoimmune Diseases. *Nutrients*. 2018 Aug 3;10(8). PII: E1016. doi: 10.3390/nu10081016.

Presentations

1. Immunology 2021 meeting, The American Association of Immunologists. Poster presentation (May 2021).
2. The 31th Annual Research Symposium, VMCVM, Virginia Tech, Blacksburg, VA, USA. Poster presentation. (March 2021).
3. The Edward Via College of Osteopathic Medicine (VCOM) Research Day. Poster presentation. (Feb.2021).

4. Research in Progress Seminar, VMCVM, Virginia Tech, Blacksburg, VA, USA. Talk entitled – Quaternary Ammonium Compound Disinfectants; Could they alter your immune cell functions and their fate? (Feb.2021).
5. Graduate Student Association Research Symposium (GSARS), Virginia Tech. Talk entitled –Toward a better understanding of the effects of vitamin A on autoimmunity. (March 2020).
6. The Edward Via College of Osteopathic Medicine (VCOM) Research Day. Poster presentation. (Feb.2020).
7. The 30th Annual Research Symposium, VMCVM, Virginia Tech, Blacksburg, VA, USA. Poster presentation. (Nov.2019).
8. Research in Progress Seminar, VMCVM, Virginia Tech, Blacksburg, VA, USA. Talk entitled –Toward a better understanding of the effects of vitamin A on autoimmunity. (Sep.2019).
9. Southeastern Immunology Symposium, Emory University, Atlanta, Georgia, USA. Poster presentation. (June 2019).

Awards and Academic Achievements

1. The Recipient of The Outstanding VMCVM Doctoral Student Award 20-21, VT. (March 2021).
2. The Recipient of Nutrients Travel Award in Nutritional Immunology for 2021. (Dec 2020).
3. VCOM Research Recognition Day Poster Award Winner (Feb 2020).

Examination Graduate Committee

Major Advisor/Chair:

Xin Luo, Ph.D.

Associate Professor of Immunology

Department of Biomedical Sciences and Pathobiology

College of Veterinary Medicine, Virginia Tech.

Graduate Advising Committee Members:

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Professor of Immunology

Virginia-Maryland Regional College of Veterinary Medicine.

Christopher Reilly, Ph.D.

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Via Virginia College of Osteopathic Medicine

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