

AccuGen™

**Clinical Pathogenic Microorganisms
Detection**

Highly Customized Service and Efficient Expansion Scheme

Infectious diseases seriously threaten human health - rapid identification of pathogenic microorganisms needs to be solved

In recent years, infectious disease has become a serious threat to human health. There are a wide variety of pathogenic microorganisms that may cause human infection. An economical and efficient detection method is urgently needed in clinical practice to quickly identify infectious pathogens and detect drug resistance genes, which is the key to subsequent symptomatic treatment for infected patients, especially critically ill patients.

01 Increasingly severe situation of infectious diseases

- ◆ By 2018, lower respiratory tract infections had risen to the third leading cause of death (3.19 million deaths, or 5.6% of all deaths);
- ◆ Statistics show that infectious diseases account for more than 50% of all diseases;
- ◆ Studies show that the number of deaths caused by infectious diseases is expected to reach 10 million by 2050.

02 Complex clinical pathogenic infections

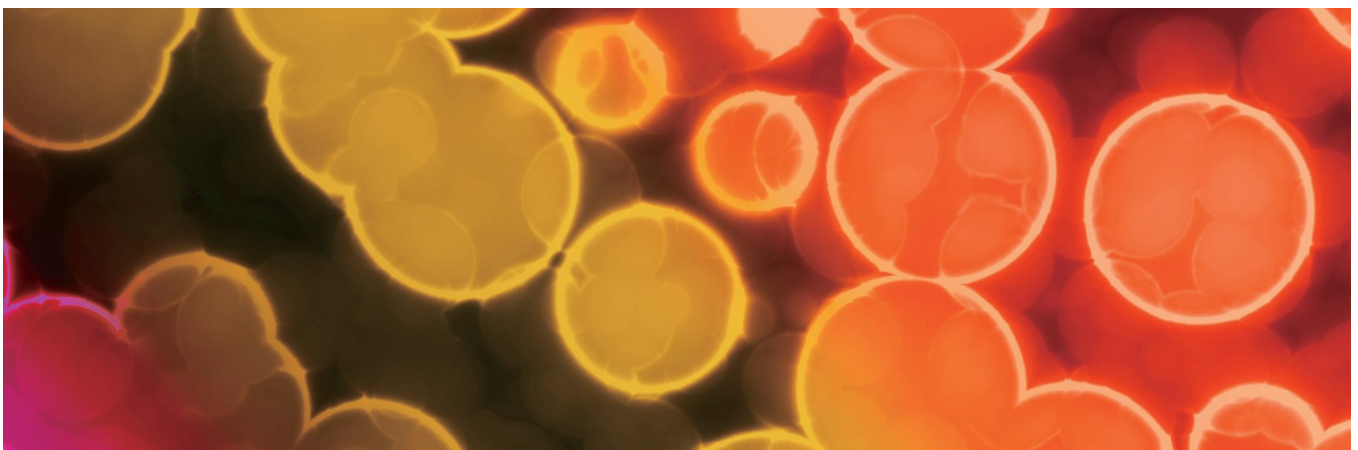
- ◆ Fever of unknown origin;
- ◆ Atypical clinical symptoms;
- ◆ Co-infection with multiple pathogens;
- ◆ New or rare pathogens;
- ◆ Widespread infections in high-risk patients such as transplant recipients.

03 Obvious shortcomings of traditional culture identification

- ◆ Low positive rate (<30%), difficult to clearly identify the pathogen;
- ◆ Long period (up to 21 days), which delays the treatment, especially for critically ill patients;
- ◆ Only suitable for a few pathogens, with extremely low coverage;
- ◆ Rely on clinicians for prior judgment.

04 Difficult to prescribe precise medication, easy to delay treatment

- ◆ Medication is dependent on clinical experience;
- ◆ Complex pathogens and high drug resistance rate.



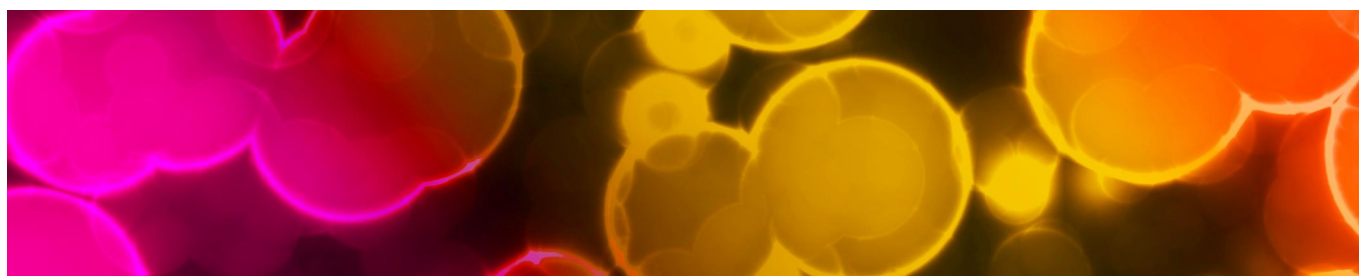
High-throughput sequencing - the optimal solution for detection of pathogenic microorganisms

With high-throughput sequencing, rapid pathogen identification and drug resistance gene detection can be realized through nucleic acid sequence detection of pathogenic microorganisms. At present, high-throughput sequencing has entered the clinical practice of pathogen identification.

AccuGen™ Detection of Common Clinical Pathogenic Microorganisms - Rapid Identification of Pathogenic Microorganisms and Drug Resistance Genes

For AccuGen™ detection of common clinical pathogenic microorganisms, a multiplex PCR+NGS patented technology independently developed by Health GeneTech is adopted to perform high-throughput sequencing of common clinical pathogenic microorganisms, and the sequencing data are compared with the special database of pathogenic microorganisms through bioinformatics methods to obtain the suspected pathogenic microorganism species and related drug resistance information, which provides a rapid and accurate diagnosis basis for infected patients and guides the rational application of drugs.

| Product Name | Detection Range | Clinical Significance |
|----------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| AccuGen 328™Advanced | 328 common pathogenic microorganisms and drug resistance genes | Identification of pan-infectious pathogenic microorganisms and detection of drug resistance |



AccuGen™ series contains the detection of 150 drug resistance genes to assist in precise medication

| Product Name | Detection Range |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Glycopeptide antibiotics | vanA,vanB,vanD |
| Fluoroquinolone antibiotics | patA,patB,pmrA,QnrA1,QnrB4,qacA,IsaE |
| Aminoglycoside antibiotics | A N T (2 ' ') - I a , a r m A , A A C (2 ') - I b , A A C (6 ') - I b , a a - d A 3 , A P H (3 ') - I b , A P H (6 ') - I d , A A C (2 ') , A N T (4 ') , A P H (3 ') - I a , A A C (3 ') , A A C (6 ') |
| Macrolide antibiotics | mphB,EreA,EreB,macA,mefE,mel,mtrC,mtrE |
| Chloramphenicol antibiotics | catB3,Paer_catB6,catB8,cmlA5,floR,CAT |
| Penicillin antibiotics | N D M - 1 , m e c A , m t r D , T E M - 1 2 , m e c - C , O X A - 1 , O X A - 2 , O X A - 7 , O X A - 9 , O X A - 2 3 , O X A - 6 6 , O X A - 6 9 , O X A - 8 2 , O X A - 1 8 1 , O X A - 1 9 8 , C M Y - 2 , K P C - 2 |
| Streptomycin antibiotics | ErmC,msrA,ErmA,ErmB,mel |
| Tetracycline antibiotics | tet(A),tet(B),tet(C),tet(D),tet(E),tet(K),tet(L),tet(M),tet(O),tet(Q),tet(S),tet(T),tet(W), TolC,adeB,Ecol_mdfA,tetR,oqxA,oqxB,rpsJ |

*Only part of the resistance genes are displayed

Advantages of AccuGen™ Series

AccuGen™ Detection of Common Clinical Pathogenic Microorganisms: It can quickly identify bacteria, fungi, viruses, parasites and other pathogenic microorganisms with high accuracy by targeting and enriching very trace amounts of pathogenic microorganism nucleic acids in the sample, combined with high-throughput sequencing and bioinformation analysis. In addition, it can analyze the drug resistance gene of pathogenic microorganisms to predict drug resistance and assist in precise clinical medication

| Advantages of AccuGen™ Series | |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Comprehensive | A comprehensive detection of clinically common pathogens in various suspected infection samples. |
| Precise | Multiplex PCR enrichment allows precise detection of pathogens with low copies in a high host background. |
| Professional | A complete pathogenic microorganism database and reports issued by professional medical teams. |
| Affordable | Multiplex PCR+NGS has obvious cost advantages and a high comprehensive cost performance over metagenome sequencing. |
| Rapid | A strict and standardized test process, and a minimum of 24h from detection to report issuance. |

AccuGen™ Product Application

| | | | | |
|----------------------------------|--------------------------------|-------------------------|----------------------------------------|------------------------------------------|
| Scope of Application: | Pediatric infectious diseases | Respiratory infection | Joint infection | Unidentified immunosuppressed population |
| Central nervous system infection | Post-transplantation infection | Fever of unknown origin | Public outbreak of infectious diseases | Bloodstream infection |

AccuGen™ Sample Submission Requirements

| Sample Type | Sample Size | Collection Tube Requirements | Transportation Conditions |
|------------------------------|-------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Blood | ≥2ml | cfDNA blood collection tube | Normal temperature transportation |
| Blood (infant) | ≥2ml | cfDNA blood collection tube | Normal temperature transportation |
| Bone marrow | ≥2ml | cfDNA blood collection tube | Normal temperature transportation |
| Alveolar lavage fluid | ≥2ml | Sterile threaded tube | Delivery under refrigeration: 48-hour delivery to laboratory, on dryice Transportation: > 48- hour delivery to laboratory |
| Sputum | ≥2ml | Sterile threaded tube | |
| Urine | ≥2ml | Sterile threaded tube | |
| Cerebrospinal fluid | ≥2ml | Sterile threaded tube | |
| Cerebrospinal fluid (infant) | ≥1ml | Sterile threaded tube | |

| Sample Type | Sample Size | Collection Tube Requirements | Transportation Conditions |
|-------------------------|-------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Hydrothorax and ascites | ≥2ml | Sterile threaded tube | Delivery under refrigeration: 48-hour delivery to laboratory, on dryice Transportation: > 48- hour delivery to laboratory |
| Joint effusion | ≥2ml | Sterile threaded tube | |
| Abscess aspiration | ≥2ml | Sterile threaded tube | |
| Bile | ≥2ml | Sterile threaded tube | |
| Other puncture fluids | ≥1ml | Sterile threaded tube | |
| Tissues | ≥3ml | Sterile threaded tube | |
| Aqueous humor | ≥0.1ml | Sterile threaded tube | |
| Vitreous | ≥0.5ml | Sterile threaded tube | |
| Nasopharyngeal swab | ≥2swabs | Swab storage tube | |
| Wound exudate | ≥2swabs | Swab storage tube | |
| Pathological section | ≥5sections | Section box | Normal temperature transportation |

AccuGen™ Detection Process



Case Excerpt I

◆ Medical History on Admission

An 81-year-old female patient (left patella) was consistent with chronic suppurative osteomyelitis, with trabecular disintegration, fragmentation, sequestrum formation, restorative hyperostosis in some areas, sparse hematopoietic tissue in the bone marrow cavity, fibrinous exudate and suppurative necrosis between and around the trabecular bone, and suppurative coccal masses and fungal hyphae and spores in the necrosis. There was also hyperplasia of inflammatory granulation tissue and fibrous scar tissue.

◆ Detection Results

Sample tissues were tested positive for *Staphylococcus haemolyticus*, *Enterococcus faecalis*, *Staphylococcus aureus*, and *Aspergillus fumigatus*. The pathogen detection result was consistent with the clinical pathology, and the patient was discharged from the hospital after medication according to the detection result.

Detection Results

1. List of Bacteria Detected

| Type | Name | Number of Sequences Detected | Relative Abundance |
|------|------------------------------------|------------------------------|--------------------|
| G+ | <i>Staphylococcus haemolyticus</i> | 33094 | 95.60% |
| G+ | <i>Enterococcus faecalis</i> | 1137 | 3.28% |
| G+ | <i>Staphylococcus aureus</i> | 140 | 0.40% |

Type: G+ (Gram-positive bacteria)/G- (Gram-negative bacteria)

2. List of Fungi Detected

| Type | Name | Number of Sequences Detected | Relative Abundance |
|------|------------------------------|------------------------------|--------------------|
| F | <i>Aspergillus fumigatus</i> | 36 | 0.10% |

Type: F (fungus)

3. List of DNA Viruses Detected

| Type | Name | Number of Sequences Detected | Relative Abundance |
|-----------|------|------------------------------|--------------------|
| Not found | | | |

Type: V (virus)

Case Excerpt II

◆ Medical History on Admission

A 61-year-old female patient with severe pneumonia, high fever, cough, and blood in sputum. Suspicious nodular shadow in the left middle lung, right pleural effusion, and emphysema. Clinical sample was sent for pathogen detection, focusing on mycobacterial infection.

◆ Detection Results

Mycobacterium tuberculosis was detected in the submitted alveolar lavage fluid sample. The pathogen detection result was consistent with the clinical pathology, and after being transferred to another hospital for treatment, the patient's condition was stable. The patient was discharged from the hospital after medication according to the detection result.

Detection Results

1. List of Bacteria Detected

| Type | Name | Number of Sequences Detected | Relative Abundance |
|------|-----------------------------------|------------------------------|--------------------|
| - | <i>Mycobacterium tuberculosis</i> | 80892 | 99.99% |

Type: G+ (Gram-positive bacteria)/G- (Gram-negative bacteria)

2. List of Fungi Detected

| Type | Name | Number of Sequences Detected | Relative Abundance |
|------|------|------------------------------|--------------------|
| | | Not found | |

Type: F (fungus)

3. List of DNA Viruses Detected

| Type | Name | Number of Sequences Detected | Relative Abundance |
|------|------|------------------------------|--------------------|
| | | Not found | |

Type: V (virus)

List of common clinical pathogenic microorganisms

Bacteria (176 species)

Acinetobacter baumannii, *Staphylococcus capitis*, *Capnocytophaga haemolytica*, *Pseudomonas fluorescens*, *Staphylococcus equorum*, *Actinomyces israelii*, *Staphylococcus epidermidis*, *Capnocytophaga ochracea*, *Pseudomonas mosselii*, *Streptobacillus moniliformis*, *Bordetella pertussis*, *Staphylococcus haemolyticus*, *Capnocytophaga sputigena*, *Pseudomonas putida*, *Streptococcus gallolyticus*, *Burkholderia cepacia*, *Staphylococcus hominis*, *Corynebacterium accolens*, *Pseudomonas stutzeri*, *Campylobacter concisus*, *Campylobacter jejuni*, *Staphylococcus lugdunensis*, *Corynebacterium afermentans*, *Salmonella enterica* subsp. *enterica* serovar *Typhi*, *Lactobacillus gasserii*, *Citrobacter freundii*, *Stenotrophomonas maltophilia*, *Corynebacterium diphtheriae*, *Shewanella putrefaciens*, *Lactococcus garvieae*, *Clostridium difficile*, *Streptococcus agalactiae*, *Dolosigranulum pigrum*, *Shigella boydii*, *Morganella morganii*, *Clostridium perfringens*, *Streptococcus pneumoniae*, *Klebsiella aerogenes*, *Shigella dysenteriae*, *Mycobacterium leprae*, *Enterobacter cloacae*, *Streptococcus suis*, *Enterobacter asburiae*, *Shigella flexneri*, *Neisseria flavescens*, *Enterococcus faecalis*, *Tropheryma whippelii*, *Enterococcus avium*, *Shigella sonnei*, *Neisseria subflava*, *Enterococcus faecium*, *Acinetobacter calcoaceticus*, *Fusobacterium necrophorum*, *Streptococcus constellatus*, *Neisseria perflava*, *Escherichia coli*, *Acinetobacter johnsonii*, *Fusobacterium nucleatum*, *Streptococcus intermedius*, *Ochrobactrum intermedium*, *Haemophilus influenzae*, *Acinetobacter lwoffii*, *Enterobacter hormaechei*, *Streptococcus anginosus*, *Bacteroides vulgatus*, *Klebsiella aerogenes*, *Acinetobacter radioresistens*, *Klebsiella variicola*, *Streptococcus mitis*, *Paenibacillus mucilaginosus*, *Klebsiella oxytoca*, *Actinomyces odontolyticus*, *Leifsonia aquatica*, *Streptococcus pyogenes*, *Pasteurella multocida*, *Klebsiella pneumoniae*, *Alcaligenes faecalis*, *Listeria monocytogenes*, *Streptococcus salivarius*, *Plesiomonas shigelloides*, *Legionella pneumophila*, *Arcanobacterium haemolyticum*, *Micrococcus luteus*, *Streptococcus sanguinis*, *Cutibacterium acnes*, *Moraxella catarrhalis*, *Bacillus anthracis*, *Mycobacterium africanum*, *Veillonella dispar*, *Providencia alcalifaciens*, *Mycobacterium abscessus*, *Bacillus cereus*, *Mycobacterium bovis*, *Veillonella parvula*, *Ralstonia solanacearum*, *Mycobacterium avium*, *Bacillus pumilus*, *Mycobacterium canettii*, *Yersinia pseudotuberculosis*, *Aeromonas aquariorum*, *Mycobacterium goodii*, *Bacillus subtilis*, *Mycobacterium colombiense*, *Vibrio cholerae*, *Bacteroides stercoris*, *Mycobacterium intracellulare*, *Bacillus thuringiensis*, *Mycobacterium haemophilum*, *Vibrio vulnificus*, *Bacteroides ovatus*, *Mycobacterium kansasii*, *Bacteroides fragilis*, *Mycobacterium iranicum*, *Yersinia frederiksenii*, *Bacteroides thetaiotaomicron*, *Mycobacterium massiliense*, *Bifidobacterium breve*, *Nocardia abscessus*, *Yersinia intermedia*, *Bordetella bronchiseptica*, *Mycobacterium tuberculosis*, *Bifidobacterium dentium*, *Nocardia farcinica*, *Yersinia kristensenii*, *Bordetella holmesii*, *Mycobacterium fortuitum*, *Bifidobacterium longum*, *Nocardia asteroides*, *Orientia tsutsugamushi*, *Burkholderia mallei*, *Neisseria gonorrhoeae*, *Campylobacter fetus*, *Enterococcus casseliflavus*, *Neisseria meningitidis*, *Bordetella parapertussis*, *Prevotella bivia*, *Campylobacter upsaliensis*, *Erysipelothrix rhusiopathiae*, *Proteus mirabilis*, *Brucella abortus*, *Prevotella buccae*, *Burkholderia cenocepacia*, *Fusobacterium periodonticum*, *Proteus vulgaris*, *Brucella canis*, *Prevotella buccalis*, *Clostridium butyricum*, *Kingella kingae*, *Pseudomonas aeruginosa*, *Brucella melitensis*, *Prevotella denticola*, *Clostridium septicum*, *Burkholderia pseudomallei*, *Salmonella bongori*, *Brucella suis*, *Prevotella enoeca*, *Clostridium tetani*, *Streptococcus gordonii*, *Salmonella enterica*, *Campylobacter coli*, *Prevotella intermedia*, *Corynebacterium jeikeium*, *Vibrio harveyi*, *Serratia marcescens*, *Capnocytophaga gingivalis*, *Prevotella loeschii*, *Corynebacterium pseudotuberculosis*, *Aeromonas caviae*, *Staphylococcus aureus*, *Capnocytophaga granulosa*, *Prevotella melaninogenica*, *Corynebacterium ulcerans*, *Aggregatibacter actinomycetemcomitans*, *Bifidobacterium animalis*, *Arcobacter butzleri*, *Streptococcus*

Viruses (96 species)

Human Respiratory Syncytial Virus, Human bocavirus 4, Norovirus GI, Enterovirus B6, Enteric Cytopathic Human Orphan virus 6 (ECHO virus 6), Human metapneumovirus (HMPV), Human adenovirus 1, Norovirus GIV, Enterovirus A114, Enteric Cytopathic Human Orphan virus 2 (ECHO virus 2), Rubella virus, Human adenovirus 35, Norovirus GV, Enterovirus (EV-A71), Enteric Cytopathic Human Orphan virus 18 (ECHO virus 18), Influenza A virus subtype H1N1, Human adenovirus 5, Sapovirus, Enterovirus A16, Hepatitis B virus, influenza A virus subtype H5N1, Human adenovirus 54, Sapovirus Mc10, Enterovirus B1, Hepatitis E virus, Influenza A virus subtype H2N2, Human adenovirus 7, Sapovirus C12, Enterovirus D70, tick-borne encephalitis virus, Influenza A virus subtype H3N2, Human adenovirus A, Human rhinovirus 14, St. Louis encephalitis virus (SLEV), Influenza A virus subtype H1N1, Human adenovirus A1, Astrovirus, Human rhinovirus 89, West Nile virus, Influenza A virus subtype H7N9, Human adenovirus B2, Astrovirus BF34, Human rhinovirus C, Human herpesvirus 6, Influenza A virus subtype H9N2, Human adenovirus C, Rotavirus A, Human coronavirus 229E (HCoV-229E), Human Herpesvirus 6A, Influenza B virus RNA1, Human adenovirus D, Enterovirus C, Human coronavirus OC43 (HCoV-OC43), Human Herpes virus type 6B (HHV-6B), Human adenovirus E, Enterovirus D68, Human coronavirus NL63 (HCoV-NL63), Human Herpes Virus Type 7 (HHV-7), Herpes simplex virus type 1 (HSV-1), Human adenovirus F, Enterovirus A4, Human coronavirus HKU1 (HCoV-HKU1), Human gammaherpesvirus 8, Herpes simplex virus type 2 (HSV-2), Primate erythroparvovirus 1 (erythrovirus B19/parvovirus B19), Enterovirus A71, Severe acute respiratory syndrome coronavirus (SARS-CoV), Human parainfluenza viruses type 1, Varicella zoster virus (VZV), Parainfluenza virus 1, Enterovirus A9, Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), Influenza C virus, Human herpesvirus 4 (HHV-4)/Epstein-Barr virus (EBV), Parainfluenza virus 3, Enterovirus B2, Middle East respiratory syndrome-related coronavirus (MERS-CoV), Japanese encephalitis, Human cytomegalovirus (HCMV)/Human betaherpesvirus 5 (HHV-5), Parainfluenza virus 4a, Enterovirus B3, Enteric Cytopathic Human Orphan virus 30 (ECHO virus 30), Measles virus, Human bocavirus 1, Norovirus GI, Enterovirus B4, Enteric Cytopathic Human Orphan virus 11 (ECHO virus 11), mumps virus, Human bocavirus 2, Norovirus GII, Enterovirus B5, Enteric Cytopathic Human Orphan virus 9 (ECHO virus 9), Hantavirus, Human bocavirus 3

Fungi (29 species)

Aspergillus nidulans, *Aspergillus oryzae*, *Cryptococcus neoformans*, *Emmonsia parva*, *Histoplasma capsulatum*, *Aspergillus fumigatus*, *Candida albicans*, *Aspergillus clavatus*, *Malassezia furfur* (Pityrosporum ovale), *Talaromyces marneffei*, *Aspergillus flavus*, *Candida glabrata*, *Aspergillus parasiticus*, *Rhizopus decemcar*, *Saccharomyces cerevisiae*, *Aspergillus ustus*, *Candida parapsilosis*, *Coccidioides immitis*, *Rhizopus microsporus*, *Schizophyllum commune*, *Aspergillus niger*, *Candida tropicalis*, *Cryptococcus gattii*, *Scedosporium apiospermum*, *Candida auris*, *Aspergillus terreus*, *Pneumocystis jirovecii*, *Emmonsia crescens*, *Sporothrix schenckii*

Others (27 species)

Chlamydia trachomatis, *Chlamydia pneumoniae*, *Rickettsia felis*, *Bartonella bacilliformis*, *Plasmodium malariae*, *Mycoplasma gallinarum*, *Chlamydia psittaci*, *Toxoplasma gondii*, *Bartonella henselae*, *Plasmodium ovale*, *Mycoplasma hominis*, *Rhipicephalus microplus*, *Treponema pallidum*, *Bartonella vinsonii*, *Schistosoma japonicum*, *Mycoplasma pneumoniae*, *Entamoeba histolytica*, *Angiostrongylus cantonensis*, *Bartonella quintana*, *Borrelia recurrentis*, *Ureaplasma parvum*, *Plasmodium falciparum*, *Leptospira interrogans*, *Plasmodium vivax*, *Borrelia burgdorferi*, *Ureaplasma urealyticum*, *Rickettsia tsutsugamushi*