

Immuno-Biochemical Diagnostics of Jaundice in Newborns

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Abstract: This article describes the origin, types and preventive measures of early diagnosis of neonatal jaundice.

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Jaundice of newborns is the appearance of icteric discoloration of the skin and mucous membranes in children in the first days of their life due to a violation of bilirubin metabolism. There are two types of newborn jaundice:

- Physiological jaundice - disappears without a trace within a short period of time;
- Pathological jaundice is caused by diseases and often requires close medical monitoring.

Physiological jaundice in newborns. Physiological jaundice is the most common jaundice in newborn babies. It occurs in approximately 60-70% of babies and appears 3-4 days after birth. This condition is not a disease and goes away over time. It is associated with the immaturity of some systems of the child's body responsible for the metabolism of a special substance – bilirubin [1].

Bilirubin is a reddish-yellow pigment that is formed when hemoglobin is broken down. As it is deposited in the skin in ever greater quantities, the skin becomes yellow in color. With physiological jaundice, the general condition of children, as a rule, does not suffer. Only if it is very pronounced, babies become drowsy, suck lazily, and sometimes vomit. The severity of jaundice is judged not by external manifestations, but by the level of indirect bilirubin in the blood. It reaches its maximum on the 3rd day of the child's life. The child's body "fights" excess bilirubin by binding it to the blood protein albumin, thereby preventing its toxic effect. But this doesn't always happen [2].

With a very strong increase in bilirubin levels, albumin cannot "block" it completely, and it penetrates the nervous system. This can have a toxic effect, primarily on vital nerve centers, the brain. This condition is called "kernicterus" or "bilirubin encephalopathy" [3].

Pathological jaundice in newborns. Pathological jaundice most often appears during the first days after birth. Often, the liver and spleen become enlarged, feces may become discolored, and the urine becomes dark in color; sometimes bruises and pinpoint hemorrhages spontaneously appear on the newborn's skin. A blood test shows signs of increased breakdown of red blood cells (hemolysis) and anemia.

If mother and newborn are incompatible by blood type and/or Rh factor, massive destruction (hemolysis) of red blood cells occurs [4]. Severe jaundice often occurs if the mother has a negative blood type and the child has a positive blood type. It is believed that with each subsequent pregnancy the risk of such complications increases. It is for this reason that it is especially dangerous for women with a negative Rh factor to have an abortion.

Conjugation jaundice. It occurs when enzymes, for some reason, do not actively bind and process bilirubin in liver cells.

Hemolytic jaundice. It can also develop with a deficiency of enzymatic systems of erythrocytes, with a disturbance in the structure of hemoglobin. The destruction of erythrocytes can also be caused by various genetically determined disorders, such as microspherocytosis (Minkowski-Choffard anemia), disturbances in the structure of hemoglobin (for example, with sickle cell anemia), changes in the shape and structure of the red blood cell itself, etc.) When treating conditions accompanied by the destruction of red blood cells, exchange transfusions are often used to “wash out” bilirubin and antibodies that cause hemolysis [6].

Hepatic (or parenchymal) jaundice. They develop when liver tissue (parenchyma) is damaged by viruses, bacteria, protozoa or toxins. With hepatitis B and C, cytomegalovirus infection and sepsis, bilirubin accumulates in the blood, the skin and mucous membranes turn greenish-yellow, the liver and spleen increase in size. The stool becomes whitish, but the urine, on the contrary, becomes brighter in color. Such jaundice is treated comprehensively, always addressing the cause of the disease. It is clear that in such cases it is impossible to do without treatment of the infectious process. Unfortunately, there are currently not effective treatments for all congenital infections. This once again emphasizes the need for careful preparation for pregnancy, especially in the presence of infectious diseases, to reduce the risk of transmitting infection to the baby [7].

Mechanical (obstructive) jaundice. Occurs if the flow of bile is disrupted. The cause may be a violation of the patency of the bile ducts due to malformations, atresia (underdevelopment), neoplasms (including from other organs). In some diseases, the bile itself becomes thick and viscous and accumulates in the bile ducts. They become overfilled and bile enters the bloodstream, causing symptoms of jaundice. Treatment depends on the cause of the jaundice, but in some cases surgery may not be necessary.

Treatment of jaundice in newborns. If icteric discoloration of the skin appears, you should immediately consult a doctor who will find out the cause of the jaundice and prescribe treatment. Treatment for jaundice depends on the disease that causes this symptom. The consequences of jaundice depend on the disease that caused an increase in bilirubin in the blood of the newborn. In most cases, jaundice disappears without a trace along with the elimination of the disease that caused it [4,6].

Let us draw your attention to the fact that most often jaundice of newborns occurs in premature babies. That is, the severity of jaundice depends on the maturity of the fetus and illnesses of the mother during pregnancy. This is why pregnancy must be carefully planned in advance to avoid treatment during pregnancy.

Prevention of jaundice in newborns. All pregnant women undergo a blood test to identify Rh-negative women, who must be registered at the antenatal clinic. For Rh-negative pregnant women, once a month, and if necessary, more often, Rh antibodies are determined in the blood. It is important to maintain the pregnancy. If there are antibodies in the blood, women are recommended to take longer breaks between pregnancies, because with each subsequent pregnancy, the antibody titer in the blood increases. Every newborn born from a mother with Rh-negative blood is at risk of jaundice and is subject to careful observation and mandatory examination in the first hours of life for the content of bilirubin, Rh factor and blood group in the blood.

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