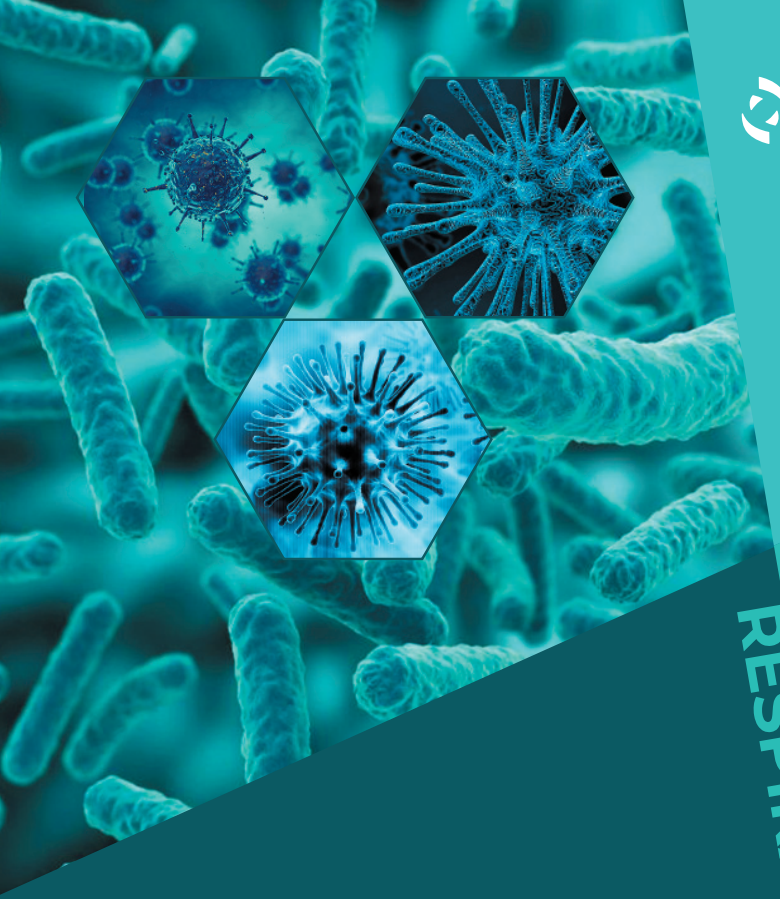


DNA-TECHNOLOGY

RESPIRATORY INFECTIONS

AVRI

REAL-TIME PCR PANEL FOR DETECTION
OF RNA FROM CAUSATIVE AGENTS
OF ACUTE RESPIRATORY INFECTIONS

CE IVD

CLINICAL SIGNIFICANCE

Acute respiratory viral infections (AVRI) are a group of diseases of viral etiology that affect the upper and lower respiratory tracts. The causative agents of AVRI are represented by RNA-containing (pneumoviruses, paramyxoviruses, coronaviruses, picornaviruses, orthomyxoviruses) and DNA-containing viruses (adenoviruses and parvoviruses). A combination (mixed infection) of various pathogens is possible, including the addition of a bacterial infection. The diseases caused by these viruses are united by the similarity of the mechanisms of transmission routes, features of pathogenesis, and clinical manifestations [1].

Differential diagnosis of AVRI, including influenza virus and COVID-19, is necessary to assess the severity of the disease and to predict complications, as well as to prevent nosocomial infection.

When conducting differential diagnosis, it is necessary to take into account the data of the epidemiological anamnesis, clinical symptoms and their dynamics. In all suspicious cases, a patient examination is recommended using nucleic acid amplification (NAA) methods for SARS-CoV-2 and other pathogens of respiratory infections: influenza A and B viruses, parainfluenza, respiratory syncytial virus, rhinoviruses, adenoviruses and human metapneumoviruses [2].

Clinical significance of AVRI pathogens

AVRI pathogen	Clinical significance
Coronaviruses (RNA-containing viruses of the family *Coronaviridae*) [2, 3]: *HKU1, NL63, OC43, 229E*	In addition to affecting the upper respiratory tract, they can cause bronchiolitis and pneumonia in young children, the elderly, and those with weakened immune systems. Manifestations of neurological and intestinal symptoms are possible
SARS-CoV-2	Some patients develop a hypercoagulability state with thrombosis and thromboembolis; other organs and systems (central nervous system, myocardium, kidneys, liver, gastrointestinal tract, endocrine and immune systems) are also affected, sepsis and septic shock may develop
Influenza viruses (RNA-containing viruses of the family *Orthomyxoviridae*) [4]: *A, B*	They disrupt the functioning of the immune system, contribute to mixed infection and the addition of a bacterial infection, that leads to complications: pneumonia (primary viral and secondary bacterial or bacterial-viral), otitis media, sinusitis
Parainfluenza viruses (RNA-containing viruses of the family *Paramyxoviridae*) [5]: *1, 2, 3, 4*	The most characteristic symptom of parainfluenza virus is the defeat of the larynx: laryngitis or laryngotracheitis. Complications are manifested by bronchitis, pneumonia, croup
Metapneumovirus (RNA-containing virus of the family *Pneumoviridae*) [6]	Clinical manifestations range from asymptomatic and mild forms to bronchiolitis, alveolitis, pneumonia, and asthma attacks. Complications of infection are manifested in the form of otitis media, pulmonary atelectasis, pericarditis, croup, asthmatic attacks may occur in children
Respiratory syncytial virus (RNA-containing virus of the family *Pneumoviridae*) [7]	It has a tropism for the epithelium of the lower respiratory pathways, causing their obstruction. Complications after an infection are manifested in the form of pneumonia, pneumothorax, atelectasis and emphysema, bronchial asthma, bacterial infection, and exacerbation of chronic diseases
Rhinovirus (RNA-containing virus of the family *Picornaviridae*) [8]	It may cause local inflammation and degeneration of the epithelium of the nasal mucosa and lead to exacerbations of chronic respiratory diseases
Adenovirus (DNA-containing virus of the family *Adenoviridae*) [9, 10]	It causes upper respiratory tract infections that may lead to meningitis, conjunctivitis, gastroenteritis, mesenteric adenitis, and acute hemorrhagic cystitis
Bocavirus (DNA-containing virus of the family *Parvoviruses*) [11]	The main clinical forms of respiratory tract damage include rhinitis, acute catarrhal otitis media, tonsillitis, pharyngitis, laryngotracheitis, pneumonia, bronchiolitis, bronchitis, including obstructive bronchitis. A third of patients are diagnosed with gastrointestinal disorder like gastroenteritis

The most susceptible to AVRI are children of preschool age, the elderly, patients with severe chronic diseases and immunodeficiency states. AVRI can lead to serious complications during pregnancy, due to the high susceptibility of pregnant women to viral diseases.

The AVRI REAL-TIME PCR PANEL is designed to detect and differentiate nucleic acids of the pathogens of epidemic and seasonal acute respiratory viral infections in humans (coronavirus SARS-CoV-2, influenza viruses A and B, respiratory syncytial virus, parainfluenza viruses types 1–4, rhinovirus, adenovirus, metapneumovirus, coronaviruses HKU1, NL63, OC43, 229E, bocavirus).

TESTING RECOMMENDED:

in the presence of symptoms and contact exposure to patients with AVRI

when staying in foci of infection (for the purpose of early detection of possible infection and prevention of further spread)

for identification and differention of causative agents and prescription of a relevant specific treatment

BIOMATERIAL:

- nasopharyngeal/oropharyngeal swab
- bronchoalveolar lavage
- endotracheal/ nasopharyngeal aspirate
- sputum

SPECIAL FEATURES OF THE PANEL

- **Comprehensive multitarget testing** to identify a wide range of AVRI pathogens
- **The reliability of detection of rapidly mutating SARS-CoV-2** is ensured by the use of two target sites in the viral genome: N and E genes
- The steps of reverse transcription of RNA and PCR amplification of cDNA/DNA are carried out **in one tube**, which increases the sensitivity of the method, reduces the likelihood of contamination and reduces the hands-on time
- **Multiplex format** — several targets are tested simultaneously in one tube, which reduces the cost of testing by 2.2 times compared to monoplex format
- **IC-RNA Internal Control** — assessment of the step of isolation of NA and the efficacy of RT-PCR
- **Automated generation of the results form** when using the recommended thermocyclers of the DT series and RealTime_PCR software
- **Availability of a file with test parameters** to automatically set the necessary parameters and calculate the results

KIT SET

The composition of the kit:

- Paraffin sealed PCR-mix
- RT-PCR buffer
- Taq/RT enzyme
- Internal control IC-RNA «A»
- Dilution buffer
- Positive control
- Strip's caps

The panel is designed for 24 tests, including control samples.

Estimated time from sample to result (excluding sample preparation): from 1 hour 40 minutes.

LIST OF PARAMETERS DETERMINED BY THE PANEL AND CHANNELS FOR DETECTION OF AMPLIFICATION PRODUCTS

tube N in the strip	Detection channel			
	Fam	Hex	Rox	Cy 5
1	*Influenza A virus*	IC-RNA	*SARS-CoV-2, E, N genes*	*Influenza B virus*
2	*Human parainfluenza virus type 2*	IC-RNA	*Human parainfluenza virus type 4*	*Human coronavirus 229E*
3	*Human bocavirus*	IC-RNA	MARKER	*Human rhinovirus*
4	*Human respiratory syncytial virus*	IC-RNA	–	*Human coronavirus HKU1*
5	*Human adenovirus*	IC-RNA	–	*Human coronavirus NL63*
6	*Human coronavirus OC43*	IC-RNA	–	*Human parainfluenza virus type 3*
7	*Human parainfluenza virus type 1*	IC-RNA	–	–
8	*Human metapneumovirus*	IC-RNA	–	–

Analytical sensitivity	▪ for influenza viruses A, B and coronavirus SARS-CoV-2 — 10 copies of nucleic acid per amplification tube ▪ for other viruses — 20 copies of nucleic acid per amplification tube

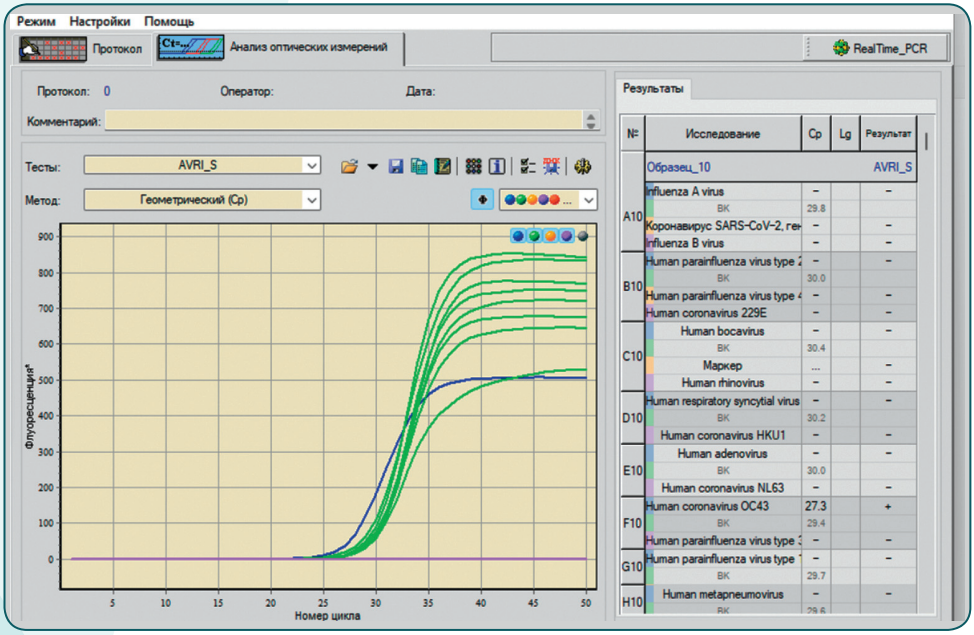
RECOMMENDED MATERIALS AND EQUIPMENT

Transport medium for samples	Kits for nucleic acids isolation	Real-time PCR instruments
▪ STOR-F	▪ PREP-NA ▪ PREP-NA PLUS	▪ DTPRIME ▪ DTLITE ▪ DT-96
produced by «DNA-Technology TS» LLC	produced by «DNA-Technology R&D» LLC	

SOFTWARE

- RealTime_PCR software.

Analysis and interpretation of the reaction results are carried out automatically for devices of the «DT» series manufactured by «DNA-Technology R&D» LLC using the RealTime_PCR software.



An example of the result of a PCR test using a detecting thermocycler of the «DT» series and related software: analysis of optical measurements

AN EXAMPLE OF THE RESULT FORM

Test result after analysis by real-time PCR

Date:
Tube number:
Patient Full Name:
Sex:
Age:
Organization:
Doctor:
Notes:

logo

Lab name and contacts:

Sample identifier number:

№	Test specification	Result
1	*Influenza A virus*	not detected
2	Coronavirus *SARS-CoV-2*, gene *E*, gene *N*	not detected
3	*Influenza B virus*	not detected
4	*Human parainfluenza virus type 2*	not detected
5	*Human parainfluenza virus type 4*	not detected
6	*Human coronavirus 229E*	not detected
7	*Human bocavirus*	not detected
8	*Human rhinovirus*	not detected
9	*Human respiratory syncytial virus*	not detected
10	*Human coronavirus HKU1*	not detected
11	*Human adenovirus*	not detected
12	*Human coronavirus NL63*	not detected
13	*Human coronavirus OC43*	POSITIVE
14	*Human parainfluenza virus type 3*	not detected
15	*Human parainfluenza virus type 1*	not detected
16	*Human metapneumovirus*	not detected

Testing completed by:

Date:
Signature:

Example of result generated automatically after analysis of sample with AVRI Panel Multiplex REAL-TIME PCR Detection Kit in combination with thermocycler of «DT» serieas and related software.

TRANSPORT AND STORAGE

The kit has to be transported in thermoboxes with ice packs by all types of roofed transport at temperatures corresponding to storage conditions of the kit components.

It is allowed to transport in thermal containers with ice packs by all types of covered transport at a temperature inside the thermobox of up to 25°C for no more than 5 days.

All components of the kit, with the exception of the Taq/RT enzyme, should be stored in a refrigerator or cold room at 2°C to 8°C for the entire shelf life of the kit. Tubes (strips) with amplification mixture sealed with paraffin should be stored in a place protected from light.

Taq/RT Enzyme should be stored in a freezer at -18°C to -22°C for the shelf life of the kit.

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