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Babies born by caesarean section harbour different microbes than do those born vaginally.

HEALTH

Do C-section babies need mum’s microbes?

Scientists begin trials to test whether swabbing infants with bacteria affects their health.

BY SARA REARDON

When a baby passes through its mother’s birth canal, it is bathed in a soup of microbes. Those born by caesarean section (C-section) miss out on this bacterial baptism, and researchers are split on whether that increases the risk of chronic health problems such as obesity and asthma.

A wave of clinical trials now under way could help to settle the question — and feed into the debate over whether seeding babies born by C-section with their mother’s vaginal bacteria is beneficial or potentially harmful. At

least four sets of researchers — in the United States, Sweden and China — have begun separate experiments, in which they are swabbing hundreds of C-section babies with their mother’s microbes, then comparing them against a control group.

Each team plans to monitor its study participants over several years in the hope of learning more about how the collection of microbes in their bodies might influence weight, allergy risk and other factors.

But some scientists say that the trials could expose C-section babies to infection, or encourage mothers to try do-it-yourself

swabbing, without much evidence that there is a benefit. “It’s not clear to me exactly what disease we’re trying to prevent or treat,” says Adam Ratner, a microbiologist at New York University in New York City. In the worst-case scenario, he says, “you’ve taken a kid with low risk of infection and you’ve rubbed herpes all over their face”.

The idea that birth mode might affect health gained traction in 2010, when microbial ecologist Maria Gloria Dominguez Bello at Rutgers University in New Brunswick, New Jersey, found that babies delivered surgically harboured different collections of bacteria than ▶

► did those born vaginally¹. C-section babies, which comprise more than 30% of births in the United States, are also more prone to obesity and immune diseases such as diabetes².

Dominguez Bello and her colleagues suspect that bacteria could be the long-sought link between birth method and long-term health. Experiments show that mice born by C-section are more prone to obesity and have impaired immune systems³. There are fewer factors that could account for these differences in the rodents, which can be studied in controlled conditions, than in people.

But many scientists say there is no evidence that differing exposure to vaginal microbes at birth can help to explain variation in people's health over time. "Right now, that whole concept is in very much a state of uncertainty," says David Aronoff, an infectious-disease researcher at Vanderbilt University in Nashville, Tennessee. "It's easy to make a logical argument that sounds great, but underneath it might not be solid data."

Aronoff says that differences in microbe exposure at birth and later health could be caused by other factors, such as whether a mother takes antibiotics during her surgery, and whether a baby is breastfed or has a genetic predisposition to obesity. He argues that the only way to isolate any effect from method of birth is through the sort of large, randomized, controlled clinical trials that are now under way.

Dominguez Bello's team began recruiting 50 pregnant women last August for a study that will swab C-section babies with their mothers' microbes. A second US trial, at the Icahn School of Medicine at Mount Sinai in New York City, is recruiting 120 pregnant women with a family history of allergies. Scientists will compare swabbed C-section babies with a placebo group and with infants born vaginally.

Researchers in Sweden began a similar experiment in March, with the goal of swabbing 100 C-section infants with their mothers' vaginal and anal bacteria. Gastroenterologist Lars Engstrand at the Karolinska Institute in Stockholm says that his team will monitor the babies over two years for signs of asthma and dermatitis. And a fourth trial, in China, began recruiting roughly 100 mothers last November. Scientists will seed these women's babies with vaginal bacteria and track their body mass index and allergy risk.

The researchers behind these trials are rigorously screening participating mothers for microbes such as group B streptococcus — a common vaginal bacterium that causes respiratory problems in newborns.

Still, some researchers say the experiments should not be done, given the lack of evidence that swabbing infants produces any benefit. "You'd have to be sure that you understand the mechanism and the trial is based on good science," says Jeffrey Keelan, a gynaecologist at

the University of Western Australia in Perth.

Some scientists also worry that physicians and mothers will swab babies with vaginal microbes without proper oversight. Scattered reports in media and medical journals suggest that some women are trying the technique on their own. In 2017, the American College of Obstetrics and Gynecology issued guidelines stating that vaginal seeding shouldn't be performed except in the context of a clinical trial.

And gynaecologist Kjersti Aagaard of Baylor College of Medicine in Houston, Texas, says that the focus on vaginal seeding could be too narrow. She thinks that microbes' influence on long-term health can begin before birth, due to factors such as a mother's diet that influence the bacteria babies pick up. By focusing on vaginal seeding, researchers are "missing actual opportunities to improve offspring health", she said in June at the American Society for Microbiology meeting in San Francisco, California.

The scientists behind the current wave of seeding trials are pushing ahead. "We're trying to repair and partially restore something that is normally in the environment of babies being born," Dominguez Bello says. "As with everything, history will tell." ■

1. Dominguez-Bello, M. G. *et al. Proc. Natl Acad. Sci. USA* **107**, 11971–11975 (2010).
2. Sevelsted, A., Stokholm, J., Bønnelykke, K. & Bisgaard, H. *Pediatrics* **135**, e92–e98 (2015).
3. Martinez, K. A. *et al. Sci. Adv.* **3**, eaao1874 (2017).

PEOPLE

Head of DNA lab suspended

Alan Cooper faces allegations that he bullied co-workers at Australian Centre for Ancient DNA.

BY DYANI LEWIS

The leader of Australia's premier ancient-DNA laboratory, Alan Cooper, has been suspended following an investigation into the 'culture' at the centre and amid allegations of bullying from his co-workers. Cooper is renowned for using ancient DNA to reconstruct how humans populated the planet.

On Monday, the University of Adelaide notified students and staff at its prestigious Australian Centre for Ancient DNA (ACAD) that Cooper has been suspended pending "the outcome of further processes".

Cooper's suspension comes after the university engaged an external firm to conduct a "culture check" of ACAD in July. "Following on from the information provided, the University has decided to take further action," a spokesperson for the university told *Nature*. The university did not name Cooper as a focus of the probe, and did not say what prompted it, but allegations that he had bullied students had surfaced on social media and blogs a month earlier.



The University of Adelaide carried out a "culture check" of its prestigious ancient-DNA centre.

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