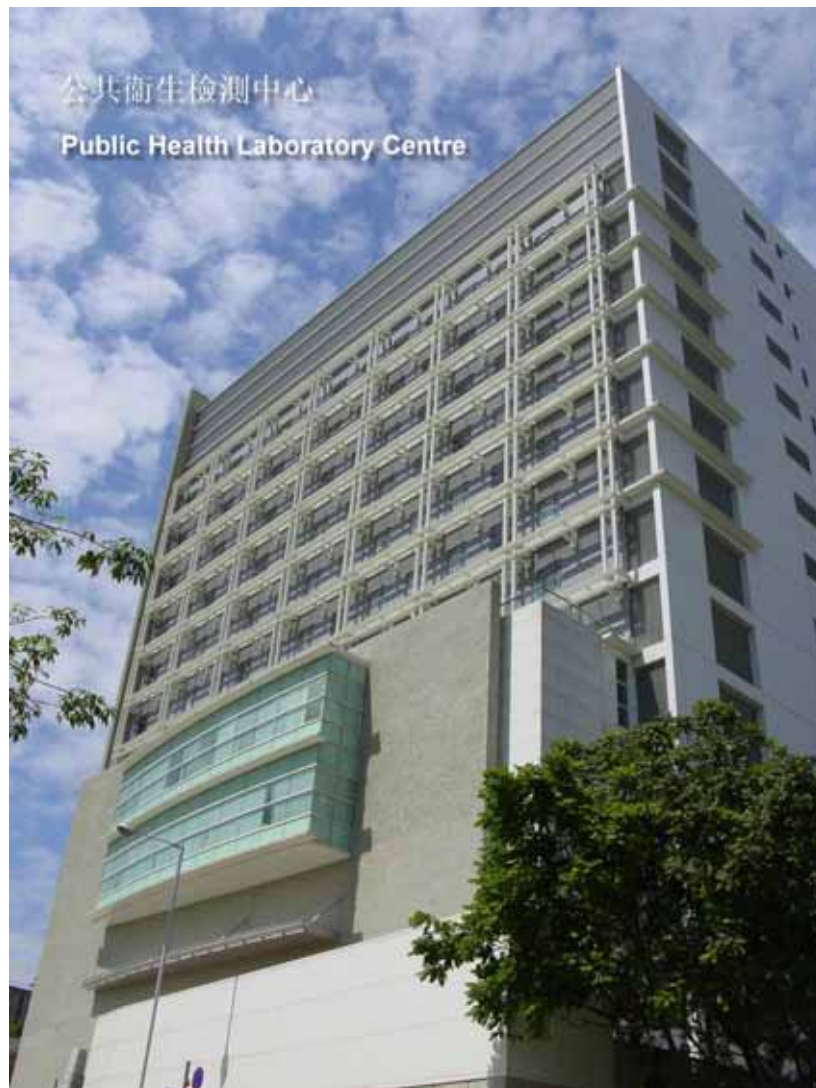


**Public Health Laboratory Centre  
Microbiology Division**



**Public Health Laboratory Services Branch  
Centre for Health Protection  
Department of Health  
Hong Kong Special Administrative Region**

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## **Overview**

The Microbiology Division provides public health (including the diagnosis and surveillance of communicable diseases) and microbiology laboratory services to clinics, hospitals and other health care institutions in Hong Kong Special Administrative Region.

The Division processes patients' specimens and surveillance samples for the diagnosis and screening of infections. The Division supports the function of the Centre for Health Protection (CHP) of Department of Health in disease surveillance, prevention and control through regular collection of laboratory-based epidemiological data, and timely laboratory diagnostic service for outbreak investigation.

The Microbiology Division comprises the following ten laboratories which are located from 5<sup>th</sup> to 10<sup>th</sup> floor of the Public Health Laboratory Centre (PHLC) building. They are:

1. Antimicrobial Resistance Surveillance and Bacterial Epidemiology Laboratory
2. Mycology and Parasitology Laboratory
3. Bacteriology Laboratory
4. Central Malaria Reference Laboratory
5. Food & Water Laboratory
6. Immunocytometry Laboratory
7. Media Preparation Laboratory
8. Mycobacteriology Reference Laboratory
9. Sexually Transmitted Diseases Laboratory
10. Syphilis Laboratory

## **Antimicrobial Resistance Surveillance and Bacterial Epidemiology Laboratory**

The Antimicrobial Resistance Surveillance section offers indispensable support to all the other microbiology laboratories by conducting majority of the antimicrobial susceptibility testing. It is also responsible for performing the laboratory part of the Sentinel Surveillance System for Antibiotic Resistance in the territory run by the CHP of Department of Health. This system covers both public and private sector practitioners.

The Epidemiology section performs laboratory tests to support epidemiological investigation. For example, it provides molecular typing tests including pulsed-field gel electrophoresis, DNA amplification and sequencing. It also performs phage typing test.



Analyser for DNA sequencing

## **Mycology and Parasitology Laboratory**

The Mycology and Parasitology section examines patient specimens for the presence of fungal pathogens and other human parasites. Specimens come from government clinics as well as hospitals. Direct microscopy and culture followed by morphological, biochemical and phenotypic tests are routinely employed to identify yeasts and pathogenic fungi. Human parasites are identified by microscopic examination. Serological tests are also performed to assist in the diagnosis and treatment monitoring for certain bacterial and fungal infections.

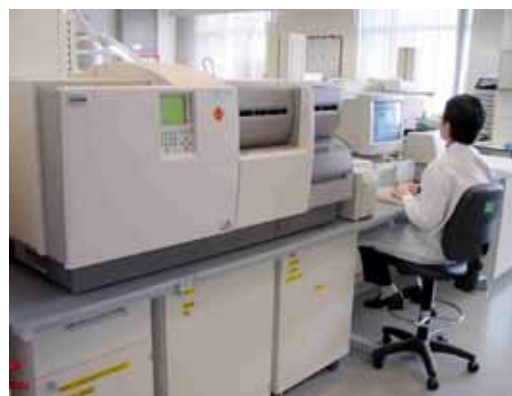
## **Bacteriology Laboratory**

The Bacteriology Laboratory provides a comprehensive bacteriological testing service.

Patient specimens from government clinics, hospitals and other health care institutions are examined for the presence of bacterial pathogens. A wide variety of specimens ranging from sputum, urine and stool to cerebrospinal fluid, blood and wound swab are handled. Techniques employed include culture using selective and differential media in a spectrum of growth conditions, from strict anaerobic to aerobic, heat-tolerant to salt-reliant and so forth. Suspected pathogens are identified to genus and if necessary to species level. Whilst conventional biochemical and phenotypic methods form the essential part of the identification procedures, modern automated identification systems and molecular biology techniques are also available. Investigation would also include susceptibility tests to selected panels of antimicrobial should chemotherapy be considered appropriate.



Anaerobic isolation



Bacterial identification equipment



Culture plates with growth of food-poisoning organisms

The laboratory also handles clinical specimens from outbreaks of communicable diseases including food-poisoning cases, cholera and respiratory tract infections. The laboratory also assists in surveillance of food handlers, acute diarrhoeal diseases and acute conjunctivitis. Laboratory support is available to any urgent event.

## Central Malarial Reference Laboratory (CMRL)

The CMRL provides reference laboratory service for screening, confirmation, identification of malaria parasites infection and assists in malaria prevention and control in the CHP of Department of Health.

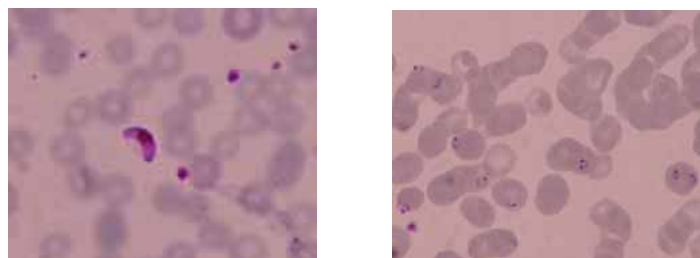


Examination of blood film for malaria parasites

The CMRL has been running a malaria parasite quality assurance program for more than 10 years for public and private laboratories in the territory. The aim of the program is to improve the public health capacity and proficiency of the laboratory personnel in making early and accurate diagnosis of malaria infection. A continuous improvement mechanism is offered to the participants who send all positive and 10 % negative slides (both thick and thin smears) to the CMRL for cross-checking.

The CMRL organizes malaria workshop on regular basis for the participants to ensure that there is continuous education and improvement in the laboratory diagnosis and speciation of malaria parasites.

The CMRL also focuses on developing and evaluating new methodologies and new reagent kits to improve the sensitivity and specificity of the diagnosis and differentiation of malaria parasites.



Left: *Plasmodium falciparum* gametocyte in blood film

Right: *Plasmodium falciparum* trophozoites in blood film

## **Food and Water Laboratory**

The Food and Water Laboratory comprises different functional laboratories which perform bacteriological examination on food samples, water samples, environmental samples, dairy products and pharmaceutical products.

The Food & Dairy Product Laboratory provides testing services for food and dairy products for the territory-wide food hygiene surveillance program and also for import and export control.



Examination of food sample



Membrane filtration for water sample

The Water Laboratory tests environmental water samples from the Food & Environmental Hygiene Department and the Leisure & Cultural Services Department. It also tests water samples for hydrotherapy pools of Physiotherapy departments of the Hospital Authority. The laboratory participates in Legionnaires' disease outbreak investigation.

The Outbreak Laboratory examines food, water and environmental samples in cholera surveillance, food-poisoning investigation and cholera outbreaks. On call service is available for urgent investigations. It performs tests for the detection of bacterial toxins of *Staphylococcus aureus*, *Clostridium perfringens* and *Bacillus cereus*.

The Pharmaceutical Product Laboratory provides testing services for the Pharmaceutical Manufactory and also for the Traditional Chinese Medicine Division of the Department of Health.

The Serotyping Laboratory provides bacteriological information related to epidemiological investigations by serotyping *Salmonella* organisms, *Campylobacter jejuni* and *Vibrio parahaemolyticus* isolates from our own laboratories and also from some laboratories of the Hospital Authority.

## **Immunocytometry Laboratory**

The Immunocytometry Laboratory is the centralized laboratory in Hong Kong SAR for performing the lymphocyte immunophenotyping for immunocompromised individuals including HIV and AIDS patients from the CHP of Department of Health, Hospital Authority, private hospitals and clinics for immune-monitoring and prognosis of the disease.

The availability of laboratory tools for the monitoring of disease status has made advances in the management of HIV/AIDS possible. Among the tests, immunologic study of markers CD3 (T-lymphocyte), CD4 (helper/inducer), CD8 (suppressor/ cytotoxic) and CD4/CD8 ratio is one of the most important tests vital in providing information on the disease progression, treatment indications and response after treatment. The laboratory performs immunophenotyping studies of CD3, CD4, CD8, CD4/CD8 ratio, and others, using the state-of-the-art automated flow cytometry system in the field.



Flowcytometer

With the use of Highly Active Antiretroviral Treatment (HAART), there is a decline in the mortality rate of HIV/AIDS patients. It is estimated that there will be about 30% increase per year in the number of test requests due to new cases and cumulative ones.

To align with the mission of the public health laboratory service for continuous improvement, quality and customer orientation, the laboratory has developed the competence to meet with future changes and challenges to cope with increased patient-orientated demands. More efficient, effective and versatile patient service can be expedited by the advanced technology with capabilities crucial for the sophisticated multicolor analysis and lymphocyte immune function.

## **Media Preparation Laboratory**

The Media Preparation Laboratory is situated on the 8<sup>th</sup> floor of the PHLC. It is the central place for preparing culture media for the daily use of the microbiology laboratories in PHLC.

The TB media section prepares large amount of Löwenstein-Jensen (LJ) medium and other related media for use by the Mycobacteriology Reference Laboratory for the isolation and susceptibility testing of Mycobacteria.

The general media section is responsible for preparing the media for use by other microbiology laboratories including Bacteriology, Sexually Transmitted Diseases and Food and Water Laboratory.



Variety of media ingredients for daily use



Finished product of the LJ medium in the inspissation room

Each day, many different kinds of agar plates and broth cultures are produced. They are prepared either aseptically or followed with sterilization. After quality control checking, they will be ready for use by the microbiology laboratories.

## Mycobacteriology Reference Laboratory

The Mycobacteriology (TB) Reference Laboratory is an integral part of the Public Health Laboratory Centre.

It provides centralized tuberculosis bacteriology services to all government TB & Chest clinics and health centres/institutions, hospitals and specialist clinics under the Hospital Authority.

It performs laboratory investigation to support epidemiological studies on local tuberculosis cases to help control of outbreak and prevention of the disease in Hong Kong.



Culture of Mycobacteria from clinical specimens



TB cultures in incubation room

It participates in collaborative studies with local and overseas institutes/organizations on clinical studies, including chemotherapy trials and quality assurance programmes to help improving and maintaining a high standard of the service.

It provides training for laboratory workers in Hong Kong and nearby areas.

### Service presently provided:

1. Microscopic examination for acid-fast bacilli from clinical specimen.
2. Direct detection of *Mycobacterium tuberculosis* from sputum by nucleic acid amplification method.
3. Culture of Mycobacteria from clinical specimen.
4. Identification of Mycobacteria isolates.
5. Drug susceptibility testing of *Mycobacterium tuberculosis* and other clinically significant *Mycobacterium* species.
6. *Mycobacterium tuberculosis* strain typing for outbreak investigations.
7. Urine isoniazid metabolite tests.
8. Collaborative studies on anti-TB drug trials and other epidemiological studies.
9. Training of laboratory workers.

## Sexually Transmitted Diseases Laboratory

The Sexually Transmitted Diseases Laboratory provides service to all the government clinics including Social Hygiene Clinics and Maternal & Child Health Centres.

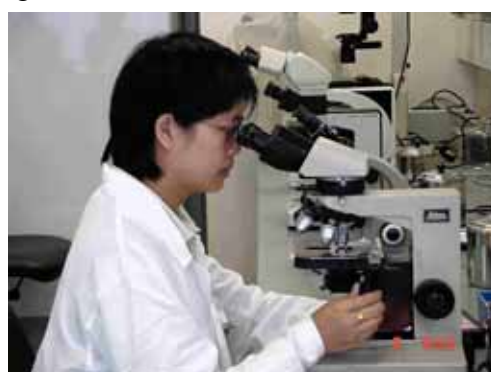
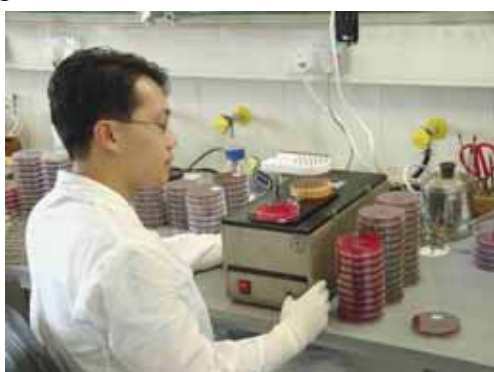
The tests performed include the detection of *Chlamydia trachomatis*, the culture of *Neisseria gonorrhoeae* and other pathogens from genital tract specimens and the culture of *Haemophilus ducreyi* from genital ulcers.



*Chlamydia* Polymerase Chain Reaction tests

Antimicrobial susceptibility testing is being performed for *Neisseria gonorrhoeae*. The laboratory also aims to determine the magnitude, nature and diversity of antimicrobial resistance in *Neisseria gonorrhoeae*, as well as study the dynamics of gonococcal strain populations within communities.

The laboratory has been participating in The Gonococcal Antimicrobial Susceptibility Programme (GASP) of WHO Western Pacific Region since 1991.



Gonococcal susceptibility testing and microscopy

Our vision is to be a world-class sexually transmitted diseases laboratory delivering excellence in public health laboratory support service as well as research and training. Our work will help to protect the sexual health of people of Hong Kong and support the development of a sound sexually transmitted diseases control programme.

## Syphilis Laboratory

The Syphilis Laboratory provides laboratory tests for screening, diagnosis and treatment monitoring of *Treponema pallidum* infection.

Serologic tests for syphilis have been performed since the early 1900s. The current tests are more sensitive and specific than the early tests. The service of this laboratory includes territory-wide antenatal serological screening for syphilis antibodies, serodiagnosis of syphilis for government clinics, some Hospital Authority and private hospitals, and treatment monitoring laboratory testing for syphilitic patients.



Automated Immunoassay System for Syphilis testing



Rotator for VDRL testing

Activities in the Syphilis Laboratory focuses on performing and ensuring that standardized tests and reagents are appropriately used in the routine service. Standardised tests available are: Venereal Disease Research Laboratory, Rapid Plasma Reagin, Fluorescent Treponema Antibody Absorption, Treponema Pallidum Particle Agglutination, and Cerebrospinal Fluid Venereal Disease Research Laboratory tests. Supplementary tests such as Enzyme Immuno Assay and Western Blot tests are also available when some of the diagnostic problems cannot be resolved by the applications of classical standard tests.

The Syphilis Laboratory also focuses on conducting evaluations of new test methodologies and new reagent kits with a view to improve the diagnostic tools for *T. pallidum* infection in assisting disease control and to fill gaps left by syndromic management and treatment algorithms.

## **Quality Assurance Activities**

The Microbiology Division is committed to provide a quality laboratory service, and actively participate in various quality assessment programmes on laboratory testing. These include the *American Society of Clinical Pathology* of United States of America, the *Royal College of Pathologists of Australasia* of Australia, the *Health Protection Agency* of United Kingdom and the *Hong Kong Institute of Medical Laboratory Services*. The Microbiology Division also helps to promote quality among local medical laboratories. The Central Malaria Reference Laboratory and the Syphilis Laboratory are conducting quality assurance programmes in malaria parasite and syphilis serological tests respectively. The Mycobacteriology Reference Laboratory is co-organising with the *Hong Kong Institute of Medical Laboratory Services* in performing a quality assurance programme for acid-fast bacilli for diagnostic laboratories in Hong Kong.