# IMMUNOPATHOGENETIC MECHANISMS AND LABORATORY AND EQUIPMENTAL INDICATORS CHARACTERIZING THE COURSE OF COVID-19.

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**Abstract:** COVID-19 infection is caused by RNA-containing viruses belonging to the Coronaviridae family. These viruses have a diameter of approximately 80-220 nm, and their outer shell is covered with villi. These villi play an important role in the binding of the virus to cellular receptors and its entry into the cell. Coronaviruses multiply mainly in the cytoplasm of epithelial cells of the upper respiratory tract, causing respiratory diseases of varying degrees. After the virus enters the cell, the process of forming new virions begins within approximately 4-6 hours. Studies show that coronaviruses are not resistant to environmental influences.

**Keywords:** coronavirus, COVID-19, immunopathogenesis, laboratory diagnostics, epidemiology, prevention.

# COVID-19 NING KECHISHINI TAVSIFLOVCHI IMMUNOPATOGENETIK MEXANIZMLAR VA LABORATOR-USKUNAVIY KO'RSATKICHLAR.

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**Annotatsiya.** COVID-19 infeksiyasi Coronaviridae oilasiga mansub bo'lgan, RNK saqlovchi viruslar tomonidan keltirib chiqariladi. Ushbu viruslar diametri

taxminan 80–220 nm bo‘lib, tashqi qobig‘i vorsinkalar bilan qoplangan. Ana shu vorsinkalar virusning hujayra retseptorlari bilan bog‘lanishi va hujayra ichiga kirishida muhim ahamiyatga ega. Koronaviruslar asosan yuqori nafas yo‘llari epiteliy hujayralarining sitoplazmasida ko‘payib, turli darajadagi respirator kasalliklarni rivojlantiradi. Virus hujayra ichiga kirgandan so‘ng taxminan 4–6 soat davomida yangi virionlar hosil bo‘lish jarayoni boshlanadi. Tadqiqotlar shuni ko‘rsatadiki, koronaviruslar tashqi muhit ta’sirlariga nisbatan barqaror emas.

**Kalit so‘zlar:** koronavirus, COVID-19, immunopatogenez, laborator diagnostika, epidemiologiya, profilaktika.

The use of the PCR method is recommended for the specific laboratory diagnosis of COVID-19. The specific diagnostic method is applied to individuals with clinical and epidemiological indications and to those who have been in contact with them. In addition, some authors recommend performing PCR analyses aimed at detecting the causative agents of respiratory infections for differential diagnosis.

For analysis, biological samples include swabs taken from the nose, nasopharynx and/or oropharynx, bronchial washings obtained by fibrobronchoscopy, (endo)tracheal and nasopharyngeal aspirates, sputum, and lung biopsy or autopsy materials. Swabs taken from the nose, nasopharynx and/or oropharynx are the main biomaterials. All these samples should be considered potentially infectious, and when working with them it is recommended to comply with the safety requirements for working with microorganisms of pathogenicity groups I–II.

Currently, the global healthcare system continues to undergo serious challenges due to COVID-19. Therefore, signs determining the severity of patients' conditions are being actively analyzed for patient triage, and various prognostic models are being proposed. The large flow of COVID-19 patients and the increasing need for hospitalization require careful evaluation of laboratory results. According to many researchers, the assessment of patients' objective and

subjective conditions plays an important role in determining patient management tactics. In particular, changes in biochemical indicators depending on the severity of the patient's condition reflect the degree of lung damage.

From this point of view, a group of scientists investigated the biochemical parameters of blood depending on the severity of patients' conditions during the acute phase of COVID-19. In particular, ferritin, CRP, glucose, urea, creatinine, total protein, albumin, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, and lactate dehydrogenase in blood serum were analyzed. The studies were carried out on the blood serum of 138 COVID-19 patients hospitalized in an infectious diseases hospital. According to the severity of the disease course, the patients were divided into three groups: patients with a moderate form of COVID-19, a severe form, and cases that resulted in death.

In accordance with the worsening of the patients' condition, a significant progressive increase in the concentrations of ferritin and CRP was detected. A statistically significant increase in glucose levels was recorded in patients of groups 2 and 3. The maximum increase in urea and creatinine concentrations was identified in patients in whom lethality was observed. A slight decrease in total protein levels was observed in patients of groups 2 and 3. In all examined patients, progressive hypoalbuminemia corresponding to the severity of the condition was present. Other biochemical indicators also changed compared to normal levels in accordance with the severity of the patients' condition, which indicates that the acute phase of the disease is accompanied by inflammation and pathological processes in many organs.

Many studies show the appropriateness of determining erythrocytes, hematocrit, lymphocytes, platelets, and the leukocyte formula in the complete (clinical) blood analysis. Changes in biochemical blood analysis (urea, creatinine, electrolytes, liver enzymes, bilirubin, glucose, albumin) may indicate the presence of organ dysfunction, comorbid diseases, their decompensation, and the development of complications. They have certain prognostic significance and have been found to help in the selection of therapeutic agents, as well as in determining

their dosage and regimen. There is evidence that the level of C-reactive protein (CRP) in blood serum can serve as a basis for assessing the severity of the disease course, the extent of inflammatory infiltration, and for the presumptive presence of pneumonia. In patients with signs of acute respiratory failure (ARF) (according to pulse oximetry data, $SpO_2$ less than 90%), it is considered appropriate to determine $PaO_2$, $PaCO_2$, pH, bicarbonates, and lactate levels.

The WHO recommends that patients with signs of ARF undergo a coagulogram with determination of prothrombin time, international normalized ratio (INR), and activated partial thromboplastin time. In addition, computed tomography of the lungs (or, if unavailable, chest radiography) is recommended for all patients with suspected pneumonia. Electrocardiography (ECG) is recommended for all patients. This examination makes it possible to timely detect rhythm disturbances and acute coronary syndrome, as well as to assess the cardiotoxicity of antibacterial drugs.

Many studies confirm that in diabetes mellitus, coronavirus infection is dangerous due to the high probability of developing prolonged pneumonia, respiratory failure, diabetic nephropathy, and severe myopathy. A number of authors consider diabetes mellitus as a risk factor leading to death in coronavirus infection. At the same time, the presence of risk factors aggravates the course of the infectious process and worsens the patient's condition.

Nosirova M.P. and co-authors studied the characteristics of the development of coronavirus infection in individuals with diabetes mellitus at the level of primary health care. During the observation period, 940 people from the total population attached to a primary health care institution became ill with coronavirus infection, including 59 (6.3%) among those registered with diabetes mellitus. Among COVID-19 patients, the majority had a severe course (47.1%), as well as a moderate course (38.2%), a mild form (11.4%), and in 2 cases (3.3%) an asymptomatic course was observed. The severity of the disease depends on health problems and the presence of comorbid diseases.

**Conclusion.** Thus, the data presented in the literature indicate that the acute phase of COVID-19 is characterized by specific immunological changes and pronounced signs of inflammation, and biochemical indicators in the blood change according to the severity of the disease. There is a correlational relationship between the abnormal changes in biochemical parameters (CRP, ferritin, glucose, urea, creatinine, albumin, aspartate aminotransferase), the degree of lung damage, and the severity of the patient's condition. Therefore, monitoring these indicators is of significant importance in preventing the development of complications. At the same time, the data obtained so far cannot fully explain the immunopathological processes specific to COVID-19, indicating the need for further comprehensive scientific research in this area.

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