

# Research and Global Standard

Kiat Ruxrungtham

Professor of Medicine

Chula VRC (Vaccine Research Center),

Chulalongkorn University;



# Types of Researches





# Goals of Researches



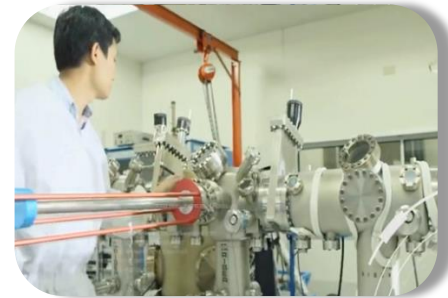
**Policy  
impact**



**Economic  
Impact**



**Social  
Impact**



**Industrial  
Impact**



**Health  
impact**



**Cultural  
Impact**



**Frontier -  
New Discovery**



# Research Management





# What are the critical issues of research?



# Ethic



# Safety



# Quality

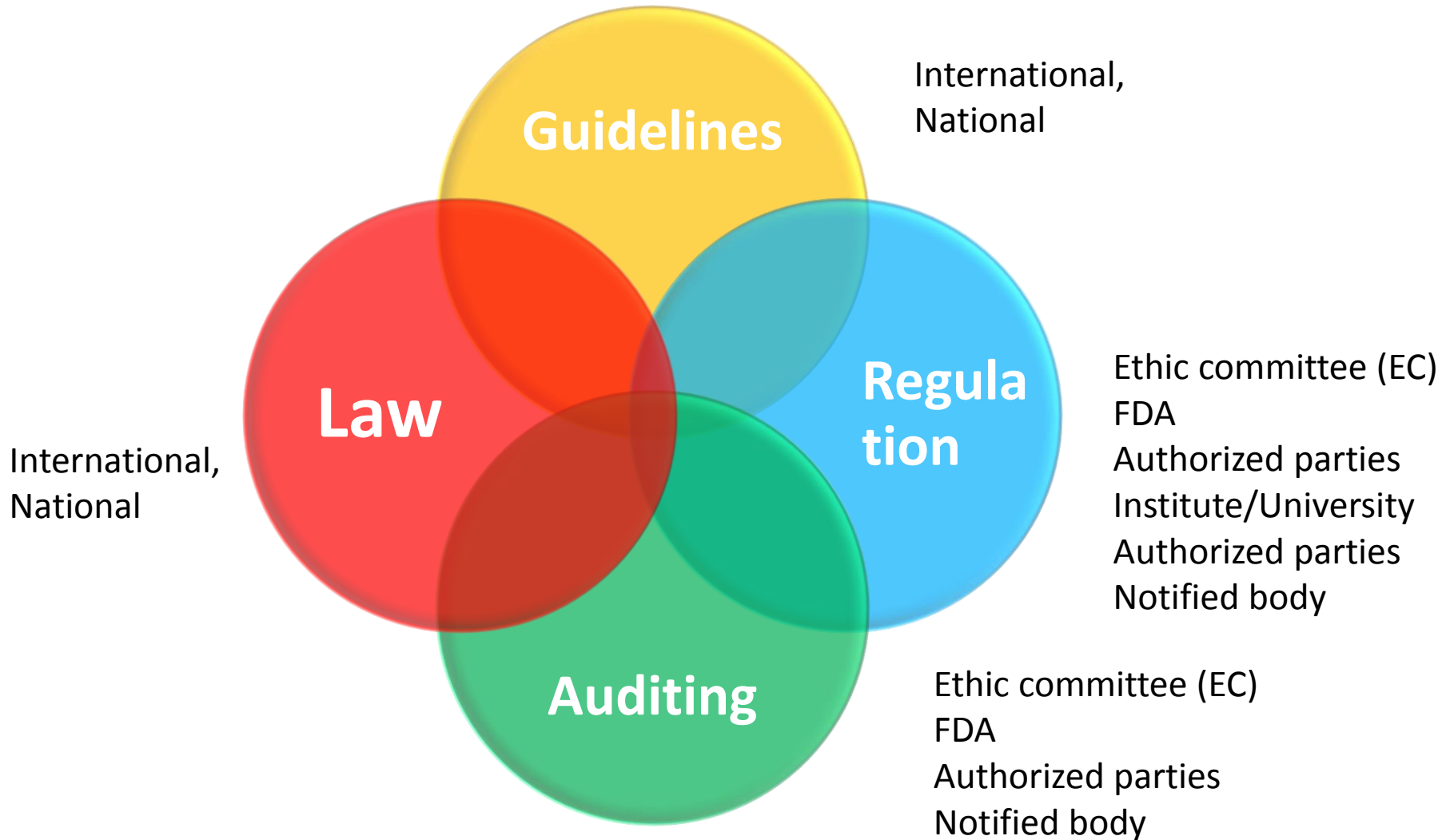


# Valid & Reproducible

## Inter-country product registration: **Standard Harmonization**



# Global and National Mechanisms to Ensure **Ethic, Integrity, Quality** of the Research





# Global Standard on Research

*From* Designing, Conducting,  
Reporting, Ethic *and* Complying to  
the Regulatory authorities



# Integrity

**“ Doing the right thing even  
when nobody is watching”**

C.S. Lewis

ความมีศีลธรรมจรรยา ความซื่อสัตย์



# Research Integrity

*Is critical for all kinds of researches*

## ***Cardinal Sins on Research Misconducts***

- 1. Plagiarism*** ลอกเขา
- 2. Fabrication*** ปั้นน้ำเป็นตัว
- 3. Falsification*** แอบแก้ไขให้ดี



# South Korean Cloning Researcher Resigns

by Sei Chong on 23 December 2005, 12:00 AM | [Permanent Link](#) | [0 Comments](#)

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PREVIOUS ARTICLE

NEXT ARTICLE

**SEOUL, SOUTH KOREA**--Seoul National University (SNU) researcher Woo Suk Hwang submitted his resignation today after an internal inquiry by a university panel found that he deliberately fabricated much of the data in a groundbreaking stem cell paper published by [Science](#).

Roe Jung Hye, dean of SNU's office of research affairs, issued the panel's preliminary report today, which said that out of the 11 stem cell lines Hwang claimed to have created in the paper, only two existed when the manuscript was submitted on 15 March. Four lines had died on 9 January because of contamination, three were observed only in the form of colonies, not stem cell lines, and no records exist for two lines. She said the university has requested DNA fingerprinting tests on the two existing stem cell lines to see whether they are clones.

[ENLARGE IMAGE](#)





# Research and Ethic

 U.S. Department of Health & Human Services

» [www.hhs.gov](http://www.hhs.gov)

Blog

 **Office of Research Integrity**  
U.S. Department of Health and Human Services

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- Publications
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**THE LAB**  
Avoiding Research Misconduct

Interactive Movie on Research Misconduct  
Watch Full Version Online

ORI Conferences

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Misconduct Findings

Annual Report System

Newsletter

Latest Newsletter (PDF)  
June 2011



ORI Update Misconduct RCR Related Organizations

 RSS News Feeds is an easy way for our latest news to come to you. Simply add <http://ori.hhs.gov/feed.xml> to your aggregate news reader.

**New Misconduct Finding: Scott Weber**  
ORI found that the Respondent engaged in research misconduct by plagiarizing text, falsifying data and references, and fabricating data.

**Recruiting human subjects. What should Karen do?**





# Conducting Research in **Human**

Both **scientific and social researches** that are involving human subjects , the researcher **must submit a proposal to** their institutional **ethic committee**



# Basic Ethical Principles

**1** **Respect** of persons

**2** **Beneficence**

**3** **Justice**



# Drug Discovery & Development



new Drug discovery and development



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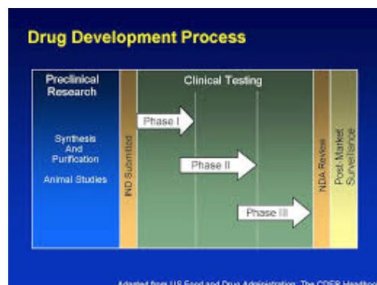
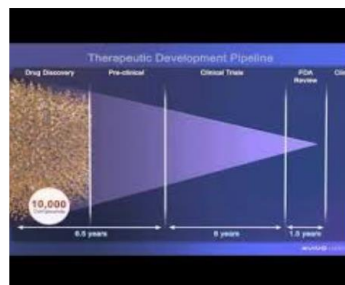
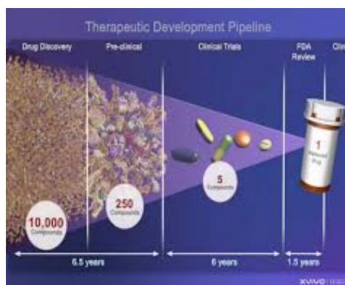
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Related images ▼

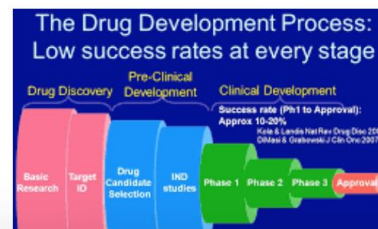
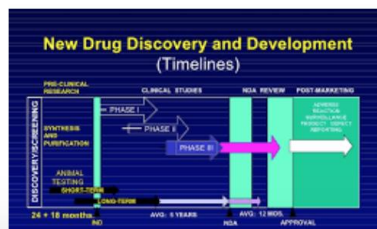
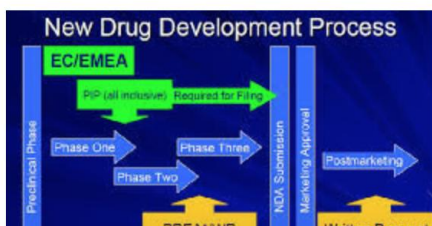
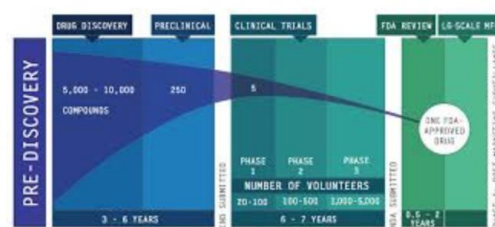
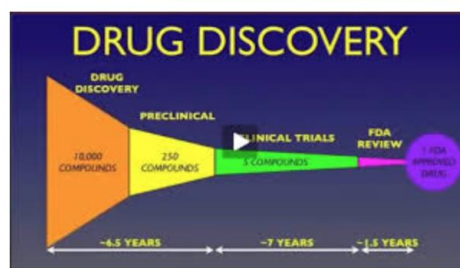
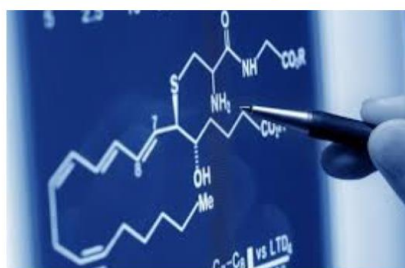
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Clear



Animal testing is wasteful and morally unjust. It can be replaced by at least 450 alternatives. Animal-tested drugs fail on humans 90% of the time.





# Drug Discovery & Development-Timeline

**DRUG  
DISCOVERY**

**10,000  
COMPOUNDS**

**PRECLINICAL**

**250  
COMPOUNDS**

**CLINICAL TRIALS**

**5 COMPOUNDS**

**FDA  
REVIEW**

**1 FDA  
APPROVED  
DRUG**

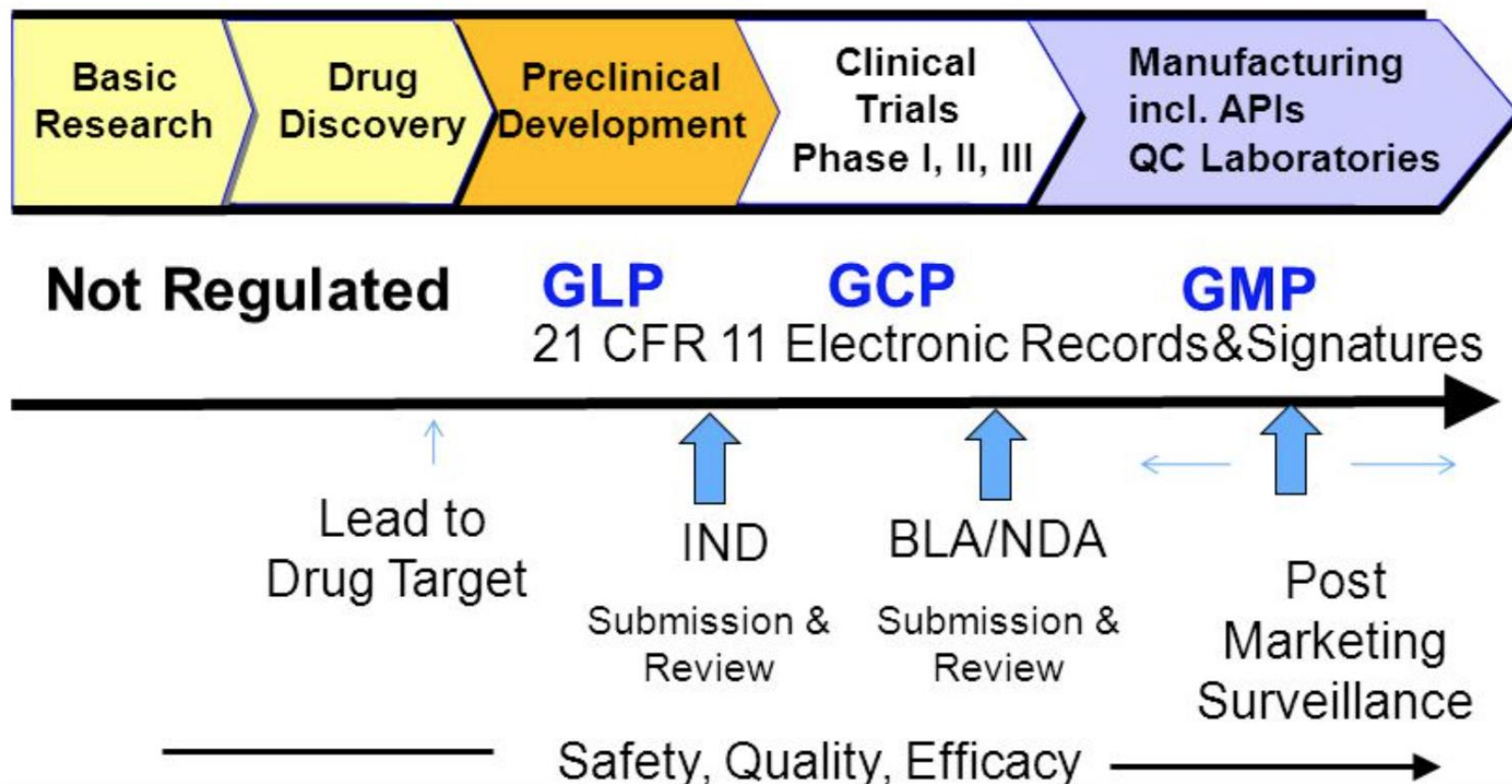
**~6.5 YEARS**

**~7 YEARS**

**~1.5 YEARS**



# Regulations Along the Drug Life

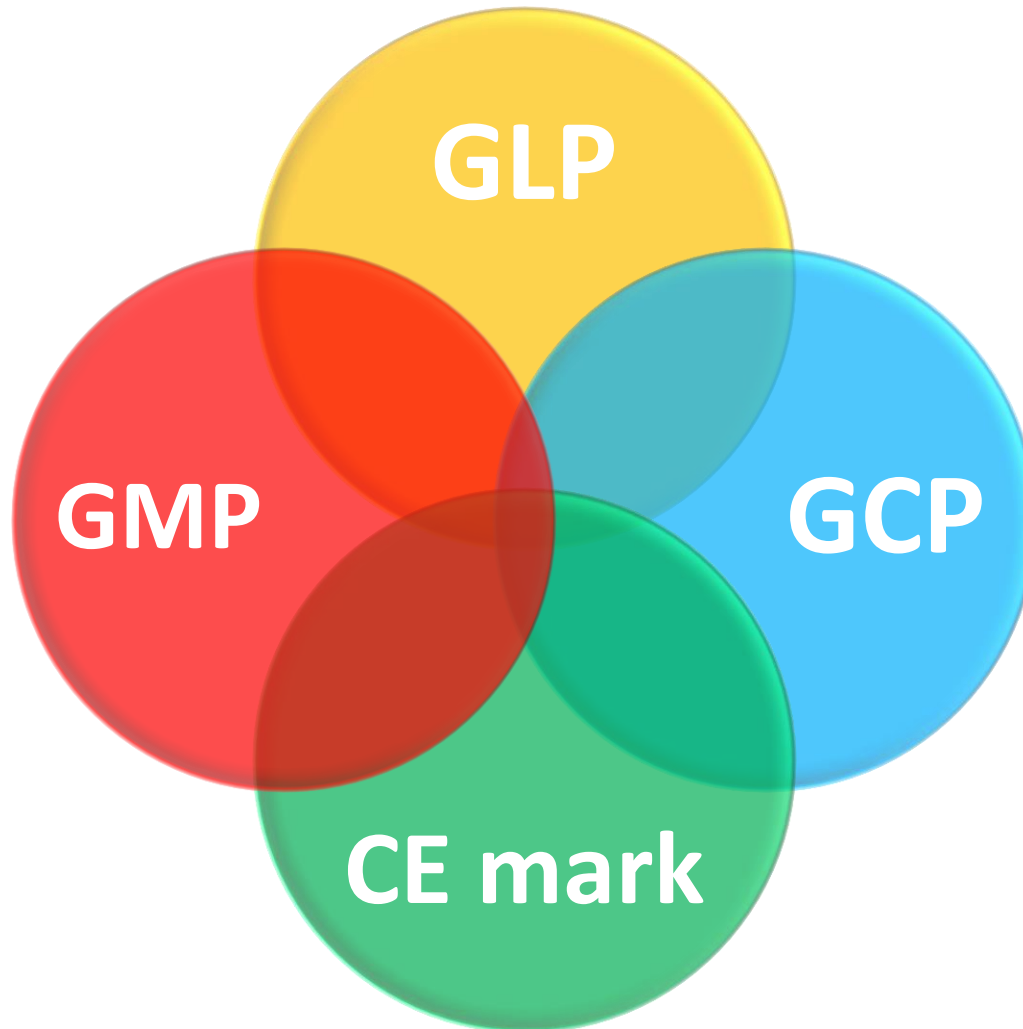


GLP = Good Laboratory Practices  
GMP = Good Manufacturing Practices  
GCP = Good Clinical Practices

GxP = GLP+GCP+GMP = Predicate Rules  
IND = Investigational New Drug Application  
BLA = Biologic License Application  
NDA = New Drug Application




# Quality Systems for Medical Products Development








### WHY WAS GLP CREATED?



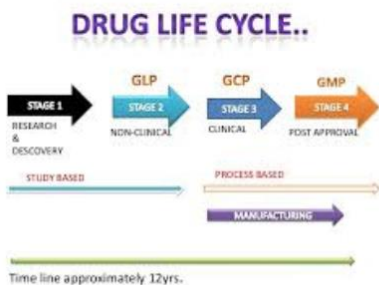
- In the early 70's FDA became aware of cases of poor laboratory practice all over the United States.
- They discovered a lot of fraudulent activities and a lot of poor lab practices.
- Examples of some of these poor lab practices found were:
  - Equipment not been calibrated to standard form, therefore giving wrong measurements.
  - Incorrect/inaccurate accounts of the actual lab study.
  - Inadequate test systems.

### GOOD LABORATORY PRACTICE (GLP)



**Presenters:**

- \_ Pramod Chaudhary
- \_ Bipin Singh
- \_ Surendra K. Bohara



GLP is

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### GLP: GOOD LABORATORY PRACTICE

- GLP is an FDA regulation.
- GLP is a formal regulation that was created by the FDA (United states food and drug administration) in 1978.



### GOOD LABORATORY PRACTICE AND ISO - 9000

Presented By: kunal c mehta  
Dept. of Q.A.  
1<sup>st</sup> year M. Pharm  
Shree Devi College Of Pharmacy..



# GLP : Good Laboratory Practice

- Is **a quality system** to ensure the tests are reliable and reproducible
- should be applied to the **non-clinical safety testing of** test items contained in
  - **Pharmaceutical products**
  - **Pesticide products**
  - **Cosmetic products,**
  - **Veterinary drugs**
  - **Food additives,**
  - **Feed additives**
  - **Industrial chemicals.**
- The test is to obtain data on **their properties and/or their safety** with respect to human health and/or the environment.



# Good Laboratory Practice

- **a quality system**

concerned with the organisational process and the conditions under which **non-clinical health** and **environmental safety studies** are

- *planned,*
- *performed,*
- *monitored,*
- *recorded,*
- *archived and*
- *reported*

# GLP

quality reliability  
consistency reproducibility  
GLP GLP  
integrity uniformity

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> Testing of chemicals

> Assessment of chemicals

## OECD Series on Principles of Good Laboratory Practice (GLP) and Compliance Monitoring

U.S. Department of Health and Human Services

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### Inspections, Compliance, Enforcement, and Criminal Investigations


Home > Inspections, Compliance, Enforcement, and Criminal Investigations > Compliance Actions and Activities > Bioresearch Monitoring

Bioresearch Monitoring

## Comparison Chart of FDA and EPA Good Laboratory Practice (GLP) Regulations and the OECD Principles of GLP

f SHARE t TWEET in LINKEDIN p PIN IT e EMAIL p PRINT

Document issued on: June 2004

 World Health Organization

SECOND EDITION

# HANDBOOK

## GOOD LABORATORY PRACTICE (GLP)

Quality practices  
for regulated non-clinical  
research and development





COLLEGE of AMERICAN  
PATHOLOGISTS

ABOUT THE CAP

CALENDAR

NEWS & MEDIA

CAREERS AT THE CAP

CAP FOUNDATION

SHOP

CO

Member Resources

Advocacy

Laboratory Improvement

Learning

Protocols and Gu

# LABORATORY ACCREDITATION PROGRAM

The College of American Pathologists (CAP's) Laboratory Accreditation Program accredits laboratory test disciplines with the most scientifically rigorous customized criteria.

The CAP's peer-based inspector model provides a unique balance of regulatory oversight and laboratory input from the most respected worldwide pathology organization.

The Laboratory Accreditation Program inspects a variety of laboratory settings from complex university medical centers to physician office laboratories, and covers a complete array of disciplines and testing procedures.





# GLP : setting up

## Resources

Personnel and training  
Facilities

## Test characteristics

Test items  
Test system

## Rules of performing studies

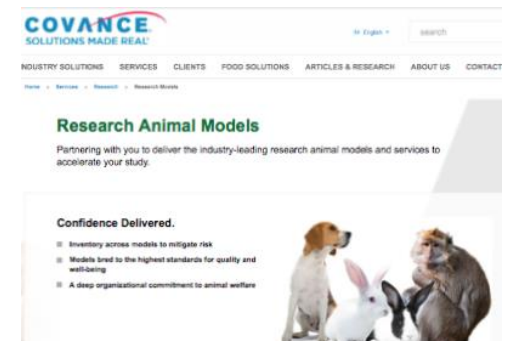
Study protocol, plan  
SOPs

## Results: Raw data, data collection

Records, recording  
Reports, reports  
Achieves, achieving  
Tracking samples, specimens

## Quality Assurance Unit

Review –protocol, SOPs  
Audits, inspections  
QA statements  
QA files and reports







medical device

# Medical Devices

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pharmaceutical

innovative

injection

simple

implantable

ivd

ultrasound

laser

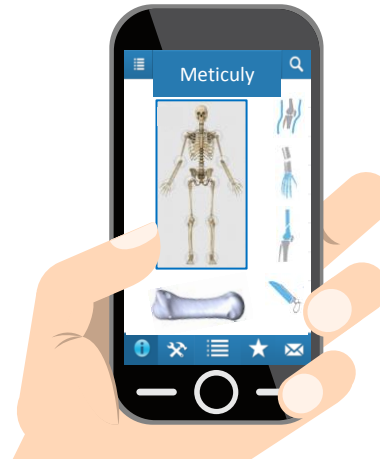
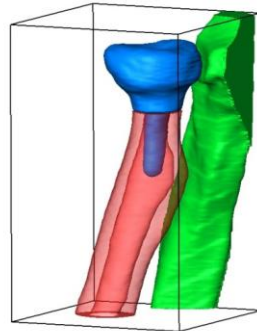
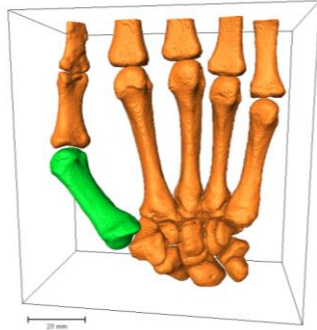




# One Patient. One Implant. In One Day.



Each titanium implant is specifically designed based on the patient's CT scan to match precisely to the 3D model of the bone. Then the model is checked for biomechanics and finally the implant is created using 3D printing technology.



Inventor: Dr. Boonrat Lowongwat and his team

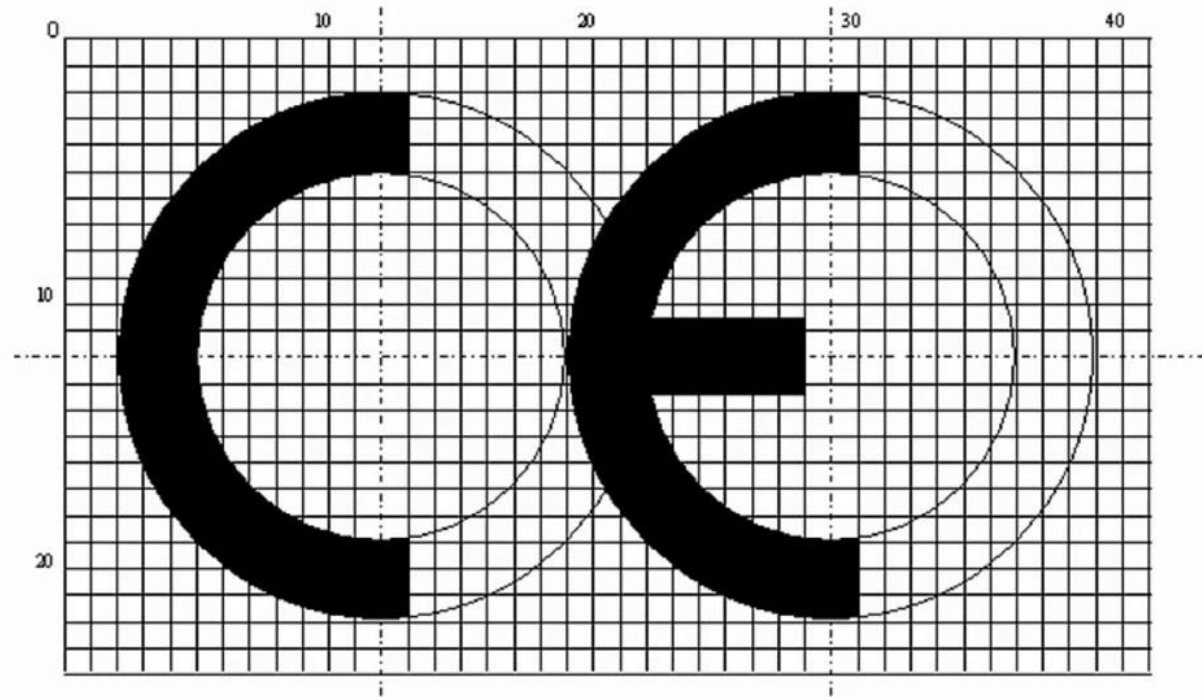




## CE Marking



- Must be affixed and visible
- Applies to labeling
- Article 17 and Annex XII







# EUROPE

CE Marking  
gives you  
access to 32  
countries in  
Europe

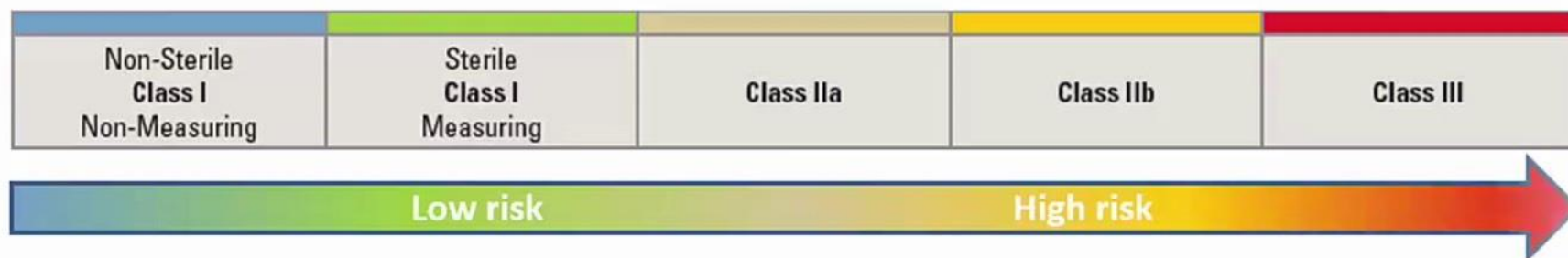






## Medical Device Classification

- Four-tiered system (class I, class IIa, class IIb and class III)
  - Certification based on the risk to the human body
- Devices in higher risk classes are associated with more stringent regulatory requirements







## Quality Management System

- Designed specifically for medical device companies
- Most commonly chosen way to comply in Europe







Google



# Clinical Trials Innovation

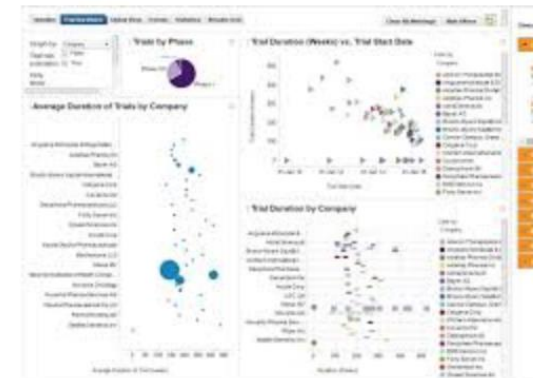


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Product	Indication	Pre-Clinical	Clinical	FDA pivotal Trial	Recent Milestone
Gileste100	Weight Loss in Overweight & Obese Patients	Completed	Phase 1/2 Completed	GLWV Ongoing <sup>1</sup>	GLWV Data Readout Mid-17
	Weight Loss in Overweight & Obese Prediabetic & Type 2 Diabetic Patients	Completed		GLWV Ongoing <sup>1</sup>	GLWV Data Readout Mid-17
	Weight Loss in Pediatric Overweight & Obese Patients	Ongoing			Initiation of Phase-1b Study
Gileste200	Glycemic Control and Weight Loss in Prediabetic & Type 2 Diabetic Patients	Ongoing			6 Month-POC Trial Initiation 1H17 (Data Readout 1H18)





# ICH GCP: USA, EU, Japan



The screenshot shows the ICH website homepage. At the top, there is a navigation bar with a logo on the left, a 'News...' link in the center, and a search box on the right. Below the navigation bar, there are several sections: 'Guidelines >> Multidisciplinary...' with a 'Q/S/E/M' icon, a 'Find quickly What's new on the ICH site' link with an arrow icon, a 'UMC and MedDRA MB Announce MedDRA's implementation in Vigibase March 18, 2008' link, a 'Read here the Tokyo Symposium Proceedings: Hot Topics and Influence on Asia' link, and a 'General E14 related GCG related MedDRA related' link with a small image icon. On the left side, there is a 'PUBLICATIONS' section with links to 'Guidelines', 'Questions & Answers', 'Concept Papers & Business Plans', 'Press Releases', 'SC Reports & Other Documents', 'New Topics', 'C T D', 'M2/ESTRI', 'CONFERENCES', 'ICH Public Meetings', 'ICH Previous Conferences', 'ABOUT ICH', 'History and Future', 'Structure of ICH', 'Process for Harmonisation', 'Glossary', 'Frequently Asked Questions', 'Contact Us', 'Meetings Schedule', and 'Global Cooperation Group' with an 'Introduction' link. The main content area features a 'Welcome to the official web site for ICH' heading, followed by three paragraphs of text. The first paragraph describes the ICH project as a unique collaboration between regulatory authorities and industry experts. The second paragraph states the purpose is to make recommendations for greater harmonisation. The third paragraph states the objective is a more economical use of resources and the elimination of unnecessary delay. The text is in a blue, serif font.

News... search

Guidelines >> Multidisciplinary...  
Q/S/E/M

Find quickly  
What's new  
on the ICH site

UMC and MedDRA MB Announce  
MedDRA's implementation in Vigibase  
March 18, 2008

Read here the  
Tokyo Symposium Proceedings:  
Hot Topics and Influence on Asia

General  
E14 related  
GCG related  
MedDRA related

text size: [s](#) [m](#) [l](#)

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Concept Papers & Business Plans  
Press Releases  
SC Reports & Other Documents  
New Topics  
C T D  
M2/ESTRI  
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ICH Public Meetings  
ICH Previous Conferences  
**ABOUT ICH**  
History and Future  
Structure of ICH  
Process for Harmonisation  
Glossary  
Frequently Asked Questions  
Contact Us  
Meetings Schedule  
**Global Cooperation Group**  
Introduction

**Welcome to the official web site for ICH**

The International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) is a unique project that brings together the regulatory authorities of Europe, Japan and the United States and experts from the pharmaceutical industry in the three regions to discuss scientific and technical aspects of product registration.

The purpose is to make recommendations on ways to achieve greater harmonisation in the interpretation and application of technical guidelines and requirements for product registration in order to reduce or obviate the need to duplicate the testing carried out during the research and development of new medicines.

The objective of such harmonisation is a more economical use of human, animal and material resources, and the elimination of unnecessary delay in the global development and availability of new medicines whilst maintaining safeguards on quality, safety and efficacy, and regulatory obligations to protect public health. This Mission is embodied in the [Terms of Reference of ICH](#).

The **International Conference on Harmonisation** of  
Technical Requirements for Registration of  
Pharmaceuticals for Human Use (ICH)



# Good Clinical Trial

Good Clinical  
Practice  
**GCP**

Good Laboratory  
Practice  
**GLP**

**S** = Scientific valid  
**E** = Ethically oriented  
**A** = Accuracy  
**T** = Traceability

**To find a New drug or New Rx regimen or Strategy or Vaccine :**  
Better efficacy, less toxic, less expensive, better compliance, prevention of infection or cancer





Dream 1



Year 2030

Be able to develop ecosystem from R&D to global marketing of

- Vaccine
- Drugs
- Biomarkers
- Devices

Be able to get at least 0.1% of the global market share of 46.5 ล้าน ล้านบาท = “46,500 ล้านบาท “



IMS Health Projection for 2020

[www.imshealth.com](http://www.imshealth.com)



# Thailand and Research Quality Regulation Systems



EC/IRB ✓

GCP ✓

GMP ✓

GLP  
Lab ✓  
Animal X

CE mark X  
ISO 13485

Law/ regulation



**Thailand** : Complying to International standard on safety and quality regulations –are under reforming to increase efficiency and speed

NRCT

วช

Animal lab  
Human Research

DMSc

กรมวิทยาศาสตร์  
การแพทย์

GLP

FDA

อย.

IND, GCP

### Transforming Challenges

1. New mindset
2. Under workforces
3. Efficient management system
4. Sufficient Budgeting





animal lab



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laboratory animal

real life

rabbit

monkey

rat

puppy

guinea pig

cat

funny

albino rat



# Institute of Animals for Scientific Purpose Development (IAD)

สถาบันพัฒนาการดำเนินการต่อสัตว์เพื่องานทางวิทยาศาสตร์ (สพสว.)

"แผนกลยุทธ์แห่งชาติว่าด้วยการพัฒนางานสัตว์ทดลอง พ.ศ. 2550 - 2559"







# National Policy and Guidelines for Human Research 2015



## มาตรฐาน คณะกรรมการจริยธรรมการวิจัยในคน (มคจค.)

อภินันทนาการจาก  
สำนักงานคณะกรรมการวิจัยแห่งชาติ (วช.)

สำนักงานคณะกรรมการวิจัยแห่งชาติ (วช.)

พ.ศ. ๒๕๕๖



# University and Global Standard on Research And Innovation



# *Chula Research Strategy*

## Strategy



### National Agenda

Research and innovation to strengthen country economy and sustainability



### Regional and Global Agenda

Transforming the world with Research and Innovation



### Cutting Edge

Frontier in science, health and social researches



### Partnerships

Collaborating thru partnership with both domestic, international research institutes and private entities



# Thailand National Strategy



Political, Economical



Unity in  
Diversity

**Stability**

Inclusive Growth  
Shared prosperity  
Equity  
Green growth

**Sustain  
ability**

**Prosperity**



National wealth  
Community wealth







# CU Innovation Ecosystem

Transforming how Thais  
live, learn & play

**Innovation Support**

**Innovation Hub**

**Innovation District**



CU Innovation Support





Health  
Aging  
and  
Biomed

## B) Startup

SMF

Superimposed Medical  
MRI Image



HelpMe!



Parkinson  
RichX  
M-Smart Brain  
Meticuly  
Superimposed  
Medical  
MRI Image  
DermaPromp

เครื่องเจียรไน



Tekram



AR



ShapeEd



Viabus



Smart City  
Creative  
Economy

Treasure  
Refun Bank  
Locall – Call Local  
Happy Worky  
Plan a Wed  
FlowFin  
Seekute  
Design my trip  
EZ Learning  
My Gym You Play  
Alcohol breath  
tester

Chula  
Innovation

Delivery Robot



Powerbank Rev



Ti2m  
Siam Organic  
Ingredient Box

Earphone Adapter  
Get rid of sound



Social-Home-Healthcare  
Robots



Intelligent 3D Printing

Inspection-Monitor Robot



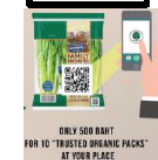
Rehabilitation Robots



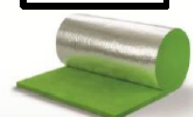
Oasiz



PlantD



Trumpdi



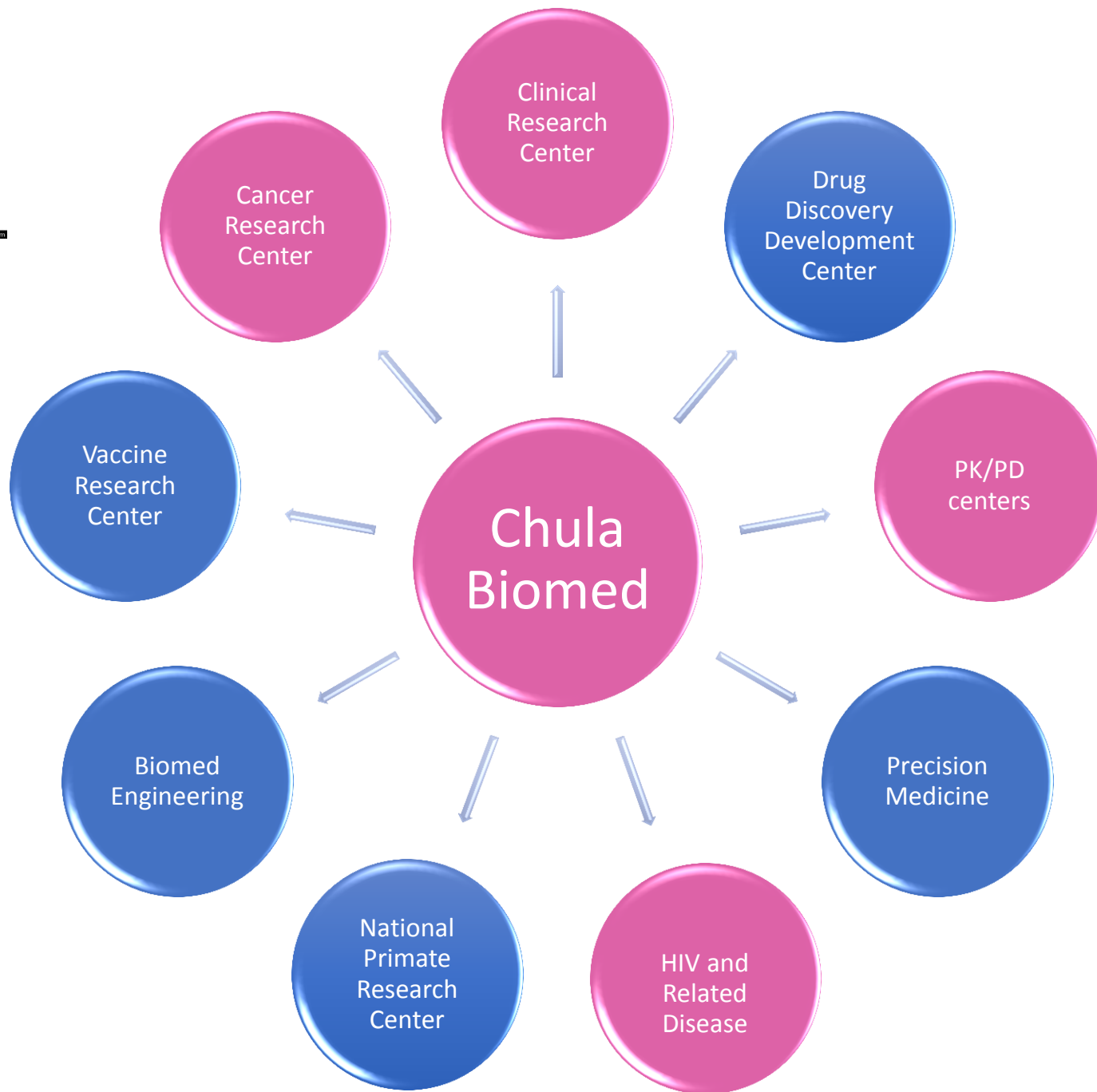
JuiceInno8



Robotic ,  
Digital and  
Electronic  
Vehicle

Food /  
Energy /  
Water /  
Agriculture

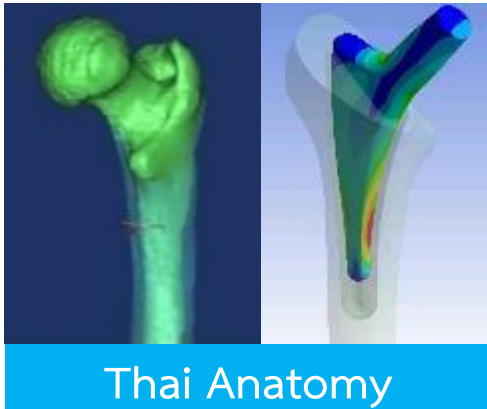






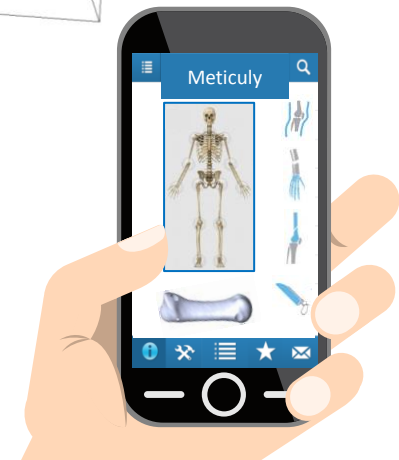
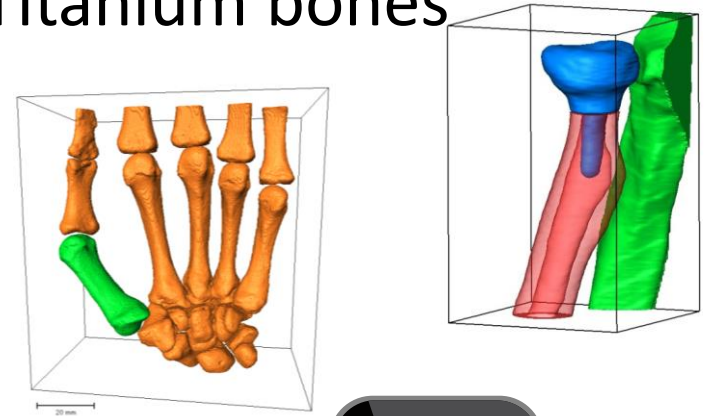
# Chula Medical Devices: Implants

## Hip prosthesis



Asst. Prof. Pairat Tangpornprasert

## 3-D Titanium bones

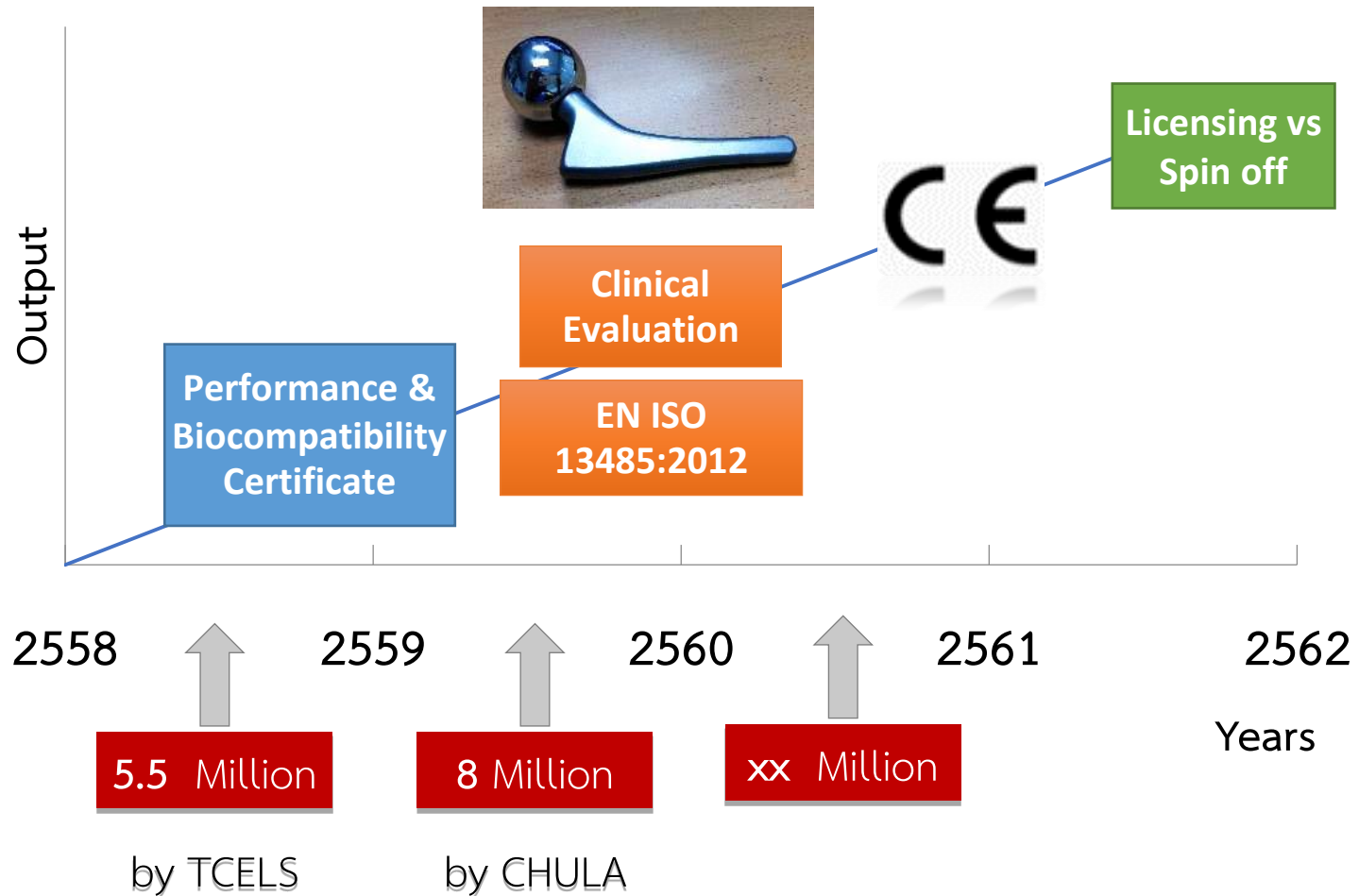


Dr. Boonrat Lowongwat



# Development timelines and standard compliance of **Hip Prosthesis**

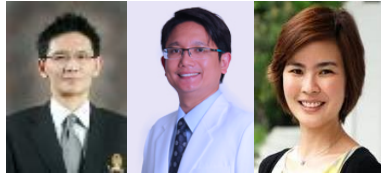
## Cemented Modular Unipolar Hip Prosthesis



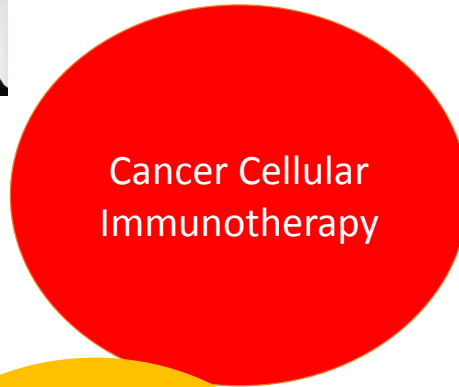


# Cancer Immunotherapy Excellence Center

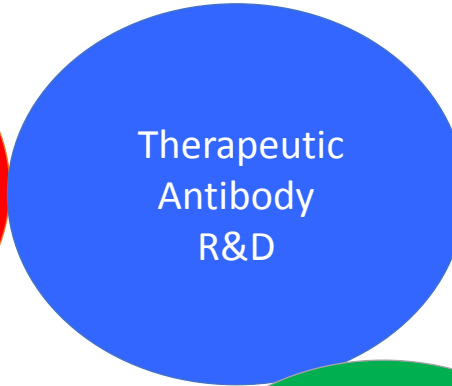
5 Research Groups



PI : Pokrath, Koramit,  
Supannikar



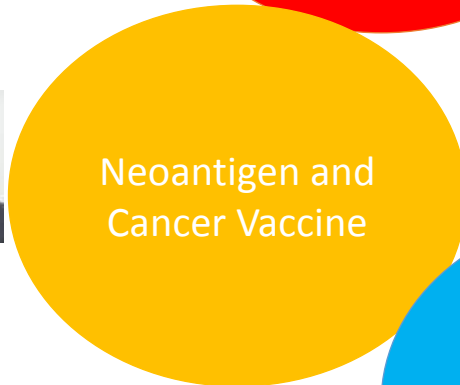
Cancer Cellular  
Immunotherapy



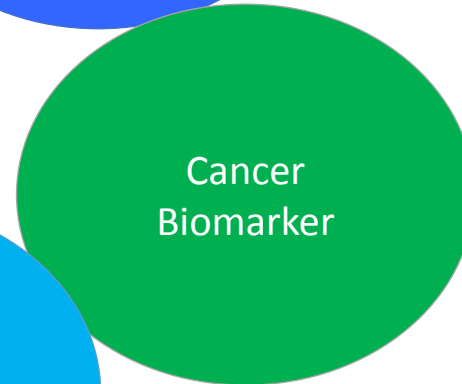
Therapeutic  
Antibody  
R&D



PI : Michael, Nattiya,  
Pornchai



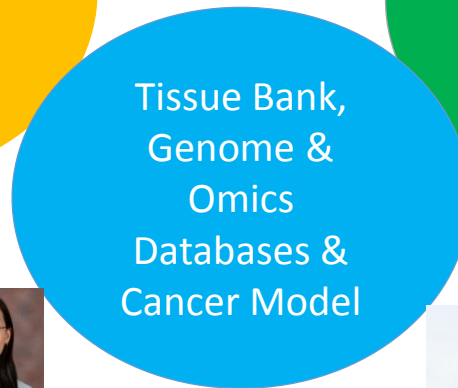
Neoantigen and  
Cancer Vaccine



Cancer  
Biomarker



PI : Virote,  
Nipan



Tissue Bank,  
Genome &  
Omics  
Databases &  
Cancer Model



PI : Nattiya, Chanida



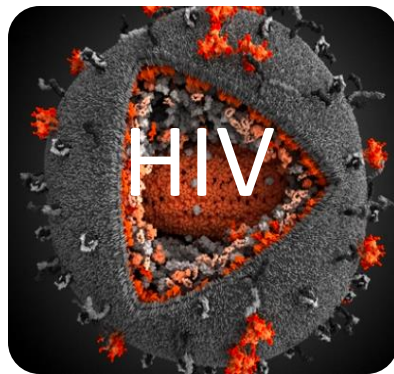
PI : Natawut, Duangdao



PI : Trairak,  
Eakachai,  
Tanapat



# Chula Vaccine Initiatives



ChulaVRC (Vaccine Research Center)

Faculty of Medicine, Chulalongkorn University



# Thailand Dengue Vaccine Development

## *Projected Timelines*

**2016-17**

NHP study



**2017-18**

GMP  
production



**2018-19**

Phase I  
trial



Collaborator -KMUTT : Dr. Panit



# House Mite Allergen Test and Vaccine Projects

## Proposed Timelines

**2016-17**

**2018**

**2018-19**

**Preclinical  
Non-clinical**

**GMP  
production**

**Clinical Evaluation:  
Dx Test  
Phase I trial:  
Vaccine**



DNA vaccine

Assay  
evaluation



Phase I  
Vaccine trial







NATIONAL PRIMATE RESEARCH CENTER OF THAILAND

ศูนย์วิจัยไพรเมทแห่งชาติ



# Chula National Primate Research Center

1.30 hours away from Bangkok

Working toward GLP accreditation



A = Administrative unit

B = Breeding unit

R = Research unit

Location: Chula Innovation and Pilot Plants Campus, Saraburi, Thailand





# Chula National Primate Research Center

1.30 hours away from Bangkok





# University : Transforming toward global standard on research and innovation

## Established system

- **Research integrity regulation:** guidelines, training, screening on plagiarism
- IP office and Tech licensing office
- **Ethic committees :** GCP, มาตรฐาน EC
- **GCP** complied clinical research center (ChulaCRC): ICH GCP
- **GLP** complied clinical lab: College American Pathologists (CAP)
- **Animal use and animal research ethic committee :** พระราชบัญญัติสัตว์เพื่องานทางวิทยาศาสตร์

## On going process

- **GLP, AAALAC Animal lab facilities:** 1. Small animal 2. Non-human primate
- **GMP pilot plants :** 2 pilot plants for implant hip prosthetic and 3-D bone : working on GMP approval and CE marking



Thailand Needs Further  
Strengthening



# Thailand: Capacity Strengthening needed

## I. Key stakeholders

- FDA: high priority
- All relevant research centers and researchers
- Domestic industries

## II. How to

- Set up a clear roadmap with milestones-timelines and proper funding
- **FDA:**
  - Quickly increase their quality workforce
  - Recruit full-time experienced experts, consultants, authorized parties,
  - Training: workshop, on the job training
- **Universities**
  - Training, workshop, on the job training; outsourcing
  - Joint program with global university or industry
- **Domestic industries**
  - **SMEs:** Outsourcing, consultants (SMEs): Government –should provide services
  - **Big corporates:** Recruit experienced staffs,
  - **Training**



Regulatory Authority with  
**Useful Website** is Essential





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[Radiation-Emitting Products](#)

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[Animal & Veterinary](#)

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## Drugs

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### Investigational New Drug (IND) Application

[Emergency Investigational New Drug \(EIND\) Applications for Antiviral Products](#)

[IND Forms and Instructions](#)

[Investigator-Initiated Investigational New Drug \(IND\) Applications](#)

[Pre-IND Consultation Program](#)



[Regulatory Information for INDs](#)

# Investigational New Drug (IND) Application



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- [Guidance Documents for INDs](#)
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  - [Code of Federal Regulations](#)
  - [Manual of Policies and Procedures \(MaPPs\)](#)
- [Emergency Use of an Investigational Drug or Biologic](#)
  - [Physician Request for a Single Patient IND for Compassionate or Emergency Use](#)


### Spotlight

- [Investigator-Initiated IND Applications](#)
- [Final Rule: IND Safety Reporting Requirements for Human Drug and Biological Products and Safety Reporting Requirements for Bioavailability and Bioequivalence Studies in Humans](#)



## Human medicines: regulatory information

**This section of the website provides information on the regulation of medicines for human use in the European Union (EU). It particularly concerns the centralised procedure, where the European Medicines Agency (EMA) plays a key role.**

For further information on EU legislation and procedures for the regulation of human medicines, see volumes 1-4 and 9-10 of the [rules governing medicinal products in the EU](#) .

- ▶ [Overview](#)
- ▶ [Research and development](#)
- ▶ [Marketing authorisation](#)
- ▶ [Post-authorisation](#)
- ▶ [Herbal products](#)







China Food and Drug Administration

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## What's New

(2017-07-21)

- [2017 BRICs cooperation meeting on drug supervision was held in Zhengzhou](#) (2017-07-21)
- [2017 Annual's Ministerial Seminar on Drug Quality Management in Developing Countries](#)



## ABOUT CFDA



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# Thai FDA



Welcome to FDA Thailand

Ministry of Public Health

Executives

Vision & Mission

Roles and Responsibilities

Historical Background

Organization Structure

Activities

## The Roles and Responsibilities of Thai FDA

The main role of Thai FDA is to protect consumers' health thru ensuring safety, quality and efficacy of consumable products within its remit. These include: foods, drugs, psychotropic substances, narcotics, medical devices, volatile substances, cosmetics and hazardous substances available in the country. This has to be implemented in accordance with the national legislation and international agreements as follows:

1. Drug Act, B.E. 2510 (1967) and Amendment No. 2 (1975), No. 3 (1979), No. 4 (1985) and No. 5 (1987),
2. Psychotropic Substance Act B.E. 2518 (1975) and Amendment No. 2 (1985), No. 3 (1992) and No. 4 (2000)
3. Food Act, B.E. 2522 (1979)
4. Narcotic Act, B.E. 2522 (1979) and Amendment No. 2 (1985), No. 3 (1987) and No. 4 (2000)
5. The Emergency Decree on Prevention of Abuse of Volatile Substances, B.E. 2533 (1990) and Amendment No. 2 (2000)
6. Hazardous Substance Act, B.E. 2535 (1992)
7. Medical Device Act, B.E. 2551 (2008)
8. Cosmetic Act, B.E. 2558 (2015)
9. The Single Convention on Narcotic Drugs 1961, commentary on the protocol amended in Geneva on March 25, 1972
10. The International Convention on Psychotropic Substances, 1971



# Thailand: Can we seriously reform ?

## Investment on Human Capital !!

# Human Development

A priority > not yet building



# Professional

## Full- time Researchers Career path



# Ecosystem for high quality Research





# CHINESE ACADEMY OF SCIENCES

*Distribution of CAS Institutions*



**China policy** is committed on  
**Infrastructure and Capacity  
Development**

104 Research Institutes

5 Universities

12 management organization

22 holding companies



There are 124 Institutions directly under the CAS by the end of 2012, with 104 research institutes, five universities & supporting organizations, 12 management organizations that consist of the headquarters and branches, and three other units. Moreover, there are 25 legal entities affiliated and 22 CAS invested holding enterprises.



We definitely can achieve these goals in the next decade !!, if we do have

- **a new mindset**
- **a real commitment, and**
- **a new way of efficient management system**
- **a reliably way of auditing on accountability**
- **a performance-based and block grant funding mechanism**



**Value-based economy**  
with **strong quality and safety regulation systems**