

Press release – 4 July 2023

C-section delivery disrupts gut barrier in newborns

The caesarean section, one of the most common surgeries worldwide, saves the lives of mothers and babies every year. One consequence of c-section delivery, however, is a disruptive effect on the development of gut microbiota in newborns. This is followed by a series of chain reactions that results in a predisposition to intestinal inflammation in adulthood. The results of this study, carried out jointly with Université Paris-Saclay, appear in the journal *Microbiome* on 3 July.

C-section delivery, which involves an incision in the abdomen and uterus of the mother, is a surgical procedure performed in place of a natural delivery. In France, the procedure is used in 20% of all births.

Natural delivery is a key moment in microbiota transmission from mother to child, and caesarean delivery disrupts this transfer. Such a disruption has recently been shown to impair immune system development and create a predisposition in children to conditions such as allergies, obesity and intestinal inflammation¹. But which link in the chain causes these effects?

This question was the primary focus of a new study by INRAE researchers, in co-operation with Université Paris-Saclay, to decipher the role of gut barrier-microbiota imbalances in early life and links to the risk of intestinal inflammation later in life.

Research was based on the study of mice born by caesarean section. Based on their findings, scientists noted that these mouse pups had a highly diverse microbiota in the days following their birth. This caused an excessive stimulation of the intestine that led to an alteration in mucosal structure² and an inflammatory reaction. Specifically, the cells that produce mucus were disrupted. This viscous substance is one of the body's first lines of defence in the intestine.

Is there a remedy? The scientists supplemented the diet of the newborn mice with Lactobacilli. This bacterial group, occurring naturally in the intestine and beneficial to microbiota balance and health, were the most affected by caesarean delivery in the mice. Supplementation made it possible to eliminate sensitivity to inflammation.

Such early-life alterations in the microbiota therefore disrupt gut development and could explain excessive sensitivity to inflammation in adulthood. Potential solutions are emerging to compensate for this alteration.

¹ *Microorganisms*. 2021 Oct 9;9(10):2122. doi: 10.3390/microorganisms9102122. From Short- to Long-Term Effects of C-Section Delivery on Microbiome Establishment and Host Health David Ríos-Covian 1, Philippe Langella 1, Rebeca Martín 1

² Cells lining the intestine that produce a protective mucus layer.

Reference

Barone M, Ramayo-Caldas Y, Estellé J, Tambosco K, Chadi S, Maillard F, Gallopin M, Planchais J, Chain F, Kropp C, Rios-Covian D, Sokol H, Brigidi P, Langella P, Martín R. Gut barrier-microbiota imbalances in early life lead to higher sensitivity to inflammation in a murine model of C-section delivery. *Microbiome*. 2023 Jul 3;11(1):140. doi: 10.1186/s40168-023-01584-0. PMID: 37394428.

Scientific contact:

Rebeca Martin-Rosique - rebeca.martin-rosique@inrae.fr

Micalis Research Unit

MICA Division

The Ile-de-France Jouy-en-Josas-Antony centre

Press contact:

INRAE Press Office: 01 42 75 91 86 – presse@inrae.fr

www.inrae/presse

About Université Paris-Saclay

Université Paris-Saclay was born from the shared ambition of French universities, grandes écoles and national research organisations. As a leading university in Europe and the world, it covers the fields of science and engineering, life sciences and health, and humanities and social sciences. The university's science policy closely intertwines research and innovation, incorporating both basic and applied science to tackle major societal challenges. Université Paris-Saclay offers a varied range of undergraduate to doctorate level degrees, including programmes with its grandes écoles, all of which are focused on achieving student success and employability. The university prepares students for an ever-changing world where the ability to think critically, remain agile and renew one's skills are crucial. Université Paris-Saclay also offers a comprehensive range of lifelong learning courses. Located to the south of Paris, the university extends across a vast and rich local area. Its location strengthens both its international visibility and its close ties with its socio-economic partners (major companies, SMEs, start-ups, local authorities, charities).

www.universite-paris-saclay.fr