

A Joint Research of
the *Chinese Academy of Sciences* and
the *National Science and Technology Development Agency*

“The novel nanoscale delivery system of mRNA
for SARS-CoV-2 vaccine”

Piroonrat Dechbumroong (an exchange Ph.D. student)

the National Center for Nanoscience and Technology (Beijing) and

the National Nanotechnology Center (NANOTEC)

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มูลนิธิเทคโนโลยีสารสนเทศตามพระราชดำริสมเด็จพระเทพรัตนราชสุดาฯ สยามบรมราชกุมารี
The Information Technology Foundation under the Initiative of
Her Royal Highness Princess Maha Chakri Sirindhorn

Piroonrat Dechbumroong

- UCAS-Royal Thai Government Scholarship of Thailand
- A First-year Ph.D. research student at **Laboratory of Controllable Nanopharmaceuticals, Nanotechnology at National Center for Nanoscience and Technology (NCNST), University of Chinese Academic of Sciences (UCAS), Beijing, P.R. China**
- **International Research Exchange Program, NANOTEC, NSTDA**



中国科学院
CHINESE ACADEMY OF SCIENCES

NANOTEC
a member of NSTDA



中国科学院
CHINESE ACADEMY OF SCIENCES

Announcement of CAS-NSTDA Joint Research Program 2021
Call for proposals on **Material Sciences / Life Sciences**

- China-Thailand Collaboration
- CAS – NSTDA Joint Research Project (2021), started March 2022
- “The novel nanoscale delivery system of mRNA for SARS-CoV-2 vaccine”

P.R. China

Professor Liang, Xing-Jie (Ph.D.)

Laboratory of Controllable
Nanopharmaceuticals

NCNST, Beijing, China

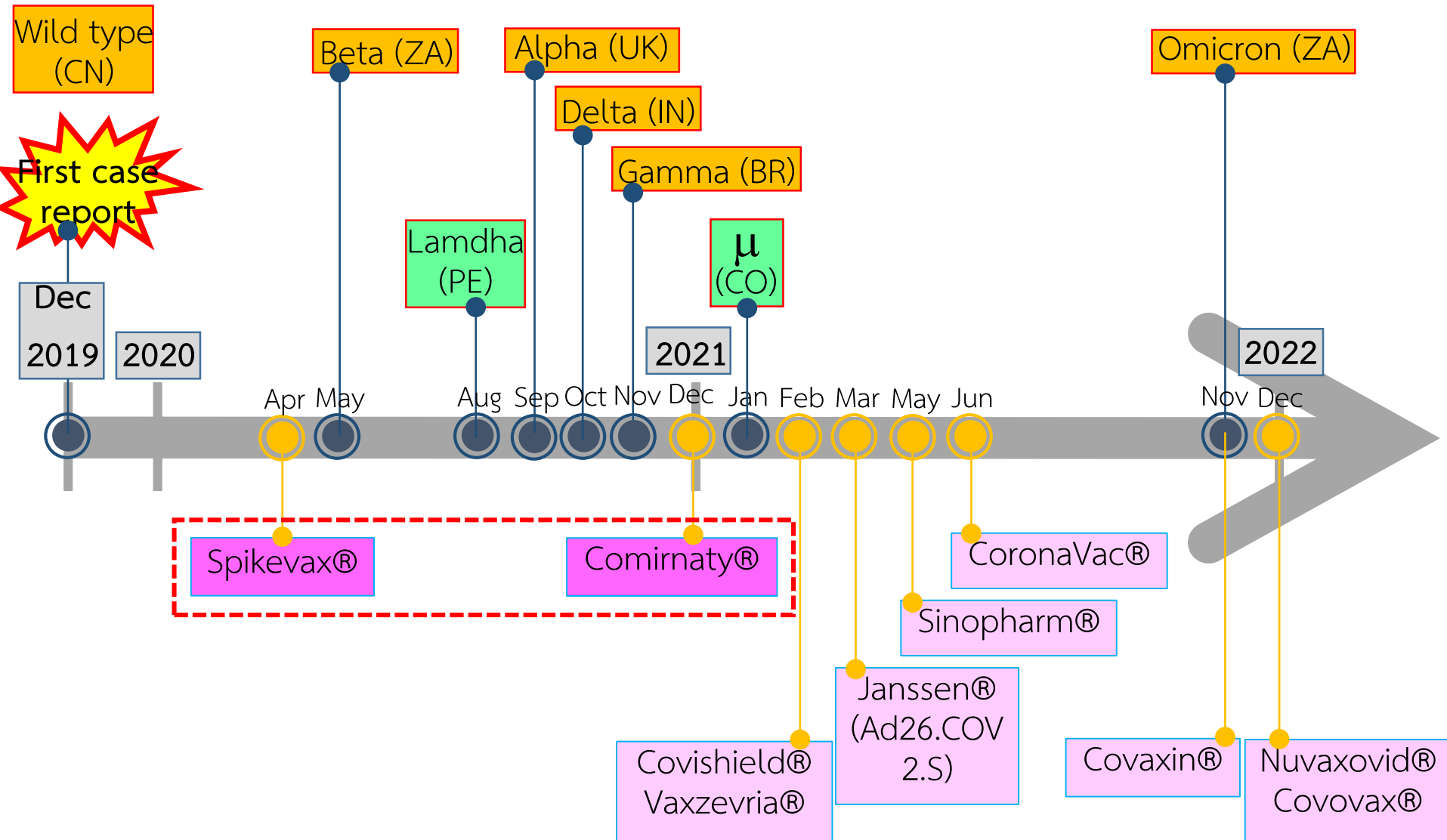
Thailand

Namdee, Katawut (Ph.D.)

Nanomedicine and Veterinary
Research Team

NANOTECH, Pathumthani, Thailand

The novel nanoscale delivery system of mRNA for SARS-CoV-2 vaccine



1. - Number of vaccines in clinical development

149

2. - Number of vaccines in pre-clinical development

195

3. - Candidates in clinical phase

Platform		Candidate vaccines (no. and %)	
PS	Protein subunit	48	32%
VVnr	Viral Vector (non-replicating)	21	14%
DNA	DNA	16	11%
IV	Inactivated Virus	21	14%
RNA	RNA	27	18%
VVr	Viral Vector (replicating)	4	3%
VLP	Virus Like Particle	6	4%
VVr + APC	VVr + Antigen Presenting Cell	2	1%
LAV	Live Attenuated Virus	2	1%
VVnr + APC	VVnr + Antigen Presenting Cell	1	1%
BacAg-SpV	Bacterial antigen-spore expression vector	1	1%
		149	

“The novel nanoscale delivery system of mRNA for SARS-CoV-2 vaccine”

mRNA vaccine

- Safe
- Mass production
- Affordable

Challenges

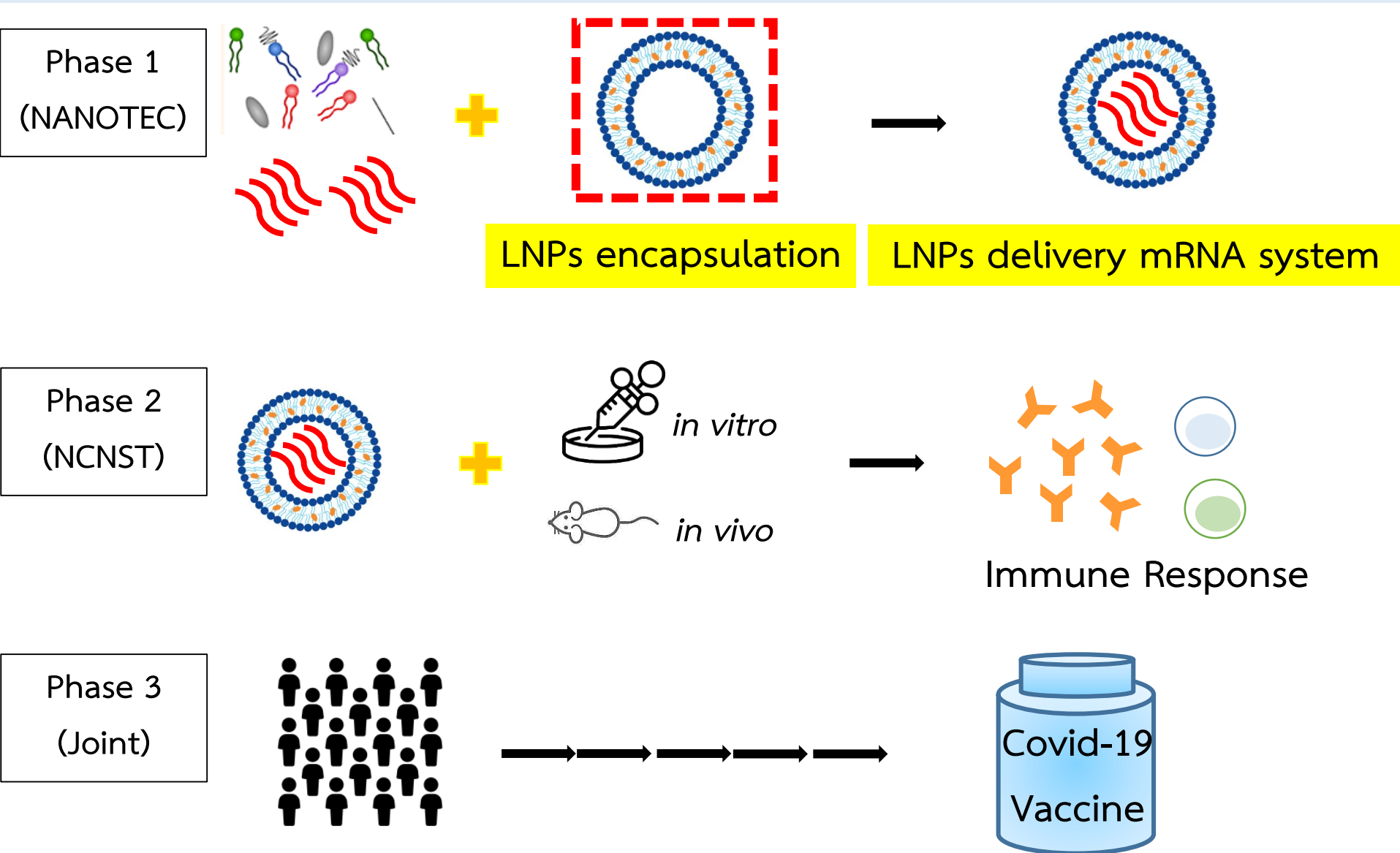
- Half-life
- Stability

LNPs

- Biocompatible
- HIGH loading capacity
- good stability

Efficiency of vaccine

“The novel nanoscale delivery system of mRNA for SARS-CoV-2 vaccine”



Acknowledgement

Professor Liang, Xing-Jie (Ph.D.)



Namdee, Katawut (Ph.D.)



CAS-NSTDA Joint Research Project

“the International Research Exchange Program,” NANOTECH, NSTDA

UCAS-Royal Thai Government Scholarship of Thailand



<https://covid19.trackvaccines.org/agency/who/>




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WORLD HEALTH ORGANIZATION (WHO)

Last Updated 28 March 2022.

10 Vaccines Granted Emergency Use Listing
(EUL) by WHO

Protein Subunit ⓘ

Novavax
Nuvaxovid



Approved in 36 countries

15 trials in 12 countries

Approval Source:
extranet.who.int ↗

Protein Subunit ⓘ

Serum Institute of India
COVOVAX (Novavax
formulation)



Approved in 3 countries

2 trials in 1 country

Approval Source:
extranet.who.int ↗

RNA ⓘ

Moderna
Spikevax



Approved in 85 countries

56 trials in 22 countries

Approval Source:
extranet.who.int ↗

RNA ⓘ

Pfizer/BioNTech
Comirnaty



Approved in 141 countries

69 trials in 26 countries

Approval Source:
extranet.who.int ↗

Non Replicating Viral Vector ⓘ

Janssen (Johnson &
Johnson).
Ad26.COV2.S



Approved in 108 countries

20 trials in 22 countries

Approval Source:
extranet.who.int ↗

Non Replicating Viral Vector ⓘ

Oxford/AstraZeneca
Vaxzevria



Approved in 138 countries

61 trials in 30 countries

Approval Source:
extranet.who.int ↗

Non Replicating Viral Vector ⓘ

Serum Institute of India
Covishield (Oxford/
AstraZeneca
formulation)



Approved in 47 countries

2 trials in 1 country

Approval Source:
extranet.who.int ⓘ

Inactivated ⓘ

Bharat Biotech
Covaxin



Approved in 14 countries

10 trials in 2 countries

Approval Source:
extranet.who.int ⓘ

Inactivated ⓘ

Sinopharm (Beijing).
Covilo



Approved in 90 countries

24 trials in 11 countries

Approval Source:
extranet.who.int ⓘ

Inactivated ⓘ

Sinovac
CoronaVac



Approved in 54 countries

36 trials in 9 countries

Approval Source:
extranet.who.int ⓘ