IMMUNOLOGY DURING PREGNANCY

During pregnancy, the immune system adapts to support the baby’s development and coordinate birth. When immunity goes awry, so can the pregnancy, with adverse outcomes such as preterm birth and stillbirth often resulting from aberrant immune activation. Diet or maternal vaccination are examples of how to modulate the immune system to improve pregnancy outcomes.

IMMUNE TOLERANCE AND RESILIENCE
Pregnant individuals must both tolerate a genetically foreign fetus (immune tolerance) and avoid overreacting to the presence of microbes with inflammatory cascades that could jeopardize the pregnancy (immune resilience). To do this, they generate exhaustion-prone T cells that selectively silence killer-cell properties as well as long-lived immunosuppressive T cells. Both appear critical to a healthy pregnancy by averting aberrant immune activation. Conversely, an imbalance in the commensal microbes of the birth canal can trigger immune responses that have been linked with prematurity and other pregnancy complications.

INFLAMMATORY CASCADE CONTROLS BIRTH TIMING
While aberrant immune activation can be disastrous, inflammation plays an important role in the process of birth. Typically initiated starting around 37 to 42 gestational weeks, these inflammatory signals can be prematurely activated and trigger the separation of the maternal and fetal placental layers, leading to preterm birth or stillbirth. Certain dietary interventions such as supplements of omega-3 can reduce preterm labor, and may act by reducing inflammatory processes.

VERTICAL TRANSFER OF MATERNAL IMMUNITY
Antibodies and other immune factors can pass across the placenta from mother to child, as well as through breast milk after birth. This means that a mother’s acquired immunity to pathogens, including through vaccination, can protect the baby after birth. In addition to providing protective antibodies against specific pathogens, maternal immune molecules transferred to the baby can regulate the fetal and newborn immune system. Such factors can support the baby’s in utero immune tolerance to the genetically foreign mother as well as its immune resilience before and after birth, avoiding excessive immune activation by commensal microbes.