# Oxygen Radicals

*Gordon Research Conference*

Biology and Pathobiology of Oxygen Radicals from Cell Signaling and Detection to Therapy

February 4-9, 2018
Ventura Beach Marriott
Ventura, CA

Chairs: Douglas D. Thomas and Michael J. Davies
Vice Chairs: Yvonne MW. Janssen-Heininger and Manisha Patel

## Contributors

Gordon Research Conferences
Frontiers of Science

NIH National Institute of Environmental Health Sciences

BRUKER

Cayman Chemical

Pittsburgh Heart, Lung, and Blood VMI Vascular Medicine Institute

Agilent Technologies

Oxygen Club of California

SfRBM Society for Redox Biology and Medicine

Taylor & Francis Group
an informa business

The Company of Biologists

SFRR Europe

American Chemical Society
Division of Biological Chemistry

ECO PHYSICS

BAKER RUSKINN

Mallinckrodt Pharmaceuticals

## Contributors (*continued*)




## Meeting Program

| Sunday | |
|---|---|
| 4:00 pm - 8:00 pm | Arrival and Check-in |
| 6:00 pm | Dinner |
| 7:30 pm - 7:40 pm | Welcome / Introductory Comments by GRC Site Staff |
| 7:40 pm - 9:30 pm | **Quantitative Analyses of Redox Changes** |
| | Discussion Leader: **Yvonne Janssen-Heininger** (University of Vermont, USA) |
| 7:40 pm - 7:50 pm | Introduction by Discussion Leader |
| 7:50 pm - 8:40 pm | **Daniel Liebler** (Vanderbilt University School of Medicine, USA)<br>"Quantitative Analyses of Redox and Electrophile Reactive Thiol Proteomes" |
| 8:40 pm - 9:20 pm | Discussion |
| 9:20 pm - 9:30 pm | General Discussion |
| **Monday** | |
| 7:30 am - 8:30 am | Breakfast |
| 9:00 am - 12:30 pm | **Mitochondria and Oxidant Signaling** |
| | Discussion Leaders: **Victor Darley-Usmar** (University of Alabama at Birmingham, USA) and **Manisha Patel** (University of Colorado Anschutz Medical Campus, USA) |
| 9:00 am - 9:05 am | Introduction by Discussion Leader |
| 9:05 am - 9:30 am | **Alberto Sanz** (Newcastle University, United Kingdom)<br>"Site-Specific ROS Signalling in Health and Disease" |
| 9:30 am - 9:35 am | Discussion |
| 9:35 am - 10:00 am | **Scott Ballinger** (University of Alabama at Birmingham, USA)<br>"Mitochondrial-Nuclear Genetic Interaction as a Mechanism for Modulating Metabolism and Gene Expression" |
| 10:00 am - 10:05 am | Discussion |

| | |
|---|---|
| 10:05 am - 10:20 am | **Douglas Ganini da Silva** (National Institute of Environmental Health Sciences, NIH, USA)<br>"Switch of Mitochondrial Superoxide Dismutase into a Prooxidant Peroxidase in Manganese-Deficient Cells and Mice" |
| 10:20 am - 10:25 am | Discussion |
| 10:25 am - 10:30 am | General Discussion |
| 10:30 am - 11:00 am | Coffee Break |
| 11:00 am - 11:25 am | **Sruti Shiva** (University of Pittsburgh, USA)<br>"Platelet Mitochondrial ROS Signaling: To Clot or Not" |
| 11:25 am - 11:30 am | Discussion |
| 11:30 am - 11:55 am | **Daniel McVicar** (National Cancer Institute, NIH, USA)<br>"Nitric Oxide, Metabolism and Mitochondria Cross Talk" |
| 11:55 am - 12:00 pm | Discussion |
| 12:00 pm - 12:15 pm | **Andrea Braganza** (University of Pittsburgh, USA)<br>"Myoglobin Regulates the Function of the E3 Ligase Parkin to Modulate Mitochondrial Fusion and Decrease Breast Cancer Tumor Progression" |
| 12:15 pm - 12:20 pm | Discussion |
| 12:20 pm - 12:30 pm | General Discussion |
| 12:30 pm | Lunch |
| 1:30 pm - 4:00 pm | Free Time |
| 3:00 pm - 4:00 pm | Power Hour<br>*The GRC Power Hour is an optional informal gathering open to all meeting participants. It is designed to help address the challenges women face in science and support the professional growth of women in our communities by providing an open forum for discussion and mentoring.*<br>Organizer: **Yvonne Janssen-Heininger** (University of Vermont, USA) |
| 4:00 pm - 6:00 pm | Poster Session |
| 6:00 pm | Dinner |
| 7:30 pm - 9:30 pm | **The Roles of Oxygen Radicals in Cancer Etiology**<br>Discussion Leaders: **Douglas Thomas** (University of Illinois at Chicago, USA) and **David Wink** (National Cancer Institute, NIH, USA) |
| 7:30 pm - 7:35 pm | Introduction by Discussion Leader |
| 7:35 pm - 8:00 pm | **Lucy Godley** (University of Chicago, USA)<br>"The Role of Hypoxia in Mediating Epigenetic Changes in Pediatric Neuroblastoma" |
| 8:00 pm - 8:05 pm | Discussion |
| 8:05 pm - 8:30 pm | **Bennett Van Houten** (University of Pittsburgh, USA)<br>"Optochemical-Targeted Mitochondrial Dysfunction Gives Insights into Mitochondria-Nuclear Crosstalk" |
| 8:30 pm - 8:35 pm | Discussion |

| | |
|---|---|
| 8:35 pm - 9:05 pm | **Shinya Toyokuni** (Nagoya University Graduate School of Medicine, Japan)<br>"Cancer as Iron Addiction with Ferroptosis-Resistance" |
| 9:05 pm - 9:10 pm | Discussion |
| 9:10 pm - 9:25 pm | **Jianhua Zhang** (University of Alabama at Birmingham, USA)<br>"Reprogramming Redox Tone and Bioenergetic Health in Cancer by Regulation of Lysosomal Biogenesis" |
| 9:25 pm - 9:30 pm | Discussion |

## Tuesday

| | |
|---|---|
| 7:30 am - 8:30 am | Breakfast |
| 8:30 am | Group Photo |
| 9:00 am - 12:30 pm | **The Interface Between Nitrogen and Oxygen Radicals** |
| | Discussion Leaders: **Neil Hogg** (Medical College of Wisconsin, USA) and **Rakesh Patel** (University of Alabama at Birmingham, USA) |
| 9:00 am - 9:05 am | Introduction by Discussion Leader |
| 9:05 am - 9:30 am | **David Wink** (National Cancer Institute, NIH, USA)<br>"Following NO in the Progression Cancer: Insight into Mechanism of Poor Outcome" |
| 9:30 am - 9:35 am | Discussion |
| 9:35 am - 10:00 am | **Jon Lundberg** (Karolinska Institutet, Sweden)<br>"Modulation of Metabolic Function by Nitrate and Nitrite" |
| 10:00 am - 10:05 am | Discussion |
| 10:05 am - 10:20 am | **Adam Sikora** (Lodz University of Technology, Poland)<br>"Kinetic and Quantum Mechanical Study on the Decomposition of Piloty's Acid Derivatives Toward the Understanding of Factors Controlling HNO Release" |
| 10:20 am - 10:25 am | Discussion |
| 10:25 am - 10:30 am | General Discussion |
| 10:30 am - 11:00 am | Coffee Break |
| 11:00 am - 11:25 am | **Joseph Beckman** (Oregon State University, USA)<br>"Progress on How Radicals Killed Lou Gehrig (ALS). The Interplay of Copper, SOD, Peroxynitrite and Tyrosine Radicals in Motor Neuron Disease" |
| 11:25 am - 11:30 am | Discussion |
| 11:30 am - 11:55 am | **Jon Fukuto** (Sonoma State University, USA)<br>"The Chemical Biology of Hydropersulfides: Possible Roles in Redox Signaling" |
| 11:55 am - 12:00 pm | Discussion |
| 12:00 pm - 12:15 pm | **Luke Carroll** (University of Copenhagen, Denmark)<br>"Reactions of Tryptophan Radicals on Peptides and Proteins: Dimersation vs Addition of Superoxide to Give Hydroperoxides" |
| 12:15 pm - 12:20 pm | Discussion |
| 12:20 pm - 12:30 pm | General Discussion |

| | |
|---|---|
| 12:30 pm | Lunch |
| 1:30 pm - 4:00 pm | Free Time |
| 4:00 pm - 6:00 pm | Poster Session |
| 6:00 pm | Dinner |
| 7:30 pm - 9:30 pm | **Redox Relays** |
| | Discussion Leaders: **Tobias Dick** (German Cancer Research Center (DKFZ), Germany) and **Gerardo Ferrer-Sueta** (Facultad de Ciencias, Universidad de la República, Uruguay) |
| 7:30 pm - 7:55 pm | **Henry Forman** (University of Southern California, USA)<br>"Altered Redox Signaling Responses to Nanoparticles in Aging" |
| 7:55 pm - 8:00 pm | Discussion |
| 8:00 pm - 8:25 pm | **Mark Hampton** (University of Otago, Christchurch, New Zealand)<br>"Peroxiredoxin Involvement in Cellular Redox Signalling" |
| 8:25 pm - 8:30 pm | Discussion |
| 8:30 pm - 8:55 pm | **Albert Van Der Vliet** (University of Vermont, USA)<br>"Redox Regulation of Protein Tyrosine Kinases: New Twists and Turns" |
| 8:55 pm - 9:00 pm | Discussion |
| 9:00 pm - 9:25 pm | **Aron Fisher** (University of Pennsylvania School of Medicine, USA)<br>"The Pathways for Repair of Peroxidized Cell Membranes" |
| 9:25 pm - 9:30 pm | Discussion |

## Wednesday

| | |
|---|---|
| 7:30 am - 8:30 am | Breakfast |
| 9:00 am - 12:30 pm | **Imaging, Sensing, and Quantification of Oxidants and Oxidant Damage** |
| | Discussion Leaders: **Ronald Mason** (National Institute of Environmental Health Sciences, NIH, USA) and **Roland Stocker** (Victor Chang Cardiac Research Institute, Australia) |
| 9:00 am - 9:05 am | Introduction by Discussion Leader |
| 9:05 am - 9:30 am | **Ursula Jakob** (University of Michigan, USA)<br>"Effects of Developmental ROS on Stress Resistance and Lifespan" |
| 9:30 am - 9:35 am | Discussion |
| 9:35 am - 10:00 am | **Murali Cherukuri** (National Cancer Institute, NIH, USA)<br>"*In Vivo* Imaging Biomarkers from EPR Based Techniques to Guide Treatment and Monitor Treatment Response: Pre-Clinical and Clinical Studies" |
| 10:00 am - 10:05 am | Discussion |
| 10:05 am - 10:20 am | **Klaus Koren** (Aarhus University, Denmark)<br>"Hydrogen Peroxide Sensors as Tools to Quantify $H_2O_2$ in Living Systems" |
| 10:20 am - 10:25 am | Discussion |
| 10:25 am - 10:30 am | General Discussion |

| | |
|---|---|
| 10:30 am - 11:00 am | Coffee Break |
| 11:00 am - 11:25 am | **Jacek Zielonka** (Medical College of Wisconsin, USA)<br>"Recent Advances in Specific Detection of Superoxide" |
| 11:25 am - 11:30 am | Discussion |
| 11:30 am - 11:55 am | **Ginger Milne** (Vanderbilt University, USA)<br>"Isotope-Reinforced Polyunsaturated Lipids (D-PUFAs), Lipid Peroxidation, and Disease" |
| 11:55 am - 12:00 pm | Discussion |
| 12:00 pm - 12:15 pm | **Cheryl van de Wetering** (University of Vermont, USA)<br>"Ablation of Glutathione-S-Transferase p Attenuates Glycolysis in House Dust Mite-Induced Allergic Airways Disease" |
| 12:15 pm - 12:20 pm | Discussion |
| 12:20 pm - 12:30 pm | General Discussion |
| 12:30 pm | Lunch |
| 1:30 pm - 4:00 pm | Free Time |
| 4:00 pm - 6:00 pm | Poster Session |
| 6:00 pm | Dinner |
| 7:00 pm - 7:30 pm | Business Meeting<br>*Nominations for the Next Vice Chair; Fill in Conference Evaluation Forms; Discuss Future Site and Scheduling Preferences; Election of the Next Vice Chair* |
| 7:30 pm - 9:30 pm | **Physiological Responses to Oxidation**<br>Discussion Leaders: **Ursula Jakob** (University of Michigan, USA) and **Kelvin Davies** (University of Southern California, USA) |
| 7:30 pm - 7:35 pm | Introduction by Discussion Leader |
| 7:35 pm - 8:00 pm | **Philip Eaton** (King's College London, United Kingdom)<br>"Redox Regulation of Protein Kinase G – Translational Opportunities" |
| 8:00 pm - 8:05 pm | Discussion |
| 8:05 pm - 8:30 pm | **Anna-Liisa Levonen** (University of Eastern Finland, Finland)<br>"Stress Response Signaling via the Keap1-Nrf2 Pathway" |
| 8:30 pm - 8:35 pm | Discussion |
| 8:35 pm - 9:00 pm | **Katrin Schroder** (Goethe University Frankfurt, Germany)<br>"The NADPH Oxidase Nox4 as a Key Player in Differentiation" |
| 9:00 pm - 9:05 pm | Discussion |
| 9:05 pm - 9:20 pm | **Laura Corrales-Diaz Pomatto** (University of Southern California, USA)<br>"To Adapt or Not to Adapt: The Consequences of an Age-Dependent Decline in the Adaptive Homeostatic Response" |
| 9:20 pm - 9:30 pm | Discussion |

## Thursday

| | |
|---|---|
| 7:30 am - 8:30 am | Breakfast |
| 9:00 am - 12:30 pm | **Oxygen Radicals, Tissue Damage, and Therapeutics** |
| | Discussion Leaders: **Clare Hawkins** (University of Copenhagen, Denmark) and **Elizabeth New** (The University of Sydney, Australia) |
| 9:00 am - 9:05 am | Introduction by Discussion Leader |
| 9:05 am - 9:30 am | **Roland Stocker** (Victor Chang Cardiac Research Institute, Australia)<br>"Myeloperoxidase Contributes to the Destabilisation of Atherosclerotic Plaques" |
| 9:30 am - 9:35 am | Discussion |
| 9:35 am - 10:00 am | **John Chen** (Massachusetts General Hospital, USA)<br>"Imaging Myeloperoxidase Activity" |
| 10:00 am - 10:05 am | Discussion |
| 10:05 am - 10:20 am | **Bindu Paul** (Johns Hopkins School of Medicine, USA)<br>"Convergence of Golgi Stress Response and Cysteine Metabolism Confers Cytoprotection in Huntington's Disease" |
| 10:20 am - 10:30 am | Discussion |
| 10:30 am - 11:00 am | Coffee Break |
| 11:00 am - 11:25 am | **Christian Schoneich** (University of Kansas, USA)<br>"Novel Redox Modifications of Proteins: Pathways to Protein Degradation, Aggregation and Immunogenicity" |
| 11:25 am - 11:30 am | Discussion |
| 11:30 am - 11:55 am | **Gautam Bhave** (Vanderbilt University Medical Center, USA)<br>"The Role of Hypobromous Acid in Tissue Biology" |
| 11:55 am - 12:00 pm | Discussion |
| 12:00 pm - 12:15 pm | **Fulvio Ursini** (University of Padova, Italy)<br>"Unraveling the Mechanism of Selenium Catalysis in GPx4: How Redox Chemistry Impacts on Life from Sperm Function to Embryogenesis and Cell Death" |
| 12:15 pm - 12:20 pm | Discussion |
| 12:20 pm - 12:30 pm | General Discussion |
| 12:30 pm | Lunch |
| 1:30 pm - 4:00 pm | Free Time |
| 4:00 pm - 6:00 pm | Poster Session |
| 6:00 pm | Dinner |

| | |
|---|---|
| 7:30 pm - 9:30 pm | **Keynote Session: The Redox Paradigm – Where to Now?** |
| | Discussion Leader: **Michael Davies** (University of Copenhagen, Denmark) |
| 7:30 pm - 7:40 pm | Introduction by Discussion Leader |
| 7:40 pm - 9:10 pm | **Helmut Sies** (Heinrich Heine University Dusseldorf, Germany)<br>"OH NO: NOX, NOS and ROS! Where Do We Go?" |
| 9:10 pm - 9:30 pm | Discussion |

## Friday

| | |
|---|---|
| 7:30 am - 8:30 am | Breakfast |
| 9:00 am | Departure |