



Introduction

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Clinical Immunology Laboratory

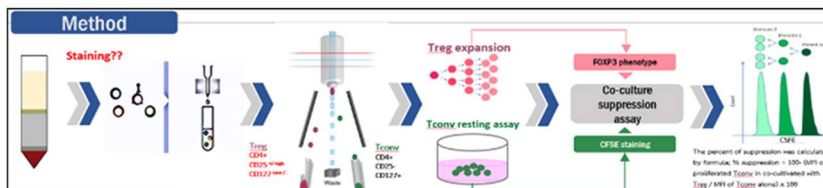


Head of Laboratory: Assoc. Prof.
Mongkol Kunakorn, M.D.,

Certificate of Proficiency in Clinical Pathology



Research themes: Immune function, Immune deficiency, Ig evaluation, Autoimmune diseases, Allergic diseases, Infectious serology, Tumor markers



Immunology Research

Rheumatoid arthritis (RA) is a systemic immune disorder which mainly results in joint inflammation. Disease-modifying antirheumatic drugs (DMARDs) are a group of medication for treating RA. RA patients with DMARDs reduction needs a tool for careful monitoring. Our project aimed to determine the number and suppressive activity of Treg and plasma cytokines from peripheral blood (PB) of RA patients with DMARDs reduction.

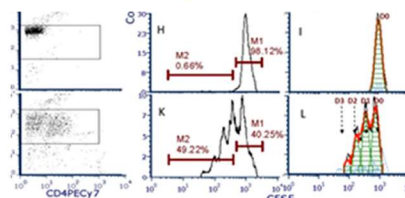
Immune deficiency & Allergy

Severe combined immunodeficiency (SCID) is a heterogeneous group of primary immune deficiency disorders. We developed a real time PCR assay to detect T cell receptor excision circles (TREC). TREC are small circular fragments of DNA that form as T cell receptor rearrangement occurs during maturation of T cells in the thymus. Once a child is identified to have very low to absent TREC, further diagnostic tests including flow cytometry to quantify total T cells (CD3), helper T cells (CD4), suppressor T cells (CD8), B cells (CD19/20), naive T cells (CD45 RA), memory T cells (CD45 RO) and NK cells (CD 16/56) is performed.

Changes of Regulatory T cells after Allergen-specific Subcutaneous Immunotherapy. Rush Protocol, in Children. Moreover, we interest immunological biomarker for diagnosis of Hypersensitivity pneumonitis (HP) in patient with a fibrosing alveolitis produced by inhalation of diverse antigens.

Immuno-Oncology Research Using Flow Cytometry

Immuno-oncology is the study of the immune system within a tumor microenvironment. Identification of biomarkers in cancer immunotherapy that predict therapeutic response and/or limit adverse events are a critical need in the field. We focus on renal cell carcinoma and lung cancer.



We recently establish use flow cytometry for quantitative measure immune cells, especially regulatory T cell (Treg), T cell CD8+ PD1+ etc. Moreover, the function of Treg by suppressing assay are evaluated and correlated with clinical characteristics for cancer patients. Including the immune checkpoint inhibitor (anti-PD1, anti-CTLA4) and cytokines panels.

Infectious Serology

Research application of viral serology including HIV, Hepatitis virus (HAV, HBV, HCV), TORCH infection, Bacterial serology e.g. Melioid titer, ASO titer, *Leptospira* Ab, *Scrub typhus* Ab, *C. difficile* toxin, *H. pylori* (Ab/Ag), fungal serology e.g. *Cryptococcus* Ag, galactomannan, mannan (candida Ag), and *Pneumocystis jirovecii* (by IF). serologic testing for syphilis e.g. VDRL, RPR, TPPA, FTA-ABS, and Syphilis TP (CLIA). Interferon-Gamma Release Assays (IGRAs) included T-SPOT.TB (Tuberculosis), QuantiFERON-TB, and QuantiFERON-CMV.

Microbial pathogenesis & Host responses to endemic pathogens

Infectious diseases pose threats to human health, and this problem has become more concerned, as drug-resistant and endemic pathogens increasingly exist.

Our research focuses on microbial pathogenesis and host responses to endemic pathogens, such as *Pythium insidiosum*, with attempts to better understand how the disease occurs at the cellular and molecular level.

We also search for a new drug and vaccine target for a particular pathogen. Many sophisticated immunological, biochemical, and molecular techniques have been employed to achieve our research goal.

The obtained knowledge will pave a way to development of effective diagnostic and therapeutic modalities, which could promote a better prognosis of patients with the infectious disease.

So far, we have published a number of publications, regarding about microbial pathogenesis and host responses, in many impacted journals as to demonstrate our contribution to the schematic community.

Contact

For more information please contact us via
Clinical Immunology Laboratory, Department of Pathology,
Faculty of Medicine Ramathibodi Hospital, Mahidol University,
270 Rama 6 Road, Rachathewi, Bangkok, Thailand 10400
Tel. +662011379 and Fax +6622011267
E-mail: putthapoom.lum@mahidol.ac.th



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Forensic Pathology

Virtual autopsy

คือการนำสไลด์พลิกศพแบบเสมือนจริง ซึ่งได้แก่การใช้ภาพรังสีในการตรวจศพ

ตัวอย่างงานวิจัยที่ตีพิมพ์

- Comparison of postmortem CT and conventional autopsy in five trauma fatalities. Forensic Imaging. 2020 Sep 1;22:200389.
- Sensitivity and Specificity of Postmortem CT for Detection of Thoracic Injury. Indian Journal of Forensic Medicine and Toxicology



Sudden Unexpected Death

คือการศึกษาเกี่ยวกับการตายตามธรรมชาติที่ทำให้เสียชีวิตแบบกะทันหัน

ตัวอย่างงานวิจัยที่ตีพิมพ์

- Myoglobin and C5b9 immunohistochemistry studies in heart tissue from sudden unexpected natural death cases. Australian Journal of Forensic Sciences. 2021 Mar 18:1-1.
- High Prevalence of Left Ventricular Hypertrophy in Sudden Cardiac Death: A Comparison Study of Two Populations. Circulation. 2017 Nov 14;136(suppl_1):A19168-.
- High frequency of hypertensive intracerebral hemorrhage as a cause of sudden unexpected death in asian population. Journal of the american college of cardiology. 2016 apr 5;67(13s):2007-.



Wound study

การศึกษารูปแบบการบาดเจ็บต่างๆ จนทำให้เสียชีวิต จากหลายกรณี เช่น อุบัติหารถติด

ตัวอย่างงานวิจัยที่ตีพิมพ์

- Entrance and exit wounds of high velocity bullet: An autopsy analysis in the event of dispersing the mass rally in Bangkok Thailand, May 2010. Legal medicine. 2016 Nov 1;23:10-6.
- Fatal firearm injuries in autopsy cases at central Bangkok, Thailand: a 10-year retrospective study. Journal of forensic and legal medicine. 2014 Nov 1;28:5-10.

Forensic Toxicology

การศึกษเกี่ยวกับสารพิษหรือยาเสพติดที่ตรวจพบในศพ

ตัวอย่างงานวิจัยที่ตีพิมพ์

- Methamphetamine-related post-mortem cases in Bangkok, Thailand. Medicine, Science and the Law. 2019 Jul;59(3):164-70.
- Rhabdomyolysis in drug-related deaths. Egyptian Journal of Forensic Sciences. 2020 Dec;10(1):1-7.



งานนิทรรศการ
กับกรณีการชันสูตรพลิกศพ
ศาลาว่าการจังหวัดปทุมธานี เมื่อวันที่ 15 ตุลาคม 2563

งานนิทรรศการ
เพื่อผู้ป่วยคดีและผู้ต้องขัง
ศูนย์ฝึกอบรม ตำรวจภูธรภาค 4
เมื่อวันที่ 15 ตุลาคม 2563

Forensic Serology and DNA

การศึกษเกี่ยวกับวัตถุพยานชีวภาพหรือดีเอ็นเอเพื่อพิสูจน์อัตลักษณ์บุคคลหรือเป็นพยานหลักฐานในคดี

ตัวอย่างงานวิจัยที่ตีพิมพ์

- Comparison between prostate specific antigen and acid phosphatase for detection of semen in vaginal swabs from raped women. Journal of forensic and legal medicine. 2013 Aug 1;20(6):578-81.
- The Study of the Yield of DNA Extracted From Hairs of Postmortem Cases. Ramathibodi Medical Journal. 2020 Jun 30;43(2):9-18.



Molecular Autopsy

การวิจัยเกี่ยวกับการเสียชีวิตด้วยการตรวจทางโมเลกุล เช่นการตรวจทาง DNA RNA Genomics ต่างๆ เพื่อวินิจฉัยสาเหตุการตาย, ประมาณอายุของผู้เสียชีวิต

Time of death estimation

เป็นการวิจัยตรวจพิสูจน์เสียชีวิตด้วยวิธีการต่างๆ เพื่อหาเวลาที่เสียชีวิต

ตัวอย่างงานวิจัยที่ตีพิมพ์

- The use of pilocarpine eye drops for estimating the time since death. Journal of forensic and legal medicine. 2016 Apr 1;39:100-3.

Contact

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Forensic Pathology, Department of Pathology,
Faculty of Medicine Ramathibodi Hospital, Mahidol University.
270 Rama 6 Road, Rachathewi, Bangkok, Thailand 10400
พ.ศ. นว.สมิทธิ์ ศรีสนธิ email: smithfa118@yahoo.com โทร. 089-6031578
ศ. นว.วิศาล วรสุวรรณรักษ์ email: Wisarn.wor@mahidol.ac.th โทร. 089-1322432



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Division of Hematology

Our staff:



Karan Paisooksantivatana, M.D. Narin Khongjareonsakun, M.D. Pawadee Chinudomwong, M.D.

Research interests:

- **R2R:**
 - o Optimization of resources for improving quality and efficacy of hematology lab in clinical practices
 - o Method verification and validation of routine-based hematology assays
- **Translational research:**
 - o Minimal residual disease in hematologic malignancies
 - o Diagnostic and prognostic biomarkers in hematologic malignancies
 - o Flow cytometry for diagnosis of various non-malignant hematologic diseases
 - o Flow cytometry assessment for novel therapeutic modalities e.g. targeted therapy, CAR T-cells

Our Facilities:

- **General hematology and coagulation lab:**
 - o Total lab automation in hematology including digital imaging system and middleware
 - o Automated coagulation analyzers and platelet function tests
- **Flow cytometry lab:**
 - o BD FACS Fortessa[®] equipped with 4 lasers 20 parameters
 - o BD FACS AriaIII[®] cell sorting equipped with 2 lasers 10 parameters
- **Thalassemia lab:**
 - o Sebia[®] Capillary electrophoresis analyzer, Bio-rad[®] High performance liquid chromatography analyzer, qualitative and quantitative PCR machines

Contact

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Division of Hematology, Department of Pathology,
Faculty of Medicine Ramathibodi Hospital, Mahidol University.
270 Rama 6 Road, Rachathewi, Bangkok, Thailand 10400
Tel. and Fax +6622011436
E-mail: karan.pai@mahidol.ac.th



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Human Genetic Laboratory



Head of Laboratory: Associated Professor
Budsaba Rerkamnuaychoke, D.M.Sc.

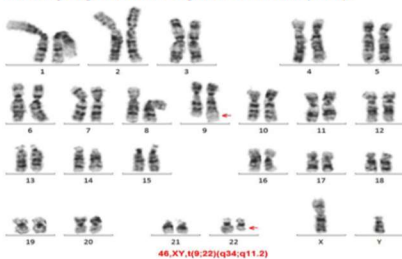


International standard laboratory for genetic testing in multi-medical disciplines including precision medicine in cancers, hemato-oncology, reproductive genetics, rare diseases, and forensic genetics

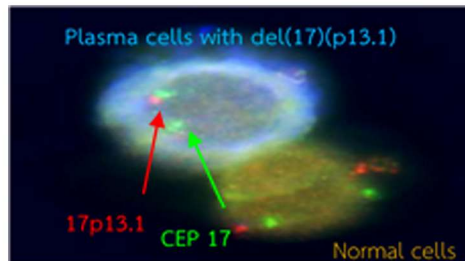
Translational Research

CYTOGENETICS

Chromosomal alterations are involved in the pathogenesis of several diseases such as classical trisomy 21 (down syndrome) and majority of chronic myeloid leukemia (CML). We performed standard karyotyping for the diagnosis of several genetic diseases and leukemia for almost 50 years. Our Lab are continuing improve as we are accredited by ISO15189 and participated in the College of American Pathologist (CAP) proficiency program. There are nearly 3,000 bone marrow samples requested for karyotyping in 2018. Our current research is focusing on the dosage respond of radioactive to chromosomal structural changes (cytogenetic biodosimetry) and the measurement of chromosome damage in Fanconi anemia. Chromosomal alterations are involved in the pathogenesis of several diseases such as classical trisomy 21 (down syndrome) and majority of chronic myeloid leukemia (CML).



A Karyotype showing Philadelphia chromosome positive in a CML patient



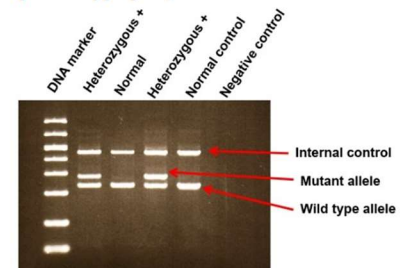
CYTOGENOMICS

We perform FISH for many applications aiming to detect know cryptic chromosomal aberrations and gain/loss of gene segments involving in several diseases. Those are including numerical abnormalities of chromosome 21, 18, and 13 in both prenatal and postnatal genetic test. Additionally, we use FISH for the detection of recurrent chromosomal translocations in blood cancer such as t(9;22), t(8;21), t(15;17), MLL and IgH rearrangements. In breast cancer, we detect HER2/neu amplification using FISH. We also provide FISH for the detection of common genetic alterations in multiple myeloma which are very important for risk-assessment. Similar to several tests available in the lab, most of FISH assays are accredited by ISO15189 and participated in CAP for proficiency testing. Recently, we success to establish chromosomal microarray to simultaneously analyse gain/loss of chromosome in several genetic diseases.

MOLECULAR PATHOLOGY

We develop variety molecular genetic tests which high specificity and sensitivity for the detection of common leukemia association transcription factors (LATFs) and driving mutations. Those are including translocations involving leukemia such as BCR-ABL1, PML-RARa, AML1-ETO, E2A-FBX1, TEL-AML1 and somatic mutations such as FLT3, NPM1, CEBPA, JAK2 V617F, CARL, and MLL rearrangement. Our lab currently success to perform comprehensive genetic analysis for the management of chronic myeloid leukemia.

We recently establish high performance PCR-based technologies including Beads-on-Beads (BoBs) and QF-PCR for routine analysis of common chromosomal aneuploidies such as down syndrome and turner syndrome. Moreover, our lab is a reference laboratory in Thailand to service for DNA fingerprinting which has broadly applications such as in paternity and maternity test, kinship analysis, mitochondrial DNA analysis and forensic casework (all tests are accredited by ISO15189 and ISO17025, and participated in CAP for proficiency program).



Contact

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Human Genetic Laboratory, Department of Pathology,
Faculty of Medicine Ramathibodi Hospital, Mahidol University,
270 Rama 6 Road, Rachathewi, Bangkok, Thailand 10400
Tel. and Fax +6622011267
E-mail: teerapong.sir@mahidol.ac.th



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Pharmacogenomics and Personalized Medicine Laboratory



Pharmacogenomics and Personalized Medicine Program focuses on teaching and learning about how human genetic abnormalities affect an individual's responses to different drugs. The most important aspect of Pharmacogenomics research is to increase patients' quality of life by preventing the adverse drug reaction and adjusting the proper dose for each patient. We have 3 major parts in Pharmacogenomics laboratory: Genotype, Phenotype and Pharmacogenomics Clinic which we can create new knowledge in order to apply into clinical setting.

Genotype

We have 3 main research fields for genetic profiles including HLA gene, CYP450 profiles and other genes that involved in pharmacokinetics and pharmacodynamics. For example, *HLA-B*1502* for carbamazepine treatment, *CYP2B6* for Efavirenz treatment and *TPMT/NUDT15* for ALL patients. We perform PCR-SSOP-luminex method and real-time PCR to detect the genetic risks of patients before starting a treatment. Our Laboratory testing are continuing to improve as we are accredited by ISO15189.



Pharmacogenomics clinic

In this part, you will learn to take Pharmacogenomics knowledge into clinical practice in terms of drug efficacy, toxicity and safety. We work based on scientific paper and our current research. In addition, you can learn the integration of genetic factors and non-genetic factors such as ethnicity, lifestyle, environment that have an influence on a comprehensive review of patients' manifestation.

Phenotype

Enzyme activities, Pharmacokinetic and Individualized Dose adjustment are significant part in monitoring and fulfilling the understanding of human biological system with different genetic profiles. We use Liquid Chromatography-tandem mass spectrometry (LC-MS/MS) technique which is highly specific, sensitive and reliable method for enzyme activity quantitation and dose adjustment testing. For example, the *TPMT* activity in ALL patient and dose adjustment of busulfan.



Contact

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Pharmacogenomics and Personalized Medicine Laboratory,
Department of Pathology, Faculty of Medicine Ramathibodi Hospital, Mahidol University.
270 Rama 6 Road, Rachathewi, Bangkok, Thailand 10400
Tel. and Fax +6622011390, +6622004331
E-mail: apichaya.pua@mahidol.ac.th