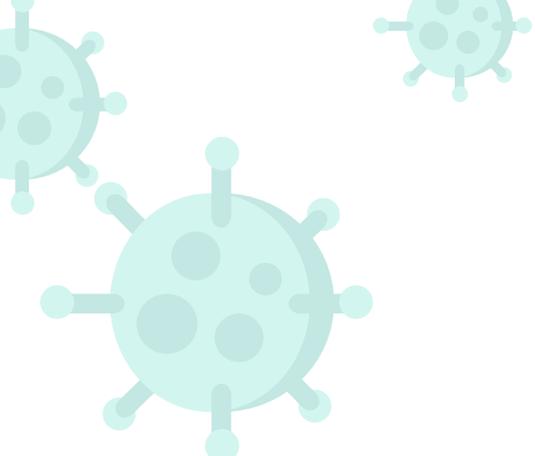


A stylized graphic of a virus particle, consisting of a large light blue circle with several smaller circles of varying sizes and colors (light blue, teal) attached to its surface by thin, light blue lines, resembling a molecular structure or a virus. The background is a dark teal color with a white diagonal line on the left side.

COVID-19 新冠肺炎的挑戰與 後疫情時代之因應

中央研究院
院長 廖俊智



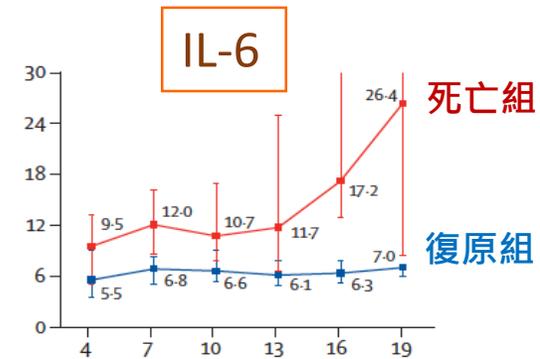
Illness Severity 疾病嚴重程度

- **Mild to moderate 輕度至中度**
 - (輕度症狀直至輕度肺炎): **81%**
- **Severe 嚴重**
 - (呼吸困難，缺氧): **14%**
- **Critical 危急**
 - (呼吸衰竭，休克或多器官系統功能障礙): **5%**

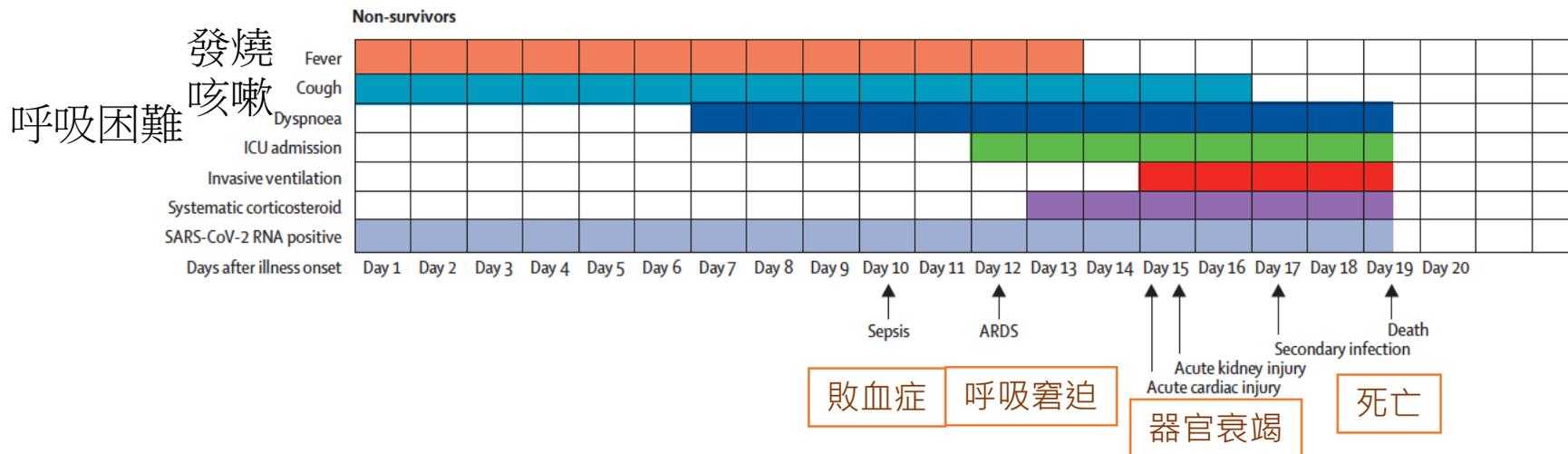
Symptoms of COVID-19

COVID-19的症狀

- 重症 Severe cases:
 - 細胞素風暴 Cytokine storm
 - 敗血症 Sepsis
 - 急性呼吸窘迫ARDS
 - 急性腎損傷 Acute kidney injury
 - 急性心臟損傷 Acute cardiac injury



- Time course of COVID-19:



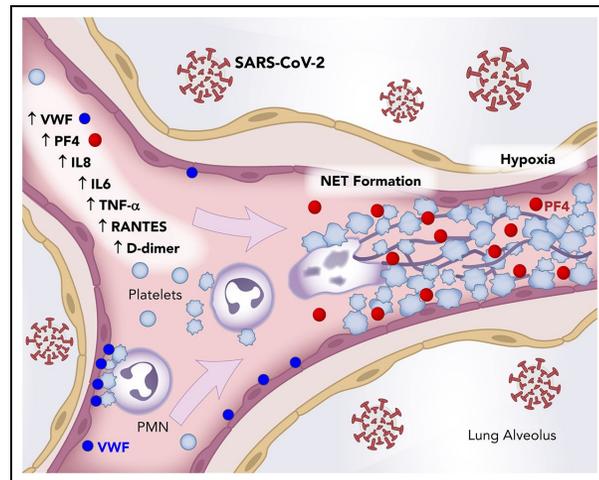
Hypercoagulability and COVID-19

COVID-19的高凝血性

There are several reports of hospitalized patients with **thrombotic complications**, most frequently **deep venous thrombosis (DVT)** and **pulmonary embolism (PE)**.

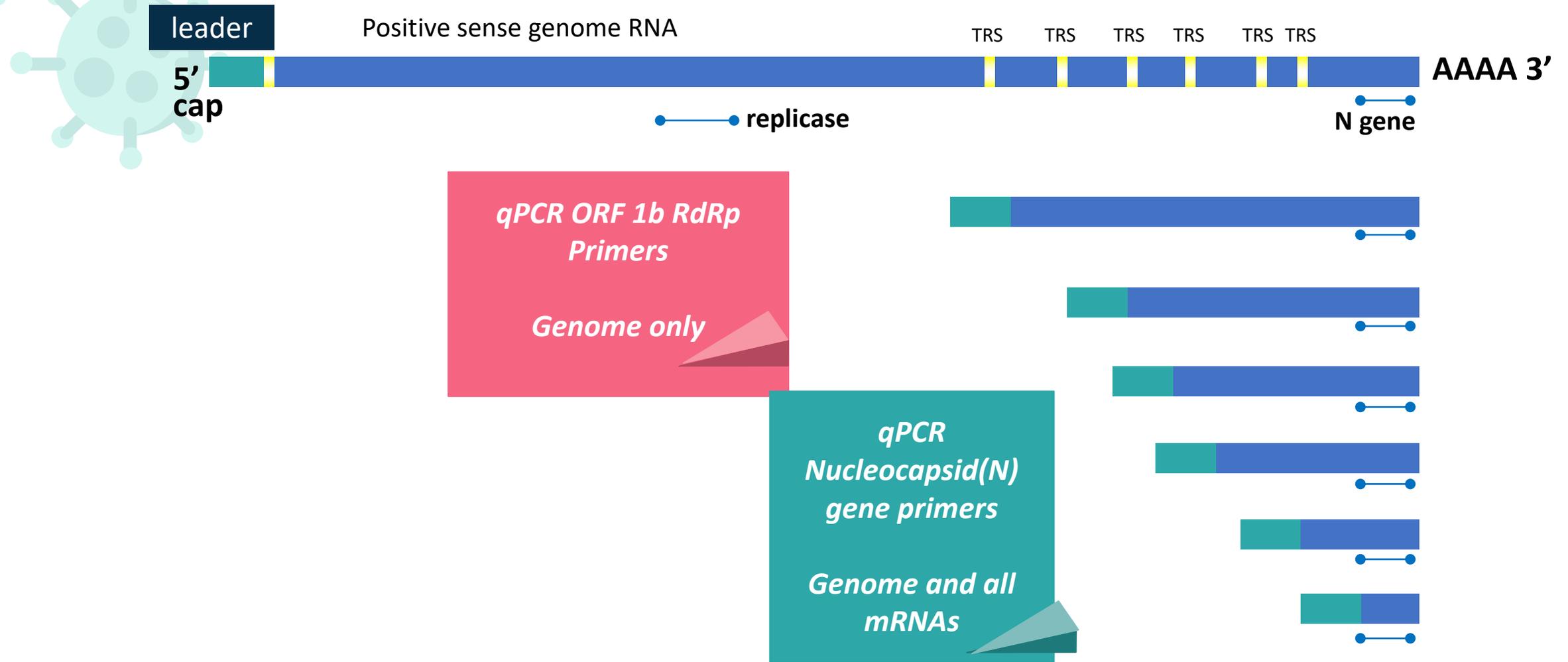
Other reported manifestations include:

有幾例住院患者發生血栓併發症的報導，
最常見的是**深靜脈血栓 (DVT)** 和**肺栓塞 (PE)**。



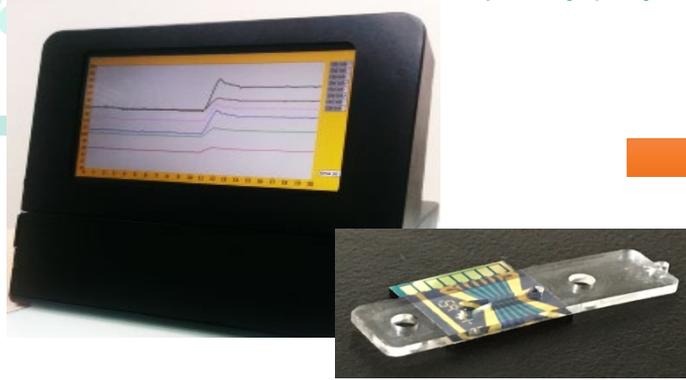
中性粒細胞結塊造成急性呼吸窘迫及形成免疫血栓

病毒檢測: RT-qPCR檢測冠狀病毒RNA

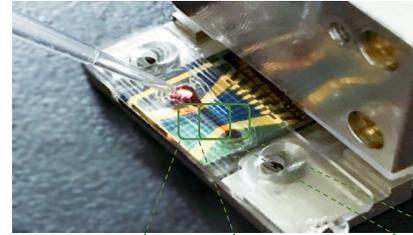


Silicon nanowire FET as a molecule sensor

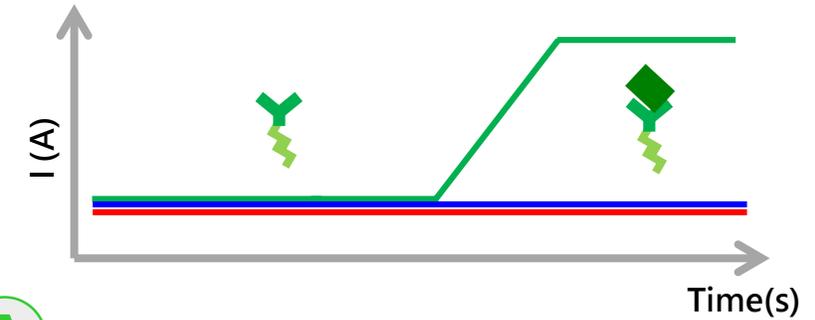
矽納米線場效應電晶體(FET)作為分子感測器



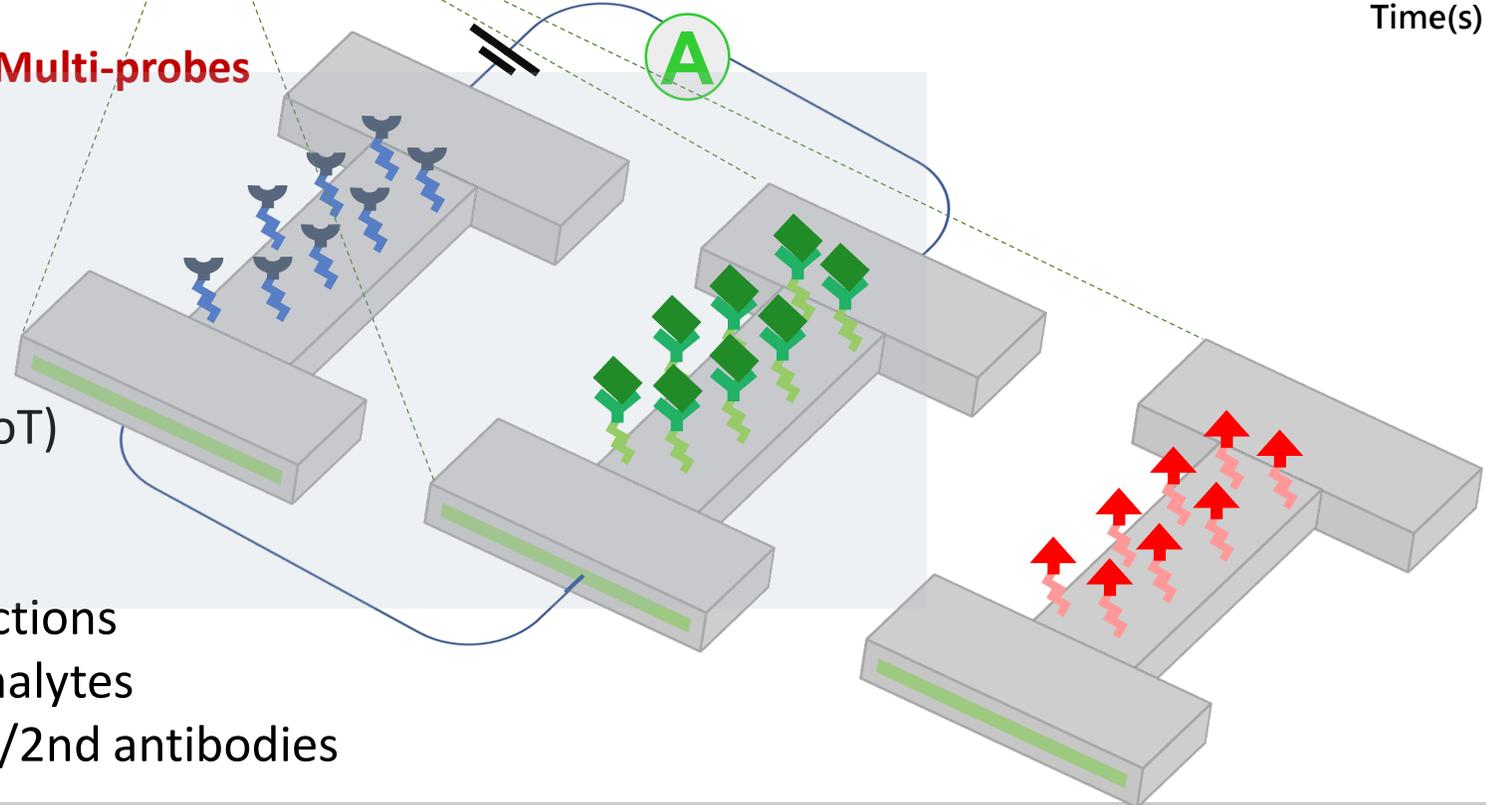
Disposable FET sensing chips



Real-time detection of molecular reactions



Multi-probes



key features

- Electrical readout (ready for IoT)
- Real time detection
- High sensitivity
- Qualitative/quantitative detections
- Need only small amount of analytes
- No need of fluorescence dyes/2nd antibodies

C.D.Chen
陳啟東

抗原快速檢測

細胞控制組

新冠病毒感染細胞萃取物

普通感冒病毒
控制組

mock control

SARS-CoV-2 infected Vero-E6 cell lysate (μg in 20 μl)

229E control

40 μg

40

20

10

5

2.5

1.25

0.625

0.3125

0.1563

0.0781

0.0391

0.0195

0.0098

0.0049

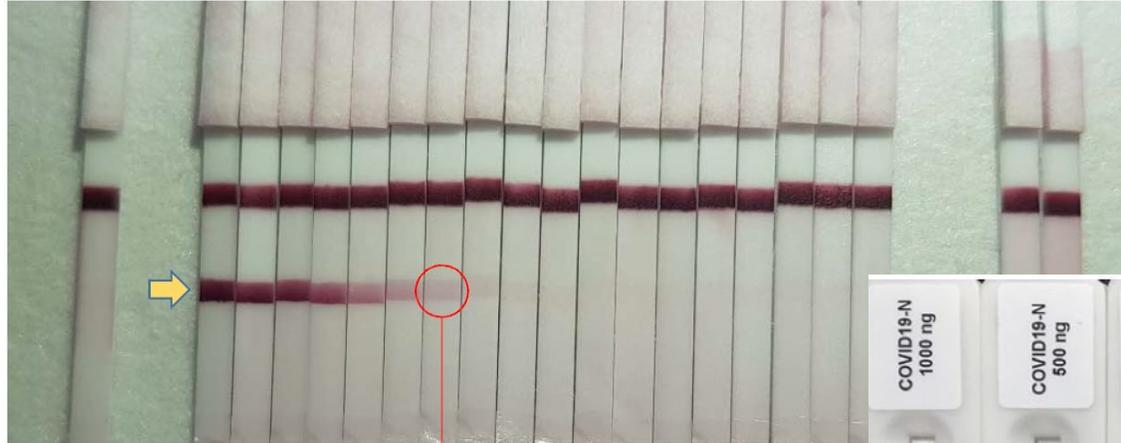
0.0024

0.0012

0

40 μg

40 μg



SARS-CoV-2 N protein detection strips
2020/4/9

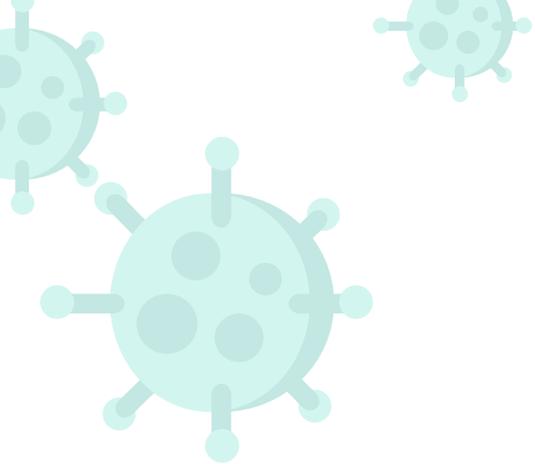
0.87 ~ 0.21 ng N protein

使用特定的抗N抗體

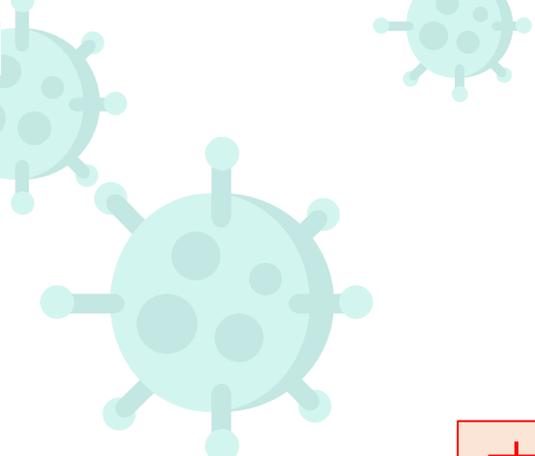
→ 檢測檢體中N 抗原



A.S.Yang
楊安綏

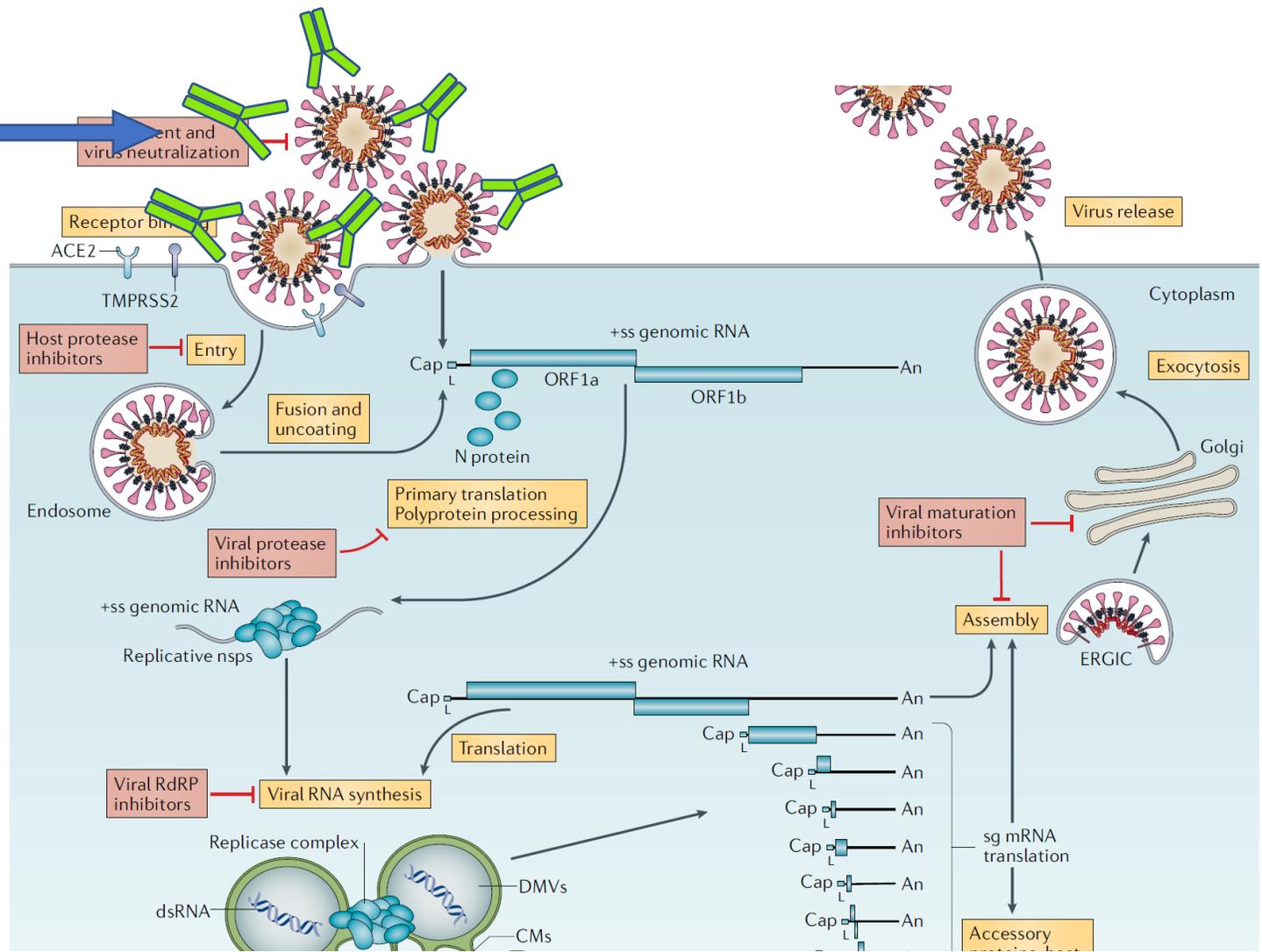


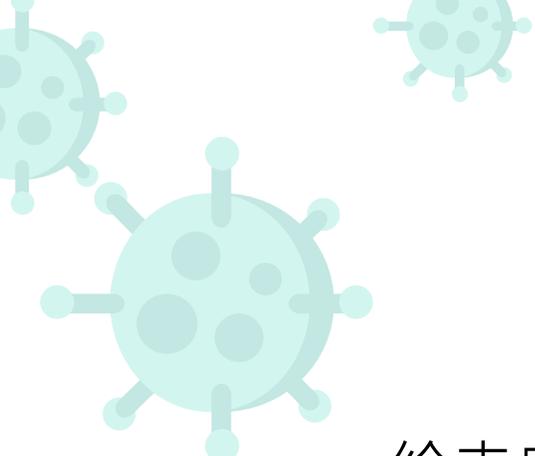
疫苗



疫苗

中和性抗體





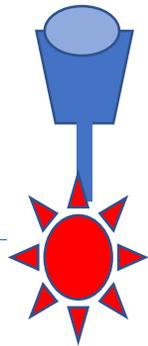
How vaccines work? 疫苗如何發揮作用

- 給未感染者施打：**安全性**為首要考量
- 疫苗**模仿病原體**，並**刺激免疫系統**來增強防禦能力
- 疫苗接種可以使免疫系統**“練習”**對抗病原體，從而**“設定”**免疫系統以記住特定的病原體。
- 如果病原體再次全力入侵人體，則免疫系統隨時準備以**快速而特異**的防禦力做出反應。

刺突蛋白 (S) 為疫苗的最佳標靶

疫苗:

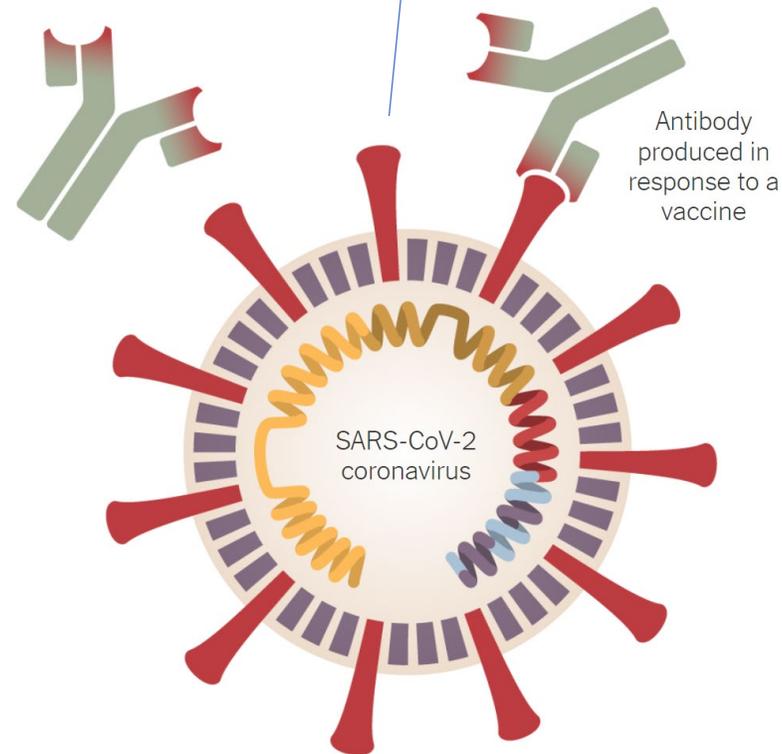
刺突蛋白
+
佐劑



抗體

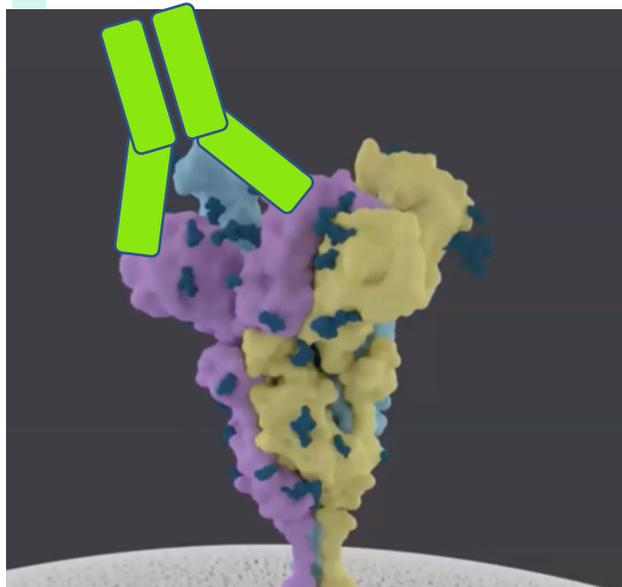


刺突蛋白

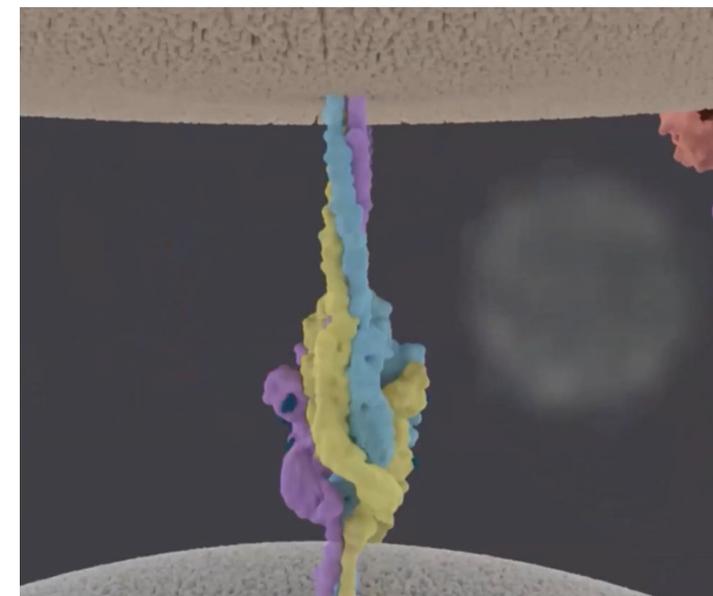
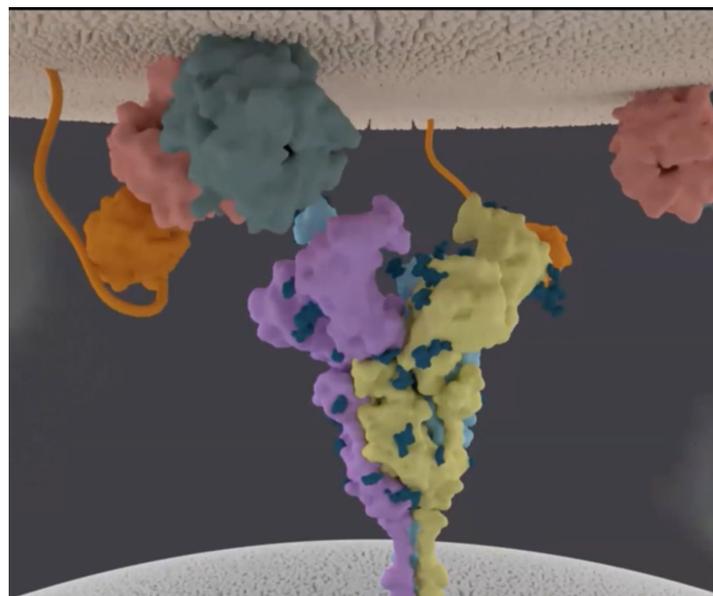


Spike protein changes conformation during infection

刺突蛋白在感染過程中改變構形



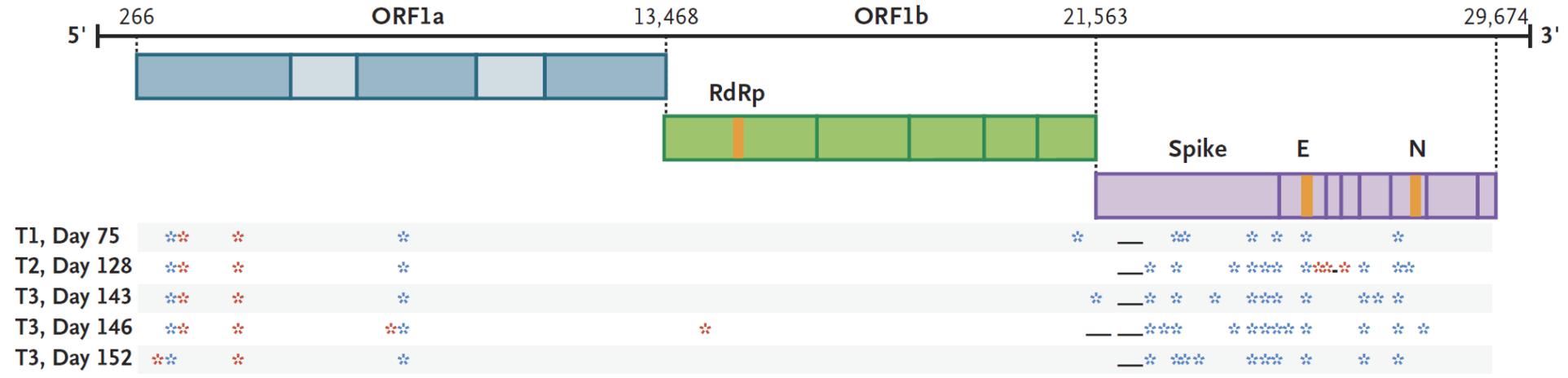
融合前構形



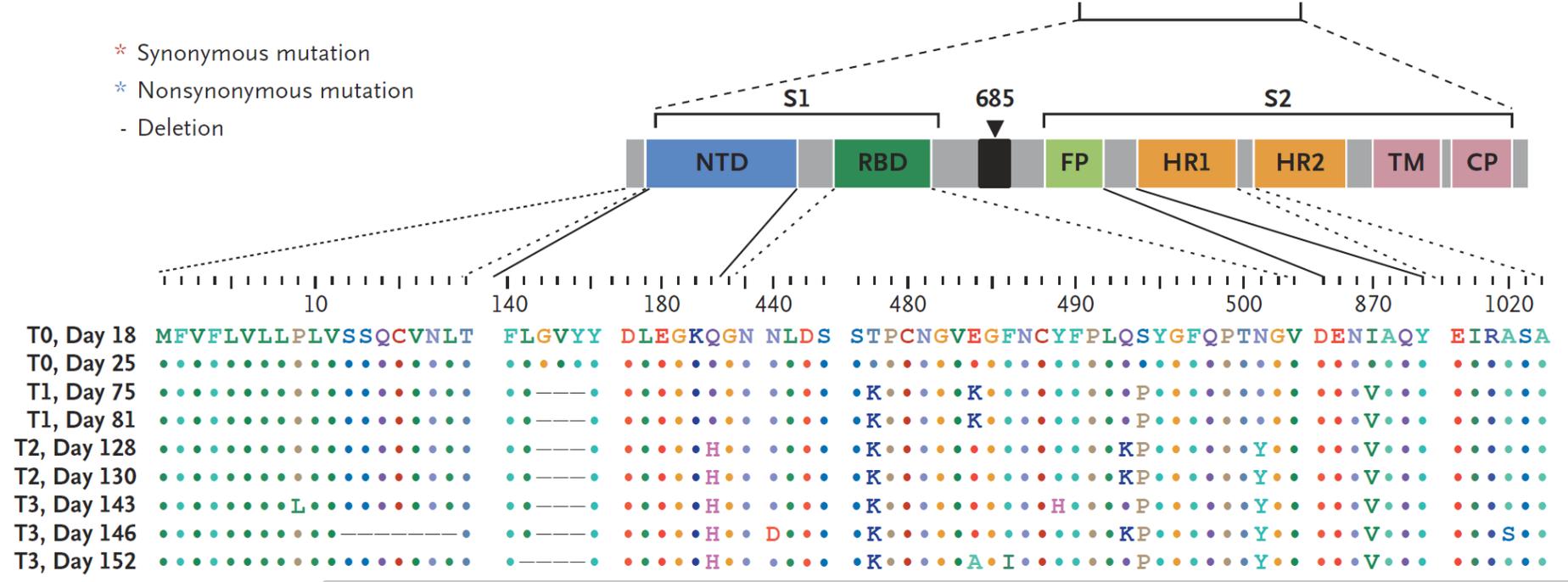
融合後構形

Credit: David Veessler, Janet Iwasa

B Locations of SARS-CoV-2 Sequence Polymorphisms over Time

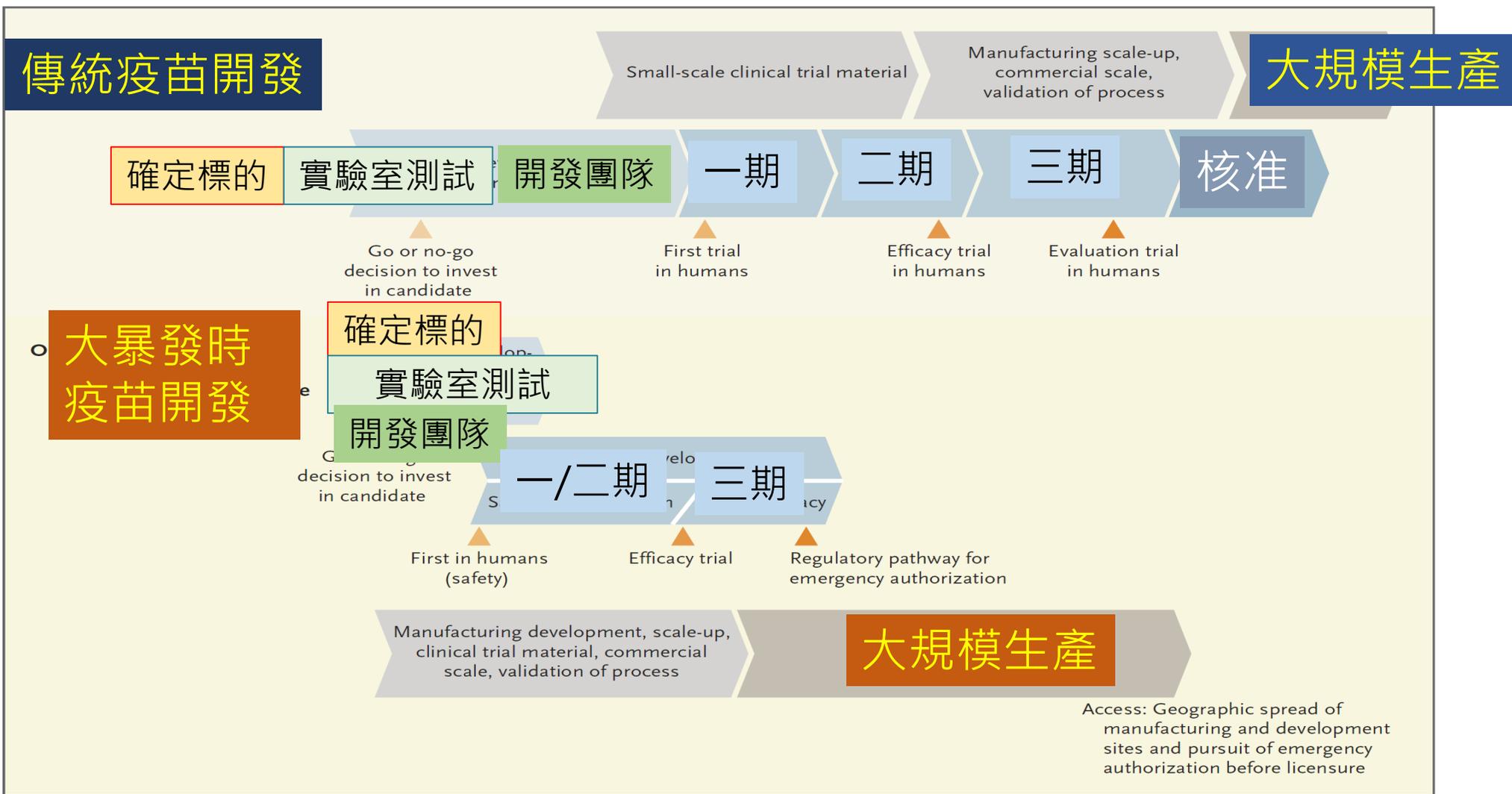


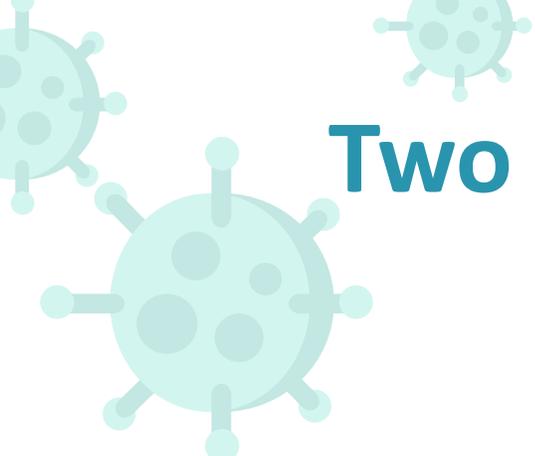
* Synonymous mutation
 * Nonsynonymous mutation
 - Deletion



Developing Covid-19 Vaccines at Pandemic Speed

以大流行速度開發Covid-19疫苗





Two broad categories of antiviral vaccines

兩大類抗病毒疫苗

基因 → 蛋白質(抗原)

- **基因疫苗**: 提供宿主細胞產生蛋白質抗原的基因序列
 - 減毒活疫苗 live attenuated virus vaccines
 - 重組病毒載體 recombinant viral vectors
 - 核酸疫苗 (DNA, RNA) nucleic acid vaccines
- **蛋白質疫苗**: 直接提供宿主細胞蛋白質抗原
 - 滅活全病毒 whole-inactivated virus
 - 病毒蛋白或次單位蛋白 Individual viral proteins or subdomain
 - 病毒蛋白組裝成顆粒 Viral proteins assembled as particles

COVID-19候選疫苗

• 44 臨床評估中的候選疫苗

- 13 病毒蛋白或次單位蛋白(RBD, S, peptide)
- 7 滅活全病毒Inactivated,
- 9不可複製重組病毒載體non-replicating viral vector (Adeno),
- 3可複製重組病毒載體replicating viral vector
(Modified **Vaccinia** Ankara (**MVA**) , Measles, Flu)
- 6 RNA, 3 DNA,
- 2 病毒蛋白組裝成顆粒 VLP

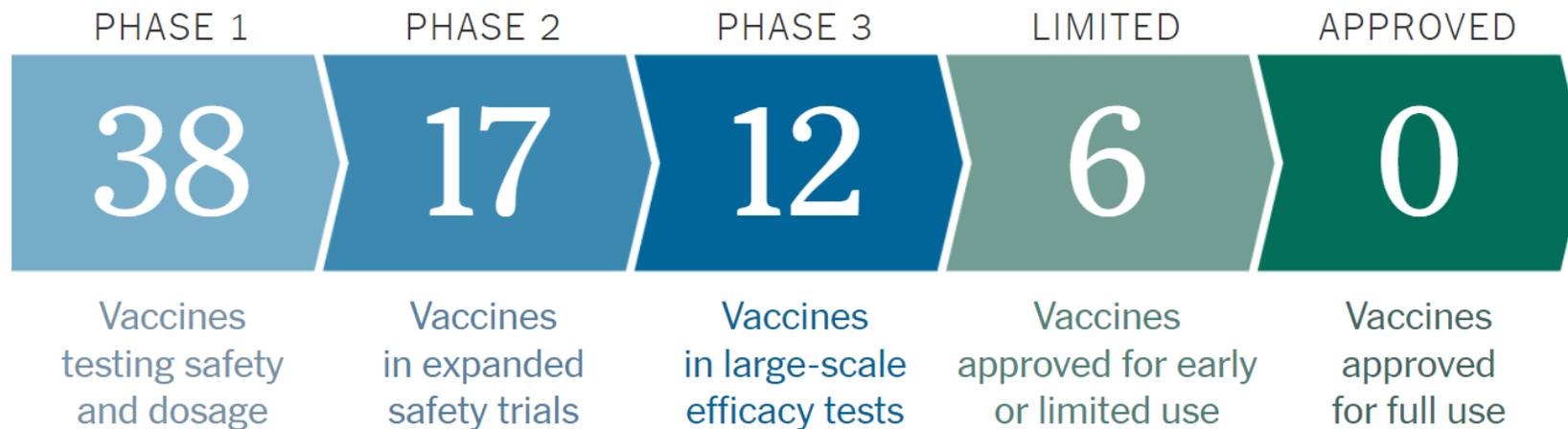
• 154 臨床前評估中的候選疫苗

- 54 Protein subunit, 12 inactivated, 3 live attenuated,
- 18 Non-replicating, 19 replicating,
- 14 VLP
- 14 DNA, 19 RNA,
- 1 T-cell



Coronavirus Vaccine Tracker

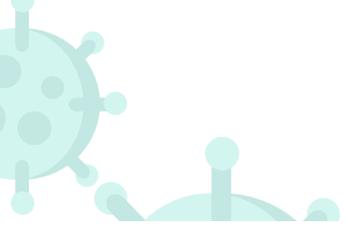
By Jonathan Corum, Sui-Lee Wee and Carl Zimmer Updated November 16, 2020





疫苗安全性

- Vaccine-dependent enhancement (VDE)
疫苗惡化疾病
- Antibody-dependent Enhancement (ADE)
抗體增強感染

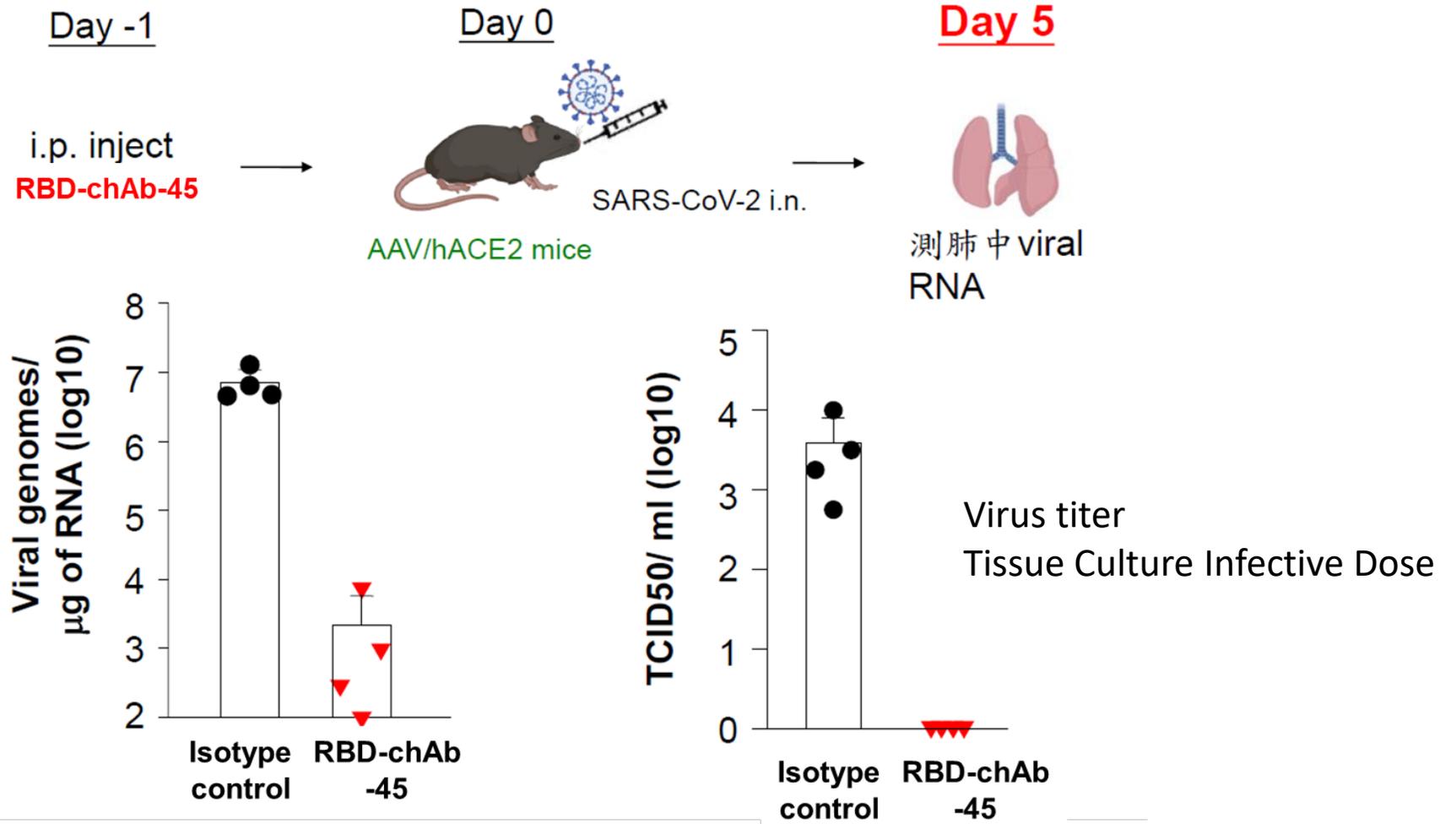


Coronavirus Drug and Treatment Tracker

We are following **22 coronavirus treatments** for effectiveness and safety:

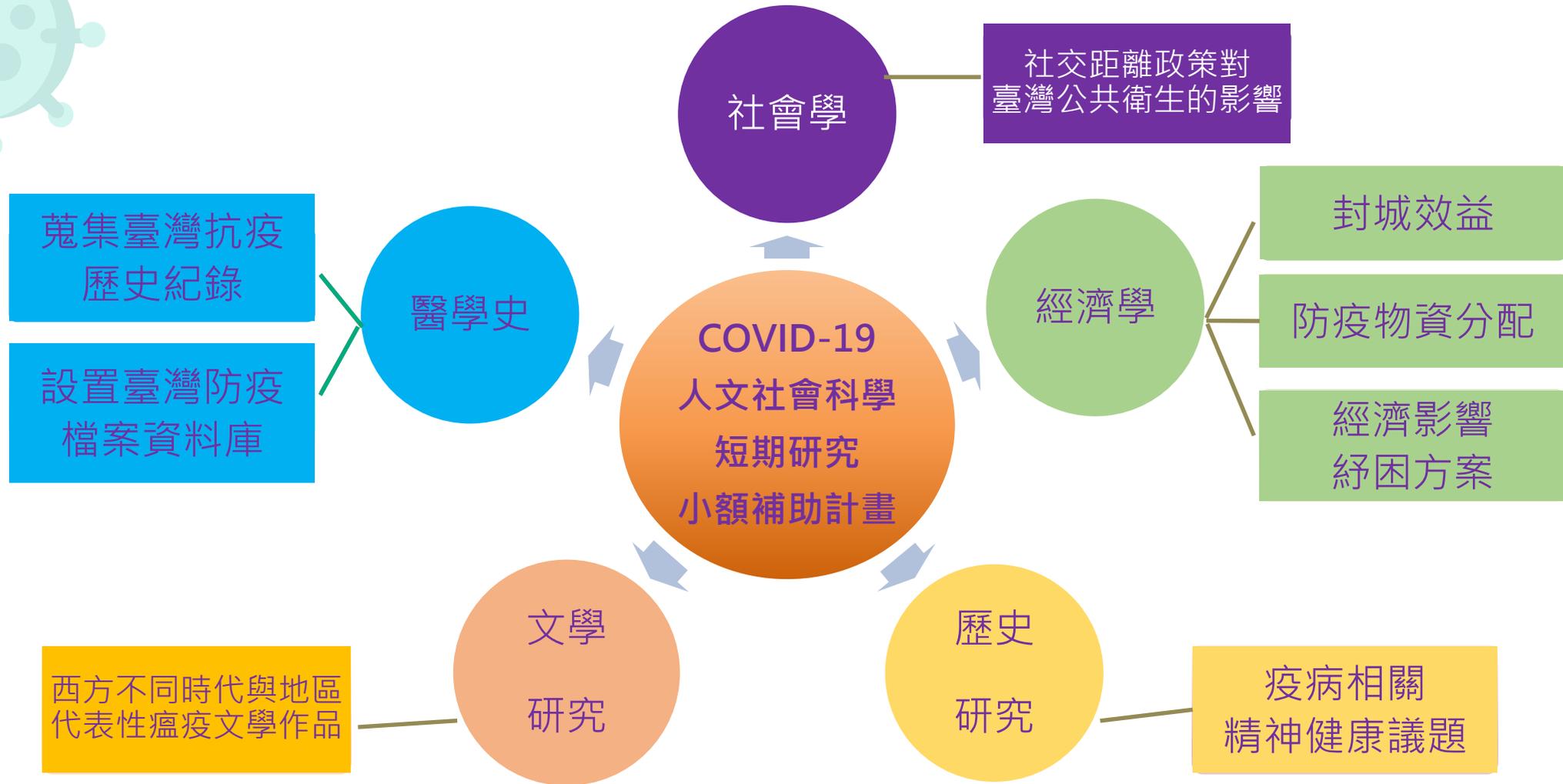


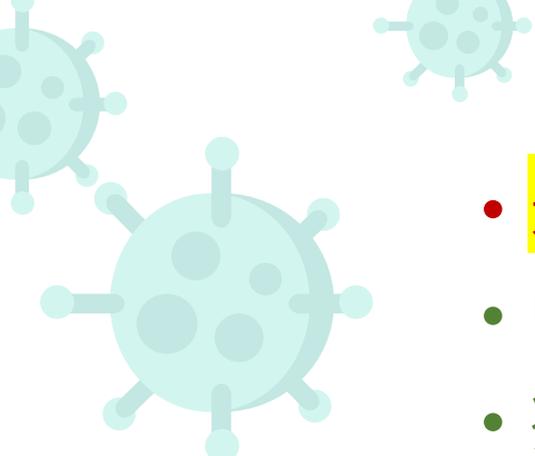
中研院研發之抗體



吳漢忠
H.C. Wu

新冠肺炎防疫研究 中研院人文及社會相關議題





全球防疫對策的疏漏

- 未追蹤武漢初期病例的密切接觸者
- 中國及世界衛生組織延後提出警訊
- 疫區入境旅客的延遲管制檢疫
- 感染源與接觸者追蹤努力不足
- 封城而未能隔離輕症病例及檢疫密切接觸者
- 普篩而未嚴密監控隔離或檢疫個案
- 未進行居家檢疫或檢疫期過短
- 未保持足夠社交距離也未避免大規模群聚
- 個人防護設備不足且分配不均
- 未即時澄清假消息和假新聞
- 未尊重專業也未保持政治中立

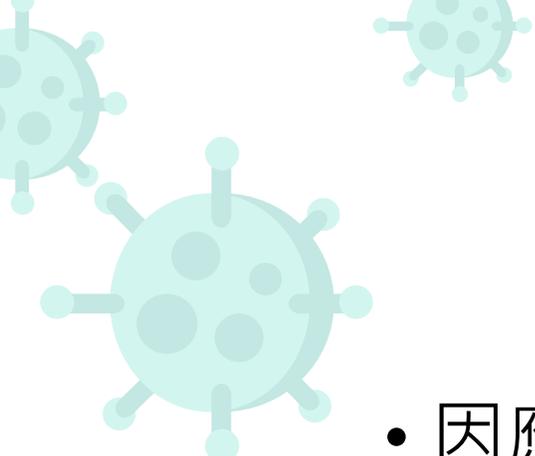
迅速應變：未封城、未普篩

- 迅速發布旅遊警示
- 加強邊境管控(TOCC旅遊、職業、接觸、群聚史)
- 深入追蹤確診個案的密切接觸
- 強化14天居家隔離及居家檢疫及7天自主健康管理
- 精準篩檢有症狀的疑似病例
- 動員醫療照護體系(20,000隔離病房 14,000呼吸器)
- 加強醫院感染管控(急診、門診、住院)
- 充分提供個人保護設備及其他醫材



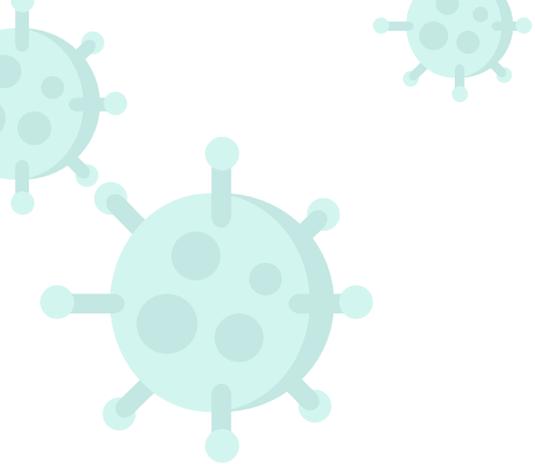
台灣COVID-19第二波挑戰

- 低感染率、低集團免疫力
- 第一波大流行仍在全球蔓延
- 國際貿易是台灣經濟的主要動力
- 移工佔台灣勞動力的比例不小
- 開放邊境將增加境外移入病例
- 疫苗尚未成功上市
- 季節性流感的困擾：快篩、克流感、疫苗



後疫情時代之因應

- 因應流感化
 - 快速檢測/篩檢
 - 抗病毒藥物
 - 疫苗
- 世界形勢的重新調整
- 迅速反應
- 重視科學
- 團隊合作/但不依賴他人
- 供應鏈重建
- 快速數位化
- 為下個挑戰做準備
 - 氣候變遷



COVID-19 vs Climate

COVID-19: likely reversible

徵兆（1月）→惡化（2月）→驚覺（3月）→大爆發（3月-）

Climate Change: irreversible

徵兆（1970-2010）→惡化（**2010-2020**）→驚覺（2020-2030）
→大爆發（2040-）

感謝聆聽

