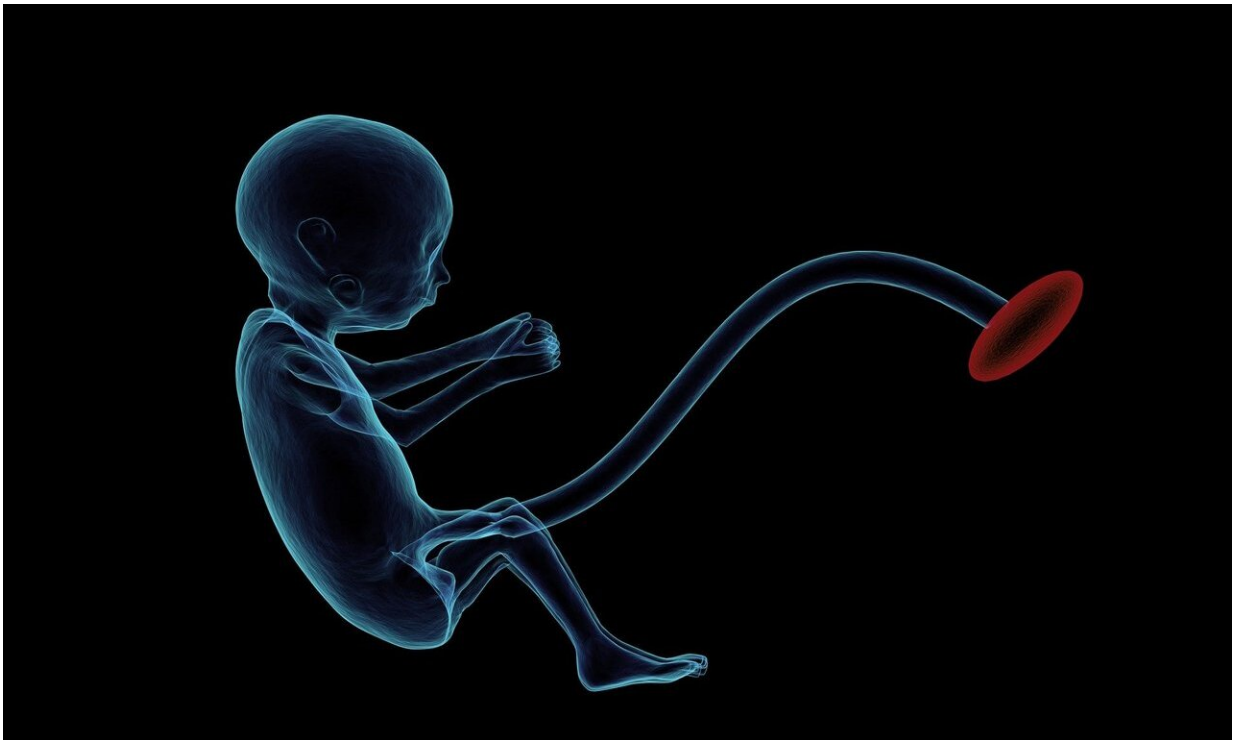


# Placentas adapt when mothers have poor diets or low oxygen during pregnancy

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Cambridge researchers have discovered the placenta regulates how much oxygen and nutrients it transports to babies during challenging pregnancies in a study using mice to model conditions in the womb.

The [placenta](#) is the least understood organ and is notoriously difficult to

study in pregnant women. But its ability to [function](#) properly is vital as it impacts on pregnancy outcomes and the lifelong health of mother and child.

The placenta develops during pregnancy and connects the developing baby to the mother. It serves as the lungs, kidneys, gut and liver for growing babies and carries oxygen and nutrients to the fetus whilst secreting hormones and discarding waste.

Dr. Amanda N Sferruzzi-Perri, a Research Associate at St John's College, University of Cambridge, is the lead author of the new study which has been published in *Proceedings of the National Academy of Sciences (PNAS)*.

The research focused on analysing small parts of the placental cells called mitochondria. Mitochondria are the energy powerhouses found in most cells of the body and use oxygen to convert sugars and fat into energy.

Dr. Sferruzzi-Perri said: "The study analysed how mitochondria in the placenta may alter their function to support both the needs of the placenta and the rapidly growing fetus during a healthy pregnancy, and when the mother is challenged by a less desirable environment.

"We found that in the placenta, mitochondria have a remarkable ability to adapt and compensate for environmental impacts such as when women are living in low oxygen areas at [high altitude](#) and not eating enough of a healthy diet during pregnancy."

Changing lifestyles in society which see women consuming nutritionally deficient diets during pregnancy can cause pregnancy complications and living at high altitudes above 2500m in places such as Bolivia, Peru, Tibet and Ethiopia restricts oxygen levels. It is estimated that around two

per cent of the human population—140 million people—live in areas with low oxygen.

In these conditions the placenta doesn't always function properly and can cause miscarriage, preeclampsia and fetal growth restriction. Around 10 per cent of babies are born with fetal growth restriction—when the baby doesn't grow properly—and it can leave a lasting legacy on their health.

Fetal growth restriction is a strong marker of potential problems with the baby, including stillbirth, death in the first weeks of life, an increased risk of being born with [cerebral palsy](#), behavioural and developmental issues, neurological disorders and chronic diseases later in life such as heart disease, obesity and diabetes.

The team of scientists introduced challenges—known as hypoxic conditions—in the laboratory. They used the mouse as a model, as its placenta develops and functions in a similar way to humans, looking at how the placenta and their mitochondria reacted and what impact this had on the growth of the fetus.

Dr. Sferruzzi-Perri explained: "Mitochondria in the placenta work out how to use oxygen and nutrients in the most efficient way so there is still sufficient for transfer to the fetus even in challenged pregnancies. When the placenta cannot compensate for the challenges then this can lead complications such as fetal growth restriction."

"We know that there is a lasting impact on the health of babies born with fetal growth restriction because organs and tissues like the heart, pancreas, muscles, and liver, are very sensitive when they are developing in the womb. If those organs don't grow properly they are more likely to malfunction in later life."

The aim of the study—the first of its kind—was to understand what is

required for a healthy placenta to perform its vital functions during pregnancy.

Dr. Sferruzzi-Perri added: "Our findings show mitochondria are really important determinants of placental function and support of fetal growth. The next step would be to target [mitochondria](#) in the placenta to alter their function and improve pregnancy success in women where we know the outcome might be poor."

When [babies](#) are born with [fetal growth restriction](#), the team had previously found the buffering mechanism of the placenta was insufficient during pregnancy.

It is hoped the new findings could lead to tests to determine whether the placenta is functioning properly and eventually provide treatments where to restore placental function to the right level for a healthy [pregnancy](#) outcome.

**More information:** Amanda N. Sferruzzi-Perri et al, Placental mitochondria adapt developmentally and in response to hypoxia to support fetal growth, *Proceedings of the National Academy of Sciences* (2019). [DOI: 10.1073/pnas.1816056116](https://doi.org/10.1073/pnas.1816056116)

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