Scientific Organizers:
Thirumala-Devi Kanneganti, St. Jude Children’s Research Hospital, USA
Vishva M. Dixit, Genentech, Inc., USA
Mohamed Lamkanfi, Ghent University, Belgium

Joint with the meeting on Type I Interferon: Friend and Foe Alike

Understanding of the signaling mechanisms by which pattern recognition receptors (PRRs) sense microbial infections and cellular stress engage innate immune responses is moving at an unprecedented rate. Developments in the past few years shed new light on how NOD-like receptors and inflammasomes are activated to promote cytokine production and cell death responses in the context of autoimmunity and microbial infection. Other findings clarified how extracellular and intracellular receptors of the Toll-like receptor, PYHIN/IFI, and helicase families respond to infections. In addition, intricate communication between PRRs and microbial commensals has emerged as a critical mechanism controlling immunity, and several fine-tuning mechanisms modulating PRR-induced immune responses have been discovered. Finally, a wealth of clinical information supporting the key roles of PRRs not only in host-microbe interactions, but also chronic autoinflammatory and autoimmune diseases in patients has emerged. This has spurred important translational medicine efforts to bring new therapies and diagnostics to the clinic. This conference unites an international group of academic and industry immunologists and microbiologists who study basic mechanisms of PRR signaling and their interaction with microbes in inflammatory disease models with clinicians and geneticists addressing the etiology of autoinflammatory and autoimmune diseases in patients. Gathering experts from these disparate research communities offers a unique opportunity to discuss new concepts of innate immune signaling and formulate novel approaches for modulating pathological mechanisms in human inflammatory diseases.

Session Topics:
- Nucleic Acid Recognition Pathways Regulating Type I IFN Induction (Joint)
- Nucleic Acids in TLR and NLR Signaling
- Recent Insights in Inflammasome Signaling
- Interfering with Pathogenic TLR and NLR Signaling
- PRR Signaling in Bacterial and Viral Infection
- Inflammasome and NF-κB Regulatory Mechanisms
- Interactions between Microbiota and the Innate Immune System
- Innate Immune Receptors and Metabolism
plus three workshops on PRRs in Inflammatory Diseases

Scholarship Application & Discounted Abstract Deadline: November 17, 2016
Abstract Deadline: December 20, 2016
Discounted Registration Deadline: January 19, 2017

Note: Scholarships are available for graduate students and postdoctoral fellows and are awarded based on the abstract submitted.

Meeting Hashtag: #KSsignal
www.keystonesymposia.org/17X5
Workshop 1: PRRs in Inflammatory Diseases (X5)

Scientific Organizers: Thirumala-Devi Kanneganti, Vishva M. Dixit and Mohamed Lamkanfi

Sponsored by AbbVie Inc., Genentech, Inc. and Merck & Co., Inc.

Type I Interferon: Friend and Foe Alike (X6)

Scientific Organizers: Alan Sher, Virginia Pascual, Adolfo Garcia-Sastre and Anne O'Garra

March 19-23, 2017 • Fairmont Banff Springs • Banff, Alberta, Canada

Supported by the Directors' Fund


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**Workshop 1: Innate Signals for Type I IFN Induction (X6)**

* Alan Sher, NIAID, National Institutes of Health, USA
* Paul J. Hertzog†, Hudson Institute of Medical Research, Australia

**John Ty Crowl**, University of Washington, USA
Loss of Sumoylation Triggers a Spontaneous Type I Interferon Response Independent of Cytosolic Nucleic Acid Sensing Pathways

**Martin R. Jakobsen**, Aarhus University Faculty of Health Science, Denmark
IFIT16 Dictates DNA Sensing in Human Macrophages by Promoting Production and Function of cGAMP

**Stefanie Luecke**, Aarhus University, Denmark
Length-Dependent Sensing of Low-Abundance dsDNA by cGAS

**Jennifer Lumb**, Stanford University, USA
Unbiased Haplotype Genetic Screen Uncovers a Novel RNA Binding Immune Regulator

**Nathalie M. Grandvaux**, Université de Montréal, Canada
Characterization of a Delayed Transcriptional Program Induced in Response to the Synergistic Action of IFNBeta+TNFalpha Reveals Novel STAT2 and IRF9-Dependent Pathways

**Jennie B. Altman**, Icahn School of Medicine at Mount Sinai, USA
Novel STAT2 and IRF9-Dependent Pathways Response to the Synergistic Action of IFNBeta+TNFalpha Reveals Novel STAT2 and IRF9-Dependent Pathways

**Antje Blumenthal**, University of Queensland, Australia
Novel STAT2 and IRF9-Dependent Pathways Response to the Synergistic Action of IFNBeta+TNFalpha Reveals Novel STAT2 and IRF9-Dependent Pathways

**Philippe D. Pierre**, Centre d'Immunologie Marseille-Luminy, CIML, France
Pp1r15a/GADD34 Controls Heterogeneity of Type-I Interferon Production and Function of cGAMP

**IFI16 Dictates DNA Sensing in Human Macrophages by Promoting Production and Function of cGAMP**

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**Nucleic Acids in TLR and NLR Signaling (X5)**

Sreya Gosh, University of Massachusetts Medical School, USA
The PYHIN Protein IFI205 Regulates Immune Signaling by Controlling Expression of the Inflammasome Adaptor ASC

**Menä Abdel-Nour**, University of Toronto, Canada
The eIF2 Alpha Kinase HRI Senses Protein Aggregation and Facilitates Signaling of Innate

**José Santos**, University of Basel, Switzerland
Novel GBP-Dependent Mechanisms of Inflammasome Activation

**Matthew James George Eldridge**, Imperial College London, UK
The Atypical Ubiquitin E2 Conjugase UBE2L3 is an Indirect Caspase-1 Target and controls IL-1Beta Secretion by Inflammasomes

**Nidhi Jain**, Cedars Sinai Medical Center, USA
NLRP12 Mutation Causes C57BL/6J Strain-Specific Defect in Neutrophil Recruitment

**Nina Van Opdenbosch†**, VIB-University of Ghent, Belgium
Defective Caspase-1 Recruitment Licenses ASC Specks to Engage Non-Inflammatory Caspase-8-Driven Apoptosis in Macrophages and Intestinal Epithelial Cells

**Charlotte Macleod**, University of Cambridge, UK
Determining the Stoichiometry of the TLR-4 Adaptor Protein Mal/TIRAP using TIRF Microscopy

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**Mendelian Interferonopathies and IFN-Deficiencies (X6)**

**Dusan Bogunovic**, Icahn School of Medicine at Mount Sinai, USA
Loss of Type I Interferon Negative Regulation in Humans

**Min Ae Lee-Kirsch**, Technische Universität Dresden, Germany
Defective Intracellular Nucleic Acid Waste Management in Type 1 Interferon-Driven Autoinflammation and Autoimmunity

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* Session Chair † Invited but not yet accepted
Program current as of February 2, 2017. Program subject to change. Meal formats are based on meeting venue.
For the most up-to-date details, visit www.keystonesymposia.org/17X5 and www.keystonesymposia.org/17X6.
Raphaela Goldbach-Mansky, NIAID, LCID, National Institutes of Health, USA
Novel Insights into the Pathogenesis and Treatment Approaches of the Type I-IFN-Mediated Autoinflammatory Diseases, CANDLE and SAVI
Joaquin M. Espinosa, University of Colorado Boulder, USA
Short Talk: Trisomy 21 Consistently Activates the Interferon Response: Understanding Down Syndrome as an Interferonopathy
Poster Session 1
TUESDAY, MARCH 21
Recent Insights in Inflammasome Signaling (X5)
Fayyaz Sutterwala, Cedars-Sinai Medical Center, USA
Cardiolipin promotes mitochondrial localization of NLRP3 and caspase-1
John Bertin, GlaxoSmithKline, USA
RIPK1 Therapeutics: From Concept to Patients
Kim Newton, Genentech, Inc., USA
Regulation of Inflammation and Cell Death by RIPK1
Feng Shao, National Institute of Biological Sciences, China
Pyroptosis in Anti-Bacterial Immunity: Sensing & Execution
Bharat Behl, University of Connecticut Health Center, USA
Short Talk: Molecular Determinants of Noncanonical Inflammasome Activation by LPS
Katharina Schneider†, Technical University Munich, Germany
Short Talk: Caspase-1 Mutant Mouse Reveals a Central Role of Caspase-1 Protease Activity and GSDMD in Fate Decisions After Inflammasome Activation
Type I IFN Regulation of Viral Infection and Cancer (X6)
Ana Fernandez-Sesma, Mount Sinai School of Medicine, USA
Modulation of Innate Immunity by Dengue Virus: Feeling the STING
Andreas Wack, National Institute for Medical Research, The Francis Crick Institute, UK
Unique and Overlapping Roles of Type I and Type III IFNs in Influenza Infection
John W. Schoggins, University of Texas Southwestern Medical Center, USA
Cell Intrinsic Modulation of Viral and Bacterial Infection by IFN-Stimulated Genes
Thomas J. Braciale, University of Virginia, USA
Innate Immune Control of Respiratory Virus Infection
Gaya Amarasinghe, Washington University School of Medicine, USA
Short Talk: Control of Type I IFN Signaling in Negative Sense RNA Viruses
Jason Waithman†, Telethon Kids Institute, Australia
Short Talk: IFNalpha Subtypes Drive Distinct Anti-Cancer Activities
Workshop 2: PRRs in Inflammatory Diseases (X5)
Marcia A. Munoz, Garvan Institute of Medical Research, Australia
Defective Protein Prenylation is a Diagnostic Biomarker for Mevalonate Kinase Deficiency
T. Sam Xiao, Case Western Reserve University, USA
Structures of GSDMD C-Terminal Domain Suggest Mechanisms of Autoinhibition
Igor E. Brodsky, University of Pennsylvania, USA
Role of Caspase-8 Enzymatic Activity in Control of TLR-Induced Macrophage Gene Expression
Damien Arnoult, Hopital Paul Brousse, France
The Golgi Apparatus Acts as a Platform for TBK1 Activation After Viral RNA Sensing
Randilea Nichols, University of California, Berkeley, USA
NLR4 Inflammasome Activation in Neutrophils is Sufficient to Cause Systemic Inflammatory Disease
Rosalie Heilig†, Switzerland
The Role of Gasdermin D in IL-1Beta Release
Gaya Amarasinghe, Washington University School of Medicine, USA
Differential Regulation of Rig-I Like Receptor-Responses by Ebola and Marburg Virus VP35 Proteins
Cindy Chiang, University of Chicago, USA
The Human Papillomavirus E6 Oncoprotein Inhibits TRIM25- and RIG-I-Mediated Innate Immune Signaling
Workshop 2: Role of Type I IFNs in Control and Enhancement of Infection (X6)
*Curt M. Horvath†, Northwestern University, USA
Charles S. Dela Cruz, Yale University, USA
Chitinase-Like Protein Chi3l1 Modulates Type I Interferon Response through TLR9-AP3-IRF7 Axis during Streptococcus Pneumoniae Lung Infection
Ren Sun, University of California, Los Angeles, USA
Genome-Wide Identification of Anti-Interferon Functions in Influenza A Virus
Khader Ghneim†, Case Western Reserve University, USA
Different interferon Signatures Characterize Two Subclasses of Immune Non-responder Subjects
Ebrahim Hassan, Institute of Virology - Freiburg University, Germany
In vivo Evasion of MxA Reveals Pandemic Potential of Emerging Influenza A Viruses
Bastian Opitz, Charité University Medicine Berlin, Germany
A Common Loss-of-Function Variant of STING Affects cGAS-Dependent Antibacterial Defense
Laura sinigaglia, Institut Pasteur, France
Transfer of Yellow Fever Virus RNA from Infected Cells to Plasmacytoid Dendritic Cells Triggers Interferon Production

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**KEystone Symposia**

**Pattern Recognition Signaling: From Innate Immunity to Inflammatory Disease (X5)**

**Scientific Organizers:** Thirumala-Devi Kanneganti, Vishva M. Dixit and Mohamed Lamkanfi

**Sponsored by AbbVie Inc., Genentech, Inc. and Merck & Co., Inc.**

**Type I Interferon: Friend and Foe Alike (X6)**

**Scientific Organizers:** Alan Sher, Virginia Pascual, Adolfo Garcia-Sastre and Anne O’Garra

**March 19-23, 2017 • Fairmont Banff Springs • Banff, Alberta, Canada**

**Supported by the Directors’ Fund**

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**Nick Parekh**, Penn State College of Medicine, USA  
cGAS Mediates a Protective Local Response to Dermal Vaccinia Infection Independent of Control of Virus Replication

**Interfering with Pathogenic TLR and NLR Signaling (X5)**

- **Dana Philpott**, University of Toronto, Canada  
  Nod2 Signaling
- **Dmitry M. Shayakhmetov**, Emory University, USA  
  Non-canonical Regulated Necrotic Death and Sensing Danger
- **Jenny P.Y. Ting**, University of North Carolina at Chapel Hill, USA  
  Intracellular Innate Immune Receptors: Regulators of Inflammation, Cancer and Immunity
- **Vikram R. Rao**, Pfizer, USA  
  Short Talk: IRAK4 Kinase Inhibitors: Emerging Biology and Therapeutic Implications

**Type I IFN Regulation of Viral Infection (X6)**

- **Netanya Sandler Utay**, University of Texas Medical Branch at Galveston, USA  
  Type I Interferons: Barrier or Pathway to HIV Disease?
- **Adolfo Garcia-Sastre**, Mount Sinai School of Medicine, USA  
  Regulation of Influenza Virus Sensing and Antiviral Responses by Host and Virus Factors
- **Andreas Pichlmair**, Max-Planck Institute of Biochemistry, Germany  
  Interactions of Cellular Proteins with Viral Nucleic Acids
- **Ricardo Rajsbaum**, University of Texas Medical Branch, USA  
  Short Talk: Friend and Foe in the Regulation of IFN Pathways: Pro-Viral and Anti-Viral Functions of the Host E3-Ubiquitin Ligase TRIM6

**Poster Session 2**

**WEDNESDAY, MARCH 22**

**PRR Signaling in Bacterial and Viral Infection (X5)**

- **Russell E. Vance**, University of California, Berkeley, USA  
  Activation of Inflammasomes by Bacterial Pathogens
- **Douglas Golenbock**, University of Massachusetts Medical School, USA  
  Pattern Recognition in Bacterial Infections: Dual Roles for TLRs and Nucleic Acid Sensors
- **Amal Amer**, Ohio State University, USA  
  Unconventional Functions of Inflammasomes
- **Denise M. Monack**, Stanford University, USA  
  Inflammasomes and Bacterial Infections
- **Christian Holm**, Aarhus University, Denmark  
  Short Talk: Influenza A Virus Targets a cGAS-Independent STING Pathway that Controls Enveloped RNA Viruses

**Peng Li**, National Institute of Biological Sciences, China  
Short Talk: Ubiquitination and Degradation of GBPs by Shigella Ipha9.8 Effector to Suppress Host Defenses

**Type I IFN Regulation of Bacterial Infection and Disease (X6)**

- **Jeffery S. Cox**, University of California, Berkeley, USA  
  Discriminating Pathogen from Non-Pathogen: Beyond Type 1 IFN
- **Katrin D. Mayer-Barber**, NIAID, National Institutes of Health, USA  
  The Dichotomy between Interleukin 1 and Type I Interferon during Mycobacterium Tuberculosis Infection Exposes Distinct and Opposing Classes of Inflammation
- **Thomas J. Scriba**, University of Cape Town, South Africa  
  IFN signatures that predict human tuberculosis
- **Craig R. Roy**, Yale University School of Medicine, USA  
  Modulation of Type I Interferon Production during Infection by Vacular Pathogens
- **Terje Espevik**, Norwegian University of Science and Technology, Norway  
  Short Talk: CD150 Positively Regulates TRAM Recruitment to E.coli Phagosomes and Type I IFN Secretion
- **Beiyun Cailtin Liu**, Tufts University, USA  
  Short Talk: Host-Intrinsic Interferon signaling Licenses GBP-Mediated Attack on Cytosolic Bacteria

**Inflammasome and NF-kB Regulatory Mechanisms (X5)**

- **Christian Stehlík**, Northwestern University, USA  
  Inflammasome inhibition
- **Eicke Latz**, University of Bonn, Germany  
  Inflammasomes in Health and Disease
- **Mohamed Lamkanfi**, Ghent University, Belgium  
  Inflammasome Regulation in Auto-Inflammation
- **Ali A. Zarrin**, Genentech, Inc., USA  
  Short Talk: TPL2 Kinase Activates MEK-1/2 and/or MEK-3/6 to Regulate Inflammatory Pathways in Myeloid Cells

**Role of Type I IFN in Complex Autoimmunity (X6)**

- **Virginia Pascual**, Baylor Research Institute, USA  
  Pathogenic Functions of Type I IFN in SLE
- **Richard M. Siegel**, NIAIMS, National Institutes of Health, USA  
  Interferon, Anti-Interferon Antibodies and NK Cells in Systemic Autoimmunity
- **Robert C. Axtell**, Oklahoma Medical Research Foundation, USA  
  Immunological Heterogeneity in Neurological Autoimmunity. Lessons from Studying Type I Interferon Responses
- **Mari L. Shinohara†**, Duke University, USA  
  Short Talk: Type-I Interferons and the NLRP3 Inflammasome in CNS Autoimmunity

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Poster Session 3

THURSDAY, MARCH 23

Interactions between Microbiota and the Innate Immune System (X5)
Ramnik Xavier, Massachusetts General Hospital and Broad Institute, USA
Host Genetics and Microbe Interactions in Human Disease
Kathy D. McCoy, University of Calgary, Canada
Intestinal Commensal Microbiota and Education of the Innate Immune System
Gabriel Nuñez, University of Michigan, USA
Interactions between Commensals and NLRs in the Gut
Andrew T. Gewirtz, Georgia State University, USA
Microbial-Mediated Protection from Infectious Disease
Grace Yi Chen, University of Michigan, USA
Short Talk: NLRP6 Limits Colonization of Akkermansia to Protect Against the Development of Colitis and Colon Tumorigenesis

Mechanisms Underlying Divergent Functions of Type I IFNs (X6)
Jae U. Jung, Keck School of Medicine of University of Southern California, USA
TRIM-Mediated Control of Type I IFN Pathway
Marco Colonna, Washington University School of Medicine, USA
Targeting Type I IFN Activity through Plasmacytoid DC
Laurel L. Lenz, University of Colorado, USA
Role of Type I - Type II IFN Crosstalk in Macrophage Effector Function
Gideon Schreiber, Weizmann Institute, Israel
The Molecular Basis for Differential Activity of Type I Interferons
Paul J. Hertzog, Hudson Institute of Medical Research, Australia
Short Talk: Systems Biology of Type I Interferon Responses
Ronald L. Rabin†, US Food and Drug Administration, USA
Short Talk: A Potential Modulatory Role for IFNalpha1 Dependent on its Low Affinity for IFNAR2

Workshop 3: PRRs in Inflammatory Diseases (X5)
Scott W. Canna, Children's Hospital of Pittsburgh, University of Pittsburgh, USA
Chronic IL-18 of Diverse Origins Defines and Drives the Hyperinflammatory State Known as Macrophage Activation Syndrome
Eric P. Hanson, National Institutes of Health, USA
A novel NEMO isoform mediates enhanced antiviral activity and autoinflammatory disease via stabilization of IKKepsilon.

Kiva Brennan, Trinity College Dublin, Ireland
Designing Vaccines for the Paediatric Population; Potential for Cytosolic Nucleic Acids as Vaccine Adjuvants
Nesrin Ozören†, Bogazici University, Turkey
ASC Specks as Vaccine Technology
Jingjin Ding†, National Institute of Biological Sciences, Beijing, China
LPS Binding to Caspase-11/4/5 Triggers Pyroptosis by Releasing the Pore-Forming Activity of GSDMD
Orna Rabinovich-Ernst††, NIAID, National Institutes of Health, USA
An Arrayed Genome-Wide RNAi Screen for the Discovery of Novel Inflammmasome Regulators

Workshop 3: Role of Type I IFNS in Autoimmunity and Malignancy (X6)
†Raphaela Goldbach-Mansky, NIAID, LCID, National Institutes of Health, USA
*Marco Colonna, Washington University School of Medicine, USA
Kebin Liu, Medical College of Georgia, USA
Jak-STAT-Mediated Chronic Inflammation Impairs Cytotoxic T Lymphocyte Activation to Decrease Anti-PD-1 Immunotherapy Efficacy in Pancreatic Cancer
Maninjay K. Atianand†, University of Massachusetts Medical School, USA
A Long Noncoding RNA IncRNA-EPS Acts as a Transcriptional Brake to Restrain Inflammation
Jacquelyn Gorman, Seattle Children's Research Institute, USA
The IFIH1A946T Coding Variant Mediates an Interferon Program that Limits Viral Infection but Increases the Risk for Autoimmunity
Mark E. Kleinman, University of Kentucky, USA
Epigenetic Regulation of Type I IFN Response in Age-Related Macular Degeneration
Elisaveta Voyanova, Medimmune, USA
Blockade of Critical Immune Regulators Results in Different Roads to Pathogenesis in Primary Sjögren’s Syndrome

Geraldine P. Grouard-Vogel, Neovacs, France
Overexpression of IFNa/IFNalpha andDerived Diseases: Innovative Approach with a Therapeutic Vaccine
Miguel A. Sanjuan, Medimmune/Astrazeneca, USA
Novel Pathogenic Role for IgE in SLE, and Pharmacological Blockade of Type I IFN Receptor in Patients
John J. O’Shea, NIAMS, National Institutes of Health, USA
Targeting Type I IFN Signaling Pathways

Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (X5)
Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (X6)
FRIDAY, MARCH 24
Departure
Mona Motwani, University of Massachusetts, USA
The cGAS-STING Pathway Restrains Systemic Autoimmunity

Simone Caielli, Baylor Institute for Immunology Research, USA
Oxidized Mitochondrial DNA is a Powerful Activator of Human pDCs and Induces a Lupus-Specific CD4 T Cell Phenotype

Innate Immune Receptors and Metabolism (X5)

Luke A. J. O'Neill, Trinity Biomedical Sciences Institute, Ireland
Metabolic Reprogramming in Innate Immunity and Inflammation

Vishwa Deep Dixit, Yale University, USA
Metabolic Control of Inflammasomes

Mihai G. Netea, Radboud University, Netherlands
Metabolic Basis for Trained Innate Immunity

Tailoring Type I IFN Interventions to Achieve Cure (X6)