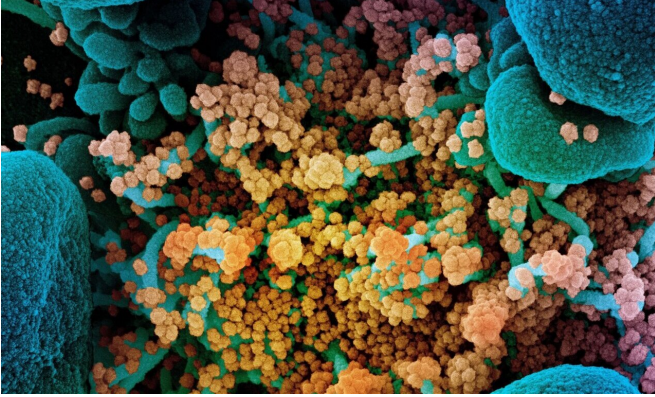


# COVID-19 transmission from mother to fetus confirmed by proteomics

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Colorized scanning electron micrograph of a dying cell (blue) heavily infected with SARS-CoV-2 (yellow), the virus that causes COVID-19. Credit: NIAID Integrated Research Facility, Fort Detrick, Maryland.

Researchers from Skoltech were part of a research consortium studying a case of vertical COVID-19 transmission from mother to her unborn child that resulted in major complications in the pregnancy, premature birth and death of the child. The consortium used a Skoltech-developed proteomics method to verify the diagnosis. The paper was published in the journal *Viruses*.

The effects of SARS-CoV-2, the novel [coronavirus](#), on maternal and perinatal outcomes are poorly understood due to limited data and research in pregnant women with COVID-19. There is some evidence suggesting vertical transmission from mother to fetus during pregnancy is possible, as, for instance, in China, immunoglobulin M (IgM) antibodies were found in babies born to mothers with positive SARS-CoV-2 tests.

Most known cases of COVID-19 in pregnant women have been in the third trimester of pregnancy, yet it is in the second trimester that the immune system of the mother is significantly less

active. Professor Evgeny Nikolaev, Dr. Alexey Kononikhin and Dr. Alexander Brzhozovskiy of Skoltech and their colleagues in the consortium report the case of a healthy 27-year-old woman who got moderately sick with COVID-19 during the 21st week of her pregnancy.

After two weeks of illness when the patient had already tested negative for SARS-CoV-2 and had no symptoms, an ultrasound scan detected severe abnormalities with the fetus, including growth restriction and impaired [blood flow](#) in the umbilical artery. A premature boy was born via cesarean section two weeks later and died after a day and a half in NICU. The patient had no previous risk factors of severe neonatal pathology, and the pregnancy had developed normally until COVID-19.

The child tested positive for COVID-19 IgG antibodies, and a PCR test on the placenta and umbilical cord blood was positive for three SARS-CoV-2 and SARS-CoV-like genes. "The results of independent polymerase chain reaction (PCR), mass spectrometry and immunohistochemistry analyses of placenta tissue, umbilical cord blood and child blood jointly indicated vertical transmission of SARS-CoV-2 from mother to the fetus, which we conclude to be the major cause for the development of maternal vascular malperfusion in the studied case," the paper notes.

The results also present the first confirmation of SARS-CoV-2 proteins in infected placenta by proteomics and confirm the potential of mass-spectrometry approaches for detecting SARS-CoV-2 in biological fluids and tissues.

"The mass spectrometry based method of virus detection used in this study was developed at Skoltech last year. In this method, the S- and N-proteins of the virus are unambiguously detected. This approach provides 100%-selectivity for virus detection, making [mass spectrometry](#) the gold standard for COVID diagnostics. The method can

be used without any modification for detection of the SARS-CoV-2 virus with any mutations," Professor Nikolaev says.

"The studied case clearly showed that transplacental transmission of SARS-CoV-2 infection is possible not only in the last trimester of pregnancy, but also in earlier stages of [pregnancy](#). Transplacental transmission can cause the inflammation of placenta and neonatal viremia with the damage of various organs and systems," the authors conclude.

**More information:** Gennady Sukhikh et al. Vertical Transmission of SARS-CoV-2 in Second Trimester Associated with Severe Neonatal Pathology, *Viruses* (2021). [DOI: 10.3390/v13030447](#)

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