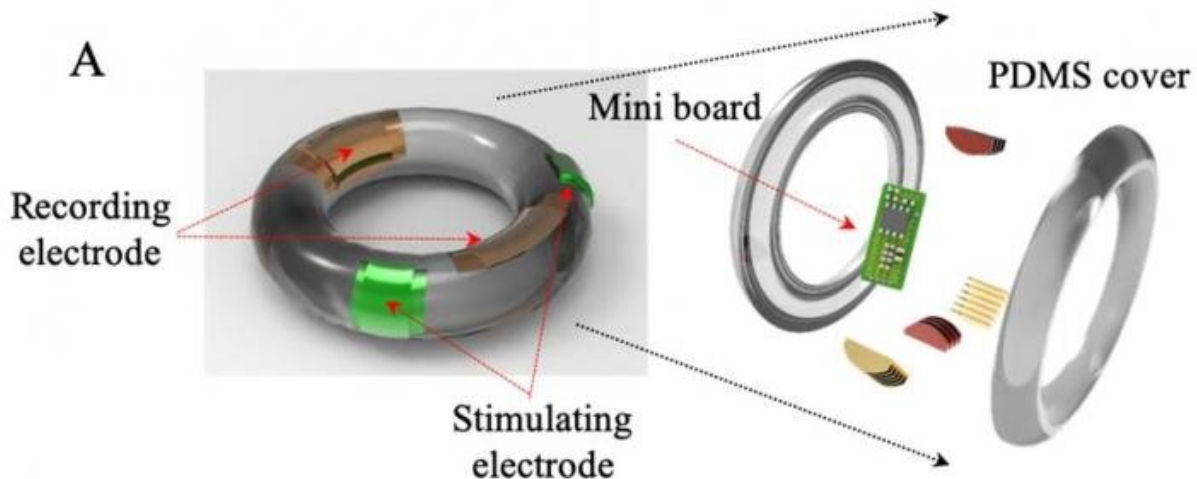


Development of an electroceutical to drastically reduce high-risk, preterm labor

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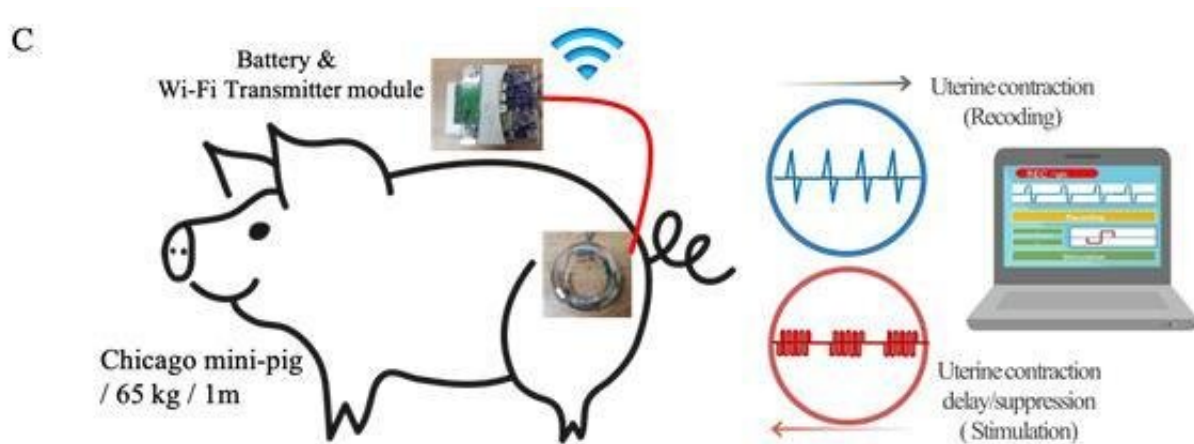
3D conceptual drawing for the ring-shaped electrode with stimulating, recording electrodes, and pre-amplifier. Credit: Korea Institute of Science and Technology(KIST)

Preterm labor comprises 12.7% of all pregnancies. Although the overall rate of pregnancy is decreasing, the occurrence of premature birth due to preterm labor in South Korea has been increasing over the past 7 years. Not only is preterm birth accountable for about a half of all neonatal mortality cases, the neurological deficits in surviving premature infants often lead to problems later in life, such as developmental disorders and respiratory complications. Currently, preterm labor is detected only

when expecting mothers experience abnormal symptoms, or when they undergo a routine test like abdominal ultrasound or a laboratory test for vaginal secretions. It is difficult to detect preterm labor early, and there are few treatment options available other than pharmaceutical agents such as anti-contraction medications, with which side effects are of concern.

The Korea Institute of Science and Technology (KIST) announced that in collaboration with the research team led by Ki Hoon Ahn, Professor at the Department of OB/GYN, Korea University Anam Hospital and Dr. Soo Hyun Lee, the team at KIST Brain Science Institute (BSI) developed a non-invasive electroceutical for the early detection and simultaneous treatment of [preterm labor](#).

While preterm [labor](#) is generally known to have various causes, including naturally occurring early contractions and premature rupture of membranes, a final symptom is irregular uterine contractions. The KIST research team developed a donut-shaped electrode that is inserted into the cervix to sense the signals of uterine contractions in real time, making the early diagnosis of preterm labor possible. Moreover, after sensing the signal of uterine contractions, the electrode can generate an [electrical signal](#), thus functioning as an electroceutical to suppress uterine contractions by relaxing uterine muscles via sympathetic nerve stimulation.



Schematic drawing for acute in-vivo experimental setup at cervix of pregnant minipig using ring electrode with wireless electrical recording and stimulating (RE-WERS) system. Credit: Korea Institute of Science and Technology(KIST)

The research team tested the safety and functioning of this electroceutical system for preterm labor detection and treatment using preterm-labor mouse and pig models, and confirmed that electrical stimulation generated from the system could delay and inhibit uterine contractions.

Professor Ki Hoon Ahn of Korea University Anam Hospital said, "Although new drug research and development (R&D) has been actively performed worldwide, the efficacy was not sufficient enough and there were side effects. We developed this system because there was a clinical need for a medical equipment with a novel mechanism." He also added that, "Infant mortality and the occurrence of sequelae due to preterm labor are expected to drastically decrease with the use of the first-ever medical device controlling uterine contractions."

Soo Hyun Lee, Ph.D., of KIST, contributed by saying that, "The donut-shaped electroceutical is not a therapy based on the existing

pharmaceuticals, but a therapeutic tool to inhibit [uterine](#) contractions via electrical stimulation, and is likely to be developed further as a new concept-based medical technology." He added that, "The research was initiated as a project of the KIST-Korea University Anam Hospital Translation Research Center. In near future, we plan to conduct clinical research with government research grants, like an interagency program for medical device R&D."

More information: Yijae Lee et al, Non-Invasive Ring Electrode With a Wireless Electrical Recording and Stimulating System for Monitoring Preterm Labor, *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (2020). [DOI: 10.1109/TNSRE.2020.3032742](https://doi.org/10.1109/TNSRE.2020.3032742)

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