

You are what your mother eats: First evidence that mother's diet influences infant sex

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New research by the Universities of Exeter and Oxford provides the first evidence that a child's sex is associated with the mother's diet. Published today, in the journal *Proceedings of the Royal Society B: Biological Sciences*, the study shows a clear link between higher energy intake around the time of conception and the birth of sons. The findings may help explain the falling birth-rate of boys in industrialised countries, including the UK and US.

The study focused on 740 first-time pregnant mothers in the UK, who did not know the sex of their fetus. They were asked to provide records

of their eating habits before and during the early stages of pregnancy.

They were then split into three groups according to the number of calories consumed per day around the time they conceived. 56% of the women in the group with the highest energy intake at conception had sons, compared with 45% in the lowest group. As well as consuming more calories, women who had sons were more likely to have eaten a higher quantity and wider range of nutrients, including potassium, calcium and vitamins C, E and B12. There was also a strong correlation between women eating breakfast cereals and producing sons.

Over the last 40 years there has been a small but consistent decline, of about one per 1000 births annually, in the proportion of boys being born in industrialised countries, including the UK, the USA and Canada. Previous research has also shown a reduction in the average energy intake in the developed world.

The ‘obesity epidemic’ is largely ascribed to declines in physical activity and differences in food quality and eating habits. There is also evidence that skipping breakfast is now common in the developed world: in the USA, the proportion of adults eating breakfast fell from 86% to 75% between 1965 and 1991.

Dr Fiona Mathews of the University of Exeter, lead author on the paper, said: “This research may help to explain why in developed countries, where many young women choose to have low calorie diets, the proportion of boys born is falling. Our findings are particularly interesting given the recent debates within the Human Fertilisation and Embryology Committee about whether to regulate ‘gender’ clinics that allow parents to select offspring sex, by manipulating sperm, for non-medical reasons. Here we have evidence of a ‘natural’ mechanism that means that women appear to be already controlling the sex of their offspring by their diet.”

Scientists already know that in many animals, more sons are produced when a mother has plentiful resources or is high ranking. The phenomenon has been most extensively studied in invertebrates, but is also seen in horses, cows and some species of deer. The explanation is thought to lie with the evolutionary drive to produce descendants.

Dr Fiona Mathews said: “Potentially, males of most species can father more offspring than females, but this can be strongly influenced by the size or social status of the male, with poor quality males failing to breed at all. Females, on the other hand, reproduce more consistently. If a mother has plentiful resources then it can make sense to invest in producing a son because he is likely to produce more grandchildren than would a daughter. However, in leaner times having a daughter is a safer bet.”

Although sex is genetically determined by fathers, mothers therefore appear able to favour the development of one sex of infant rather than another. The mechanism is not yet understood in mammals, but it is known from IVF research that high levels of glucose encourage the growth and development of male embryos while inhibiting female embryos. In humans, skipping breakfast depresses glucose levels and so may be interpreted by the body as indicating poor environmental conditions and low food availability.

The group of women taking part in the study was representative of the UK average in terms of the weight, health and lifestyle. The findings showed no evidence of a link between a mother smoking and drinking caffeine prior to pregnancy and the gender of her baby. There was also no correlation between the body mass index (BMI) of a mother and the sex of her child. Although this research provides the first link between a human mother’s diet and the sex of her offspring, there is still no evidence that diet during pregnancy, rather than around the time of conception, plays any role in the sex of a fetus.

Source: University of Exeter

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