Pharmacogenomics in the Clinics: International Progress

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Center of Medical Genomics
Ramathibodi Hospital
Mahidol University

South East Asian Pharmacogenomics Research Network

Southeast Asia › Countries


"Global leaders in Genomic Medicine identifying
Pharmacogenomics
as a flagship."
Global Leaders in Genomic Medicine
Washington, DC, USA
January 8, 2014
genome.gov
National Human Genome Research Institute
National Institutes of Health

The Institute of Medicine (IOM):
a division of the National Academies of
Scien: ces, Engineering, and Medicine.

Global Genomic
Medicine Collaborative

November 6-7, 2015 in
Singapore

Global Genomic
Medicine Collaborative

3rd Global Genomic Medicine Collaborative
Implementing Genomic Medicine into Prtactice
27-29 April 2017, Athens GREECE

Implementing Genomic Medicine Into Practice


3
Deep sequencing
For drug resistant
genes
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PGS/PGD
5
NIPT/NIPD
6
New born
screening
Gene panels
7
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Gene panels
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diseases/
ศูนย์จีโนมทางการแพทย์
CENTER FOR MEDICAL GENOMICS
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human genome
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Cell free tumor DNA
Gene panels

ศูนย์จีโนมทางการแพทย์
CENTER FOR MEDICAL GENOMICS

Thailand 4.0 มีฐานรากทางความคิดมาจาก "การปฏิวัติอุตสาหกรรมครั้งที่ 4" (4th Industrial Revolution)

Genuine creativity, innovation, and deep interaction with people, building strong relationships with clients (human being).

หัวหน้าศูนย์จีโนมทางการแพทย์

หัวหน้าห้องปฏิบัติการไวรัสวิทยา

ผู้อำนวนการโครงการเภสัชพันธุศาสตร์

ID	ชื่อ
1	ศ.ดร. วสันต์ จันทราทิตย์

	โครงการเภสัชพันธุศาสตร์
2	รศ.ภก.ดร. ชลภัทร สุขเกษม
3	นพ. สุรัคเมธ มหาศิริมงคล
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9	นางสาว สันติรัตน์ พรหมมาศ
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15	ผศ.พญ. ธัญนันท์ เรืองเวทย์วัฒนา
16	นพ. จักรกฤษณ์ เอื้อสุนทรวัฒนา
17	นางสาว อังคณา เจริญยิ่งวัฒนา
18	นาย อินทรี เสนสอน
19	นางสาว นรีนาถ เอี่ยมวิมังสา
20	นาย ภาคภูมิ ปานตั้น
21	นาย สมมน กล่ำเสถียร
22	นางสาว วันทนิช ไพโรจน์

	ห้องปฏิบัติการไวรัสวิทยา
23	นาย วิโรจน์ ปองธนพิสิฐ
24	นาง จุฑาทิพย์ ศรีจันทร์รัศมี
25	นางสาว ปารีณา จันทร์ชมภู
26	นางสาว ช่อทิพย์ วาทิตต์พันธุ์
27	นางสาว กนกนันท์ ถนอนปกรณ์
28	นางสาว วิชุฎา นาคพวง
29	นางสาว ญาณิกา กีรติวงศา
30	นางสาว สุคันธา กวีภัทรนนท์


Exome sequencing
Data analysis & Clinical Interperation

We are free from diseases inherited in our families

Hereditary non-polyposis colon cancer

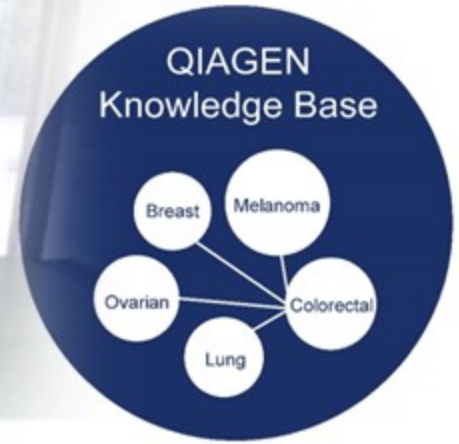
Pantothenate kinase-associated neurodegeneration

Gaucher disease

FREE FROM HEMOPHILIA A

Marfan syndrome

Congratulations to Team Thailand – GAME ON!



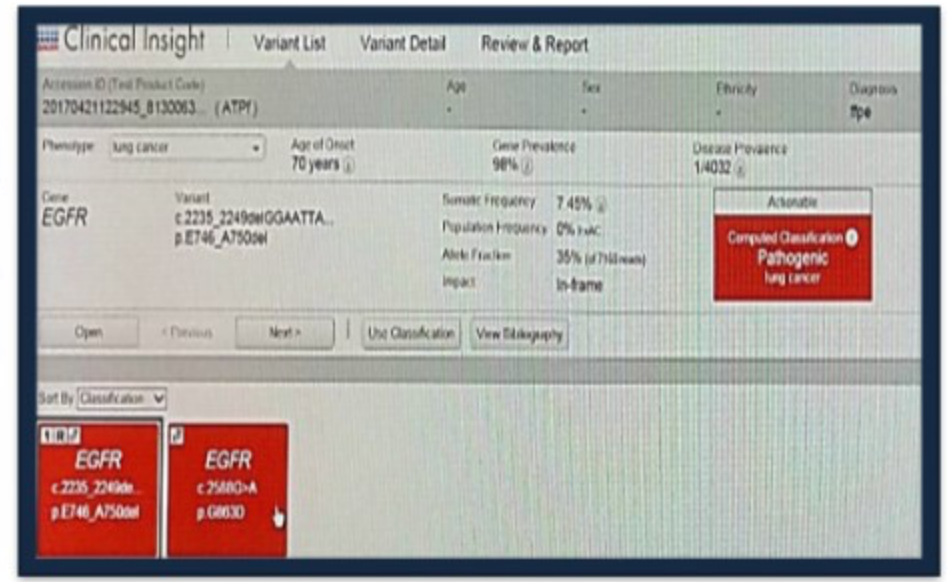
Targeting solid tumors with:

- Highest prevalence
- Greatest need for testing
- Variants associated with actionable insights

12 genes

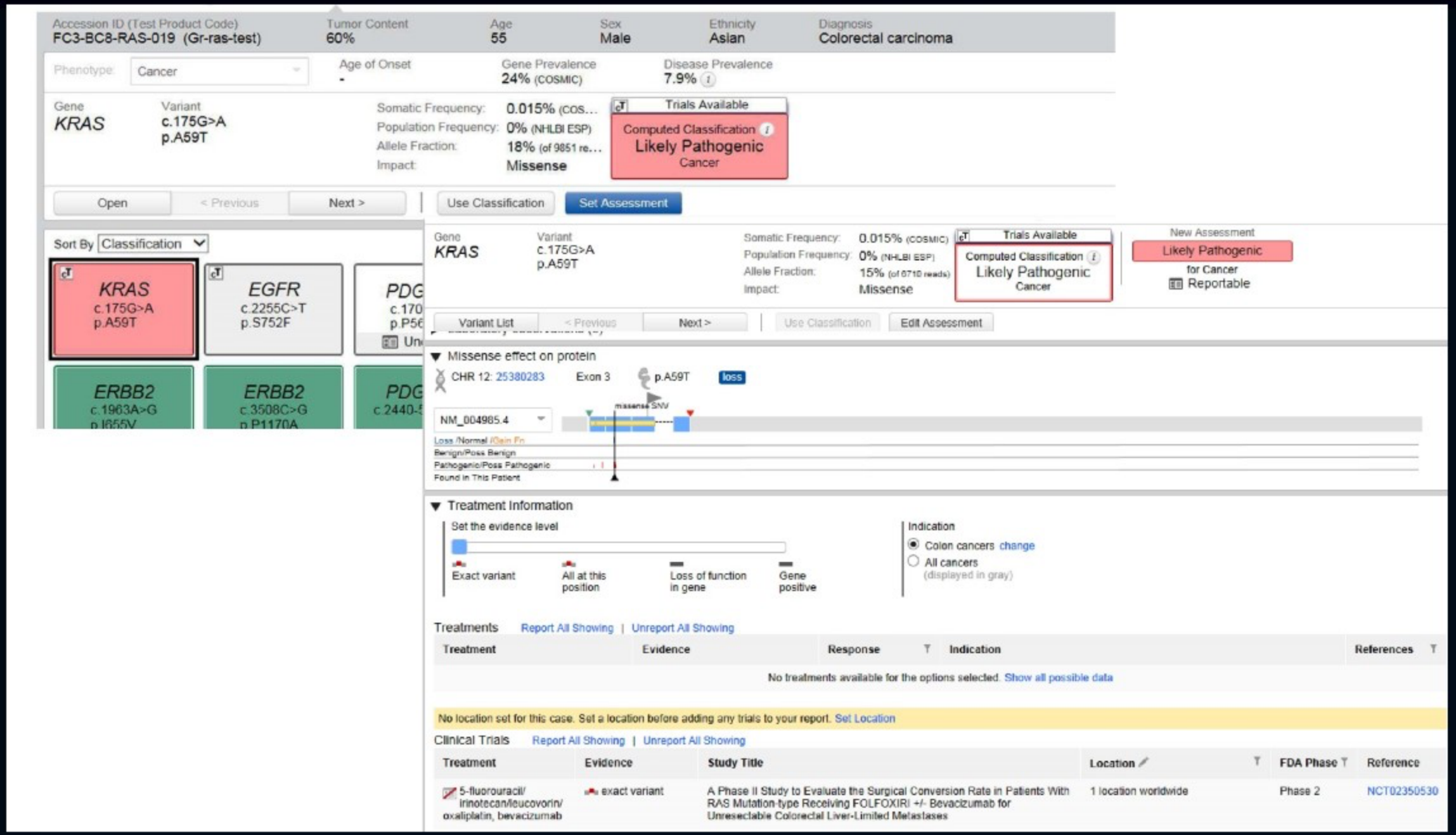
- KRAS
- NRAS
- KIT
- BRAF
- PDGFRA
- ALK
- EGFR
- ERBB2
- PIK3CA
- ERBB3
- ESR1
- RAF1

Actionable cancer panel



"As part of our Thailand initiative, we are happy to share a recent story for the first GeneReader installation in SEA at Ramathibodi Hospital - Prof. Dr. Wasun Chantratita. This is a great milestone we are reaching with a leading professional in NGS technology. He had a bioinformatics group called "Brainstorming" to support on pharmacogenomics and liquid biopsy diagnostics for precision medicine in Thailand. With our GeneReader and QCI, we are now making a huge difference in how they are able to satisfy clinicians needs. We appreciate all the effort the team put through to make a big success."

"GeneReader has made actionable cancer treatment more precisely and efficiently" – says Prof. Dr. Wasun Chantratita, Chief of Medical Genome Center.


Accession ID (Test Product Code)
FC3-BC8-RAS-019 (Gr-ras-test)
Tumor Content
60%
Age
55
Sex
Male
Ethnicity
Asian
Diagnosis
Colorectal carcinoma
Phenotype: Cancer
Age of Onset
-
Gene Prevalence
24% (COSMIC)
Disease Prevalence
7.9%
Gene
KRAS
Variant
c.175G>A
p.A59T
Somatic Frequency: 0.015% (COS…
Population Frequency: 0% (NHLBI ESP)
Allele Fraction: 18% (of 9851 re…
Impact: Missense
Trials Available
Computed Classification
Likely Pathogenic
Cancer
Open
< Previous
Next >
Use Classification
Set Assessment
Sort By Classification
KRAS
c.175G>A
p.A59T
EGFR
c.2255C>T
p.S752F
ERBB2
c.1963A>G
ERBB2
c.3508C>G
p.P1170A
Somatic Frequency: 0.015% (COSMIC)
Population Frequency: 0% (NHLBI ESP)
Allele Fraction: 15% (of 6710 reads)
Impact: Missense
Trials Available
Computed Classification
Likely Pathogenic
Cancer
New Assessment
Likely Pathogenic
for Cancer
Reportable
Variant List
< Previous
Next >
Use Classification
Edit Assessment
Missense effect on protein
CHR 12: 25380283
Exon 3
p.A59T
loss
missense SNV
NM_004985.4
Loss /Normal /Gain Fn
Benign/Poss Benign
Pathogenic/Poss Pathogenic
Found in This Patient
Treatment Information
Set the evidence level
Exact variant
All at this position
Loss of function in gene
Gene positive
Indication
Colon cancers change
All cancers
(displayed in gray)
Treatments
Report All Showing | Unreport All Showing
Treatment
Evidence
Response
Indication
References
No treatments available for the options selected. Show all possible data
No location set for this case. Set a location before adding any trials to your report. Set Location
Clinical Trials
Report All Showing | Unreport All Showing
Treatment
Evidence
Study Title
Location
FDA Phase
Reference
5-fluorouracil/ irinotecan/leucovorin/ oxaliplatin, bevacizumab
exact variant
A Phase II Study to Evaluate the Surgical Conversion Rate in Patients With RAS Mutation-type Receiving FOLFOXIRI +/- Bevacizumab for Unresectable Colorectal Liver-Limited Metastases
1 location worldwide
Phase 2
NCT02350530

The first high throughput-fully automated NGS system for
HIV-DR Assay
From sample extraction to generating clinical annotation report-suggested actions

Reverse Transcriptase

This region was sequenced successfully and covers codons 1 - 386

Detected Mutations

NRTI M184IV
NNRTI None
Other V179I

Drug name	Class	Assessment		
		Stanford	*ANRS*	*Rega*
abacavir (ABC)	NRTI	Low-Level Resistance	Possible resistance	Susceptible GSS 1
zidovudine (AZT)	NRTI	Susceptible	Susceptible	Susceptible GSS 1
stavudine (D4T)	NRTI	Susceptible	Susceptible	Susceptible GSS 1
didanosine (DDI)	NRTI	Potential Low-Level Resistance	Susceptible	Susceptible GSS 1
emtricitabine (FTC)	NRTI	High-Level Resistance	Resistance	Resistant GSS 0
lamivudine (3TC)	NRTI	High-Level Resistance	Resistance	Resistant GSS 0
tenofovir (TDF)	NRTI	Susceptible	Susceptible	Susceptible GSS 1
efavirenz (EFV)	NNRTI	Susceptible	Susceptible	Susceptible GSS 1
etravirine (ETR)	NNRTI	Susceptible	Susceptible	Susceptible GSS 1
nevirapine (NVP)	NNRTI	Susceptible	Susceptible	Susceptible GSS 1
rilpivirine (RPV)	NNRTI	Susceptible	Susceptible	Susceptible GSS 1

Comments

- M184V/I cause high-level in vitro resistance to 3TC and FTC and low-level resistance to ddI and ABC. However, M184V/I are not contraindications to continued treatment with 3TC or FTC because they increase susceptibility to AZT, TDF and d4T and are associated with clinically significant reductions in HIV-1 replication.
- V179I is a polymorphic mutation that is frequently selected in patients receiving ETR and RPV. But It has little, if any, direct effect on NNRTI susceptibility.

Protease

This region was sequenced successfully and covers codons 1 - 99

Detected Mutations

Major None
Accessory None
Other M36I, I62V, H69K, L89M

Drug name	Class	Assessment		
		Stanford	*ANRS*	*Rega*
atazanavir/r (ATV/r)	PI	Susceptible	Susceptible	Susceptible GSS 1.5
darunavir/r (DRV/r)	PI	Susceptible	Susceptible	Susceptible GSS 1.5
fosamprenavir/r (FPV/r)	PI	Susceptible	Susceptible	Susceptible GSS 1.5
indinavir/r (IDV/r)	PI	Susceptible	Susceptible	Susceptible GSS 1.5
lopinavir/r (LPV/r)	PI	Susceptible	Susceptible	Susceptible GSS 1.5
nelfinavir (NFV)	PI	Susceptible	Susceptible	Susceptible GSS 1
saquinavir/r (SQV/r)	PI	Susceptible	Susceptible	Susceptible GSS 1.5
tipranavir/r (TPV/r)	PI	Susceptible	Resistance	Susceptible GSS 1.5

Comments

There are no comments for this section

Integrase

This region was sequenced successfully and covers codons 1 - 288

Detected Mutations

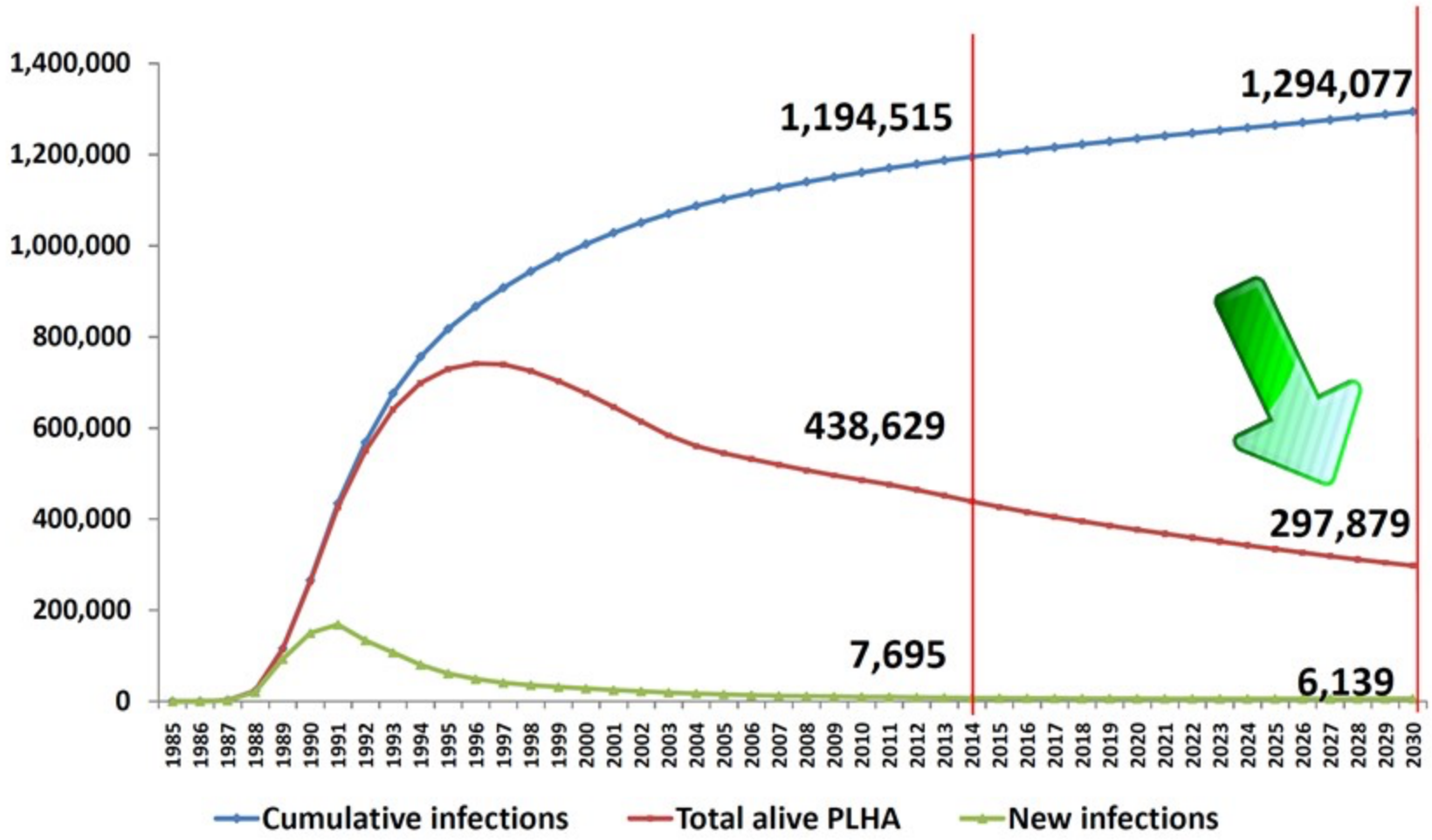
Major None
Accessory None
Other None

Drug name	Class	Assessment		
		Stanford	*ANRS*	*Rega*
dolutegravir (DTG)	INSTI	Susceptible	Susceptible	Susceptible GSS 1
elvitegravir (EVG)	INSTI	Susceptible	Susceptible	Susceptible GSS 1
raltegravir (RAL)	INSTI	Susceptible	Susceptible	Susceptible GSS 1

Comments

There are no comments for this section

Estimated number of adults living with HIV, new HIV infections and cumulative HIV cases in Thailand 1985-2030



Source: Summary Result 2010-2030 Projection for HIV/AIDS in Thailand by Thailand Working Group on HIV/AIDS Projection

Pharmacogenomics

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Wasun Chantratita

When a Genetic ID Card Is the Difference Between Life and Death

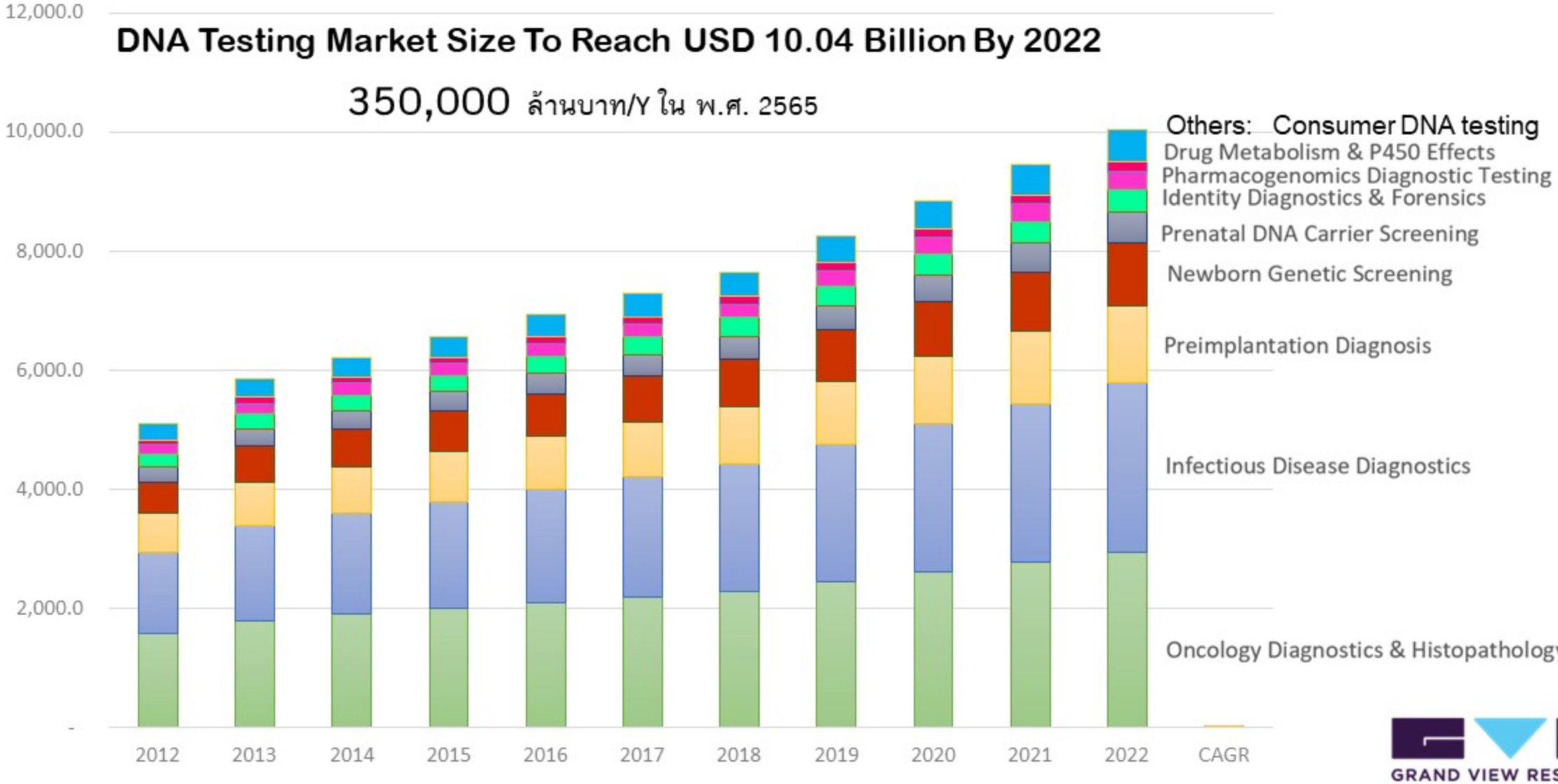
http://theatln.tc/2p8EJYV

It's “the low-hanging fruit of genomic medicine.”

To deal with it, you don't need to edit genes, or turn to stem cells, or prescribe drugs that target mutations in a patient's DNA. You just need to screen people for the risky variants and withhold the triggering drugs.

You guys are talking about whole-genome sequencing for millions of people, and we just have a simple plastic card.

Global DNA Diagnostics Market, 2012 - 2022,
by Application, (USD Million)



GRAND VIEW RESEARCH

Phase I 2006-2016 (2549-2559)

RIKEN-Thailand Collaboration started at 2006

AGREEMENT ON TECHNICAL COOPERATION BETWEEN DEPARTMENT OF MEDICAL SCIENCES, MINISTRY OF PUBLIC HEALTH (KINGDOM OF THAILAND) AND RIKEN SNP RESEARCH CENTER (JAPAN)

Date: May 23, 2006

Paijit WARACHIT
Director General
Department of Medical Sciences
Ministry of Public Health

NAKAMURA Yusuke
Director
RIKEN SNP Research Center

Thai MOPH and TCELS

- Providing DNA / clinical information based on call for proposals from Thai academia and institutions
- Staffs with expertise on genomics / epidemiology

(14 projects)

RIKEN-IMS

- Genomic Research Support
  - ✓ Genome-wide association study (GWAS)
  - ✓ Next generation sequencing (NGS)

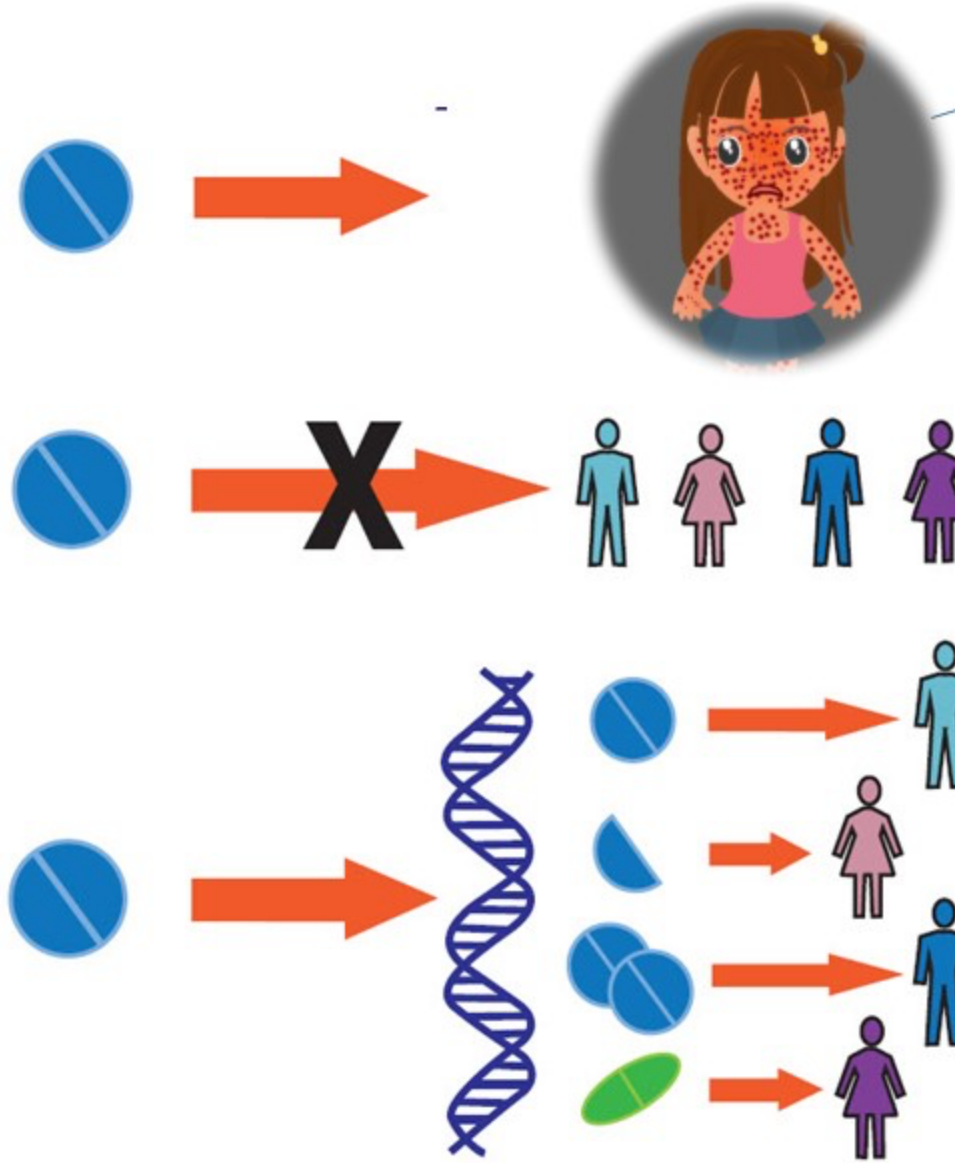
Courtesy of Dr. Kubo from Riken

10 Year Anniversary of pharmacogenomics in clinical practice in Thailand, what do we gain?

SEAPHARM
SOUTH EAST ASIAN PHARMACOGENOMICS RESEARCH NETWORK

Dr. Michiaki Kubo

There were 6 Southeast Asian countries, Malaysia, Thailand, Singapore, Indonesia, Cambodia, Vietnam + Riken Japan joined in the 5th SEAPharm meeting held in Bagkok during July 14-15, 2016



Life-threatening adverse drug reactions

1

The drug does not work with you, me, or us.

2

How to do Drug selection & Dose adjustments

3

SOLVING 3 BIG PROBLEMS
IN MODERN MEDICINE

Invited Researchers: RIKEN-Thailand collaboration

2006	Conclusion of MOU of technical cooperation Ms. Sukanya Wattanapokayakit (DMSc) joined RIKEN
2007	Dr. Soranun Chantarangsu (Chulalongkorn University) Ms. Bussaraporn Kunhapan (Mahidol University) Ms. Supannee Kaewsutthi (Mahidol University)
2008	Dr. Wattanan Makarasara (Mahidol University) Dr. Jurairut Promjai (TB/HIV Research Project Office) Ms. Amara Yowang (DMSc) Dr. Manit Nuinoon (Mahidol University) Ms. Pareena Janchompoo (Mahidol University)
2009	Dr. Watoo Phrompittayarat (DMSc) Mr. Therawut Phusantisampan (Prince of Songkla University) Dr. Cholaphat Sukasem (Mahidol University) Ms. Anchalee Prasansuklab (Chulalongkorn University) Mr. Thanyapat Wanitchanon (DMH Rajanukul Institute)
2010	Ms. Punnarai Veersaetakul (DMSc)
2011	Ms. Hathaichanoke Boonyarit (Mahidol University) Dr. Ekawat Pasomsub (Mahidol University)
2012	Ms. Kansiri Viboonaut (DMSc) Ms. Tiparat Potipitak (DMSc) Ms. Wimala Inunchot (DMSc)
















Courtesy of Dr. Kubo from Riken

Publications: RIKEN-Thailand collaboration

	Author	Publication	Journal	Year
1	Chantarangsu S	HLA-B*3505 allele is a strong predictor for nevirapine-induced skin adverse drug reactions in HIV-infected Thai patients.	Pharmacogenet Genomics.	2009
2	Wangsomboonsiri W	Association between HLA-B*4001 and lipodystrophy among HIV-infected patients from Thailand who received a stavudine-containing antiretroviral regimen.	Clin Infect Dis.	2010
3	Phasukkijwatana N	Genome-wide linkage scan and association study of PARL to the expression of LHON families in Thailand.	Hum Genet.	2010
4	Nuinoon M	A genome-wide association identified the common genetic variants influence disease severity in beta-thalassemia/hemoglobin E.	Hum Genet.	2010
5	Hosono N	Development of new HLA-B*3505 genotyping method using Invader assay.	Pharmacogenet Genomics.	2010
6	Chantarangsu S	Genome-wide association study identifies variations in 6p21.3 associated with nevirapine-induced rash.	Clin Infect Dis.	2011
7	Ozeki T	Genome-wide association study identifies HLA-A*3101 allele as a genetic risk factor for carbamazepine-induced cutaneous adverse drug reactions in Japanese population.	Hum Mol Genet.	2011
8	Mahasirimongkol S	Genome-wide association studies of tuberculosis in Asians identify distinct at-risk locus for young tuberculosis	J Hum Genet.	2012
9	Jongjaroenprasert W	A genome-wide association study identifies novel susceptibility genetic variation for thyrotoxic hypokalemic periodic paralysis.	J Hum Genet.	2012
10	Boonyarit H	Development of a SNP set for human identification: A set with high powers of discrimination which yields high genetic information from naturally degraded DNA samples in the Thai population.	Forensic Sci Int Genet.	2014
11	Wattanapokayakit S	NAT2 slow acetylator associated with antituberculosis drug-induced liver injury in Thai patients.	Int J Tuberc Lung Dis.	2016

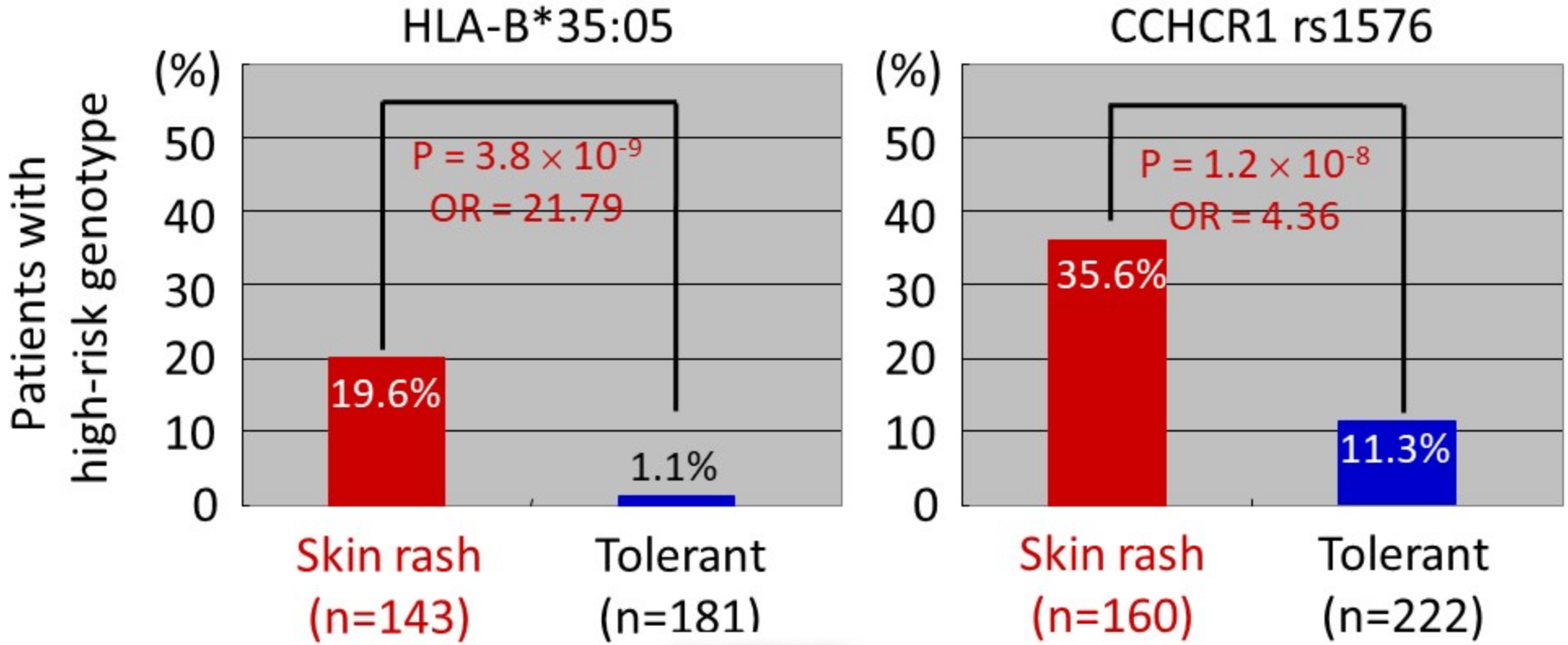
Courtesy of Dr. Kubo from Riken

Genes identified by RIKEN-Thailand collaboration

Project	Gene	PI
Nevirapine-induced skin rash	HLA-B*35:05 CCHCR1	Prof. Wasun Chantratita
Stavudine-induced lipodystrophy	HLA-B*40:01	Prof. Wasun Chantratita
β-Thalassemia	HBBP1 BCL11A HBS1L-MYB	Prof. Suthat Fucharoen
Leber hereditary optic neuropathy	PARL	Prof. Patcharee Lertrit
Tuberculosis	HSPEP1-MAFB	Dr. Surakameth Mahasirimongkol
Thyrotoxic hypokalemic periodic paralysis	KCNJ2	Dr. Wallaya Jongjaroenprasert
Anti-tuberculosis drug-induced hepatic injuly	NAT2	Dr. Surakameth Mahasirimongkol

Courtesy of Dr. Kubo from Riken

Genomic biomarkers for nevirapine-induced skin rash



Prof. Wasun Chantratita
(Mahidol University)

Dr. Soranun Chantarangsu
(Chulalongkorn University)

Dr. Surakameth Mahasirimongkol (DMSc)

Courtesy of Dr. Kubo from Riken

IAS 2013
7th IAS CONFERENCE ON HIV PATHOGENESIS, TREATMENT AND PREVENTION
30 June - 03 July 2013 - Kuala Lumpur, Malaysia

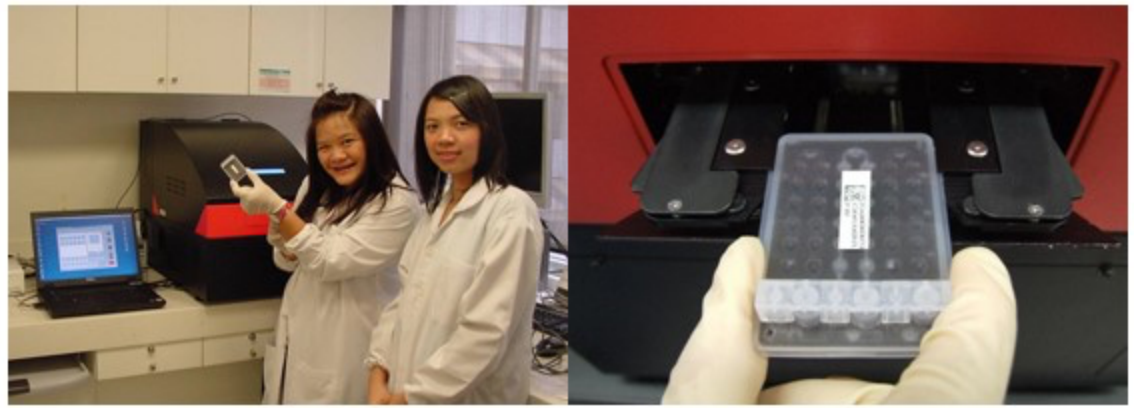
ceria

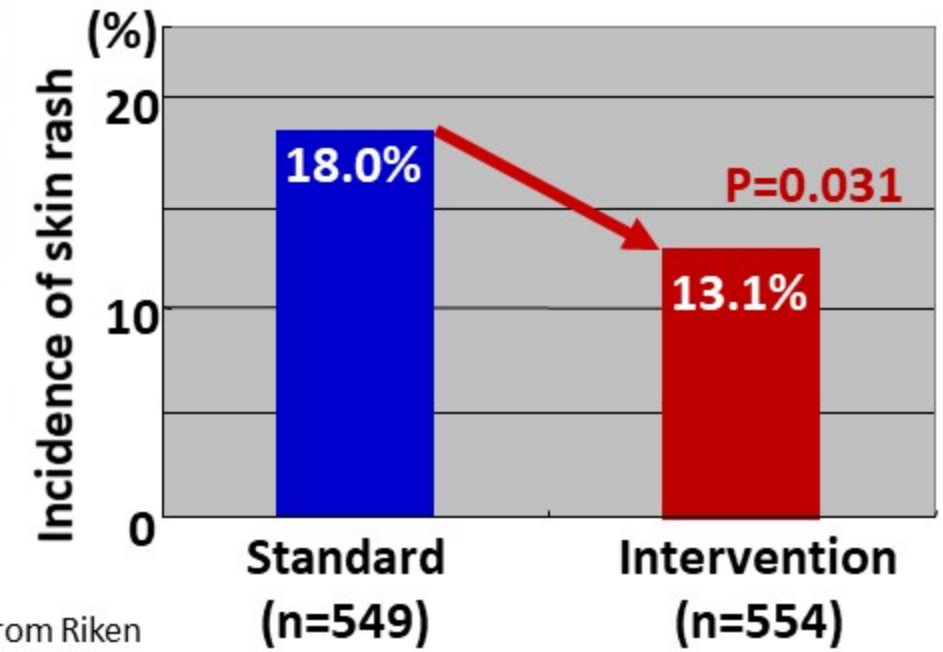
International AIDS Society
Stronger Together Against HIV

*HLA-B*35:05* and *CCHCR1* screening reduces nevirapine-associated cutaneous adverse reactions in Thailand: a prospective multicenter randomized controlled trial

Presented by Sasisopin Kiertiburanakul (Thailand).

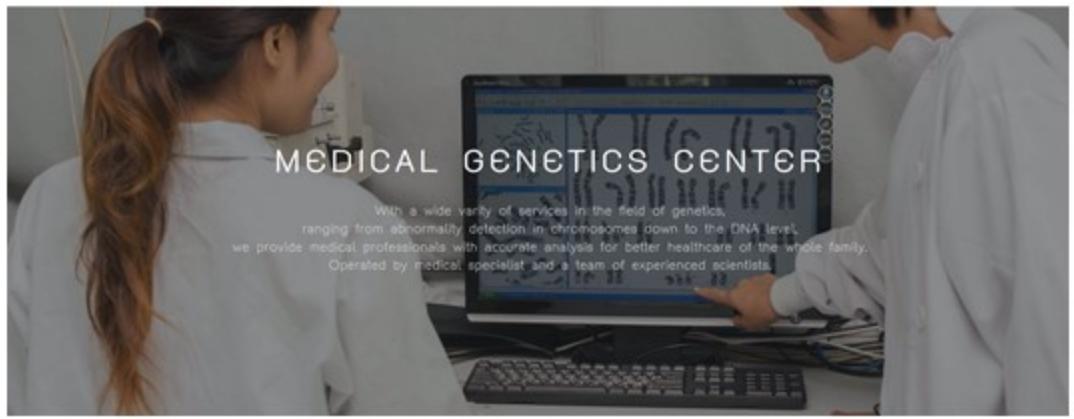
S. Kiertiburanakul[1], S. Mahasirimongkol[2], N. Rajatanavin[1], A. Charoenyingwattana[3], A. Rojanawiwat[2], W. Wangsomboonsiri[4], W. Manosuthi[5], P. Kantipong[6], A. Apisarnthanarak[7], W. Sangsirinakakul[8], P. Wongprasit[9], R. Chaiwarith[10], W. Tantisiriwat[11], Y. Nakamura[12], T. Mushiroda[12], W. Chantratita[13], S. Sungkanuparph[1]





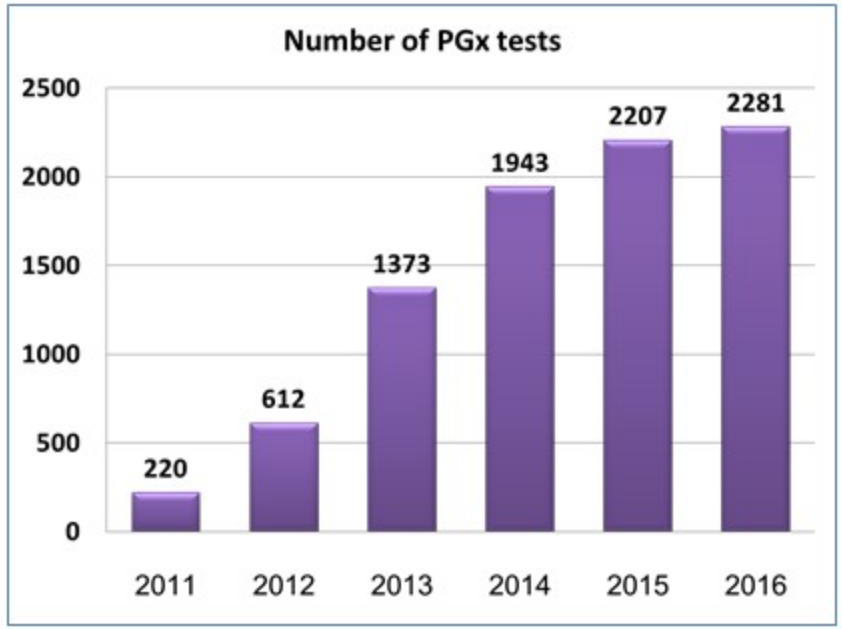
Courtesy of Dr. Kubo from Riken

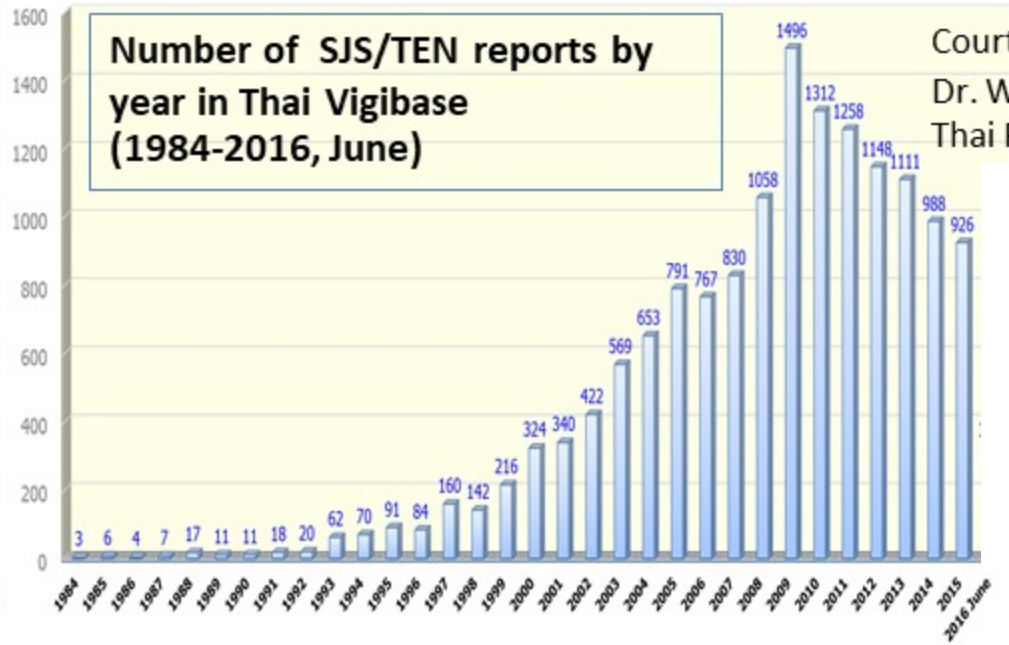
Laboratory for Pharmacogenomics, Ramathibodi hospital, Mahidol University, Bangkok,Thailand



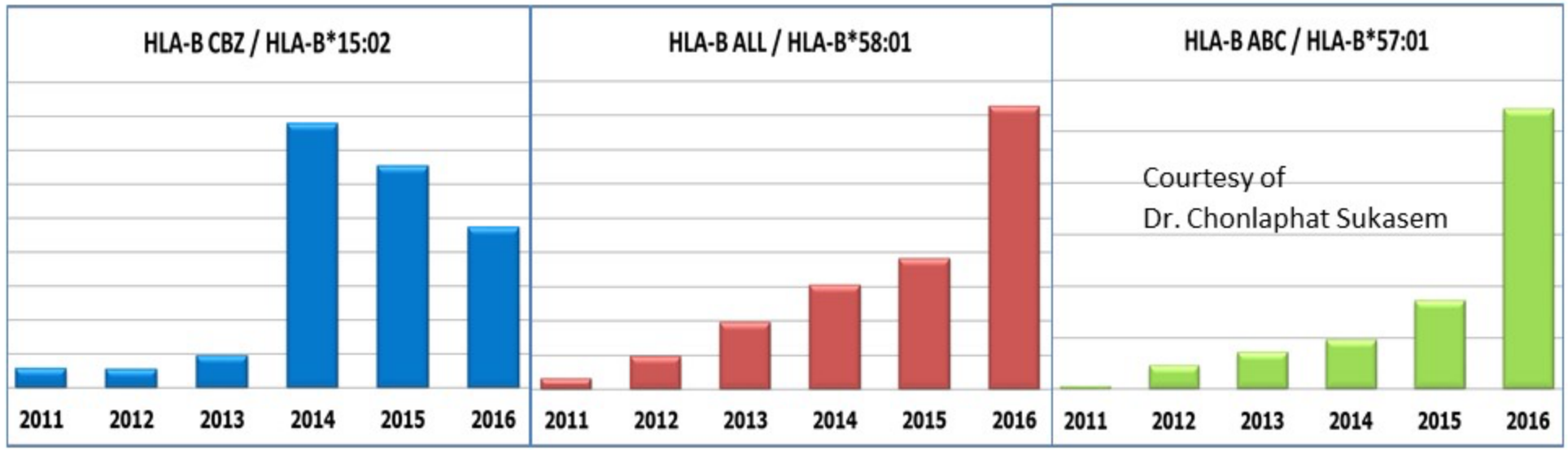
Thai MOPH

Number of HLA-B genotyping 2011-2016





Courtesy of
Dr. Wimol
Thai FDA



Courtesy of
Dr. Chonlaphat Sukasem


PUBLIC ANNOUNCEMENT

ศูนย์จีโนมทางการแพทย์
CENTER FOR MEDICAL GENOMICS

Genomics Medicine
The future starts now.

Center for Medical Genomics in 10 min

http://bit.ly/2oCBndo

เภสัชพันธุศาสตร์ ใน 5 นาที

http://bit.ly/2ol6wml

Pharmacogenomics in 5 min

http://bit.ly/2cJBkc0

สรุปผลงานของศูนย์จีโนมทางการแพทย์ ใน 26 นาที

http://bit.ly/1QZ4Mb0

จีโนมทางการแพทย์ในกรอบของ Thailand 4.0 ใน 30 นาที

http://bit.ly/2nPpROC

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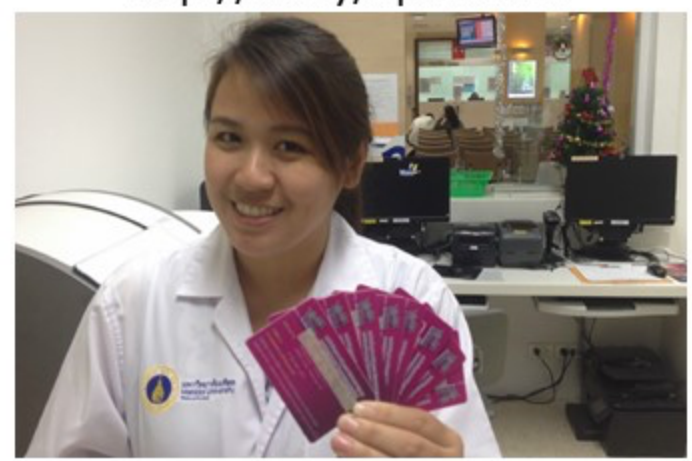

When a Genetic ID Card Is the Difference Between Life and Death

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Health Economic Evaluation

Health economic evaluation of HLA-B*15:02 genotyping prior carbamazepine

Epilepsia, 54(9):1628–1638, 2013
doi: 10.1111/epi.12325

FULL-LENGTH ORIGINAL RESEARCH

Economic evaluation of HLA-B*15:02 screening for carbamazepine-induced severe adverse drug reactions in Thailand

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Summary

Purpose: There is strong evidence of an association between the presence of the human leukocyte antigen (HLA)-B*15:02 and two severe adverse drug reactions—Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN)—in patients taking carbamazepine (CBZ), a common treatment for patients with epilepsy and neuropathic pain. As a result, there are calls for all patients that are due to undergo CBZ therapy to be screened for this genetic marker before commencing their therapy. This study aims to determine the value for money of HLA-B*15:02 screening compared to the following: (1) administering CBZ therapy without conducting patient screening, and (2) not prescribing CBZ but alternative drugs that are less likely to result in severe reactions, but that come at a higher cost.

Method: An economic evaluation was carried out by using a decision tree and Markov models to examine the cost-utility of providing HLA-B*15:02 screening for all patients with either newly diagnosed epilepsy or neuropathic pain in the Thai setting. All transitional probabilities were derived from the national and international literature. The majority of the data on direct medical care costs were collected from 10 community, provincial, and regional hospitals throughout Thailand. Direct non-medical cost and health-related quality of life (HRQoL) data were obtained from interviews that were conducted with 33 patients, some of whom had experienced severe drug reactions.

Key Findings: The incremental cost-effectiveness ratio (ICER) of adopting a universal HLA-B*15:02 screening policy was estimated at 222,000 Thai baht, THB/quality-adjusted life year (QALY) gained for epilepsy patients and 130,000 THB/QALY gained for patients with neuropathic pain. Furthermore, we found that 343 patients need to be tested for HLA-B*15:02 allele to prevent one case of SJS/TEN.

Significance: Universal HLA-B*15:02 screening represents good value for the money in terms of preventing SJS/TEN in CBZ-treated patients with neuropathic pain at the Thai ceiling ratio of 120,000 THB/QALY gained. However, the prevalence of CBZ-induced SJS/TEN in the Thai population and the positive predictive value (PPV) are major factors that influence the cost-effectiveness of HLA-B*15:02 screening. Therefore, an active surveillance system to make a more accurate assessment of the prevalence CBZ-induced SJS/TEN in the Thai population would enhance the generalizability of the results.

KEY WORDS: Cost-utility analysis, HLA-B*15:02, Stevens-Johnson syndrome, Toxic epidermal necrolysis.

According to national and global pharmacovigilance systems, the most common adverse drug reactions (ADRs) are cutaneous. The most severe life-threatening forms of cutaneous ADRs are Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN), two related acquired bullous disorders of the skin that, in the majority of cases, are caused by reactions to certain drugs, such as sulfonamide-antibiotics, antiepileptic agents—especially carbamazepine (CBZ), allopurinol, and oxicam-type nonsteroidal antiinflammatory drugs (NSAIDs) (Harr & French, 2010). Incidence rates for SJS/TEN vary according to ethnicity, and the highest rates are seen among Han Chinese, Malays, and Thais (Lim et al., 2008).

CBZ is the primary treatment choice for patients with epilepsy and neuropathic pain according to current Thai

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Economic evaluation of HLA-B*15:02 screening of CBZ-induced SCAR in Thailand

Dr. Waranya Rattanavipapong
(HITAP)

AT QALY 120,000 Baht
(4000 USD)

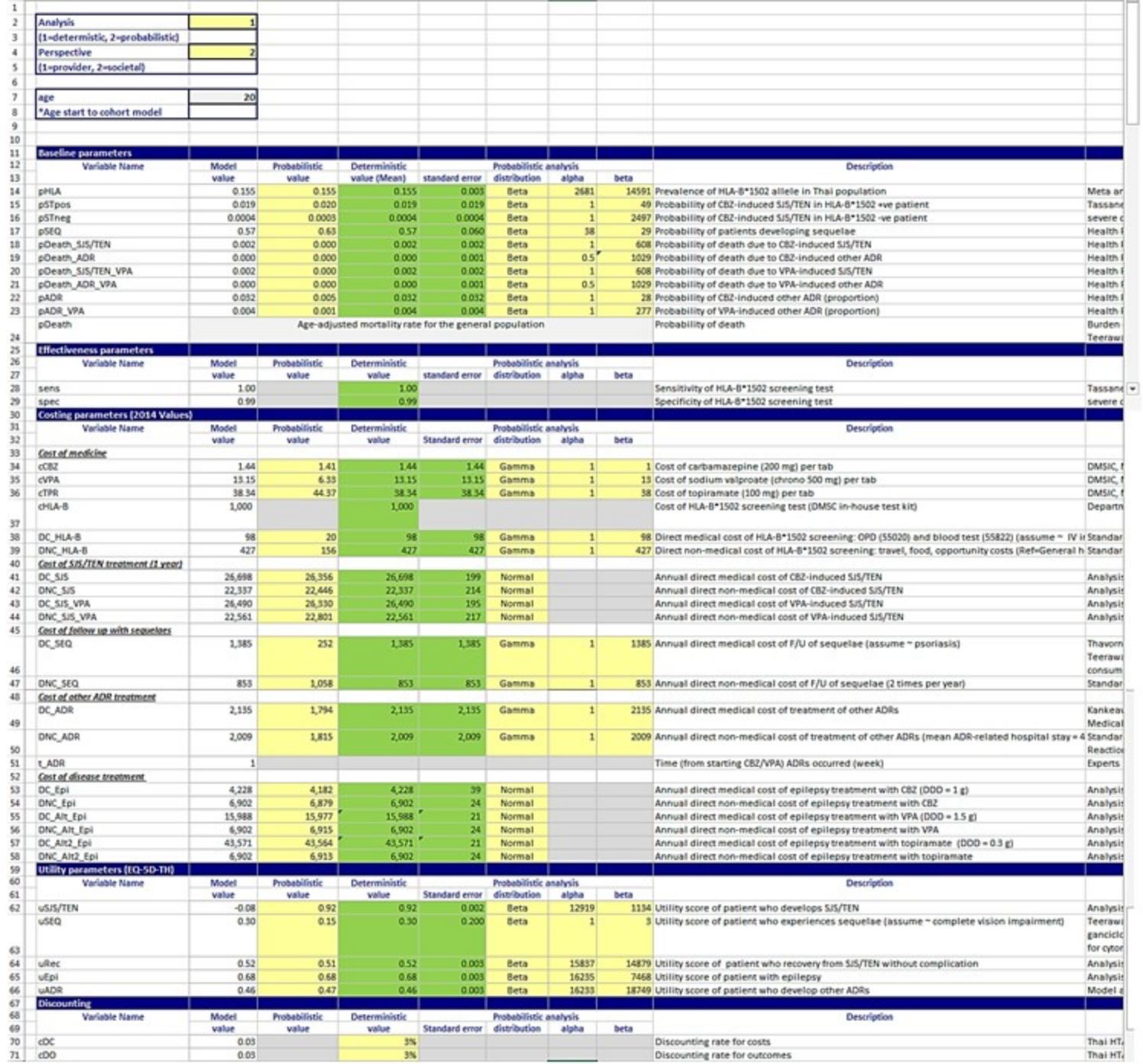
Testing for Neuropathic pain is cost effective

Testing for Epilepsy is borderline cost effective

HITAP โครงการประเมินเทคโนโลยีและนโยบายด้านสุขภาพ
Health Intervention and Technology Assessment Program

Parameters using in the Model

- Baseline parameters
- Effectiveness parameters
- Costing parameters (2014 Values)
- Utility parameters (EQ-5D-TH)
- Discounting



Analysis	1							
(1=deterministic, 2=probabilistic)								
Perspective	2							
(1=provider, 2=societal)								
age	20							
*Age start to cohort model								
Baseline parameters								
Variable Name	Model value	Probabilistic value	Deterministic value (Mean)	standard error	Probabilistic analysis distribution	alpha	beta	Description
pHLA	0.155	0.155	0.155	0.003	Beta	2681	14591	Prevalence of HLA-B*1502 allele in Thai population
pSTpos	0.019	0.020	0.019	0.019	Beta	1	49	Probability of CBZ-induced SJS/TEN in HLA-B*1502 +ve patient
pSTneg	0.0004	0.0003	0.0004	0.0004	Beta	1	2497	Probability of CBZ-induced SJS/TEN in HLA-B*1502 -ve patient
pSEQ	0.57	0.63	0.57	0.060	Beta	38	29	Probability of patients developing sequelae
pDeath_SJS/TEN	0.002	0.000	0.002	0.002	Beta	1	608	Probability of death due to CBZ-induced SJS/TEN
pDeath_ADR	0.000	0.000	0.000	0.001	Beta	0.5	1029	Probability of death due to CBZ-induced other ADR
pDeath_SJS/TEN_VPA	0.002	0.000	0.002	0.002	Beta	1	608	Probability of death due to VPA-induced SJS/TEN
pDeath_ADR_VPA	0.000	0.000	0.000	0.001	Beta	0.5	1029	Probability of death due to VPA-induced other ADR
pADR	0.032	0.005	0.032	0.032	Beta	1	28	Probability of CBZ-induced other ADR (proportion)
pADR_VPA	0.004	0.001	0.004	0.004	Beta	1	277	Probability of VPA-induced other ADR (proportion)
pDeath	Age-adjusted mortality rate for the general population							Probability of death
Effectiveness parameters								
Variable Name	Model value	Probabilistic value	Deterministic value	standard error	Probabilistic analysis distribution	alpha	beta	Description
sens	1.00		1.00					Sensitivity of HLA-B*1502 screening test
spec	0.99		0.99					Specificity of HLA-B*1502 screening test
Costing parameters (2014 Values)								
Variable Name	Model value	Probabilistic value	Deterministic value	Standard error	Probabilistic analysis distribution	alpha	beta	Description
Cost of medicine								
cCBZ	1.44	1.41	1.44	1.44	Gamma	1	1	Cost of carbamazepine (200 mg) per tab
cVPA	13.15	6.33	13.15	13.15	Gamma	1	13	Cost of sodium valproate (chrono 500 mg) per tab
cTPR	38.34	44.37	38.34	38.34	Gamma	1	38	Cost of topiramate (100 mg) per tab
cHLA-B	1,000		1,000					Cost of HLA-B*1502 screening test (DMSC in-house test kit)
DC_HLA-B	98	20	98	98	Gamma	1	98	Direct medical cost of HLA-B*1502 screening: OPD (55020) and blood test (55822) (assume ~ IV i
DNC_HLA-B	427	156	427	427	Gamma	1	427	Direct non-medical cost of HLA-B*1502 screening: travel, food, opportunity costs (Ref=General h
Cost of SJS/TEN treatment (1 year)								
DC_SJS	26,698	26,356	26,698	199	Normal			Annual direct medical cost of CBZ-induced SJS/TEN
DNC_SJS	22,337	22,446	22,337	214	Normal			Annual direct non-medical cost of CBZ-induced SJS/TEN
DC_SJS_VPA	26,490	26,330	26,490	195	Normal			Annual direct medical cost of VPA-induced SJS/TEN
DNC_SJS_VPA	22,561	22,801	22,561	217	Normal			Annual direct non-medical cost of VPA-induced SJS/TEN
Cost of follow up with sequelaes								
DC_SEQ	1,385	252	1,385	1,385	Gamma	1	1385	Annual direct medical cost of F/U of sequelae (assume ~ psoriasis)
DNC_SEQ	853	1,058	853	853	Gamma	1	853	Annual direct non-medical cost of F/U of sequelae (2 times per year)
Cost of other ADR treatment								
DC_ADR	2,135	1,794	2,135	2,135	Gamma	1	2135	Annual direct medical cost of treatment of other ADRs
DNC_ADR	2,009	1,815	2,009	2,009	Gamma	1	2009	Annual direct non-medical cost of treatment of other ADRs (mean ADR-related hospital stay = 4
t_ADR	1							Time (from starting CBZ/VPA) ADRs occurred (week)
Cost of disease treatment								
DC_Epi	4,228	4,182	4,228	39	Normal			Annual direct medical cost of epilepsy treatment with CBZ (DDD = 1 g)
DNC_Epi	6,902	6,879	6,902	24	Normal			Annual direct non-medical cost of epilepsy treatment with CBZ
DC_Alt_Epi	15,988	15,977	15,988	21	Normal			Annual direct medical cost of epilepsy treatment with VPA (DDD = 1.5 g)
DNC_Alt_Epi	6,902	6,915	6,902	24	Normal			Annual direct non-medical cost of epilepsy treatment with VPA
DC_Alt2_Epi	43,571	43,564	43,571	21	Normal			Annual direct medical cost of epilepsy treatment with topiramate (DDD = 0.3 g)
DNC_Alt2_Epi	6,902	6,913	6,902	24	Normal			Annual direct non-medical cost of epilepsy treatment with topiramate
Utility parameters (EQ-5D-TH)								
Variable Name	Model value	Probabilistic value	Deterministic value	Standard error	Probabilistic analysis distribution	alpha	beta	Description
uSJS/TEN	-0.08	0.92	0.92	0.002	Beta	12919	1134	Utility score of patient who develops SJS/TEN
uSEQ	0.30	0.15	0.30	0.200	Beta	1	3	Utility score of patient who experiences sequelae (assume ~ complete vision impairment)
uRec	0.52	0.51	0.52	0.003	Beta	15837	14879	Utility score of patient who recovery from SJS/TEN without complication
uEpi	0.68	0.68	0.68	0.003	Beta	16235	7468	Utility score of patient with epilepsy
uADR	0.46	0.47	0.46	0.003	Beta	16233	18749	Utility score of patient who develop other ADRs
Discounting								
Variable Name	Model value	Probabilistic value	Deterministic value	Standard error	Probabilistic analysis distribution	alpha	beta	Description
cDC	0.03		3%					Discounting rate for costs
cDO	0.03		3%					Discounting rate for outcomes

ACTIVE

3U01HG007269 - 02S1 (Johnson) 8/1/2014 – 7/31/2015 0.1 calendar

NIH

Genomic Medicine Implementation: The Personalized Medicine Program - Administrative supplement for HLA-B-carbamazepine project

The major goals of this project are to determine health economic evaluation of HLA-B*15:02 genotyping prior carbamazepine prescribing in Indonesia and Malaysia setting, develop the generic decision tree model and perform a cost effectiveness threshold analysis using the generic model.

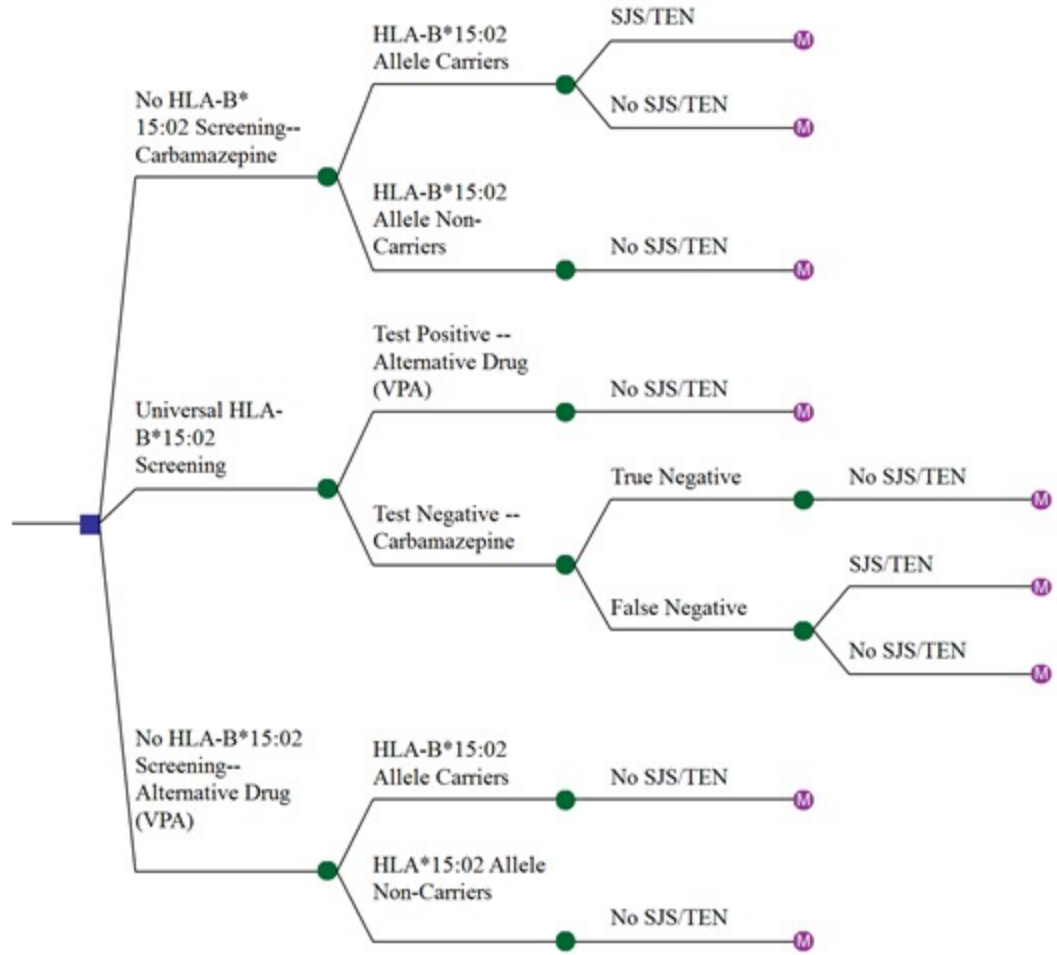
Generic Modeling

- A generic pharmacogenomic cost-effectiveness model enabling use of local input values is feasible and can offer an efficient and timely value-based decision making tool.
- Implementing this approach demonstrates that cost-effectiveness analyses can be rapidly performed without extensive training in decision modeling to provide useful evidence for decision making and facilitate understanding about what conditions can meet cost-effectiveness thresholds.

Courtesy of Dr. Marc S Williams

Conceptual Framework and Decision Tree

- Overview
- Model Diagrams
- Input Tables
- Results
- ICER
- CE Plane
- CEAC



Courtesy of Dr. Marc S Williams

Inputs

Required Input Variables	Input Value
Prevalence	
Prevalence of HLA-B*1502 allele (carrier status) in study population, please note that this is not allele frequency, it is twice of allele frequency	0.208
Cost	
Selected Currency	-
Base year	-
Cost of HLA-B*1502 screening test (includes all costs related to screening test)	1000000
Cost of SJS/TEN treatment (1 year): Annual direct medical cost of CBZ-induced SJS/TEN	5026302
Cost of follow up with SJS/TEN sequelae: Annual direct medical cost of sequelae (base-case value assume ~ dry eye syndrome)	3540000
Cost of disease treatment	
Annual direct medical cost of epilepsy treatment with CBZ	1064909
Annual direct medical cost of epilepsy treatment with VPA	2457384
Ceiling ratio and threshold value	
Maximum acceptable ceiling value for use in the maximum acceptable ceiling ratio (in selected currency/QALY gained)	1,500,000,000
Cost-effectiveness threshold value (in selected currency/QALY gained)	150,000,000

Optional Input Variables	Input value
Probabilities	
Probability of CBZ-induced SJS/TEN in HLA-B*1502 +ve patient	0.015
Utility	
Utility score of patient with epilepsy	0.85
Utility score of patient with SJS/TEN sequelae	0.68
Treatment Duration	
Treatment duration of epilepsy	30
Discount rate	
Discount rate for costs	0.03
Discount rate for outcomes	0.03

Generic Model Inputs

Model variables and assumptions were identified that would considered unlikely to be readily available or generalizable and were thoroughly reviewed by the model development team with decisions made to eliminate or retain them in the generic model. Variables and assumptions retained requiring an input value were assigned to one of three categories.

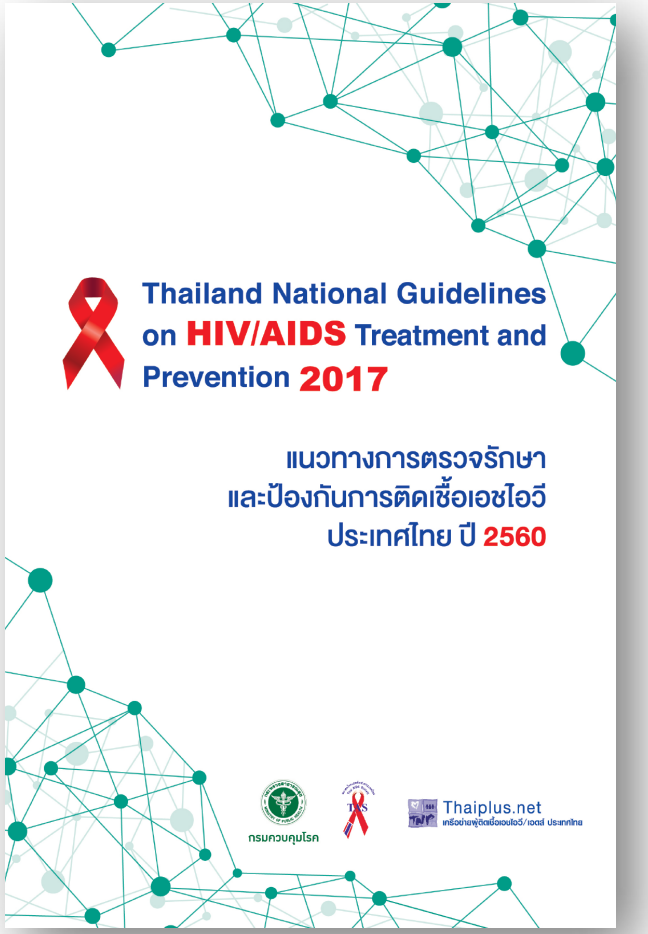
1) *Input value only* based on the need for a user-specified value (e.g., all medical cost variables, population allele prevalence for pharmacogenomics test);

2) *Default value only* supported by very strong available evidence (e.g., test sensitivity and specificity); the unlikely availability of information due to very limited evidence (e.g., health state utility of a very rare disease), or otherwise required by the model to meet certain logic requirements (e.g., health state utility value is constrained by its relationship to other state values).

3) *Default value with an input option* to allow the generic model user to select either approach to address the need for information for an input value which is not readily available by providing a default based on available evidence.

Courtesy of Dr. Marc S Williams

Pharmacogenomics Guideline



http://bit.ly/2mdCKCH

2.6.2 การตรวจกรองยีนแพ้ยา

การแพ้ยารุนแรง (severe adverse drug reaction) อาทิ ในกลุ่มอาการสตีเวนส์จอห์นสัน (Stevens Johnson Syndrome (SJS) and Toxic Epidermal Necrolysis (TEN)) สามารถก่อให้เกิดอันตรายต่อชีวิตได้ ปัจจุบันยังไม่มีวิธีรักษาโดยตรง แต่สามารถป้องกันได้ โดยตรวจยีนแพ้ยา หากตรวจพบ แพทย์สามารถเลี่ยงไปใช้ยาตัวอื่นได้ ยาตัวแรกที่ สปสช. ระบุไว้ในสิทธิประโยชน์สามารถเบิกค่าตรวจยีนก่อนการให้ยา คือ คาร์บามาซีปีน ส่วนการตรวจยีนที่ก่อให้เกิดผลข้างเคียงต่อการใช้ยาต้านเอชไอวีได้เริ่มขึ้นแล้วในหลายสถาบันทางการแพทย์ แต่ยังไม่ได้ถูกบรรจุในชุดสิทธิประโยชน์ของผู้ติดเชื้อเอชไอวี เช่น

- การตรวจยีน HLA-B*57:01 เพื่อเลี่ยงการเกิดภาวะภูมิคุ้มกันไวเกิน (drug hypersensitivity) ที่อาจเป็นอันตรายถึงชีวิตในผู้ติดเชื้อเอชไอวีที่ใช้ยา Abacavir
- การตรวจ HLA-B*35:05 และการตรวจการกลายพันธุ์ของเบสเดี่ยวบางตำแหน่ง (single nucleotide polymorphism) เพื่อเลี่ยงการเกิดผื่นแพ้ยา และกลุ่มอาการสตีเวนส์จอห์นสันจากการใช้ยา Nevirapine
- การตรวจ HLA-B*40:01 เพื่อเลี่ยงการเกิดกลุ่มอาการไขมันกระจายตัวผิดปกติ (lipodystrophy) จากการใช้ยา Stavudine
- การตรวจยีน CYP2B6 เพื่อปรับลดปริมาณยา Efavirenz เพื่อลดอาการมึนศีรษะ ซึมเศร้า ฝันร้าย ประสาทหลอน (Efavirenz-associated CNS symptoms)

โดยพบว่าผู้ที่ติดเชื้อเอชไอวีและมีการตรวจกรองกลุ่มยีนแพ้ยาก่อนเลือกใช้ยาต้านเอชไอวี พบว่าจะมีความร่วมมือในการใช้ยาดี (good compliance) เนื่องจากเกิดผลข้างเคียงจากการใช้ยาน้อย ทำให้มี VL ต่ำอย่างมีนัยสำคัญ เกิดเชื้อดื้อยาน้อยลง ส่งผลให้สามารถยืดระยะเวลาในการใช้ยาสูตรพื้นฐานที่มีราคาถูก ก่อนที่จะต้องปรับเปลี่ยนไปใช้สูตรดื้อยาที่มีราคาแพง อันจะส่งผลให้ประหยัดงบประมาณในการจัดหายาที่ใช้ในสูตรดื้อยาจากต่างประเทศ

ศูนย์จีโนมทางการแพทย์ คณะแพทยศาสตร์ รพ รามาธิบดีเข้าไปมีส่วนสำคัญในการตรวจเภสัชพันธุศาสตร์เพื่อปรับเปลี่ยนยาต้านไวรัสในปัจจุบันและอนาคต ซึ่งได้รับการบรรจุไว้ใน Thailand National Guideline ปี 2560 เพื่อเป็นแนวทางการรักษาและป้องกันการติดเชื้อไวรัสเอชไอวี

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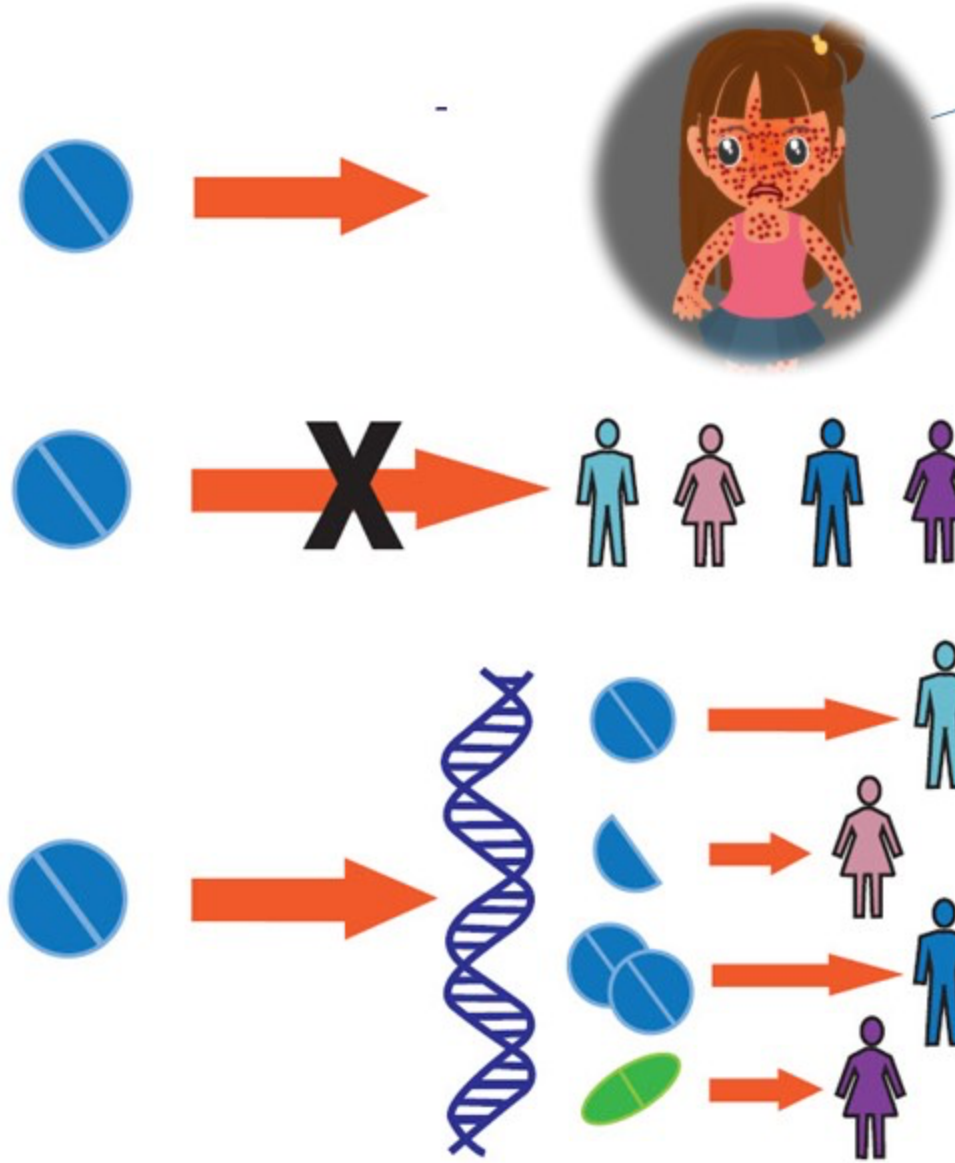

Life-threatening adverse drug reactions

1

The drug does not work with you, me, or us.

2

How to do Drug selection & Dose adjustments

3

SOLVING 3 BIG PROBLEMS
IN MODERN MEDICINE

RE-SEQUENCING PROJECT OF 1,000 SOUTHEAST ASIAN INDIVIDUALS USING THE 100 PHARMACOGENE-NGS PANEL + CNVs GENOTYPING

SOLVING 3 BIG PROBLEMS IN MODERN MEDICINE

1. LIFE-THREATENING ADVERSE DRUG REACTIONS

Outcome: Will enable to avoid dangerous drug reactions, such as SJS/TEN

2. THE DRUG DOES NOT WORK WITH YOU.

Outcome: Will enable to avoid to use the drug that does not work with you.

3. HOW TO MAKE CORRECT DRUG SELECTION & THE RIGHT DOSE ADJUSTMENTS

Outcome: Will enable to adjust the appropriate drug dose to save life.

The 1,000 Genome samples from Southeast Asian

With 100 European genome samples as controls

SEAPHARM | Genomic Medicine Alliance | Global Genomic Medicine Collaborative

Participants:

Thailand: PI, Project coordination & Contact person:
Prof. Wasun Chantratita
Head of Center of Medical Genomics
Head of Virology Laboratory
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Partnering with The Thailand Centre of Excellence for Life Sciences (TCELS)
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Riken, Japan: re-sequencing & genotyping supporter

Co-project: Public Health Genomics

Outcome to maximize the benefits from this project into public health in these countries through education.

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About Us

The International Research Network (IRN)

เป็นที่ทราบกันดีว่า ผลงานวิจัยที่มีผลกระทบสูงในทางวิชาการมักจะเป็นผลงานที่ได้รับการตีพิมพ์ในวารสารนานาชาติที่เป็นที่ยอมรับ เป็นผลงานที่ได้รับการอ้างอิงสูง และมีลักษณะเป็นสหสาขาวิชา สำนักงานกองทุนสนับสนุนการวิจัย (สกว.) จึงได้ริเริ่มให้ทุนสนับสนุนกลุ่มวิจัยในลักษณะเครือข่ายวิจัยนานาชาติ (International Research Network: IRN) ขึ้นในปีงบประมาณ 2557 โครงการนี้ได้รับการพัฒนามาจากโครงการปริญญาเอกกาญจนาภิเษก (คปก.) ซึ่ง สกว. ได้ดำเนินการให้ทุน คปก. มาแล้วกว่า 16 ปี ก่อให้เกิดการเชื่อมโยงระหว่างนักวิจัยไทยกับนักวิจัยในต่างประเทศเป็นจำนวนมาก เครือข่ายวิจัยนานาชาติ หรือ IRN จึงเป็นเครื่องมือและกลไกสำคัญในการบริหารจัดการโปรแกรมวิจัยในรูปแบบเครือข่าย เพื่อให้นักวิจัยดำเนินการวิจัยในลักษณะโปรแกรมวิจัยที่เป็นสหสาขาวิชา และเพิ่มประสิทธิภาพของการบริหารจัดการงานวิจัยเพื่อสร้างผลกระทบทางวิชาการ เศรษฐกิจ และสังคมของประเทศให้สูงขึ้น

เครือข่ายวิจัยนานาชาติ หรือ IRN นี้ ให้การสนับสนุนในรูปแบบของการแลกเปลี่ยนวิชาการ (Mobility Fund) ของนักศึกษาและอาจารย์ไทยและต่างประเทศ โดยการสนับสนุนทุนผู้ช่วยวิจัยและทุนวิจัยสำหรับการผลิตดุษฎีบัณฑิต 4-6 ทุน ทุนผู้ร่วมวิจัยหลังปริญญาเอก 2-4 ทุน และทุนวิจัยในรอบ 3 ปีของแต่ละเครือข่าย

สกว. คาดหวังว่า ในอนาคตโครงการเครือข่ายวิจัยนานาชาติ จะสามารถยกระดับความร่วมมือกับนานาชาติ และก่อให้เกิดความร่วมมือในการให้ทุนสนับสนุนงานวิจัย (Joint Research Fund) และในที่สุดอาจเกิดขึ้นเป็นหน่วยวิจัยนานาชาติ (Joint Research Center) ขึ้นได้ในประเทศไทย

กระบวนการสนับสนุนการวิจัยผ่านเครือข่ายวิจัยนานาชาตินี้ จะเป็นการกระตุ้นให้นักวิจัยของไทยสามารถดำเนินการร่วมมือการวิจัยในลักษณะของเครือข่ายทั้งภายในและภายนอกประเทศ โดยใช้โปรแกรมวิจัยขนาดใหญ่ ที่มีผลกระทบสูงในด้านวิชาการ เทคโนโลยี และนวัตกรรม เพื่อการพัฒนาเศรษฐกิจและสังคมของประเทศไทยในท่ามกลางการเปลี่ยนแปลงของบริบทโลก

สถาบันวิจัยระบบสาธารณสุข (สวรส.)
Health Systems Research Institute (HSRI)

หน้าแรก | About HSRI | สื่อสุขภาพ | กิจกรรม | โพลสุขภาพ | Rating งานวิจัย

History of HSRI

Health Systems Research Institute (HSRI) was established by the Health Systems Research Institute Act of 1992. It is an autonomous state agency established at about the same period as the Thailand Research Fund (TRF) and the National Science and Technology Development Agency (NSTDA).

HSRI's organizational and management architecture was designed to allow the institute more flexibility to function in the ever-evolving economic, social and political environment. Working in partnership with multilevel public and private agencies, HSRI's main goal is to achieve effective knowledge management in the service of the Health System.

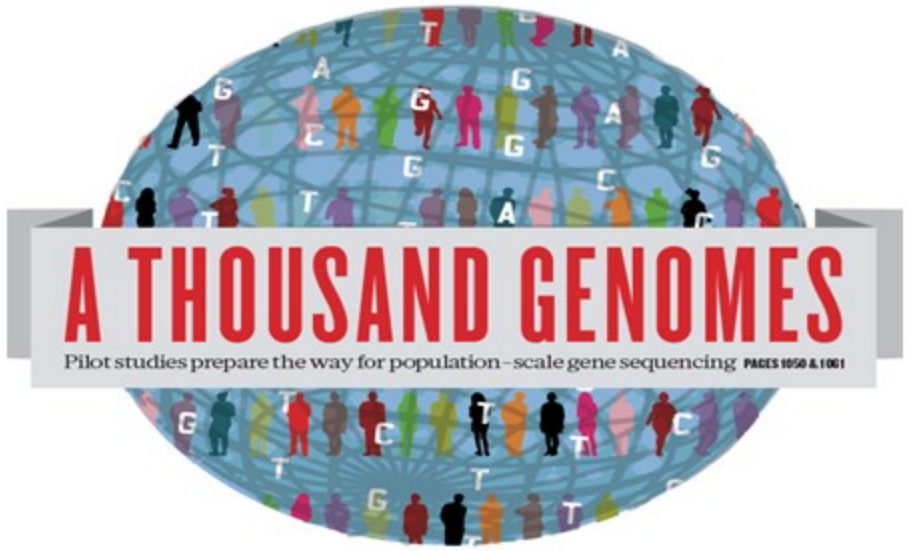
The Executive Board, chaired by the Ministry of Public Health, provides guidance and direction for HSRI's strategic plans and performance. It consists of nine permanent members and seven senior experts, as follows:

RIKEN

จุฬาภรณ์ จุฬม กาล
มหาวิทยาลัยมหิดล
คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี

TCELS
ศูนย์ความเป็นเลิศด้านชีววิทยาศาสตร์ (องค์การมหาชน)
Thailand Center of Excellence for Life Sciences (Public Organization)

กระทรวงสาธารณสุข
MINISTRY OF PUBLIC HEALTH



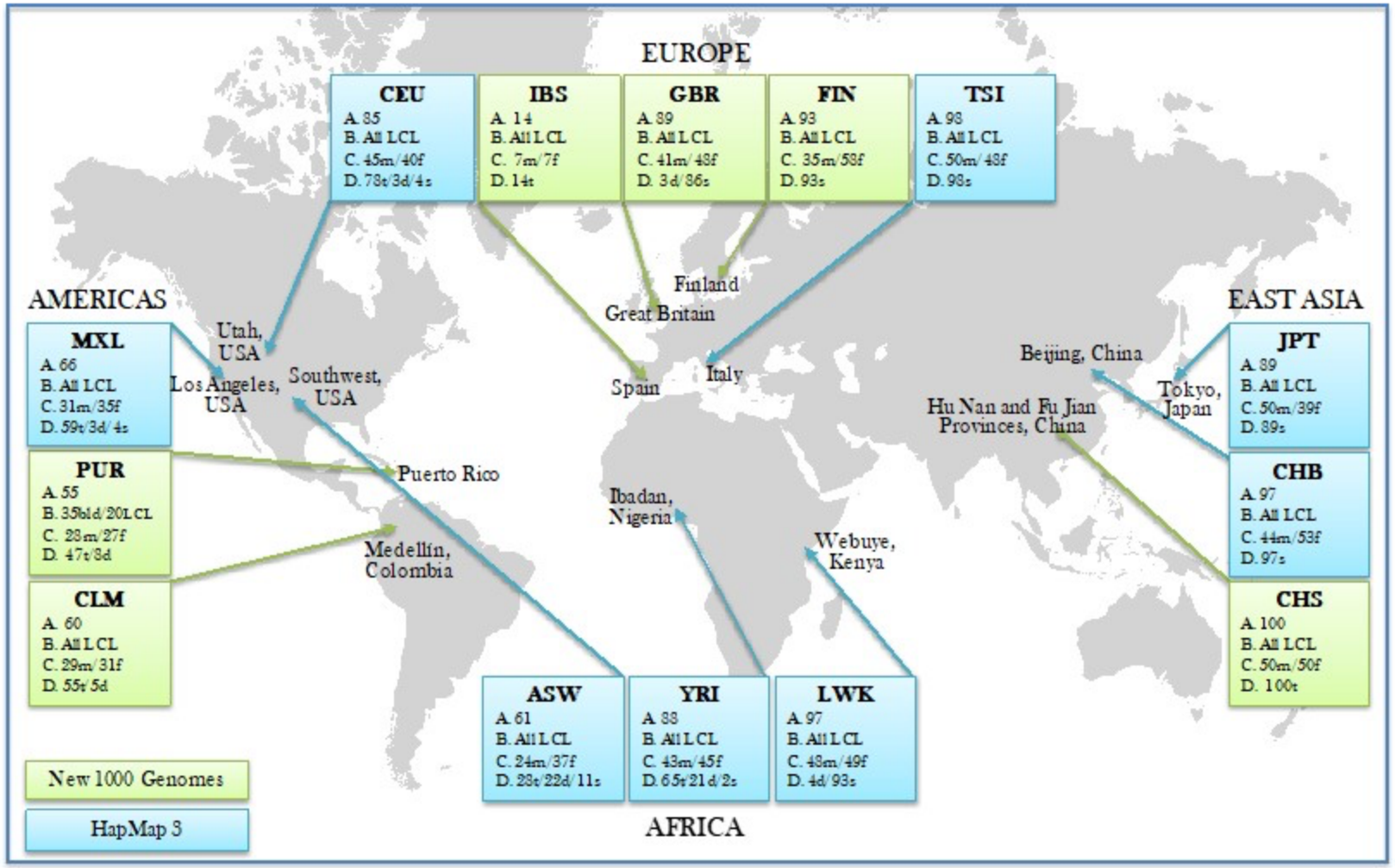
The 1000 Genomes Project
The Phase 1 Variant Set and Future Developments

Laura Clarke

16th October 2012

EMBL-EBI

Phase 1 populations



Phase 2/3 populations


Barbados


Ghana


Pakistan


Bangladesh


Peru


Nigeria


India


Vietnam


Sierra Leone


Sri Lanka


USA

Aims of re-sequencing 100 pharmacogenes in 1,000 Southeast Asian individuals-

Plus HLA & CNV genotyping

1. To evaluate the RIKEN's design of the 100 Pharmacogene-NGS panel with Southeast Asian populations, namely, those of Thailand, Singapore, Malaysia, Indonesia, Cambodia, Vietnam, Laos PDR and Myanmar.

2. To identify genetic variations of 100 pharmacogenes associated with dose-dependent drug efficacy and adverse reactions related to pharmacokinetics (Absorption, Distribution, Metabolism, Excretion, Toxicity: ADMET) in Southeast Asian populations.

3. To study how cost effective the number of selected pharmacogenes would be to develop an affordable Pharmacogenomic panel in Southeast Asian countries.

4. To establish Southeast Asian guidelines for clinical implementation of a pharmacogenomics panel combined with a review of well-established guidelines in the USA and Europe, in order to adapt them to the local situation.

5. To establish the pharmacogenomic markers for severe cutaneous adverse drug reactions (SCARs) in Southeast Asian populations.

6. To establish the pharmacogenomic markers for drug induced liver injuries (DILI) in Southeast Asian populations.

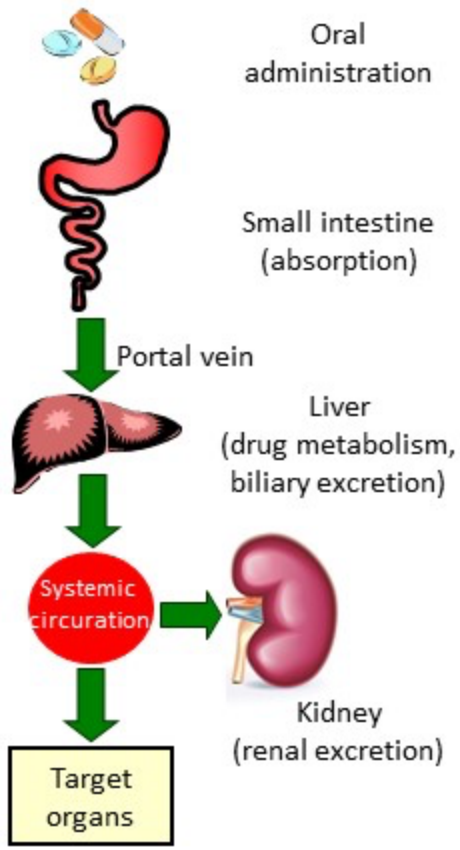
7. To utilize Public Health Genomics as a tool to maximize the benefits from this project into public health in Southeast Asian countries and to expedite implementation of pharmacogenomics into the clinic

8. To organize conferences in the field of pharmacogenomics and to encourage participation of junior biomedical scientists in related conference to boost pharmacogenomics education of healthcare professionals.

New strategy for pharmacogenomics Research

Target re-sequencing of 100 Pharmacogenes (developed by Drs. Mushiroda & Fukunaga)

- Dose-dependent drug efficacy and adverse reactions are often related to pharmacokinetics (absorption, distribution, metabolism, excretion: ADME).
- Target re-sequencing of ADME genes is an efficient method to identify genetic variations associated with dose-dependent drug responses.



Classification	Genes	N
Drug Metabolizing Enzymes	Cytochrome P450 (CYP)	30
	Flavin-containing monooxygenase (FMO)	5
	N-Acetyltransferase (NAT)	2
	UDP-glucuronosyltransferase (UGT)	10
	Sulfotransferase (SULT)	4
	Carboxyltransferase (CES)	2
	Glutathione S-transferase (GST)	4
	P450 oxidoreductase (POR)	1
	Thiopurine methyltransferase (TPMT)	1
	Dihydropyrimidine dehydrogenase (DPYD)	1
Drug Transporters	SLC transporter	29
	ABC transporter	8
Others	NUDT1, NUDT15, VKORC1	3
	100 genes	

Courtesy of Dr. Kubo from Riken

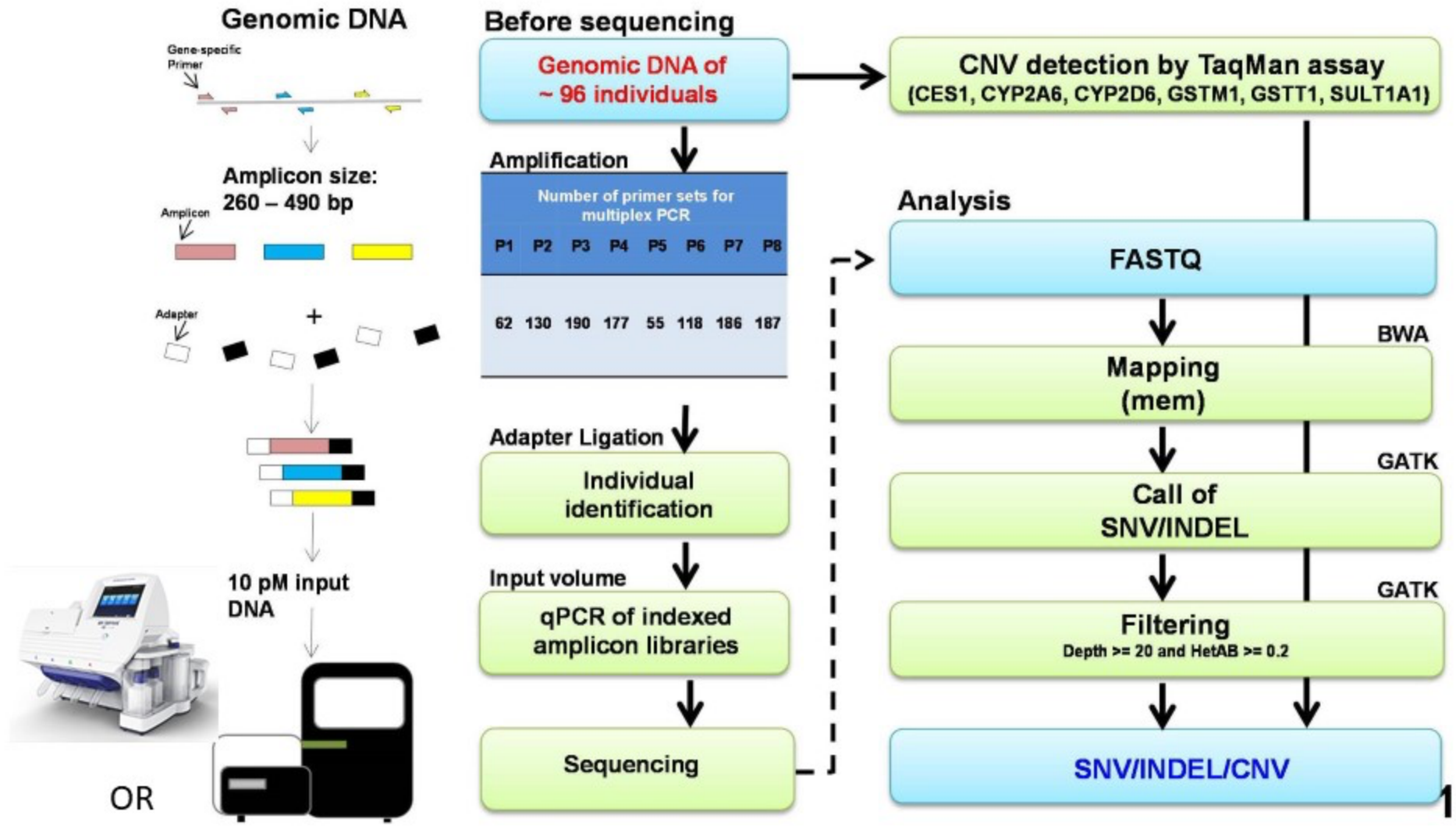
100 'RIKEN Pharmacogenes' selected as representing genes that have a key role in drug metabolism and pharmacokinetics

Dr. Taisei Mushiroda

1	ABCB1	26	CYP3A4	51	NAT1	76	SLC29A2
2	ABCB4	27	CYP3A5	52	NAT2	77	SLC29A3
3	ABCB11	28	CYP3A7	53	NUDT1	78	SLC31A1
4	ABCC1	29	CYP3A43	54	NUDT15	79	SLC46A1
5	ABCC2	30	CYP4A11	55	POR	80	SLC47A1
6	ABCC3	31	CYP4B1	56	SLC10A1	81	SLC47A2
7	ABCC4	32	CYP4F2	57	SLC10A2	82	SLCO1B1
8	ABCG2	33	CYP4F3	58	SLC15A1	83	SLCO1B3
9	CES1	34	CYP4F8	59	SLC15A2	84	SLCO2B1
10	CES2	35	CYP4F12	60	SLC16A7	85	SULT1A1
11	CYP1A1	36	CYP4Z1	61	SLC19A1	86	SULT1A2
12	CYP1A2	37	CYP11A1	62	SLC22A1	87	SULT1E1
13	CYP1B1	38	CYP17A1	63	SLC22A2	88	SULT2B1
14	CYP2A6	39	CYP19A1	64	SLC22A3	89	TPMT
15	CYP2A13	40	CYP26A1	65	SLC22A4	90	UGT1A1
16	CYP2B6	41	DPYD	66	SLC22A5	91	UGT1A3
17	CYP2C8	42	FMO1	67	SLC22A6	92	UGT1A4
18	CYP2C9	43	FMO2	68	SLC22A8	93	UGT1A5
19	CYP2C18	44	FMO3	69	SLC22A9	94	UGT1A6
20	CYP2C19	45	FMO4	70	SLC22A11	95	UGT1A7
21	CYP2D6	46	FMO5	71	SLC22A12	96	UGT1A8
22	CYP2E1	47	GSTA1	72	SLC28A1	97	UGT1A9
23	CYP2J2	48	GSTM1	73	SLC28A2	98	UGT1A10
24	CYP2S1	49	GSTP1	74	SLC28A3	99	UGT2B7
25	CYP2W1	50	GSTT1	75	SLC29A1	100	VKORC1

Courtesy of Dr. Taisei Mushiroda

Workflow of targeted-resequencing of 100 pharmacogenes in a run




Brunei
Cambodia
Vietnam
Indonesia
Laos
Malaysia
Myanmar
Philippines
Singapore
Thailand

The draft of the project proposal, you may review from http://bit.ly/2pfmNsM

- Riken, Japan is the sponsor for 1,000 DNA samples for re-sequencing and CNV genotyping. I am now the Principal Investigator (PI)/point of contact of the project. Eight countries namely, Thailand, Singapore, Malaysia, Indonesia, Cambodia, Vietnam, Laos PDR and Myanmar have agreed to join in. Brunei and Philippines are now considering the research proposal.
- IRN to provide grants for Ph.D and Post doc selected among Southeast Asian countries participating in this project.
- IRN will also provide the support for (at least) a yearly update meeting on this re-sequencing project of 1,000 Southeast Asian project in Bangkok, Thailand.
- TCELS and Thai MOPH will provide budget for HLA genotyping.
- The budget for re-sequencing of EU samples using 100 pharmacogenes will be obtained from other sources of funding.
- To maximize the benefits from this pharmacogenomics project into public health for Southeast Asian countries, Public Health Genomics activities will be developed and supported in part by SEAPharm, the Golden Helix Foundation, the Genomics Medicine Alliance and the Global Genomic Medicine Collaboration (G2MC) through conference on education.

Institutes/Organizations providing support in this project (so far);

1. Center for Medical Genomics, Ramathibodi hospital, Mahidol University, Bangkok, Thailand
2. The Thailand Center of Excellence for Life Sciences (TCELS): *http://www.tcels.or.th/en/home/page*
3. IRN (The International Research Network): http://irn.trf.or.th/
4. SEAPharm (South East Asian Pharmacogenomics Research Network)
5. Riken, Japan: http://www.riken.jp/en/
6. The Golden Helix Institute of Biomedical Research (http://www.goldenhelix.org/)
7. G2MC (Global Genomic Medicine Collaborative): http://www.nationalacademies.org/hmd/Activities/Research/GenomicBasedResearch/Innovation-Collaboratives/Global_Genomic_Medicine_Collaborative.aspx
8. GA4GH (Global Alliance for Genomic Health (GA4GH): http://genomicsandhealth.org/

Many activities related to pharmacogenomics and genomic medicine will be proceeded shortly. I will inform you of each event in advance.

Insert logos of sponsors here

SEAPHARM
SOUTH EAST ASIAN PHARMACOGENOMICS RESEARCH NETWORK

THE 6TH SEAPHARM MEETING

South East Asian Pharmacogenomics Research Network

17 August 2017

Ho Chi Minh City International University, Vietnam

Quarter 6, Linh Trung, Thu Duc District, HCMC

8.00	**Registration**	
9.00	**Opening Remarks and Introduction**	- Assoc. Prof. Dr. Le Thi Ly - Dr. Michael D Winther
9.30	**100 Pharmacogene Project**	- Dr. Michiaki Kubo - Prof. Wasun Chantratita - Dr. Taisei Mushiroda - Dr. Michael Winther
10:15	**Pharmacogenomics of Severe Cutaneous Adverse Reactions (SCARs) Updates; Japan/ Thailand/ Others**	- Dr. Taisei Mushiroda - Prof. Wichittra Tassaneeyakul - Dr. Chonlaphat Sukasem - Dr. Surakameth Mahasirimongkol
11:00	**Coffee Break**	
11:15	**Pharmacogenomics of Anti-Tuberculosis Drug Induced Liver Injury (AT-DILI) Updates; Japan/ Thailand/ Malaysia/ Indonesia**	- Dr. Taisei Mushiroda - Dr. Rika Yuliwulandari - Prof. Zahurin Mohamed - Dr. Surakameth Mahasirimongkol
12.30	**Lunch**	
13.30	**Feasibility and Health Economics of HLA Genotyping to Prevent SJS/TEN Updates; Japan/ Thailand/ Malaysia/ Indonesia**	- Assoc. Prof. Usa Chaikledkaew - Dr. Rika Yuliwulandari - Prof. Zahurin Mohamed
15:00	**UPDATES:** **Pharmacogenomics of Drug-induced Hearing Loss** **Pharmacogenomics of Drug-induced Cardiomyopathy** **Pharmacogenomics and HIV Therapeutics**	- Prof. Suradej Hongeng - Assoc. Prof. Chonlaphat Sukasem
16:00	**Coffee Break**	
16.30	**Future Collaboration/ Next Steps**	- Dr. Michiaki Kubo - Prof. Wasun Chantratita - Dr. Surakameth Mahasirimongkol - Dr. Michael D Winther

Co-organized by Dr. Michael Winther, Genome Institute of Singapore & Assoc. Prof Le Thi Ly, Ho Chi Minh International University

GENOMIC MEDICINE DAY 2017

18 AUGUST 2017

HO CHI MINH ,VIETNAM

This one-day conference will provide an overview of the challenges and opportunities for genomics sciences to impact medical care. We also seek to connect scientists and promote cooperation across the region and internationally.

Genomic Medicine is an interdiscipline involving: disease genomics, disease epigenomics, proteomics and metabolomics, pathogen and microbiome genomics, immunogenomics, translational genomics, pharmacogenomics and personalized medicine.

GM 2017 offers a real opportunity for medical and research communities to come together to discuss emerging trends, tackle complex problems and find solutions to advance Genomic Medicine.

Programme Topics:

- Genomic Technologies: Next Generation Sequencing, Genome Assembly, Functional and Comparative Genomics
- Bioinformatics, Big Data, Computer-aided Drug Development and Molecular Modeling
- Personalized Medicine Updates: Genomics of Cancer, Inherited Diseases, Complex diseases and Adverse Drug Responses
- Global updates on status of Pharmacogenomics Implementation

http://www.saphire.sg/seapharm-genomic-medicine-day-2017/