

## Microbial Evolution and Bioinformatics

Studying the evolution of microorganisms is crucial to understanding the complexity of genetic adaptation of pathogens to diverse hosts and environmental conditions. Our goal is to decode this process in order to reverse the harmful effect of pathogens on human health. In our work, we have played a compelling role identifying the genetic heterogeneity of papillomaviruses and the evolution of viruses into a carcinogen. As members of a leading international authority — the Papillomaviridae Study Group of the International Committee on Taxonomy of Viruses — we are involved in virus classification and nomenclature. Currently, we utilise the advanced tools of systems biology and bioinformatic pipelines, including Next-Generation Sequencing (NGS) and large dataset analyses, to explore the evolution of pathogen genomes and their association with cancers.

Zigui CHEN | [zigui.chen@cuhk.edu.hk](mailto:zigui.chen@cuhk.edu.hk) ✉



香港中文大學醫學院  
Faculty of Medicine  
The Chinese University of Hong Kong

## Microbiology

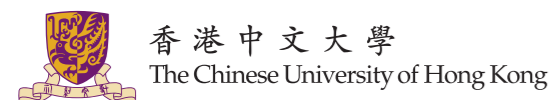
Microorganisms cause a broad-spectrum of infections that can have a serious impact on human health. Clinical microbiology is the medical discipline concerned with preventing, managing and curing infectious diseases. At the Department of Microbiology, we provide training in the skills required by healthcare professionals to handle real-time challenges in a wide range of patient situations. We also conduct cutting-edge research on issues of global and local concern, with a special focus on oncoviruses and antimicrobial resistance. Our enthusiasm and collaboration with clinicians and experienced scientists, both locally and internationally, have enabled the Department to excel in several areas. Among the Department's many achievements, we have identified human papillomavirus variants of high cancer risk affecting Asian women, fine-tuned influenza therapy, and elucidated the pathogenesis of human herpesvirus 6 in transplant recipients. Additionally, we have accumulated extensive experience studying antibiotic resistance and the epidemiology of multidrug resistance microorganisms.

# DEPARTMENT OF MICROBIOLOGY

## Microbiota and Microbiome

The terms microbiota and microbiome refer to assemblages of microorganisms and their collective genomic material, respectively. Human microbiomes have long been implicated in the maintenance of health and wellbeing. Combining advancements in high-throughput DNA sequencing technology and bioinformatics, the Department is spearheading research into microbiota and microbiome to understand their disease mechanisms and exploring clinical applications. By reconstructing and studying microbial genomes specific to Hong Kong, mainland China and other populations, we are putting a new spin on the development of microbiota-based personalised medicine.

Yun Kit YEOH | [yeohyunkit@cuhk.edu.hk](mailto:yeohyunkit@cuhk.edu.hk) ✉



## Novel Antimicrobial Discovery

The emergence of multi-drug resistant bacteria or superbugs is considered by the World Health Organization to be an "increasingly serious threat to global public health." New classes of antimicrobial agents are crucial for halting society's slide into "the post-antibiotic era". The Department employs rational design to identify bacterial transcription inhibitors that exhibit antimicrobial activities against clinically important pathogens, including methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile*.

Xiao YANG | [xiaoyang@cuhk.edu.hk](mailto:xiaoyang@cuhk.edu.hk) ✉

[www.med.cuhk.edu.hk](http://www.med.cuhk.edu.hk)

“ Our mission is to improve human health by solving clinical microbiological problems. We aspire to deliver world-class education, training, research and patient-oriented clinical services. With the combined efforts of colleagues in different disciplines, our Department is well-prepared to face the challenges ahead. We will strive to maximise the clinical benefits that microbiologists make possible. ”

Paul Kay Sheung CHAN  
Chairman

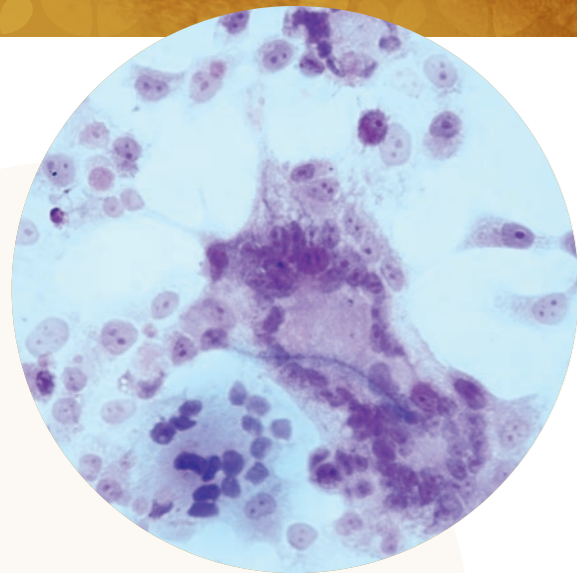




## Human Tumour Virology

About 20% of human cancers are caused by viruses, many of which are human papillomaviruses (HPVs). The Department leads a multidisciplinary team, including gynae-oncologists, pathologists, rheumatologists, otorhinolaryngologists, epidemiologists, public health specialists and physicians, who are focused on local and global HPV-related issues. Together, we have successfully generated comprehensive contextual-specific data on HPV infection that have greatly benefited local cervical screening and contributed to an HPV vaccination programme. We also established The International HPV52/58 Study Group, a collaborative effort by investigators from 15 countries that has led to ground-breaking research on two types of HPV with a high cancer risk in East Asia. This has had a significant impact on the development of diagnostic assays and a vaccine tailored for the region. In addition, we are working towards uncovering new cancers associated with HPV, identifying the contribution of environment pollutants and co-factors in HPV-induced carcinogenesis, and searching for a technical breakthrough to improve the clinical value of HPV testing.

Paul Kay Sheung CHAN | paulkschan@cuhk.edu.hk ✉



## Human Respiratory Viruses

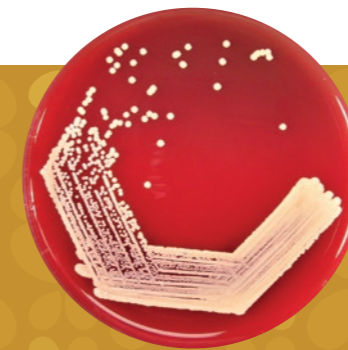
Respiratory viral infections are a major cause of hospitalisation and death worldwide. At the Department, we are committed to exploring novel means of controlling these respiratory diseases. The wide-ranging expertise of our medical specialists and researchers has enabled us to adopt multi-dimensional approaches to combating influenza, respiratory syncytial virus and rhinovirus. Furthermore, we have achieved breakthroughs in clinical practice and vaccination strategies, and have had our findings in influenza therapy incorporated into the guidelines issued by key authorities such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) in the United States. Our epidemiological findings on influenza B have also provided evidence that supported the adoption of new quadrivalent vaccines in Hong Kong. At present, we are exploring a new approach for identifying influenza vaccine strains in Hong Kong and other tropical/subtropical regions of Asia, and studying the effects of climate change on infection.

Paul Kay Sheung CHAN | paulkschan@cuhk.edu.hk ✉

## Antimicrobial Resistance

Antimicrobial resistance is an increasingly serious threat in clinical settings and the socio-economic environment worldwide. The Department has a longstanding interest in tackling antimicrobial resistance and has established an Asia-Pacific and international collaborative network for finding solutions to this challenge. Within the Department, we focus on the clinical and molecular epidemiology of bacteria that have global importance but local relevance, including methicillin-resistant *Staphylococcus aureus* (MRSA), *Streptococcus pneumoniae* and multidrug resistant Gram-negative bacteria. Over the last few decades, we have studied the resistance mechanisms of several bacteria species, such as penicillin-resistant *Streptococcus pneumoniae*, MRSA, Imipenem-resistant Acinetobacters, and Multidrug-resistant *M. tuberculosis*, with discoveries in novel bacterial resistance genes and determinants. To address their disease pathogenesis and antimicrobial resistance, we utilise multiple approaches ranging from basic bacteriology and animal models to advanced genome sequencing, transcriptomics and proteomics technologies.

Margaret IP | margaretip@cuhk.edu.hk ✉



## Norovirus Gastroenteritis

Norovirus is a leading cause of food-borne acute gastroenteritis that affects all age groups worldwide and which poses a tremendous threat to the food industry. Our group focuses on the epidemiology, evolution, and pathogenesis of the norovirus. In recent years, we have successfully established a hospital-based norovirus surveillance system linked to an international network for monitoring the emergence of novel strains. We also pioneered the discovery of a novel variant, GII.17, and contributed to over 80% of its complete genome. These and other findings have been published in leading international journals. Currently, we are investigating the genome-wide evolutionary dynamics and global circulation of novel norovirus variants, as well as the reservoir of emergent norovirus variants.

Martin Chi-wai CHAN | martin.chan@cuhk.edu.hk ✉

## Antifungal Resistance

Invasive fungal infections lead to morbidity and mortality in immunocompromised patients. Although antifungal agents such as azoles, polyenes and echinocandins are therapeutic, they are not devoid of side effects. Moreover, the recent emergence of antifungal resistance has limited the choice of such lifesaving agents. Unlike antibacterial resistance, antifungal resistance can be physiological in nature. Therefore, a thorough understanding of the mechanisms of antifungal resistance is essential and will lead to novel strategies for tackling this issue. Our main research focus is the epidemiology of invasive fungal diseases, the prevalence and mechanisms of antifungal resistance agents, and the development of *in vivo* animal models to evaluate novel therapeutic agents and treatment strategies.

Mamie HUI | mamiehui@cuhk.edu.hk ✉