

Pre-pregnancy body weight affects early development of human embryos

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New research indicates that the embryos of women who are overweight or obese at the time they conceive display distinct differences in early development compared to embryos from women of a healthy weight.

The results of the study, published today in the journal *Human Reproduction*, provide strong evidence for a direct link between what mothers eat and the ability of their fertilised eggs to divide and grow. The researchers claim this could potentially have long-term health implications for any children born from these embryos.

The four key findings of the study, which was carried out by researchers at the Hull York Medical School in collaboration with the Hull IVF Unit, were as follows:

- Eggs from women who are overweight or obese (defined as having a BMI between 25 and 29.9kg/m² for overweight women and more than 30kg/m² for [obese women](#)), were significantly smaller in diameter than eggs from women with a BMI considered to be in a healthy range (less than 25kg/m²).
- The smaller eggs from overweight and obese women were less likely to reach a crucial stage of development called the 'blastocyst', which occurs around five days after fertilisation when the embryo resembles a hollow ball of cells.
- Embryos from overweight and obese women that do reach the blastocyst stage, did so on average 17 hours faster than comparable embryos from women of a [healthy weight](#). This accelerated [early development](#) meant that blastocysts from overweight and obese women contained fewer cells, most notably in the outermost layer, which goes on to form a large part of the placenta.
- Embryos from overweight and obese women also showed considerable

alterations in their biochemistry. This included a significantly reduced intake of glucose (an important energy source for early stage embryos) and a significant increase in triglyceride content, which is a type of fat. Embryos from overweight and obese women also showed altered metabolism of some amino acids, which are often described as the 'building blocks' of our cells, muscles and tissues.

Dr Roger Sturmey, from the HYMS Centre for Cardiovascular and Metabolic Research at the University of Hull, said:

"Previous studies have indicated that a mother's weight at conception is associated with increased risk of cardiovascular and metabolic diseases in the children later in life.

"What we have found here, is that being overweight at conception does appear to result in changes to the embryo at a very early stage, and that these changes are most likely the result of the conditions in the ovary in which the egg matured.

"These changes may reduce the chances of conception for [overweight women](#), and may even have long-term health implications for the children of overweight and obese women."

The study involved a total of 368 fertilised eggs from 58 different women (see additional information). All of the women who participated in the study were receiving fertility treatment at the Hull IVF Unit and were fully informed about the research before giving their consent to take part.

Dr Sturmey continued: "This is a small study, which involved only one IVF clinic, but we believe it is the first to examine the impact of a mother's weight on the development and nutrition of human eggs and early stages embryos.

"The research highlights the importance of a healthy pre-pregnancy body weight for not only optimising the chances of conception, but also for safeguarding maternal and child health. However, we are optimistic that with further research, we will be able to provide appropriate and realistic lifestyle advice which may prevent these changes in the early embryo."

The research team are now seeking further funding to uncover the full impact of these modifications, and to investigate whether such changes can be avoided in women who are [overweight](#).

More information: Human embryos from overweight and obese women display phenotypic and metabolic abnormalities", by Christine Leary, Henry J. Leese, and Roger G. Sturmey. *Human Reproduction*. [DOI: 10.1093/humrep/deu276](https://doi.org/10.1093/humrep/deu276)

Provided by University of Hull

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