IMMUNOSYSTEM EVALUATION OF CHILDREN BORN TO MOTHERS WITH COVID-19

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Annotation: *This article describes the health of infants born to mothers infected with Covid-19, the impact of the disease on the health of mother and child, the immune system of infants born to infected mothers, based on experiments by American and Canadian scientists.*

INTRODUCTION

Coronavirus infection is a disease affecting mammals and birds, having strict species affiliation. In humans, the infection proceeds as an acute respiratory tract disease with a polymorphic clinical picture – from mild catarrh of the upper respiratory tract to severe lesions of the lower respiratory tract with high mortality. To date, six human coronaviruses (HCoV) have been known: 229E, HKU1, NL63, OC43 associated with ARVI, as well as "reassortant" viruses SARS-CoV and MERS-CoV, which caused outbreaks of severe respiratory infections [1]. The new coronavirus, which appeared at the end of 2019 in China, is the third of the "reassortant" viruses of this group since the beginning of the XXI century. The virus was identified in early January 2020, initially receiving the name 2019-nCoV. On February 11, 2020, the International Committee on the Taxonomy of Viruses, taking into account the genetic relationship with the causative agent of the outbreak of severe acute respiratory syndrome (SARS, SARS), assigned the new virus the name SARS-CoV-2 8 (severe acute respiratory syndrome coronavirus-2) [2]. Currently, SARS-CoV-2 is classified as a new betacoronavirus, line B (subgenus Sarbecovirus), which also includes the SARS-CoV virus that caused SARS (severe acute respiratory syndrome) in 2002-2003 [3]. Children are susceptible to COVID-19 in the same way as adults. But the reasons for the milder course of infection in children remain unclear, and there are many hypotheses that require further research [9]. Given the high proportion of asymptomatic and mild forms 9, children are currently considered as potential sources of infection. At the same time, testing of the child population in the foci does not confirm their high infection rate, and the main infection of children occurs in family foci or medical institutions (maternity hospitals) [10,11]. In the first study conducted in February 2020, nine pregnant women with laboratory-confirmed COVID-19 pneumonia found no evidence of intrauterine infection caused by vertical transmission from mother to child, and therefore all cases are considered acquired after birth [11]. As the incidence increased, the number of newborns from mothers with COVID-19 increased. Currently, there are descriptions of three cases of postnatal transmission, in children born to pregnant women with laboratory-confirmed

COVID-19, occurring with pneumonia [21]. All three children were male, two were born on time. One child was born at 32 weeks of pregnancy with an Apgar score of 3/5 points. Delivery in all cases was artificial (cesarean section). Clinical symptoms manifested in the first 48 hours from birth, and the diagnosis of COVID-19 was confirmed in the laboratory at the same time. Fever and drowsiness were observed in two full-term children. All three were radiographically diagnosed with pneumonia. A premature baby developed acute respiratory distress syndrome with respiratory failure. Taking into account the data available today, the criteria for a presumptive diagnosis of neonatal COVID-19 infection may be:

• at least one clinical symptom, including unstable body temperature, low activity or poor nutrition, or shortness of breath;

• changes on the chest X-ray showing anomalies, including unilateral or bilateral changes of the "frosted glass" type;

• the presence among family members or caregivers of people with confirmed COVID-19 infection or

• close contact with people with confirmed COVID-19 infection, or patients with

severe pneumonia [22]. As the studies show, the clinical manifestations of lower respiratory tract lesions in children are not pronounced and are nonspecific. No auscultative changes have been described in any study, and therefore a combination of cough, fever, shortness of breath and a decrease in oxygen saturation can serve as signs of an inflammatory pulmonary process. The presence of all four symptoms suggests a severe course of COVID-19 and serves as an indication for emergency chest CT. At the same time, changes on CT may be noted in children with mild and asymptomatic forms, but these same changes may not be visualized with an overview radiography, and therefore chest CT is the preferred method for imaging. Chest CT changes 86.2% 64.9% "Frosted glass" symptom 56.4% 32.7% Local consolidates 41.9% 18.7% Bilateral consolidates 51.8% 12.3% Interstitial Changes 14.7% 1.2% Suspicion of COVID-19 in children is based on a combination of clinical and epidemiological data with subsequent laboratory confirmation of the diagnosis in the reference laboratory. The diagnostic requirements are the same for children and adults. The key laboratory in the Russian Federation is the Federal State Budgetary Institution of the World Bank "Vector" of Rospotrebnadzor, on the basis of which there is a Reference Center for Monitoring coronavirus Infectious Diseases [49]. This center is one of the 16 WHO reference laboratories (one of five in the WHO European Region) providing confirmatory testing for SARS-CoV-2 [50]. The immunosuppressive effect is manifested in many viral infections, especially in the development of severe clinical forms. Suppression of immunity often leads to the chronization of the infectious process, the development of severe complications of viral infections. The development of immunodeficiency, suppression of specific and nonspecific cellular and humoral immunity are recorded: a decrease in the functional activity of EC, macrophages, the level of interaction of immunocompetent cells, a violation of antibody formation, etc. Interferon

deficiency is also detected: decreased ability of leukocytes, fibroblasts and immune lymphocytes to produce alpha, beta and gamma interferons, respectively. The violation of immunity is not only of a general systemic nature, but also of a local nature: a decrease in mucosal immunity (mucosal immunity), interferon formation in the foci of viral lesions. The immunosuppressive effect of viral infections is due to the affinity (tropism) of many viruses to cells of the monocyte-macrophage system (MMC), T-helper cells, polymorphonuclear neutrophils and other immunocytes. Transient immune disorders develop in many viral infections. Taking into account the above, the algorithm of diagnostic and therapeutic activities of a doctor in relation to patients 1) immunological diagnostics: detection of immune disorders by studying the indicators of general and specific antiviral immunity, especially in severe, progressive, torpid course of viral infections. It should be noted that the determination of immune status indicators in recurrent viral infections is more informative at the stage of exacerbation of persistent infections;

2) pathogenetic immunotherapy with the help of immunomodulators, adequately identified immune disorders in order to correct them;with viral infections should include the following stages:

3) repeated immunological testing after immunotherapy for to determine its effectiveness and achieve complete immunorehabilitation of patients. Thus, as criteria for effective therapy of patients, in addition to clinical, virological (disappearance of virus replication markers), an immunological criterion (normalization, optimization of immune status indicators) should also be used, indicating the most reliable stable remission. In the context of the current 2019 coronavirus disease pandemic (COVID-19), pregnant women wondered whether they and/or their children were at increased risk due to the direct or indirect consequences of contracting severe acute respiratory syndrome 2 coronavirus. (SARS-CoV-2). A new study recently published as a preprint on the medRxiv* server indicates that babies born to mothers who were infected two or more months before giving birth are protected by maternal antibodies, in addition to causing a strong immune response in case they become infected during pregnancy. the perinatal period. The transmission of passive immunity to the fetus through the placenta depends on the production of high levels of effective neutralizing antibodies in the mother and their persistence in the fetus for a long period of time. The present study was aimed at studying this phenomenon when infected with SARS-CoV-2 during pregnancy to help form recomm Many early researchers have shown that maternal antibodies to COVID-19 were transmitted through the placenta, but most of these infections occurred later in pregnancy. The question remains, at what stage of pregnancy does the immune system react most strongly and when does the transplacental transfer of antibodies occur most effectively? If a child becomes infected, what kind of immune response occurs? And how long do antibodies, active or passive, persist in a child after birth? In order to find answers to these questions, experiments and studies conducted by US government experts were conducted. According to the experiments, 145 mothers, mainly of Latin American origin,

infected with SARS-CoV-2, and 147 children were included in the study. Of the total, about 60% (86) had symptoms, the majority (78) showed only mild or moderate symptoms.endations for vaccination of expectant mothers and infants against COVID-19.

The results show a high correlation between maternal antibodies and passively acquired fetal antibodies. While 65% of mothers were seropositive at birth, umbilical cord blood showed a positive level of antibodies to immunoglobulin G (IgG) 58% at this point in time. When testing paired samples from 125 mother-child pairs, 90% parity was observed (60 seropositive infants from 77 seropositive mothers). Of the remaining eight, seven were born within 45 days after the first positive PCR test from the mother, and the last one was born 254 days after the first positive test. There were 48 seronegative mothers, and 94% (45) of their children had the same result. In three infants, IgM was detected in the umbilical cord blood, as well as in their mothers, during childbirth. Two of them showed subsequent negative results for both IgG and IgM, the third was lost for follow-up. All three had negative RT-PCR results. Thus, paired samples showed a high degree of correlation. The median coefficient of transplacental IgG transfer was 1. However, it ranged from higher levels in mothers with severe or critical COVID-19 to low levels in mothers with asymptomatic infection or mild to moderate infection.

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