



NYU



Novel Biomarkers for Detection and Treatment of Immune Deficiencies During Pregnancy

A non-invasive method of detecting immune abnormalities during pregnancy to identify women at risk of infection-induced preterm birth.

Technology Overview

A researcher at NYU Langone Health has discovered a novel microRNA, miRNA-519c, while searching for mediators for endotoxin tolerance in placental extracellular vesicles. This invention uses miRNA-519c as a novel biomarker that provides an easy, non-invasive way of detecting immune abnormalities during pregnancy to identify women at increased risk of infection-induced preterm birth. miRNA-519c affects target cells by inhibiting the phosphodiesterase PDE3B, thereby decreasing production of the pro-inflammatory TNF α that can mediate preterm birth. miRNA-519c levels are maintained during pregnancy but its levels will be significantly reduced in pregnant mothers with inflammatory processes, e.g. chorioamnionitis or premature rupture of membrane, compared to healthy mothers.

Background

Premature birth is a common complication that occurs in around 12% of pregnancies and costs the American healthcare market \$30 billion annually. Premature birth can lead to long-term problems, including various developmental and intellectual disabilities. During pregnancy, the maternal immune system must strike a balance between immunosuppression in order to maintain the pregnancy while at the same time defending against microbial pathogens. Infection is one of the leading causes of preterm birth. Although many pregnant women are exposed to infection, it is unclear why some pregnant women are more prone to infection-induced preterm birth than others are. Immune tolerance/adaptation is a well-described phenomenon by which organs exposed to pathogens become less responsive to subsequent exposures. This is a defense mechanism to protect the tissue from harmful exaggerated inflammation after repeated infections. Failure of this immune tolerance can lead to exaggerated inflammatory response during pregnancy that can lead to inflammation-mediated preterm birth.

This invention describes a specific molecule called miRNA-519c, a placenta-specific miRNA, as a key regulator of endotoxin tolerance during pregnancy. Maintenance of high miRNA-519c levels during pregnancy will protect the pregnant women from immune tolerance failure, hence protection from infection-induced preterm birth. Women with low miRNA519c levels are more prone to infection-induced preterm birth.

Benefits

Technology ID

HAN04-01

Category

Life Sciences/Diagnostics

Life

Sciences/Therapeutics/Women's Health

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- This invention provides a non-invasive way to screen pregnant mothers for immune problems that could pose a risk to the pregnancy.
- miRNA-519c is placenta-specific and thereby reflects the placental immune health.
- This single miRNA marker provides a relatively cheap and efficient method for screening the placental immune microenvironment.

Applications

- miRNA-519c is a biomarker that can test whether a pregnant woman is prone to a health risk, such as premature birth.
- The inventors have elucidated the pathway by which miRNA519c acts on the immune system. Therefore, it can be used to act on the maternal immune system and activate immune-tolerance, which is necessary for reducing inflammation-induced pathologies in pregnancy.

IP Status

Provisional patent application pending [US20210355539A1](#)

References

1. Caterina Tiozzo, Mark Bustoros, Xinhua Lin, Claudia Manzano De Mejia, Ellen Gurzenda, Martin Chavez, Iman Hanna, Paola Aguiari, Laura Perin, Nazeeh Hanna(June 25, 2021) , <https://pubmed.ncbi.nlm.nih.gov/34181894/>
2. Emily A Schiller, Koral Cohen, Xinhua Lin, Rania El-Khawam, Nazeeh Hanna(January 30, 2023) , <https://pubmed.ncbi.nlm.nih.gov/36768944/>