

New approach to repair fetal membranes may prevent birth complications

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Researchers from Queen Mary University of London and University College London have developed a new approach to repair defects in fetal membranes which could prevent life-long medical conditions and disabilities associated with preterm birth.

The integrity of the fetal membranes that surrounds the baby in the womb during pregnancy is vital for normal development. Once the fetal membranes have ruptured or are damaged, they fail to heal leaving a defect until the end of pregnancy.

This condition is called pre-term premature rupture of the fetal [membrane](#) (PPROM), and is a common cause of preterm birth.

Currently, there are no clinical solutions to improve healing of the fetal membranes after they rupture.

This new research, published in the journal *Scientific Reports*, describes a reason for this poor healing response. The researchers have identified a [molecular mechanism](#) activated during the repetitive stretching of the amniotic membrane

linking the mechanical forces to factors that may cause preterm labour and PPRM.

When the researchers used a combined bioengineering and pharmaceutical approach to knock down a protein called connexin 43 (Cx43), they found the reduction in this molecule encourages rebuilding of the fetal membranes, and enhances the processes of tissue healing and repair, similar to healing skin wounds.

Dr. Tina Chowdhury, lead author of the study from Queen Mary University of London, said: "We are using novel bioengineering tools at Queen Mary which have allowed us to test the tissue in a way that has never been done before. The bioengineering tools give us an understanding of both the mechanical as well as biological mechanisms involved and will help us to develop therapies that will reduce the number of preterm births."

She added: "We hope that that our combined bioengineering and pharmaceutical approach will effectively repair defects in the fetal membranes, therefore allowing the amniotic fluid to reaccumulate around the baby and preventing the life-long medical conditions and disabilities associated with PPRM and preterm birth."

Fetal medicine specialists are increasingly offering surgery to [babies](#) in the womb before birth, to treat abnormalities of the spine, diaphragm or placenta. PPRM complicates around one-third of these cases, which reduces the clinical effectiveness of fetal surgery.

Professor Anna David, a consultant in pre-term birth at University College London Hospital (UCLH), Director of the UCL EGA Institute for Women's Health and a co-author of the paper, said: "Improving fetal membrane healing is a major unmet clinical need for my patients who spontaneously rupture their membranes. We are

now offering fetal surgery at UCLH to close spina bifida in the baby before birth, and the ability to heal the [fetal membranes](#) after surgery would improve baby outcomes. Our findings could lead to a therapy that will prevent preterm birth, with the potential to save many lives worldwide."

Kiki Syrad, Director of Grants at Sparks, the children's medical research charity, said: "Our aim at Sparks is to fund research that will have the [greatest impact](#) for seriously ill children and finding new ways to prevent [preterm birth](#) could have a tremendous impact for some of the 60,000 babies in the UK who are born too soon each year. It's very encouraging to see the exciting and innovative progress being made by Dr. Chowdhury and her team in this important area of child health that can affect babies not only at [birth](#), but also throughout their lives."

More information: 'Targeting mechanotransduction mechanisms and tissue weakening signals in the human amniotic membrane'. David W. Barrett, Rebecca K. John, Christopher Thrasivoulou, Alvaro Mata, Jan A. Deprest, David L. Becker, Anna L. David, Tina T. Chowdhury, *Scientific Reports*, 2019.

Provided by Queen Mary, University of London

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