WORKSHOP DESCRIPTIONS AND SPEAKERS

1. Genomic communication

Organizer: Yoel Sadovsky MD, Magee Women’s Research Institute, Pittsburgh USA

While circulating RNAs, either bound by plasma membranes or packaged within extracellular vesicles (EVs), may transmit information to researchers about tissue function, disease, and organismal wellness, recent data indicate that these messages play a key role in local and distant cell communication. Using a series of targeted and provocative exchanges, this workshop will center on the transfer of RNAs within EVs and their entry into target cells, the use of minimally invasive, circulating RNA biomarkers for disease monitoring, and the integration of these data into longitudinal assessment of pregnancy health, projecting a futuristic view of “scientific wellness”.

Speakers: Larry Chamley PhD, University of Auckland, New Zealand

Peter Kurre MD, Oregon Health Sciences University, USA

Nathan Price PhD, Institute for Systems Biology, USA

Yoel Sadovsky MD, Magee-Women’s Research Institute, USA

Alison Paquette PhD, Institute for Systems Biology, USA

Carlos Salomon PhD, University of Queensland, Australia

2. New innovations in placental imaging; focus on practical aspects of in vivo data acquisition and analysis

Organizers: Antonio Frias MD, Victoria Roberts PhD, Oregon Health & Science University and John Sled PhD, University of Toronto

Speakers: Matthias Schabel PhD, Oregon Health and Science University USA

John Sled PhD, University of Toronto, Canada

Sally Collins MD, University of Oxford, UK

Dinesh Shah MD, University of Wisconsin, Madison, USA

3. Linkage between placenta and development of other organs

Organizer: Peta Grigsby, Ph.D. Oregon Health & Science University

“The intimate linkage between placental size and function and overall fetal growth and development has been recognized for a long time. Similarly the linkage between placental function and development of certain organs, e.g. heart, liver, pancreas, kidney has been increasingly recognized. More recently the mechanisms operating at the physical and molecular levels linking placental development and function to development and function of fetal organs are beginning to be elucidated, particularly in relation to fetal programming of adult disease. In addition development of other fetal organs, e.g. brain are being shown to be regulated by placental factors such as serotonin. This workshop will feature a series of presentations describing the mechanistic linkages between placental function and development of fetal organs in the normal and pathologic settings, the role for these mechanisms in fetal programming and potential therapeutic approaches”

Speakers: Helen Jones PhD Cincinnati Children’s Hospital Medical Center
4. Decidua- trophoblast Interactions

Organizers:  Gendie Lash, PhD.  Guangzhou Institute of Pediatrics, Guangzhou Women and Children’s Medical Center, Guangzhou, China

Invasion of the uterine decidua and inner third of the myometrium by extravillous trophoblast cells (EVT) and the resultant remodeling of the spiral arteries are key to the establishment of a healthy successful pregnancy. During these processes EVT interact with different decidual cell types including decidual stromal cells, uterine natural killer cells, uterine macrophages, different T cell populations, vascular smooth muscle cells, endothelial cells and myometrial stromal cells. These interactions have the potential to alter the phenotype, and therefore function, of either interacting cell type. The aim of this workshop is to explore some of these interactions and discuss how they contribute to the establishment of a healthy pregnancy.

Speakers:  Peggy Petroff PhD, Michigan State University, USA
“Potential mechanisms of communication between decidual cell populations and trophoblast”

Gendie Lash PhD, Guangzhou Institute of Pediatrics, China – Consequences of decidual leucocyte and EVT communication

Christina Duzyj PhD, Rutgers University, USA
Multinuclear trophoblast giant cells: evidence of ongoing terminal differentiation of extravillous trophoblast to term

Sonia DaSilva-Arnold PhD, Hackensack University Medical Center, USA
“EVT genotype/phenotype disconnect in abnormally invasive placenta: necessity for decidual interactions in over invasion”

5. Inflammation – What is it and how does it affect the placenta

Organizers:  Kent Thornburg, Ph.D., Oregon Health and Science University, Portland, USA and Murray Mitchell, D. Phil. University of Queensland, Brisbane, Australia

Inflammation or mediators of inflammation play important roles in many physiological and pathological mechanisms in reproductive biology. The relationships between pathogen-driven inflammation vs. non-infectious inflammation or more simply, “hot” versus “cold’ inflammation are complex. The different intracellular pathways that are activated in chronic versus acute processes are important and not understood even though they should result in different approaches to therapy. In this workshop we aim to approach the issues head on in this critical area of reproductive biology.

Speakers: TBA

6. Sexual dimorphism in placental function

Organizers: Leslie Myatt PhD FRCOG, Alina Maloyan PhD, Oregon Health and Science University

Sexual dimorphism in pregnancy outcomes has been described for many years with the male fetus being at increased risk for adverse outcomes particularly those related to prematurity. There is now increasing awareness of sexual dimorphism at the level of placental function with well described differences in gene expression and in inflammatory responses being seen. However the molecular basis for sexual dimorphism in placental function is poorly understood. The aim of this workshop is to discuss findings from recent studies and to outline potential mechanisms underlying the sexual dimorphism

Speakers:  Leslie Myatt PhD, Oregon Health and Science University, Portland, USA
“Sexual dimorphism in placenta and pregnancy outcomes”

Wendy P Robinson PhD, UBC Dept. of Medical Genetics, Child & Family Research Institute
University of British Columbia, Canada
“Mechanisms operating at the Genome Level”

Vicki Clifton PhD, Mater Research and Translational Research Institute, Brisbane, Australia
“Teasing out the complexity of sex differences in placental GR”

Jennifer Adibi MPH, ScD, Department of Epidemiology, Department of Obstetrics,
Gynecology and Reproductive Sciences, University of Pittsburgh, USA
“The battleground of viruses, plastics and hormones: unified thinking on sex-specific placental mediation of teratogenic and endocrine disrupting effects”

7. Key mechanisms and novel insights into trophoblast implantation and invasion

Organizers: Martin Knöfler PhD. Medical University of Vienna, Austria, Alexander Beristain PhD, University of British Columbia, Canada.

Trophoblast differentiation along the invasive pathway is fundamental to early implantation, placental development and establishment of the fetal-maternal interface. Multiple gene pathways and heterogeneous cellular interactions have been described in directing and controlling trophoblast invasion. The focus of this workshop aims to address well accepted as well as controversial paradigms central to the intrinsic control of trophoblast invasion. Novel cellular mechanisms with respect to implantation, development of an early invasive trophoblast lineage, and new insights into the versatile functions of invasive trophoblasts will be discussed. The importance of key transcription factors, the cell cycle, and aging as well as the role of polyploidy and ADAM proteases in differentiating extravillous trophoblast populations will be a primary focus. Moreover, the role of external environmental stimuli, such as hypoxia and mechanisms regulating uterine leukocyte cross-talk will be explored.

Speakers: Introduction: M. Knöfler / A. Beristain

John D. Aplin PhD, Institute of Human Development, University of Manchester, UK.
“Development of the invasive trophoblast phenotype in the early stages of implantation”

Michael J. Soares PhD. Institute of Health and Regenerative Medicine, University of Kansas, USA.
“Plasticity in development of the invasive trophoblast lineage”

Jürgen Pollheimer PhD. Department of Obstetrics and Gynecology, Medical University of Vienna, Austria.
“Defining the versatile functions of invasive human trophoblasts”

Alexander Beristain PhD. Department of Obstetrics and Gynecology, University of British Columbia, Canada.
“ADAM proteases in trophoblast differentiation: Establishing protective mechanisms in hypoxia?”

Caroline Dunk PhD. Research Centre for Women's and Infants' Health. The Samuel Lunenfeld Research Institute, Toronto, Canada. “Transcription factors and SNPs affecting trophoblast-leukocyte interactions”

General discussion and concluding remarks: M. Knöfler / A. Beristain
8. Bioinformatics and omics applied to the placenta

Organizer: Lucia Carbone, PhD Oregon Health & Science University, Portland, OR

Omics technologies and associated bioinformatics tools have greatly and rapidly evolved in the last few years. These advances have significantly impacted the placenta field as such dataset offer the potential for identifying characteristic attributes reflecting placenta health and/or possible abnormalities. One of the ultimate goals of performing omics analyses is the identification of biomarkers that inform about the status of the placenta, the mother and the baby. However the bioinformatics analysis and integration of such datasets is faced with many issues. First, references for placenta transcriptomes, metabolomics, and epigenomes are missing, hindering the interpretation and integration of omics data. Moreover, the range of variability within the population is still unknown; hence a baseline to evaluate adverse profiles is missing. During this workshop scientists involved in the analyses of different types of omics data (e.g. epigenomes, microRNAomes and metabolomes), will elaborate on the current methods used to obtain and analyze omics data and strategies used to deal with the issues raised above. During this workshop we aim to raise and start addressing some of the provocative questions that are raised in the placenta field when omics data are generated and analyzed.

Speakers: Geetu Tuteja PhD, Iowa State University
Priyadarshini Pantham PhD, University of Illinois
Katie Powell PhD, University of Sydney
Diana Morales-Prieto PhD, University of Jena
Samantha Wilson BSc, University of British Columbia

9. Trophoblast Biology & Pathology

Organizers: Shawn Chavez PhD, Oregon Health and Science University and Julie Baker PhD, Stanford University

Normal placental development is largely dependent upon the differentiation and invasion of the trophoblast, which originates from the trophectoderm of the blastocyst prior to embryo implantation. Given that aberrant trophoblast development is a common phenomenon observed in pregnancy complications such as preterm labor, preeclampsia, and intrauterine growth retardation, much research emphasis has been placed on the genetic, epigenetic, and chromosomal aspects regulating trophoblast function. Recent technological advances in genome-wide DNA methylation analysis, next generation sequencing (NGS), and live-cell imaging, as well as the use of human pluripotent stem cells to assess trophoblast regulation, has provided considerable insight into normal placental development and the pathophysiology of these pregnancy-related diseases.

The overall objectives of this workshop are to discuss the NGS, imaging, and other emerging approaches for assessing trophoblast competency at the single-cell and/or whole-genome level. We will also discuss the key trophoblast regulators, including endogenous retroviruses, and intracellular signaling pathways mediating trophoblast fate that have been identified as important for normal placental function.

Speakers: Louise Laurent MD, PhD University of California, San Diego, USA
Balaji Rao PhD North Carolina State University, USA
Julie Baker PhD, Stanford University, USA
Shawn Chavez PhD, Oregon Health & Science University, USA

This workshop will look at several new technologies that are becoming available for research into placental transport and will provide new opportunities for investigation. These will be presented as 30 min talks including time for questions and discussion.

**Speakers:**
- **Charles McKenzie PhD**, Department of Medical Biophysics, University of Western Ontario
  “Prospects for non-invasive measurement of placental metabolic and transport processes with Hyperpolarized MRI”
- **Christiane Albrecht PhD**, Institute of Biochemistry & Molecular Medicine, University of Bern
  “Primary trophoblast Transwell model mimicking the function of chorionic villi”
- **Che-Ying Kuo PhD**, Department of Bioengineering, University of Maryland
  “Engineering diffusion of chemoattractants in bioprinted placental tissue models to measure migration”
- **Cassidy Blundell PhD**, School of Engineering and Applied Science, University of Pennsylvania
  “Leveraging organ-on-a-chip technology to study the human placental barrier”

11. **Immune cells at the maternal-fetal interface.**

**Organizers:** Peggy Petroff PhD, Michigan State University, Ted Golos PhD, University of Wisconsin, Madison

Immune cells at the maternal-fetal interface can serve multiple purposes. On one hand, they play an important role in placental development and uterine remodeling; on the other, they participate in defense against pathogens and prevent vertical transmission. Yet a third effect is the 'bystander' damage that occurs as a result of inflammation when infection or other stressors are present. In this workshop we will discuss these seeming Janus-faced roles of immune and other cells, and immune-mediated processes that occur in normal pregnancy outcomes.

Questions to be addressed will include:
- When does the balance shift from normal to abnormal immune function?
- Who are the players in adverse, immune-mediated placental dysfunction – resident, in-fluxing, and/or peripheral immune cells? Are the immune cells that are critical in normal placental development and function the same as those involved in host defense against pathogens?
- What are the different roles of resident, influxing and peripheral immune cells in normal placental development and function, and in the host response to infection?
- Can the decidua and/or chorionic villi safely accommodate an inflammatory response to infection?
- What is the role of the trophoblast in the host response to infection?

**Speakers:**
- **Gendie Lash PhD**, Guangzhou Women and Children’s Medical Center, Guangdong, China
- **Caroline Dunk PhD**, Lunenfeld-Tanenbaum Research Institute, Mount Sinai Hospital, Toronto, Canada
- **Anne-Charlotte Iverson PhD**, Norwegian University of Science and Technology
- **Ulrike Kemmerling PhD**, University of Chile, Santiago, Chile
- **Jennifer Stencel-Baerenwald PhD**, University of Washington, Seattle, USA
- **Ted Golos PhD**, University of Wisconsin – Madison, USA

12. **Trophoblast cell lines: their characteristics and limitations.**

**Organizers:** Graham J Burton PhD, University of Cambridge and Udo Markert MD, University of Jena
In the absence of human trophoblast stem cells various trophoblast-like cell lines have been developed, some choriocarcinoma and some transformed. These are widely used in placental research, but how accurately do they reflect the real tissue? As analyses become more sophisticated the limitations of the different cell lines are becoming increasingly evident. This workshop will review evidence from a number of different approaches, including karyotype, gene expression, epigenetics and HLA antigens. The principal aim is to generate a panel of markers that can be used to characterize the various cell lines, and to consider what supporting data should be included in any publication in Placenta reporting data based on their usage.

**Speakers:**

- Maja Weber PhD, University of Jena, Germany,
- Cheryl Lee PhD, University of Cambridge,
- Diana Morales Prieto PhD, University of Jena, Germany,
- Padma Murthi PhD, Monash University, Australia,
- Jürgen Pollheimer PhD, University of Vienna, Austria
- Georges Daoud PhD, American University of Beirut, Lebanon