Clinician-investigators at Penn Medicine are participating in the NIH-funded Human Placenta Project, a clinical study of placental structure and function, as a precedent to the development of better methods to predict adverse pregnancy outcomes. Placental dysfunction is a suspected cause of early pregnancy loss, and of later pregnancy complications, such as fetal growth restriction and stillbirth.

The placenta implants in the maternal uterine wall and is composed of thousands of chorionic villi containing minute blood vessels that allow for fetal absorption of maternal oxygen, water and nutrients and the diffusion of wastes through the connecting umbilical cord. The maternal blood vessels in the uterine wall must successfully transform and remodel to safely and effectively supply blood to the villi.

In most pregnancies, the placenta sustains the fetus until parturition. However, many things can go wrong during placental development. Failure of the maternal vessels to properly remodel can lead to dysfunctional blood supply to the placenta. The placental villi may not mature sufficiently to adequately absorb nutrients and release carbon dioxide.

Inflammation and infection may disrupt villous function and can lead to interruption in the maternal blood supply to the placenta (infarction) resulting in necrosis and placental insufficiency. The consequences of these events can include preeclampsia, fetal growth restriction, prematurity and stillbirth.

In an effort to discover new ways to prevent abnormal placental development, the National Institute of Child Health and Human Development has initiated the Human Placenta Project (HPP) to support independent clinical studies at collaborating institutions across the nation.

One of the many goals of the HPP is to create new placental imaging and assessment technologies to evaluate human placental structure and function throughout gestation.

To this end, clinicians and investigators at Penn Medicine and The Children’s Hospital of Philadelphia (CHOP) have teamed up to develop a comprehensive approach to assess placental morphology, perfusion and oxygenation early in pregnancy using ultrasound, MRI and near-infrared spectroscopy (NIRS).

**The specific aims of the Placenta Project study at Penn are:**

- to devise and validate an automated ultrasound segmentation tool to standardize quantitative biometric analysis of placenta morphology and vascularization in vivo;
- to apply novel MRI techniques for evaluating blood flow as a measure of placental perfusion;
- to develop novel and non-invasive tools to quantify placental oxygenation using functional MRI and NIRS; and
- to conduct a pilot study using the optimal measures obtained in these efforts to study the impact of maternal nutritional status on placental development and function.

The ultimate goal of the study is to create a simple, clinically useful imaging modality that can be used at the bedside to identify women early in pregnancy who are at highest risk of pregnancy complications attributed to abnormal placental morphology, perfusion, and/or oxygenation.

The primary investigators for this study are Nadav Schwartz, MD, of Penn Maternal Fetal Medicine, and Daniel Licht, MD, of CHOP Neurology. Information about the trial may be obtained by contacting Dr. Schwartz at 215-662-6913.
MATERNAL FETAL MEDICINE

Penn Maternal Fetal Medicine obstetricians specialize in the evaluation and management of women with medical, obstetrical and fetal complications before and during pregnancy. To care for medically complicated pregnancies, treatment is coordinated with Penn specialists in hematology, oncology, pulmonary, cardiology and gastroenterology, among other specialized fields.

The Placenta Project Team

Principal Investigators
Nadav Schwartz, MD
Assistant Professor of Obstetrics and Gynecology
Daniel J. Licht, MD
Associate Professor of Neurology
The Children’s Hospital of Philadelphia

Other Faculty Investigators

Maternal Fetal Medicine
Samuel Parry, MD
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Associate Professor of Obstetrics and Gynecology

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Arjun Yodh, PhD
Professor of Physics and Astronomy

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Walter R. Witschey, PhD
Assistant Professor of Radiology
Paul A. Yushkevich, PhD
Associate Professor of Radiology

Nutrition and Nursing
Charlene W. Compher, PhD
Associate Professor of Nutrition Science

ACCESS TO STUDY

Clinical research coordinators will be recruiting patients to participate in the Placenta Project from the following practices:

Maternal Fetal Medicine
Hospital of the University of Pennsylvania
2000 Courtyard Building
3400 Spruce Street
Philadelphia, PA 19104

Helen O. Dickens Center for Women’s Health
Hospital of the University of Pennsylvania
1 West Gates
3400 Spruce Street
Philadelphia, PA 19104

Penn Ob/Gyn Associates
3rd Floor
3701 Market Street
Philadelphia, PA 19104