Lymphatic Forum 2025

Thursday Posters

Lymphatic Development and Differentiation

T01

Aging-induced changes in lymphatic muscle cell transcriptomes are associated with reduced pumping of peripheral collecting lymphatic vessels in mice

Pin-Ji Lei PhD[1], Katarina J Ruscic MD, PhD[1], Kangsan Roh PhD[1], Johanna J Rajotte[2], Meghan J O'Melia PhD[1], Echoe M Bouta PhD[1], Marla Marquez[1], Ethel R Pereira PhD[1], Ashwin S Kumar PhD[1], Mohammad S Razavi PhD[1], Hengbo Zhou PhD[1], Lutz Menzel PhD[1], Liqing Huang PhD[3], Heena Kumra PhD[1], Mark Duquette BS[1], Peigen Huang MD[1], James W Baish PhD[4], Lance L Munn PhD[1], Natasza A Kurpios PhD[3], Jessalyn M Ubellacker MD, PhD[5], Timothy P Padera PhD[1]

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Key Ideas:

- Lymphatic muscle cells express specific ion channel molecules
- Peripheral lymphatic vessels in aged mice exhibit reduced contractility
- TNF-α induces reduced contractility in LMCs in aged mice

T02

Notch4 is essential for preserving the structure and regenerative capacity of dermal lymphatics

Glicella Salazar-De Simone PhD[1], Joseph D McCarron BS[2], Hannah Fruitman BS[1], Carrie J Shawber PhD[1]

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Key Ideas:

- NOTCH4 maintains dermal lymphatic homeostasis postnatally
- Postnatally, NOTCH4 promotes LEC proliferation in lymphatic regeneration
- NOTCH4 preserves capillary LEC fate, likely via canonical signaling

T03

Functional roles of chemokine signaling in lymphatic development and cardiac repair

Long Do, Esteban Delgado, Liam Flynn, Sarah Rose Fallouh, Erhe Gao, Xiaolei Liu

Temple University, Philadelphia, PA, USA

Key Ideas:

- CXCR4 is required for VEGFC/VEGFR3/PI3K signaling to regulate developmental lymphangiogenesis
- CXCR4 is significantly upregulated in cardiac lymphatic vessels after MI
- CXCR4 mutant mice showed reduced cardiac lymphangiogenesis and impaired cardiac function after MI

T04

Genetic ablation of NOTCH1 prevents lymphatic button junction formation

Abbigail Price BS, Diandra Mastrogiacomo BS, Kunyu Li BA, Ying Yang PhD, Joshua P. Scallan PhD
University of South Florida, Tampa, FL, USA

Key Ideas:

- Constitutive lymphatic-specific Notch1 knockouts fail to remodel zippers into buttons postnatally
- Postnatal tamoxifen-inducible deletion of Notch1 prevents button junction formation
- Our results show that NOTCH1 regulates lymphatic button formation after birth

T05

FOSB transcription factor as a common link and possible divergent point between TNFα and VEGFC effects on lymphatic microvasculature

Ewa A. Kreft, Zuzanna J. Juskiewicz, Brant E. Isakson
University of Virginia, Charlottesville, VA, USA

Key Ideas:

- TNFα and VEGFC have similar initial effects on HDLEC properties, which diverge over time
- TNFα and VEGFC promote LV formation in HDLECs, while prolonged TNFα exposure disrupts LV networks
- Early exposure to TNFα or VEGFC significantly upregulates FOSB, potentially driving the phenotypes

T06

Role of β-arrestin1/2 in embryonic lymphatic vessel development and maintenance

Yanna Tian PhD, D Stephen Serafin PhD, Alyssa Meryl Tauro, Elizabeth S Douglas, Kathleen M. Caron PhD
UNC-CH, Chapel Hill, NC, USA

Key Ideas:

- Lymphatic deletion of β-arrestin1/2 causes embryonic mid-gestational arrest and growth restriction
- Arrb1/2ΔiLEC embryos exhibit dilated lymphatic vessels with decreased continuous junctions
- β-arrestin 1/2 are required for embryonic development and lymphatic vessel maintenance in mammals

T07

Identifying a role for lymphatic junction morphology in perinatal lung inflation

Olivia R Crawford B.S.
University of Connecticut, Storrs, Ct, USA

Key Ideas:

- Lung lymphatic capillary junctions mature during embryonic development
- Lymphatic-specific Rock1/2 embryonic deletion zippers lymphatic capillaries

- Embryonic junction maturation contributes to perinatal lung fluid clearance

T08

Recapitulating lymphatic endothelial cell development to study human lymphangiogenesis

Sawan Jha Ph.D.[1], Alanna Pyke B.S.[2,3], Pratima Prabala B.S.[1], Juan Alcocer B.S.[4], Mathias Francois Ph.D.[5], Kyle Loh Ph.D.[3,6,7], Lay Teng Ang Ph.D.[3,8], Kristy Red-Horse Ph.D.[4,3,6,7,1]

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Key Ideas:

- Human model of lymphatic differentiation
- Lymphatic diseases modeling
- Novel pathways in human lymphatic development

Lymphatic Disease Detection and Therapeutics

T09

How to modulate lymphatic vasculature to attenuate lymphedema

Agnès Noel Pr

Uliege, Liege, Liege, Belgium

Key Ideas:

- uPARAP is a novel putative therapeutic target for treating lymphedema
- Inducing a complex and tortuous labyrinthine lymphatic vasculature can attenuate lymphedema
- uPARAP regulates VE-cadherin-mediated cell-cell junctions

T10

Dissecting the mechanisms that underpin the lymphatic uptake and pharmacokinetic profile of lipid conjugated brush PEG polymer delivery systems

Mohammad Abdallah PhD[1], Ian K Styles PhD[1], Alexander Mörsdorf PhD[1], James L Grace PhD[1], John F Quinn PhD[1,2], Michael R Whittaker PhD[1], Natalie L Trevaskis PhD[1,3]

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Key Ideas:

- Pre-mixing a medium-chain diacylglycerol-brush PEG with rat albumin extends its plasma half-life
- Transport of a long-chain diacylglycerol-brush PEG pre-mixed with HDL into lymph nodes is enhanced

- Inhibiting SRB1 can confirm the in vivo transport mechanism of agents known to associate with HDL

T11

The effects of vascular endothelial growth factor-C (VEGF-C) in the vasculature during metabolic-associated steatohepatitis (MASH)

Seock-Won Youn PhD[1], Jason Wei-Liang Eng MD/PhD[1,2], Pamela Teneqexhi BS[1], Jan Kitajewski PhD[1,3]

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Key Ideas:

- MASH in humans and mice results in high VEGFC
- Chronic expression of VEGFC exacerbates murine MASH
- A VEGFR2/VEGFR3 inhibitor reduces MASH progression

T12

Trametinib reduces vascular malformations and corrects gene dysregulation in *NRAS*^{Q61R} human endothelial cells

Sara Alharbi MS[1,2], Andrew Wagner[2,1], Svatava Merkle MD[1], Patricia Pastura[1], Charles Griffin McDaniel[1], Punam Malik Ph.D.[1], Yan Xu Ph.D.[1], Tim D. Le Cras Ph.D.[1,2]

[1]Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA. [2]University of Cincinnati, Cincinnati, OH, USA

Key Ideas:

- KLA is a severe lymphatic anomaly, often driven by NRASQ61R mutations
- Trametinib effectively reduces NRASQ61R EPC proliferation, migration, and ANG-2
- Trametinib corrects dysregulated MAPK/Notch pathways and inhibits vascular growth

T13

ARPA-H: Meet team BOLD - Biotechnology of lymphatic discovery

Kimberley E Steele MD, PhD

ARPA-H, Washington, DC, USA

Key Ideas:

- We have diagnostic tools and therapies for all body systems except the lymphatic system.
- What if we could make the once invisible lymphatic system visible?
- What if doctors were able to prevent and cure human disease by targeting the lymphatic system?

Lymphatic Fluid Regulation

T14

Characterization of cervical lymphatic vessels as a key pathway for cerebrospinal fluid drainage

Hokyung Jin M.D., Ph.D., Jin-Hui Yoon Ph.D., Jieun Choi Ph.D. candidate
Institute for Basic Science, Daejeon, Korea, Republic of

Key Ideas:

- Cervical lymphatics as a key pathway for CSF drainage
- CSF flows through periorbital, olfactory, nasopharyngeal, and hard palate lymphatics to lymph nodes
- Deep and superficial cervical lymphatics exhibit different physiological characteristics

T15

A modular computational fluid dynamic model of interstitial lymphatic fluid uptake

Tharanga D Jayathungage Don Ph.D.[1], Finbar Argus Ph.D.[1], Soroush Safaei Ph.D.[1], Peter S Russell Ph.D.[2,3], Anthony RJ Phillips Ph.D.[2,3], Hayley M Reynolds Ph.D.[1]
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Key Ideas:

- Modular Framework: Simulates lymphatic fluid uptake
- Forces Enhance Flow: Active & passive forces increase lymph flow
- Permeability Impact: High permeability boosts drainage efficiency

T16

A computational model of how lymphatic massage works

James Baish PhD[1], Timothy Padera PhD[2], Lance Munn PhD[2]
[1]Bucknell University, Lewisburg, PA, USA. [2]MGH/Harvard, Boston, MA, USA

Key Ideas:

- Lymphatic massage moves interstitial fluid to initial lymphatics
- Massage modulates lymphatic pumping through shear stress and stretch mechanisms
- Computational modeling illustrates massage-induced fluid movement and facilitates parametric study

T17

A poroelastic model of coupled flow and stress in a lymph node

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Key Ideas:

- A computational model has been developed that investigates flow pathways through the lymph node

- Flow patterns in the node are altered by the deformation of the node
- Metastasis and T-cell proliferation may cause different deformation and flow patterns

T18

Effect of Dapagliflozin on lymphatic contractile function

Giovanni Bertoldi PharmD, PhD[1], Brasilina Caroccia PhD[1], Anna Poretto MD[1], Roberto Luisetto PhD[2], Giacomo Rossitto MD, PhD[1,3]

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Key Ideas:

- SGLT2 inhibitors affect lymphatic contraction ex-vivo in healthy preclinical models
- Dapagliflozin differentially exerts its effects on lymphatics at different loading pressures
- The role of lymphatics in the beneficial effects of Dapagliflozin needs further investigation

T19

Porcine pulmonary and cardiac lymphatic collecting vessels have lymphatic muscle cells and display spontaneous contractions.

Scott D Zawieja PhD, Soumiya Pal PhD, Grace A Pea BS, Sarah E Broyhill BS, Karen H Bromert MS, Darla L Tharp PhD

University of Missouri, Columbia, MO, USA

Key Ideas:

- Pig Pulmonary Collecting Lymphatics are Muscularized and Contract
- Pig Cardiac Collecting Lymphatics are Muscularized and Contract
- Pig as a pre-clinical model for lymphatic disease

T20

Differential expression of ryanodine receptor subtypes in the lymphatic endothelium of rats and mice

Junghoon Lee Ph.D, Lucy Fry BS, Hayden Roys MS, Tiffany Weinkopff Ph.D, Amanda J Stolarz Pharm.D., Ph.D

University of Arkansas for Medical Sciences, Little Rock, Arkansas, USA

Key Ideas:

- Lymphatic vessels
- Ryanodine receptors
- lymphatic endothelial cells

Lymphatics in Oncology

T21

Immune remodeling in lymph node niche of cervical cancer: new insights into nodal metastases

Léa Zanella PhD[1], Louis Baudin PhD[1], Alizée Lebeau Dr[2], Pascal de Tullio Dr[1], Frédéric Kridelka Pr[2], Agnès Noël Pr[1]
[1]Uliège, Liège, Belgium. [2]CHU Liège, Liège, Belgium

Key Ideas:

- Predictive signature for metastatic spread to lymph node in cervical cancer patients
- Immunohistochemistry combined with whole-slide imaging quantification
- Specific immune environment in lymph node of cervical cancer patients

T22

Targeting lymphatics-derived FABP4 and SCD1 in cancer cells boosts ferroptotic cell death of metastatic cancer cells in the lymph nodes

Mohammad Farran, Laetitia Montero-Ruiz, Nor Eddine Sounni, Agnès Noël
University of Liège, Liège, Belgium

Key Ideas:

- The lipid metabolism of the tumor influences cancer cell survival and metastasis
- SCD1 is an enzyme that plays an essential role in lipid homeostasis and cancer cell ferroptosis
- FABP4 provided by the lymphatics has an impact on tumor growth and lymph node metastasis

T23

Fibroblasts in tumor-draining lymph nodes

Fatine CHERKAOUI, Noémie Gubbels, Louis Baudin, Sébastien Pirson, Agnes NOEL
University of Liège, Liège, Belgium

Key Ideas:

- Fibroblastic reticular cells may undergo remodeling in tumor-draining lymph nodes before metastasis
- Single-cell RNA sequencing suggests a possible fibroblast subpopulation in pre-metastatic nodes
- Tumor-lymph node communication could drive fibroblast remodeling before metastatic cell arrival

T24

JAG1 expressed by breast tumor cells promotes lymphovascular invasion and lymph node metastasis

Natalia A Obacz B.Sc.[1], Benjamin Gordon[2], Bhairavi Swaminathan[2], Rahul Vadakath[2], Pamela Teneqexhi[2], Seock Won Youn[2], Isabel Alvarez-Lopez[3], Marta Rezola[3], Ziqiao Xu[4], Zhengjia Chen[4], LA Naiche[2], Jan Kitajewski[2,4]
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Key Ideas:

- Breast cancer cell expression of Notch ligand JAG1 promotes lymphovascular invasion and metastasis

- JAG1 expression is higher in breast tumor cells invading the lymph node than in primary tumors
- JAG1 promotes breast tumor cell migration across lymphatic endothelial cells

T25

Tumor lymphangiogenesis improves radiotherapy-induced anti-tumor immunity outcomes

Anish Mukherjee Ph.D., Nikolaos Mitrousis, Maria Stella Sasso, Colleen Foley, Ainhoa Arina, Ralph Weichselbaum, Melody Swartz

The University of Chicago, Chicago, IL, USA

Key Ideas:

- Tumor lymphangiogenesis improves anti-tumor response of radiotherapy
- Lymphangiogenesis improves abscopal effects of radiotherapy in combination with immunotherapy
- Radiotherapy enhances immune cell infiltration and activation in lymphangiogenic tumors

Lymphatic Pathobiology

T26

Saturated fatty acids induce lipotoxicity in lymphatic endothelial cells contributing to secondary lymphedema development

Karina P Gomes PhD, Emily Liu, Jacob Korodimas, Nirav Patel, Xiaoyan Yang, Susan Goruk, Catherine J Field PhD, Spencer B Gibson PhD

University of Alberta, Edmonton, AB, Canada

Key Ideas:

- Saturated fatty acids drive lymphatic dysfunction and exacerbate lymphedema through lipotoxicity
- FABP4 inhibition mitigates SFA-induced damage and reduces lymphedema severity in vitro and in vivo
- Dietary modulation of fatty acid composition offers a potential non-invasive therapeutic strategy

T27

Role of meningeal lymphatic vasculature in neuroinflammation in a mouse model of sialidosis

Alexandra Olate-Briones PhD, Sofia Albornoz-Muñoz, Enzo Bonacic-Doric, Victor Rojas-Henriquez, Andres A Herrada PhD, Noelia Escobedo PhD

Universidad Autonoma de Chile, Talca, Chile

Key Ideas:

- Lysosomal function is required for the mLV function
- infiltration of immune cells in the meninges is prior to mLV morphological changes
- meningeal lymphatic vasculature contributes to neuroinflammation in sialidosis

T28

Development of a novel chronic large animal model to study the role of lymphatic circulation in the end-organ dysfunction associated with Fontan physiology

Junya Matsuda[1], Benjamin Blais[2,3], Cameron DeShetler[1], Jennifer Kievert[1,4], Fahd Taha[1], Rehab Salah Mohamed[1], Satoshi Yuhara[1], Tatsuya Watanabe[1], Syed Faizullah Hussaini[1], Daisuke Onohara[1], Sergio A. Carrillo[1,2,3,5], Aymen Naguib[2,3], Christopher McKee[2,3], Rajesh Krishnamurthy[6], Toshiharu Shinoka[1,2,3,5], Christopher Breuer[1,2,3,5], John Kelly[1,2,3]
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Key Ideas:

- Ovine Fontan model demonstrates significant lymphatic morphological changes and liver fibrosis
- Transhepatic lymphangiography shows tortuous lymphatic ducts with venous collaterals in Fontan sheep
- Lymphatic circulation may play a critical role in Fontan-associated end-organ dysfunction

T29

Lightsheet microscopy investigates the initial lymphatic network in the murine knee joints

Xi Lin Phd, Lianping Xing PhD
University of Rochester, Rochester, NY, USA

Key Ideas:

- Initial lymphatic network of the mouse knees is highly variable
- Establish reproducible lightsheet imaging protocol and outcome parameters to assess the lymphatics
- Validate parameters measured by lightsheet using a post-traumatic osteoarthritis mouse model

T30

Glucocorticoids strengthen endothelial barriers but impair contractility in renal lymphatic vessels

Jianyong Zhong, Jing liu, Haichun Yang, Valentina Kon, Elaine L Shelton
Vanderbilt University Medical Center, Nashville, TN, USA

Key Ideas:

- Glucocorticoids modulate lymphatic endothelial reabsorptive capacity
- Glucocorticoids modulate smooth muscle cell-driven contractility
- Part of the glucocorticoid side effect is related to lymphatic vessel dysfunction

T31

Therapeutically-induced lymphangiogenesis is ineffective in resolving established kidney disease in mice

Saranya Kannan PhD, Joseph M Rutkowski PhD
Texas A&M University College of Medicine, Bryan, TX, USA

Key Ideas:

- Lymphatics are important in inflammation resolution
- Chronic Kidney Disease (CKD) is a progressive, inflammatory disease
- Inducing lymphangiogenesis in the kidney could be a CKD target

T32

Dysregulated lymphatic remodeling promotes immunopathology during non-healing cutaneous leishmaniasis

Lucy Fry[1], Flavia Neto de Jesus[2], Matheus Batista Carneiro[2], Hayden Roys[1], Anne K Bowlin[1], Nathan C Peters[2], Pierre-Yves von der Weid[2], Tiffany S Weinkopff[1]

[1]University of Arkansas for Medical Sciences, Little Rock, AR, USA. [2]University of Calgary, Calgary, Canada

Key Ideas:

- Infection
- lymphangiogenesis
- Leishmania

Lymphatics in Mechanotransduction

T33

Hyaluronic acid coating and oscillatory shear stress synergistically enhances lymphatic valve phenotypes

N. Keilany Lightsey, Sanjoy Saha, Eva Hall, Donny Hanjaya-Putra Ph.D.

University of Notre Dame, Notre Dame, IN, USA

Key Ideas:

- Hyaluronic-acid based biomaterials for lymphatic collecting vessel phenotype
- Mechanotransduction of lymphatic endothelial cells influenced by various markers
- Engineering of 3D lymphatic collecting vessel by biomechanic and biochemical stimuli

T34

The effect of the high-flow-PIEZO1-ITGA9 axis on Schlemm's canal endothelial cell proliferation

Naoki Kiyota MD, PhD, Ben Thomson PhD, Susan E Quaggin MD

Northwestern University, Chicago, IL, USA

Key Ideas:

- PIEZO1 knockout narrows Schlemm's canal and elevates IOP, mirroring ITGA9 knockout
- Tracer-labeled high-flow region and SC endothelial proliferation are both reduced in ITGA9 CKO
- High-flow-PIEZO1-ITGA9 axis might be critical for SC proliferation and IOP homeostasis

T35

Digging into the PHAT of lymPHATic function: The role of cholesterol in collecting lymphatic function and lymphatic disease

Keith P Keane Ph.D., Rhea Blanks, Mary Schulz, Victoria Akerstrom, Jorge Castorena-Gonzalez

Tulane University, New Orleans, LA, USA

Key Ideas:

- Ion channel function can be altered by membrane cholesterol content
- Hypercholesterolemia alters lymphatic function in part by altering ion channel function
- Reducing membrane cholesterol improves lymphatic function

T36

VE-cadherin phosphorylation regulates lymphatic valve development

Fabrice Gucciardo Postdoctoral Fellow, Kunyu Li Laboratory Technician, Joshua P Scallan PI

University of South Florida, Tampa, FL, USA

Key Ideas:

- Phosphorylation of tyrosine Y685 of VE-cadherin is increased with flow
- Phosphorylation of tyrosine Y685 is required for half of the lymphatic valve formation
- VE-cadherin along with PECAM-1, VEGFR2 and VEGFR3 form a mechanosensory complex in LECs

Friday Posters

Lymphatic-Immune Crosstalk

F01

High-salt-conditioned immune cells inhibit renal lymphangiogenesis: Role of VEGFR3 shedding

Jing Liu, Jianyong Zhong, Haichun Yang, Annet Kirabo, Elaine Shelton, Valentina Kon
Vanderbilt University Medical Center, Nashville, TN, USA

Key Ideas:

- Inhibited lymphangiogenes in HS-PAN rats, which is not usually seen in renal disease states
- High Na+ precondition immune cells affect lymphangiogenesis independently of direct sodium exposure
- VEGFR3 shedding impairs LEC response to increased VEGFC, leading to lymphangiogenesis inhibition

F02

Depression-like behavior is associated with changes in the meningeal lymphatic vasculature and meningeal B cells in a murine lupus model

Andrés A Herrada Phd, Alexandra Olate-Briones PhD, Sofía Albornoz-Muñoz, Francisca Rodriguez-Arriaza, Victor Rojas-Henriquez, Stefanny Rojas, Noelia Escobedo
Universidad Autónoma de Chile, Talca, Chile

Key Ideas:

- Meningeal lymphatics are altered in a neuropsychiatric lupus mouse model
- B cells clusters are abundant close to the meningeal lymphatics in the SLE mouse model
- Meningeal and CNS-infiltrating B cells have a more mature phenotype in this lupus mouse model

F03

The immunosuppresive modulation of CD8^{+} T cell responses by lymphatic endothelial cell-derived Semaphorin3a in inflammation and cancer

Hazal Tatliadim M.Sc.[1], Sebastian Dawo M.Sc.[1], Marina Thoma M.Sc[1], Katharina Blatter[1], Anastasia Olga Gkounditi PhD[1], Victor Collado-Diaz PhD[2,1], Peter Runge PhD[1], Karina Silina PhD[1], Micheal Detmar PhD[1], Cornelia Halin PhD[1]
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Key Ideas:

- LECs are the main source of Sema3a in skin and dLN in humans and mice
- LEC-derived Sema3a can negatively regulate CD8+ T cell activation and expansion
- In the absence of LEC-derived Sema3a, there is an enhanced anti-tumoral immunity

F04

Effect of inflammation activation/adjuvant on lymph transport to and within the sentinel lymph node and its short-term responses

Dave C Zawieja PhD[1], Anand Narayanan PhD[2], Wei Wang MD[1], Walter E Cromer PhD[1], Karen Newell PhD[1], James E Moore Jr. PhD[3]

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Key Ideas:

- Immune activation change lymph transport of immune signals to and within the sentinel lymph node
- Immune activation changes lymph flow/pressures to the sentinel lymph node
- Immune activation rapidly changes the lymph node size & LEC space with small changes in cell numbers

F05

Characterization of the role of the lymphatic vasculature in organ-specific responses induced by nucleoside-modified mRNA-based platforms

Zoltan Jakus

Semmelweis University, Budapest, Hungary

Key Ideas:

- The role of the lymphatic vasculature in mRNA-induced immune responses is still not fully understood
- Our results suggest that at least three lymphatic-dependent processes are involved
- The lymphatic vasculature is essential for generating an adequate immune response to mRNA vaccines

F06

Targeting VEGF-A induced lymphatic remodeling to boost tumor-specific immunity

Anna Kolarzyk, Evan Carter, Scott Leddon, Issahy Cano, Esak Lee, Deborah Fowell

Cornell, Ithaca, New York, USA

Key Ideas:

- Lymphatic junctions zipper in the tumor microenvironment through a VEGFA/VEGFR2-dependent mechanism
- VEGFR2/VEGFA clinical inhibitors alter leukocyte intratissue migration capacity
- Kaede mouse model is an excellent tool for tracking immune cell migration in both time and space

F07

Lymphatic mechanisms in tertiary lymphoid organ formation

Guilherme Pedron Formigari Ph.D.[1], Hayoung Cho M.Sc.[1], Marcella Neves Datilo Ph.D.[1], Zoheb Ahmed Ph.D.[1], Lijuan Chen[1], Zheila Azartash-Namin M.Sc.[1], Ilaria Del Gaudio Ph.D.[2], Eric Camerer Ph.D.[2], Xin Geng Ph.D.[1], Sathish Srinivasan Ph.D.[1]

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Key Ideas:

- Tertiary lymphoid organs are present in the mesenteries of Sphk1/2ΔLEC and S1pr1iΔLEC mice
- Depletion of microbiota and APCs prevents TLO formation in S1pr1iΔLEC mice
- The formation of TLOs may be induced by lymphatic vessel overgrowth in S1pr1iΔLEC mice

Lymphatics in Human Diseases

F08

Fluorescence imaging methods to measure brain interstitial fluid drainage via cervical lymphatic vessels

Roisin McCague Ph.D., Mohammad Abdallah PhD, Cameron Nowell, Hefeng Song, Michael Whittaker PhD, Natalie Trevaskis PhD

Monash University, Parkville, Victoria, Australia

Key Ideas:

- Fluorescence imaging to assess cervical lymphatic vessel contractions
- Assessing cerebrospinal fluid and brain interstitial fluid drainage
- Improving oedema clearance after ischaemic stroke

F09

Tsc2 deficiency-mediated mTORC1 hyperactivation in lymphatic endothelial cells results in chylothorax caused by defective lymphatic valves

Richa Banerjee Ph.D., Razieh Dehghan, Luz Astrid Kanuer, Ying Yang Ph.D.

University of South Florida, Tampa, FL, USA

Key Ideas:

- LEC-specific Tsc2 deletion causes chylothorax and lymphatic vasculature defects in mice
- TSC2 knockdown in cultured LECs causes mTORC1 hyperactivation and reduction in valve gene expression
- Ablation of LEC-specific Rptor, a mTORC1 component, rescues lymphatic defects in TSC2 KO mice

F10

Doxorubicin oxidizes ryanodine receptors to induce ca^{2+} leak in rat mesenteric lymphatic vessels

Pritam Saha Podder B.Pharm, Jenat Rahman MS, Zachary Nickell MS, Soumiya Pal PhD, Nukhet Aykin-Burns PhD, Amanda J Stolarz PharmD, PhD

University of Arkansas for Medical Sciences, Little Rock, AR, USA

Key Ideas:

- Doxorubicin oxidizes ryanodine receptors through superoxide generation, leading to lymphatic damage
- Doxorubicin oxidizes the thiol groups at cysteine residues of the ryanodine receptors
- Ryanodine receptor blockade prevent the contractile dysfunction caused by superoxide

F11

The presence of CMR-assessed myocardial edema is a prognostic indicator for major adverse cardiac events in myocarditis patients: a meta-analysis

Shreya Kurup B.S., Tsutomu Kume PhD

Department of Medicine, Feinberg Cardiovascular and Renal Research Institute, Feinberg School of Medicine, Northwestern University, Chicago, IL, USA

Key Ideas:

- Chronic myocardial inflammation and persistent edema can lead to myocardial fibrosis
- T2 CMR values are crucial for predicting clinical outcomes
- Cardiac lymphatic function is essential for clearing myocardial edema

F12

Dynamic imaging of CSF outflow in infants with post hemorrhagic hydrocephalus: a lymphatic outflow impairment?

Eva M Sevick-Muraca Ph.D., Banghe Zhu Ph.D., Ahmed T Massoud MD, Manish N Shah MD

University of Texas Health Science Center, Houston, Texas, USA

Key Ideas:

- Imaging CSF outflow through the lymphatics in humans
- Method to evaluate extracranial outflow through the lymphatics
- Neuroinflammation may impact CSF outflow through the lymphatics

F13

Pathogenic variants in *RIT1* cause central conducting lymphatic anomaly

Lola Zerbib PharmD, PhD[1], Benjamin A. Sempowski[1], Christopher M. Marshall[1], Jessica T.E. Johnson[1], Dhyanam Shukla[1], Yoav Dori MD, PhD[2], Dong Li PhD[3,4,5], Michael E. March PhD[4], Catherine McInernev[1], Sarah E. Sheppard MD, PhD, MSTR[1,4]

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Key Ideas:

- RIT1 is implicated in CCLA
- Novel zebrafish model of CCLA
- Targeted therapy for CCLA

F14

The interaction between CD36 and oxLDL decreases lymphatic permeability by altering VE-cadherin membrane localization

Destiny DeNicola B.S, Abbie Burtis, Megan Ferguson, Matthew Burchill, Nathaly Limon de la Rosa

University of Colorado - Anschutz Medical Campus, Aurora, CO, USA

Key Ideas:

- OxLDL signaling induces altered LEC permeability in vitro and in vivo
- OxLDL mediated VE-cadherin increase is contingent on CD36 receptor signaling
- SRC-family kinase activation and p120 catenin membrane localization stabilize surface VE-cadherin

F15

Isocitrate dehydrogenase is a novel genetic cause for lymphatic malformations

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Key Ideas:

- Identifying molecular causes of lymphatic malformations is key to developing targeted therapeutics
- We utilized the zebrafish and Tol2 systems to create a model of novel patient-identified variants
- Variant models show clinically relevant phenotypes of cystic malformations and pericardial edema

Lymphatics in Metabolism

F16

Lymphangiogenesis in the skin of hypercholesterolemia

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Key Ideas:

- Elevated serum LDL concentration can cause the inflammation-associated phenotypes in the skin
- Elevated serum LDL concentration can cause the morphological changes in dermal lymphatic vessels
- The aberrant lymphangiogenesis induced by macrophage-produced VEGF-C in the skin

F17

Regulation of collecting lymphatic vessel contractile function by TRPV4 channels: unraveling sex differences and understanding implications in obesity and metabolic syndrome

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Key Ideas:

- TRPV4 channels regulate collecting lymphatic vessel contractile function differently across sexes
- TRPV4 signaling may act as a critical regulator of lymphatic dysfunction in obesity
- scRNAseq on lymphatic vessels reveals sex differences in Trpv4+ macrophages and dendritic cells

F18

Understanding metabolic mechanisms regulating lymphatic vessel development

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Key Ideas:

- FGFR1 inhibition induces upregulation of FAO in lymphatic endothelial cells by increasing CPT1A
- Post glycolytic reduction via FGFR1 inhibition, FAO plays a compensatory role in energy production
- Dual deficiency of CPT1A and FGFR1 induces more pronounced lymphangiogenic defects than FGFR1 alone

F19

Glutamine metabolism supports glycolysis in hypoxic lymphatic endothelial cells

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Key Ideas:

- Lymphatic endothelial cells (LECs) function in a wide range of oxygen concentrations
- Glutamine increases LEC glycolytic gene expression and lactate production in hypoxic conditions
- Glutamine is a new metabolic target for wound healing and vessel normalization

New Models and Technologies

F20

Parameters of emulsion polymerization and copolymer composition predict nanoparticle properties and lymphatic uptake

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Key Ideas:

- Copolymer surfactants can tune properties of nanoparticles synthesized by emulsion polymerization
- Nanoparticle properties predict in vitro and in vivo lymphatic uptake
- Poly(propylene sulfide) nanoparticles synthesized with more PEG exhibit greater lymphatic uptake

F21

Double conditional knockout of Rasa1 and Tsc1 in endothelial cells leads to pulmonary capillary barrier dysfunction in mice

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Key Ideas:

- Tsc1 and Rasa1 deletion in endothelium leads to pulmonary capillary barrier dysfunction in mice
- Double deletion of Rasa1 and Tsc1 leads to defective EC cytoskeleton and junctions
- Double deletion of Rasa1 and Tsc1 leads to abnormally action of alveolar epithelial cells

F22

Targeting the endothelium of Schlemm's canal with 4OH-tamoxifen nanoparticles

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Key Ideas:

- PEG-b-PPS nanocarriers can load 4OHt and overcomelimitations of Tamoxifen-inducible Cre-loxP systems
- PEG-b-PPS nanocarriers can target SC endothelial cells and allow cell-specific gene deletion
- PEG-b-PPS nanocarriers are a potential system for studying otherwise systemically lethal KOs in SC

F23

***Notch1* regulation of Schlemm's Canal integrity and endothelial junctional stability**

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Key Ideas:

- Notch1 is critical for maintaining Schlemm's Canal integrity and structure
- Notch1 regulates endothelial junctional integrity through Tie2 signaling
- Notch1 signaling persists in mature Schlemm's Canal endothelium

Novel Concepts in the Lymphatics Field

F24

Tissue-specific VEGF-D overexpression promotes lymphangiogenesis and osteoclast-mediated bone resorption

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Key Ideas:

- Trauma-induced HO is a difficult condition marked by ectopic bone formation in soft tissues
- Native and heterotopic bones are devoid of lymphatic vessels
- Lymphatic invasion of native and heterotopic bone induces bone destruction

F25

Generation of new tumor lymphatic vessels – a story of attraction, cohesion, and fusion

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Key Ideas:

- Tumor lymphangiogenesis is induced by fusion of bone marrow progenitors with pre-existing vessels
- Fusion of progenitors with tumor or inflamed lymphatic endothelial cells induces cell division
- Fusion of progenitors with tumor lymphatics is regulated by TLR4 and Th2 immunosuppressive pathways

F26

Ciliary and non-ciliary functions of LEC intraflagellar transport proteins are essential for lymphangiogenesis and lymphatic valve formation

Delayna Paulson, Ahana Majumder, Caden Johnson, Hannah Polejewski, Luke Knutson, Alyvia Reese, Michael Schipper, Darci M Fink

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Key Ideas:

- IFT20 controls VE-cadherin vesicular trafficking in LECs
- IFT74 controls postnatal lymphatic valve formation in mouse diaphragm
- Ciliary and non-ciliary intraflagellar transport protein functions are essential in LECs

F27

Heterogeneous lymphatic endothelial cell subsets define distal lung architecture

Erin Crossey MD PhD, Isabella Garza MS, Meliza Perez, Matthew Jones PhD, Alan Fine MD

Boston University, Boston, MA, USA

Key Ideas:

- There are at least two transcriptionally unique subtypes of distal lung lymphatic endothelial cells
- Stabilin-2 is a unique marker for peri-venous lung lymphatic endothelial cells
- A nuclear membrane-localized lymphatic reporter allows enrichment of lung LECs for snRNAseq

F28

Oral delivery of ^{18}FTHA highlight endogenous variant lymphatic drainage in healthy participants

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Key Ideas:

- Orally ingested 18-FTHA can be a relatively safe PET tracer of lymphatic drainage in living humans
- Orally ingested 18-FTHA begins to highlight the thoracic duct as early as 10 to 20 minutes
- Orally ingested 18-FTHA highlights variation in lymphatic drainage across healthy participants

Lymphatic Tissue Bioengineering

F29

Lymphangiogenic hydrogel scaffolding to augment vascularized lymph node transplant

Shao-Yun Hsu M.D.[1,2], Yarelis Gonzalez-Vargas Ph.D.[2], Young Jae Ryu B.S.[2], Zhanna Nepiyushchikh M.D.[2], Brandon Dixon Ph.D.[2]

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Key Ideas:

- Hydrogel improves VLNT efficacy by enhancing lymphangiogenesis and lymphatic pump function
- NIR imaging tracks lymphatic function in a clinically relevant lymphedema rat model
- iPhone volumetry enables longitudinal tracking of swelling in a secondary lymphedema rat model

F30

Local flow dynamics control structural remodeling of blind-ended lymphatic microvessels

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Key Ideas:

- We engineered a 3D blind-ended lymphatic vessel with controlled interstitial flow
- Selective lymphangiogenesis occurred at the blind-end due to the highest range of transverse flow
- There is a dynamic interrelationship between extravascular sprouting and intraluminal morphology

F31

Humanized in vitro platform reveals age related effects of cerebrospinal fluid on lymphatic vessels

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Key Ideas:

- Humanized in vitro LV-chip enables human-specific research and accelerates aging-related therapies
- Old CSF reduces junctional proteins and lymphatic integrity, increasing vascular permeability
- Young CSF promotes lymphatic proliferation, suggesting it may improve brain waste removal

F32

Single-cell genomic profiling of alpelisib response in patient-derived lymphatic malformation tissues: insights from *ex vivo* and *in vitro* models

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Key Ideas:

- LM patient-derived explants in PEG hydrogels were treated with alpelisib and analyzed via scRNAseq
- Hydrogel-based expansion increased stromal cell enrichment, impacting LEC detection and analysis
- Ongoing work examines PIK3CA variant allele fractions and organoid drug responses in LM-derived LECs

F33

Tuning the morphological properties of granular hydrogels to control lymphatic capillary formation

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Key Ideas:

- Granular gel morphology influences lymphangiogenesis, with tight packing enabling vessel formation
- Pipetted gels promote better capillary connectivity, while vortexed gels lead to earlier maturation
- Hydrogel curvature and topology are key factors in guiding lymphatic tube formation

F34

Investigating the role of granular hydrogel matrix compositions on differentiated LEC behavior and gene expression

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Key Ideas:

- Granular hydrogels mimic ECM properties to regulate lymphangiogenesis
- Interstitial matrix composition influences dLEC behavior, vessel sprouting, and gene expression
- Biomimetic hydrogels enable lymphatic drainage studies for drug screening and regenerative medicine

F35

Data processing pipeline to analyze calcium signaling dynamics in lymphatic endothelial cells

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Key Ideas:

- Lymphatic endothelial cells
- Intracellular calcium signaling
- Data processing pipeline

Clinical Trials

F36

Validation of the LymVAS: a visual analog scale for lymphedema-specific quality of life in the context of therapeutic intervention

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Key Ideas:

- Few validated tools exist to assess lymphedema-related quality of life in therapeutic contexts
- We evaluated the validity of a novel tool, the LymVAS, to facilitate this empirical assessment
- The LymVAS tool may be a valid measure of quality of life and disease status for lymphedema

F37

3D quantification of dermal lymphatic backflow as an indicator of disease response to early physiotherapeutic intervention in head and neck cancer survivorship

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Key Ideas:

- The extent of dermal backflow (DB) may provide marker of disease progression/regression
- Quantitative near-infrared fluorescence lymphatic imaging provides method for 3D, DB quantification
- Ongoing clinical trial in head and neck cancer survivors demonstrates use of this novel technology