

**Media contact**

Rhiannon Bugno

+1 254 522 9700

[Biol.Psych@sobp.org](mailto:Biol.Psych@sobp.org)

### **Subtle inflammation *in-utero* contributes to mental health risks**

*Maternal diet, cord blood cytokines offer clues*

**Philadelphia, December 15, 2020** – The *in-utero* environment is a major determinant of fetal brain health and perturbations in the environment can lead to long-term developmental effects. For example, maternal illness or infection during pregnancy has been linked to multiple neurodevelopmental and mental health conditions in children. Now, two papers highlight the lasting effects of more subtle maternal inflammation on children’s mental health.

In [one study](#), by Kinga Polanska, PhD, and colleagues, maternal diet during pregnancy was a factor in determining offspring mental health: children whose mothers ate a poorer-quality or more pro-inflammatory diet while pregnant had a higher risk for emotional and behavioral symptoms at 7 to 10 years of age.

A [second study](#) from Cédric Galera, MD, PhD, and colleagues also found lasting behavioral consequences of early-life immunity by examining blood samples from human umbilical cord, which contain a milieu of both maternal and fetal factors. Lower levels of a particular immune signal were associated with the development of depression and anxiety symptoms at ages 3, 5 and 8.

Both studies appear in [Biological Psychiatry](#), published by Elsevier.

The study of maternal diet during pregnancy was based on data from four European countries, representing a variety of dietary patterns and socio-economic and lifestyle characteristics. Based on self-report, maternal diets were scored on two metrics: one of nutritional quality and one measuring inflammatory potential. Those dietary indices provide a more holistic picture of diet than previous studies measuring selected nutrients, for example.

“This is the first study evaluating the impact of both inflammatory potential and quality of maternal diet during pregnancy on their offspring’s mental health,” said Professor Polanska. “This overview of habitual diet is important for developing more effective public health guidelines focusing on dietary recommendations for pregnant women.”

In general, a poor diet is thought to produce inflammation by fostering unhealthy bacteria in the gut that irritate or invade the gut lining. That makes the gut lining leaky, allowing proteins from the gut to enter the blood, stimulating an immune response that evokes systemic inflammation. The current studies did not examine this mechanism, however.

The second study, said Professor Galera, “confirms that early immune changes, measured in cord blood, may contribute to subsequent anxiety and depression symptoms in childhood.”

Professor Galera and colleagues collected cord samples at birth from 871 mother-child pairs, who were part of a French cohort undergoing long-term study. They measured an array of cytokines – immune signaling molecules that can be pro- or anti-inflammatory. Although the team looked at so-called “networks” of interacting cytokines, one stood out. Interleukin 7 (IL-7) in particular was associated with a trajectory of development of depression and anxiety symptoms.

“This work is original because most prior knowledge in this area arises from animal studies,” said Professor Galera, rather than human samples. And epidemiological studies have not previously focused on cytokines at birth, which he says “is a highly relevant biological matrix to measure early biomarkers” of mental illness. Although prevention of anxiety and depression by targeting immune dysregulation “is still far off in humans, it is now clearly on the agenda of animal research,” Professor Galera added.

“These two papers provide provocative new evidence that maternal factors promoting inflammation may have consequences for inflammation in their babies which, in turn, may increase the risk for symptoms like anxiety and depression,” said John Krystal, MD, Editor of *Biological Psychiatry*. “Medicine has always advocated that pregnant women consume a healthy diet. However, this definition of ‘healthy’ may now need to include diets that minimize maternal inflammation.

“Future research will be needed to more clearly establish the links between maternal diet, maternal inflammation, fetal inflammation, and the later negative behavioral outcomes.”

---

#### **Notes for editors**

The first article is “Dietary quality and dietary inflammatory potential during pregnancy and offspring emotional and behavioral symptoms in childhood: an individual participant data meta-analysis of four European cohorts,” by Kinga Polanska, Pawel Kaluzny, Adrien M. Aubert, Jonathan Y. Bernard, Liesbeth Duijts, Hanan El Marroun, Wojciech Hanke, James Hébert, Barbara Heude, Agnieszka Jankowska, Giulia Mancano, Sara Mensink-Bout, Caroline Relton, Nitin Shivappa, Matthwe Suderman, Elzbieta Trafalska, Ewelina Wesolowska, Raquel Garcia-Esteban, Mònique Guxens, Maribel Casas, and Catherine Phillips (<https://doi.org/10.1016/j.biopsych.2020.10.008>).

The second article is “Cord serum cytokines at birth and children’s anxiety-depression trajectories from 3 to 8 years,” by Cédric Galera, Susana Barbosa, Ophélie Collet, Olfa Khalfallah, Bruno Aouizerate, Anne-Laure Sutter-Dalley, Muriel Koehl, Lucile Capuron, Judith Van der Waerden, Maria Melchior, Sylvana Côté, Barbara Heude, Nicolas Glaichenhaus, Laetitia Davidovic, on behalf of the EDEN Mother-Child cohort group (<https://doi.org/10.1016/j.biopsych.2020.10.009>).

The articles both appear as Articles in Press in *Biological Psychiatry*, published by [Elsevier](#).

Copies of these papers are available to credentialed journalists upon request; please contact Rhiannon Bugno at [Biol.Psych@sobp.org](mailto:Biol.Psych@sobp.org) or +1 254 522 9700. Journalists wishing to interview the authors may contact Cédric Galera at [cedric.galera@u-bordeaux.fr](mailto:cedric.galera@u-bordeaux.fr) or +33 556561719, or Kinga Polanska at [kinga.polanska@imp.lodz.pl](mailto:kinga.polanska@imp.lodz.pl) or +48 426314569.

The authors’ affiliations and disclosures of financial and conflicts of interests are available in the article.

John H. Krystal, MD, is Chairman of the Department of Psychiatry at the Yale University School of Medicine, Chief of Psychiatry at Yale-New Haven Hospital, and a research psychiatrist at the VA Connecticut Healthcare System. His disclosures of financial and conflicts of interests are available [here](#).

### **About *Biological Psychiatry***

*Biological Psychiatry* is the official journal of the [Society of Biological Psychiatry](#), whose purpose is to promote excellence in scientific research and education in fields that investigate the nature, causes, mechanisms and treatments of disorders of thought, emotion, or behavior. In accord with this mission, this peer-reviewed, rapid-publication, international journal publishes both basic and clinical contributions from all disciplines and research areas relevant to the pathophysiology and treatment of major psychiatric disorders.

The journal publishes novel results of original research which represent an important new lead or significant impact on the field, particularly those addressing genetic and environmental risk factors, neural circuitry and neurochemistry, and important new therapeutic approaches. Reviews and commentaries that focus on topics of current research and interest are also encouraged.

*Biological Psychiatry* is one of the most selective and highly cited journals in the field of psychiatric neuroscience. It is ranked 7<sup>th</sup> out of 155 Psychiatry titles and 12<sup>th</sup> out of 271 Neurosciences titles in the Journal Citations Reports® published by Clarivate Analytics. The 2019 Impact Factor score for *Biological Psychiatry* is 12.095. [www.sobp.org/journal](http://www.sobp.org/journal)

### **About Elsevier**

As a global leader in information and analytics, [Elsevier](#) helps researchers and healthcare professionals advance science and improve health outcomes for the benefit of society. We do this by facilitating insights and critical decision-making for customers across the global research and health ecosystems.

In everything we publish, we uphold the highest standards of quality and integrity. We bring that same rigor to our information analytics solutions for researchers, health professionals, institutions and funders.

Elsevier employs 8,100 people worldwide. We have supported the work of our research and health partners for more than 140 years. Growing from our roots in publishing, we offer knowledge and valuable analytics that help our users make breakthroughs and drive societal progress. Digital solutions such as [ScienceDirect](#), [Scopus](#), [SciVal](#), [ClinicalKey](#) and [Sherpath](#) support strategic [research management](#), [R&D performance](#), [clinical decision support](#), and [health education](#). Researchers and healthcare professionals rely on our 2,500+ digitized journals, including [The Lancet](#) and [Cell](#); our 40,000 eBook titles; and our iconic reference works, such as *Gray's Anatomy*. With the [Elsevier Foundation](#) and our external [Inclusion & Diversity Advisory Board](#), we work in partnership with diverse stakeholders to advance [inclusion and diversity](#) in science, research and healthcare in developing countries and around the world.

Elsevier is part of [RELX](#), a global provider of information-based analytics and decision tools for professional and business customers. [www.elsevier.com](http://www.elsevier.com)

### **Media contact**

Rhiannon Bugno, Editorial Office  
*Biological Psychiatry*  
+1 254 522 9700  
[Biol.Psych@sobp.org](mailto:Biol.Psych@sobp.org)