

Maternal obesity compromises babies' immune system at time of birth

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Ilhem Messaoudi is an associate professor of biomedical sciences in the School

of Medicine at the University of California, Riverside. Credit: L. Duka.

Almost 60 percent of women of childbearing age in the United States are overweight or obese. Obesity is a major public health issue, and has been linked to health problems like heart disease, cancer and hypertension. It can complicate pregnancy by increasing the mother's risk of having gestational diabetes, preeclampsia, preterm birth or a baby with birth defects. Maternal obesity is also linked to several adverse health outcomes for the infant that can persist into adulthood, such as type-2 diabetes, heart disease and mortality.

But when exactly does the immune system of babies born to [obese mothers](#) get compromised? Very early in the baby's life, according to a new study by a research team led by Ilhem Messaoudi of the University of California, Riverside.

The team analyzed [umbilical cord blood](#) samples of infants born to lean, overweight and obese mothers, and found that pre-pregnancy maternal [weight](#) has a significant impact on the immune system of the neonate, putting such children at risk for potential diseases such as [heart disease](#) and asthma.

The pilot study, performed on 39 mothers in Portland, Ore., is published online in [PubMed](#) and will soon appear in the journal *Pediatric Allergy and Immunology*.

"A number of studies have linked maternal obesity - starting pregnancy with excess weight and gaining a lot of weight during pregnancy - to a higher incidence of cardiovascular disease and asthma in children," said Messaoudi, an associate professor of biomedical sciences in the School of Medicine at UC Riverside. "Our study offers potential links between

changes in the offspring's immune system and the increased susceptibility and incidence of these diseases later in life."

The researchers used established [body mass index](#) (BMI) categories to sort the mothers participating in the study, BMI being a number calculated from height and weight. A mother was considered overweight if her BMI was 25 to 29.9. A mother was considered obese if her BMI was 30 or higher.

The mothers were all non-smoking, had no diabetes, and had an uncomplicated gestation at term. Each mother delivered just one baby. Eleven mothers were lean, 14 were overweight, and 14 were obese. Thirty were white, three were Asian American/Pacific Islander, one was an American-Indian/Alaskan native, and two were African American. The racial identity of three women was unknown.

"We found that very specific immune cells in circulation - monocytes and dendritic cells -isolated from babies born to moms with high BMI were unable to respond to bacterial antigens compared to babies born to lean moms," Messaoudi said. "Such babies also showed a reduction in 'CD4 T-cells.' Both of these changes could result in compromised responses to infection and vaccination."

Further, the researchers found that cells (eosinophils) that play a role in allergic response and asthma pathogenesis were significantly reduced in the umbilical cord blood of babies born to obese mothers. One potential explanation for these observations is that these cells have already moved into the lungs, which could explain the increased incidence of asthma observed later in life in children born to obese mothers.

The research is the first to show the link between [maternal obesity](#) during pregnancy and neonatal immune outcomes, and shows that changes in immunity are already detectable at birth and could persist for

the lifetime of the child into adulthood.

"This could change how we respond to vaccination and how we respond to asthma-inducing environmental antigens," Messaoudi said. "As we know, in the first two years of life, children typically receive plenty of vaccines. The questions that arise are: Are the responses to vaccines in infants born to obese moms also impaired in the first two years of life? Should we change how often we vaccinate children born to obese moms? Should we change practices of how much and how often we vaccinate?"

Messaoudi sees the research paper as a launching point for further studies and a call to action.

"If you are thinking of becoming or are already pregnant, talk to your ob-gyn about weight management, weight gain and the ideal targets for weight gain," she said. "When moms come in for prenatal visits, doctors tell them about smoking, recreational drug use, and alcohol. But they should be talking also about weight and weight management. Obesity has serious repercussions for maternal health. It is associated with low fertility and success with pregnancy. Rates of [gestational diabetes](#), preeclampsia, placental abruption - all of these risks increase dramatically with [weight gain](#) and obesity. So it is important to talk to your doctor about ideal weight entering into pregnancy and throughout pregnancy."

Provided by University of California - Riverside

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