The cervix is a remarkable structure. It adapts continuously through pregnancy to hold the growing fetus while preparing to eventually allow delivery—a process known as “cervical remodeling.” Doctors and scientists at Washington University in St. Louis believe that how the cervix changes—and why—is an important factor in preterm birth.

In Theme One, scientists plan to develop a next-generation imaging device that may not only provide a window for obstetricians to view the details of cervical remodeling, but also provide a novel method to predict preterm birth.

“The goal of Theme One is to build and test a new, groundbreaking imaging technology called cervical photoacoustic endoscopy, or c-PAE,” says Dr. Lihong Wang, Ph.D., the Gene K. Beare Distinguished Professor of Biomedical Engineering at Washington University. “cPAE uses light and sound synergistically. It will allow us to acquire multiple types of information about the cervical microenvironment in a non-invasive way that we’ve never been able to do before.”

WHAT CERVICAL CHANGES MAY REVEAL

The cervix remodels progressively throughout pregnancy via incompletely understood mechanisms that culminate in altered collagen processing, assembly, and ultimately, structure. Techniques for understanding cervix progression today are rudimentary, and are largely subjective, based on digital examinations or measurement of cervical length. These methods can only detect late events, when the cervix has already softened, shortened or dilated, limiting intervention.

But many changes occur earlier in pregnancy that are undetected, including metabolic, vascular, and microstructural variations. Scientists will also be measuring possible markers of preterm birth, including secreted molecules, microRNAs, and chemical mediators of inflammation from vaginal swabs. They anticipate that some of these could eventually be used to accurately identify women who will deliver prematurely.

STUDY OF 1000 WOMEN

Now that the imaging probe has been built and tested, phase two of the project applies it in 1000 women who receive prenatal care at Washington University Medical Center. The goal will be to establish the changes that define and precede cervical remodeling in both preterm and term deliveries. Women will be tested every six weeks throughout pregnancy. The cervical imaging characteristics from pregnant women who go on to deliver at term is compared to those from pregnant women who deliver preterm. A profile can then be composed so that the earliest cervical features of preterm births can be identified and used for diagnosis and targeting of interventions.

These cervical features on c-PAE will also be matched to levels of the possible markers of preterm birth measured in vaginal swabs. “We will be testing our hypothesis that certain levels of these biomarkers during cervical remodeling will correlate with cervical features from c-PAE and be identified as indicators of preterm birth,” says Methodius Tuuli, M.D., M.P.H., Assistant Professor, Department of Obstetrics and Gynecology, Division of Maternal-Fetal Medicine at Washington University in St. Louis.

This research project will maximize its findings in collaboration with Michal Elovitz, M.D., Professor in the Department of Obstetrics and Gynecology at University of Pennsylvania, and Mala Mahendroo, Ph.D., Professor in the Department of Obstetrics and Gynecology at UT Southwestern. The images will be obtained in conjunction with other testing, such as genetic biomarkers which will allow coordination of findings and a richer and fuller understanding of cervical remodeling in preterm birth.

The cervix’s role during pregnancy is so important that even uterine contractions will not lead to delivery if the cervix is firm, according to research findings. And a soft cervix is associated with preterm birth even in the absence of uterine contractions.
Moms and babies in the U.S. are facing an urgent health crisis:

• In this country 1 in 10 babies is born prematurely each year.

• Worldwide 15 million babies are born prematurely each year.

• Premature birth and its complications are the largest contributors to infant death in the United States and globally.

• More than 380,000 babies are born prematurely in the U.S. each year.

• In addition to the human toll, the societal cost of premature birth is more than $26 billion in the U.S. per year.

• Women of color are up to 50 percent more likely to give birth prematurely and their children can face a 130 percent higher infant death rate.

• In this country black women have maternal death rates over three times higher than women of other ethnicities.

• More than 20 percent of premature babies are born to black women—that’s 1 in 5 babies.

• Employers pay 12 times as much in health care costs for premature/low birthweight babies compared to babies born without these complications.

Because premature birth has many possible causes, each PRC is charged with exploring a different transdisciplinary research target that is likely to be crucial to the prevention of premature birth. Washington University in St. Louis have unique strengths in studying the following areas: sleep patterns, the role of the cervix, and building an imaging device to analyze uterine contractions—all to understand how to predict and prevent preterm birth.

DONATE

For more information on how you can be a part of this effort please contact: 914.997.4492

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