

Les Vaccins COVID-19

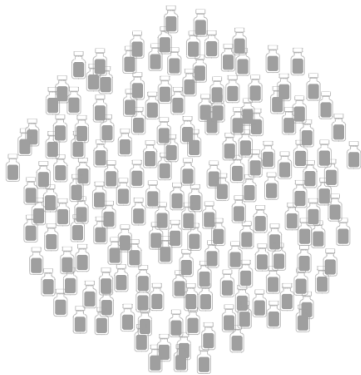
Où en est-on?

Marie-Paule Kieny, Inserm

Plus de 200 vaccins en cours de développement...

By **Aaron Steckelberg**, **Carolyn Y. Johnson**,
Gabriel Florit and **Chris Alcantara**

Updated Nov. 9 at 12:20 p.m.



Pre-clinical

170+ vaccines

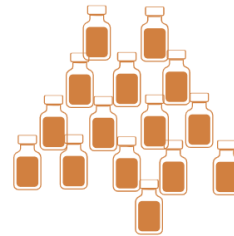
are being tested in
animals and lab
experiments



Phase 1

14 vaccines

are being tested in a
small number of healthy,
young people to assess
safety and correct dose



Phase 2

15 vaccines

are broadened to a larger
group of people, including
people at higher risk of
illness



Phase 3

10 vaccines

are being tested in
thousands of people to
check their effectiveness
and safety

Approved

0 vaccines

have been determined to
provide benefits that
outweigh known and
potential risks

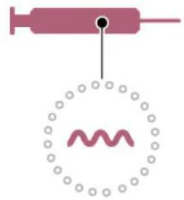
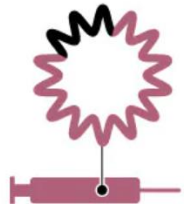
The Washington Post
Democracy Dies in Darkness

By **Aaron Steckelberg**, **Carolyn Y. Johnson**,
Gabriel Florit and **Chris Alcantara**

Vaccins basés sur une plateforme ARNm/ADN

DNA vaccine

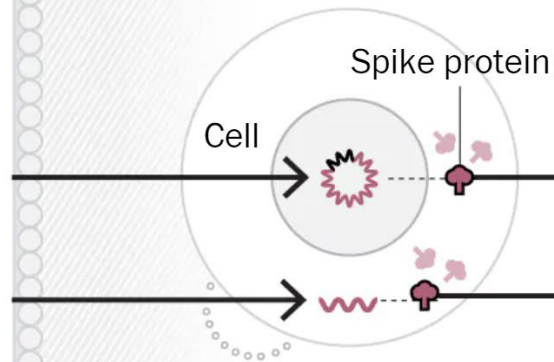
Spike gene on DNA



mRNA in lipid shell

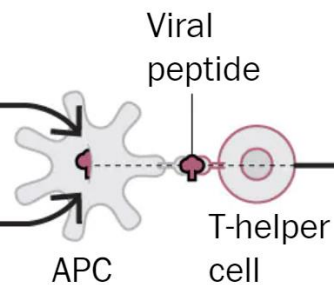
RNA vaccine

An electric pulse allows DNA into the cell's nucleus where it forms mRNA, then creates spike proteins

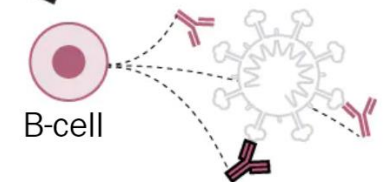
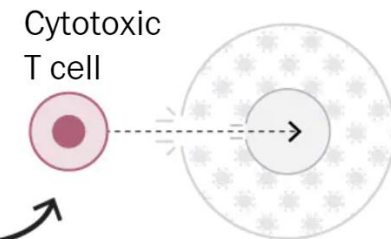


A lipid shell delivers mRNA into the cell, where it is used to produce proteins

Antigen-presenting cells (APCs) consume the viral proteins and pass viral peptides to T-helper cells



Cytotoxic T cells may eliminate virus-infected cells



Antibodies from B-cells may block the virus

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Vaccins basés sur une plateforme ARNm/ADN les plus avancés

Moderna; National Institutes of Health



Pfizer; BioNTech; Fosun Pharma



AnGes; Osaka University; Takara Bio



Arcturus Therapeutics; Duke-NUS



CureVac



Genexine



Imperial College London; VacEquity Global Health



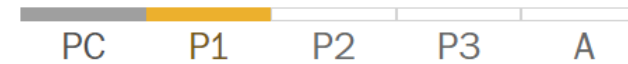
Inovio Pharmaceuticals



Zydus Cadila



China's Academy of Military Sciences; Walvax Biotech



Symvivo



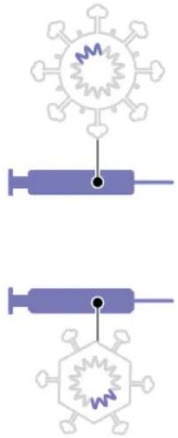
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Vaccins basés sur une plateforme virale atténuée

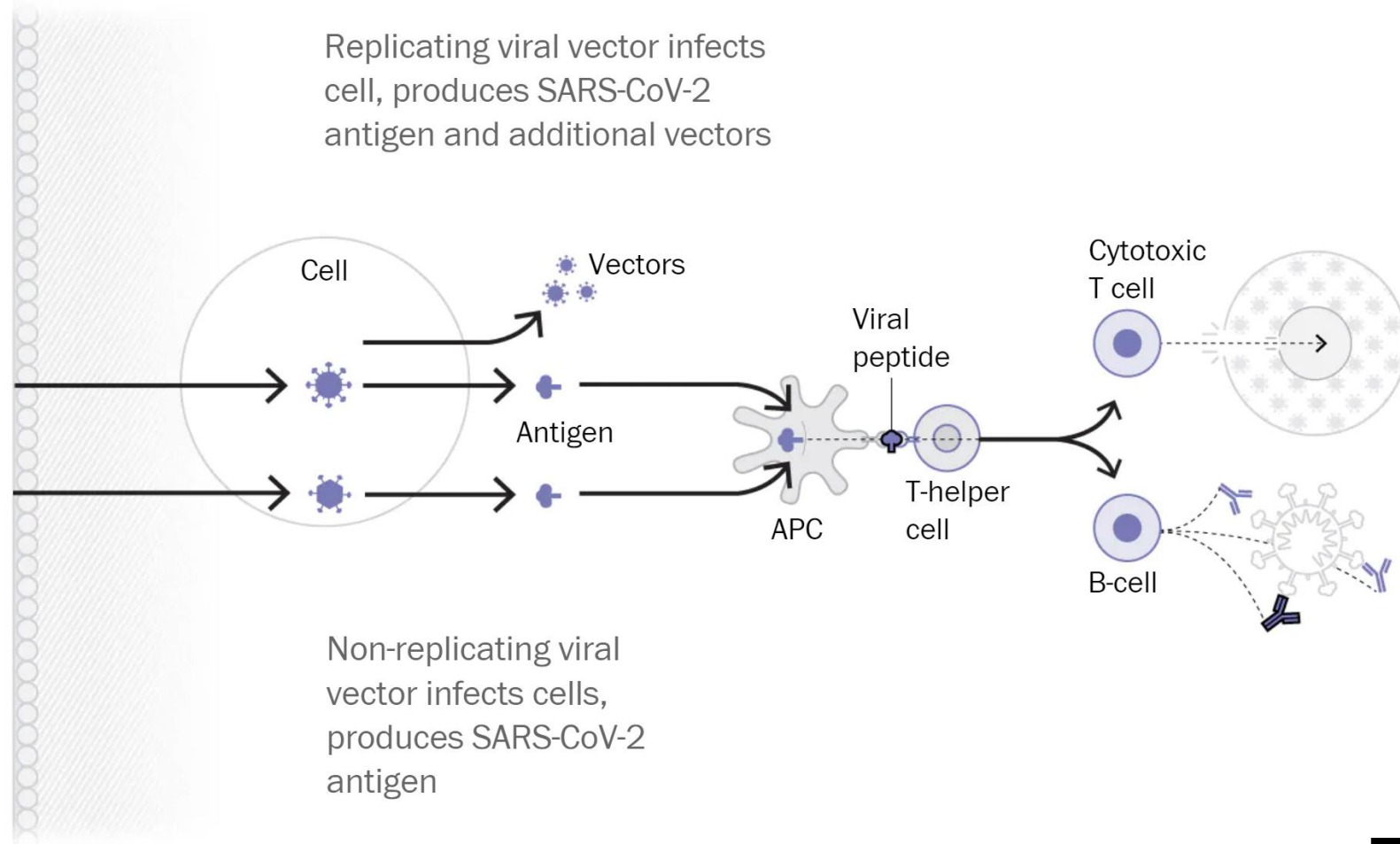
Replicating viral vector

SARS-CoV-2 gene in a different virus



SARS-CoV-2 gene in a different virus

Non-replicating viral vector



The Washington Post

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Vaccins basés sur une plateforme virale atténuée les plus avancés

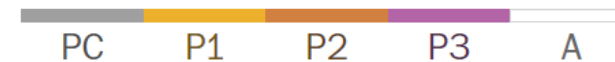
AstraZeneca; University of Oxford



CanSino Biologics; Beijing Institute of Biotechnology;
Canada's National Research Council; Petrovax



Gamaleya Research Institute*



Johnson & Johnson, Beth Israel Deaconess Medical Center



Institut Pasteur; Themis; University of Pittsburgh CVR; Merck
Sharp & Dohme



ImmunityBio; NantKwest



ReiThera; Leukocare; Univercells; National Institute of
Infectious diseases Lazzaro Spallanzani



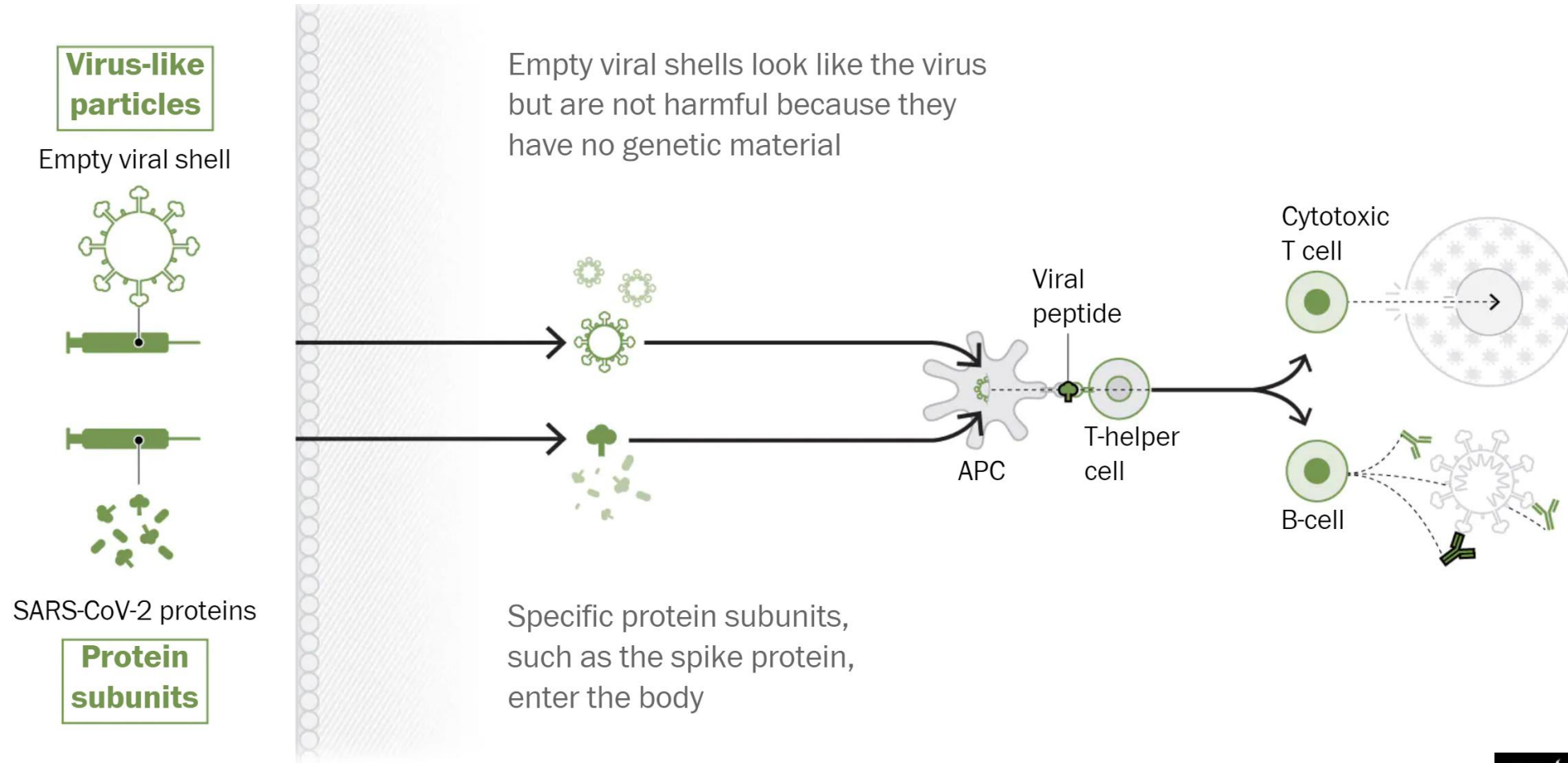
Vaxart; Emergent BioSolutions



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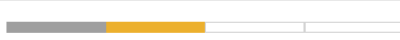
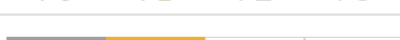
Vaccins sous-unitaires



The Washington Post
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Vaccins sous-unitaires les plus avancés

Novavax	
Anhui Zhifei Longcom; Chinese Academy of Sciences	
Federal Budgetary Research Institution (FBRI) State Research Center of Virology and Biotechnology "VECTOR"	
Instituto Finlay de Vacunas	
SpyBiotech; Serum Institute of India	
Adimmune Corporation	
CSL; University of Queensland	
Clover Biopharmaceuticals; GSK; Dynavax	
Covaxx; University of Nebraska Medical Center (UNMC); DASA; United Biomedical Asia	
Medicago	
Medigen Vaccine Biologics Corp; NIAID; Dynavax	
Sanofi Pasteur; GSK	
Vaxine	
West China Hospital, Sichuan University	

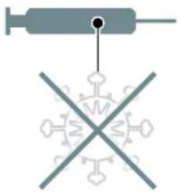
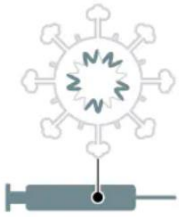
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Vaccins atténués et inactivés

Weakened virus

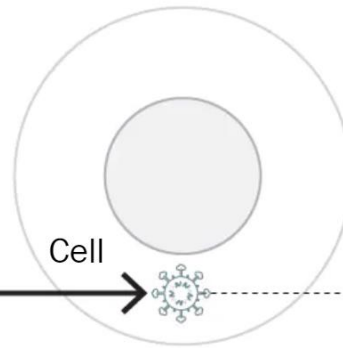
Weakened virus



Dead virus

Inactivated virus

Weakened virus replicates in human cells.



Replicated virus



Cell



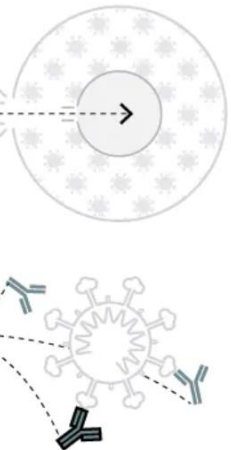
APC

Viral peptide

T-helper cell

Cytotoxic T cell

B-cell



Dead virus from the vaccine enters the body

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Vaccins atténués et inactivés les plus avancés

Beijing Institute of Biological Products; Sinopharm



Sinopharm



Sinovac



Bharat Biotech



Chinese Academy of Medical Sciences



Research Institute for Biological Safety Problems, Republic of Kazakhstan



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13 vaccins en Phase 3 — 15 Nov 2020

(parmi eux, 5 ont une approbation conditionnelle et 1 est non-spécifique)

 sinovac



Inactivated vaccines



Subunit vaccine



Adenovirus-based vectored vaccines

The New York Times
Coronavirus Vaccine Tracker

By Jonathan Corum, Sui-Lee Wee and Carl Zimmer Updated September 25, 2020



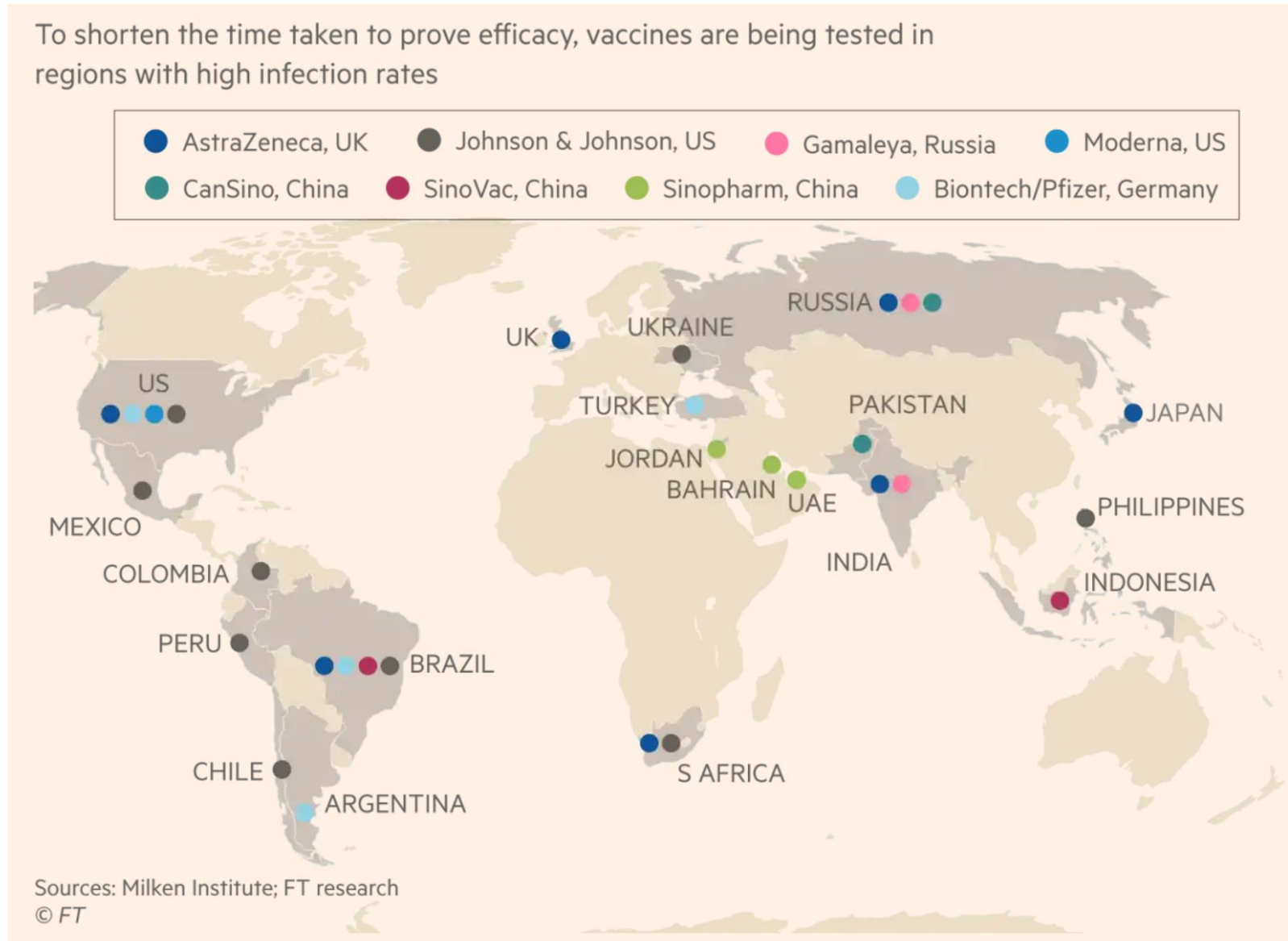
mRNA vaccines



Les vaccins français

Les vaccins qui « font la course en tête » néant	<i>La France est totalement absente de la course en tête</i>
Les vaccins du « peloton » MSD/Pasteur – virus de la rougeole/protéine spike Sanofi-Pasteur (collaboration GSK) – protéine spike + adjuvant ...	<i>La France est à l'origine d'un des deux vaccins développés par MSD et basés sur des virus atténués replicatifs, qui pourraient potentiellement être efficace après une seule administration (projet MSD/Pasteur)</i> <i>Sanofi-Pasteur met en œuvre une technologie éprouvée</i>
Vaccins « suiveurs » Sanofi-Pasteur/Translate Bio – vaccin ARNm Valneva – vaccin inactivé VRI Créteil – vaccin utilisant des peptides dérivés du SARS-CoV-2 présentés par des anticorps monoclonaux – approche très innovante Institut Pasteur Lille – vaccin vivant atténué basé sur la bactérie <i>Bordetella pertussis</i> Inserm et CEA/LETI – nanoparticules pour véhiculer un vaccin ARNm OSIVAX – vaccin utilisant la nucléoprotéine et pas la protéine spike – approche rarement utilisée par la concurrence internationale mais sans preuve du concept à ce stade OSE Immunotherapeutics – vaccin basé sur des peptides dérivés du SARS-CoV-2 Potentiellement quelques candidats vaccins recensés par REACTing en mai 2020	<i>Ces vaccins candidats méritent d'être développés malgré l'existence de plusieurs vaccins qui seront déjà sur le marché pendant le premier semestre 2021 parce qu'ils pourraient avoir des attributs intéressants (voies d'administration, durée de protection) et parce qu'ils ont un potentiel d'innovation au-delà du COVID.</i>

Localisation géographique des études de phase 3



FINANCIAL TIMES

Anna Gross and Ian Bott in London SEPTEMBER 23 2020

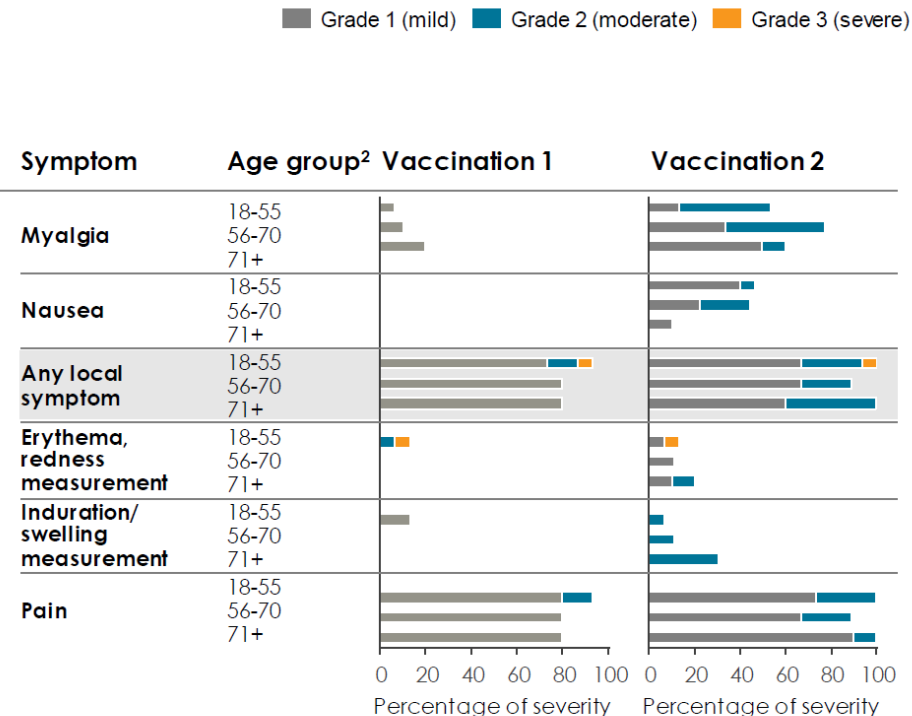
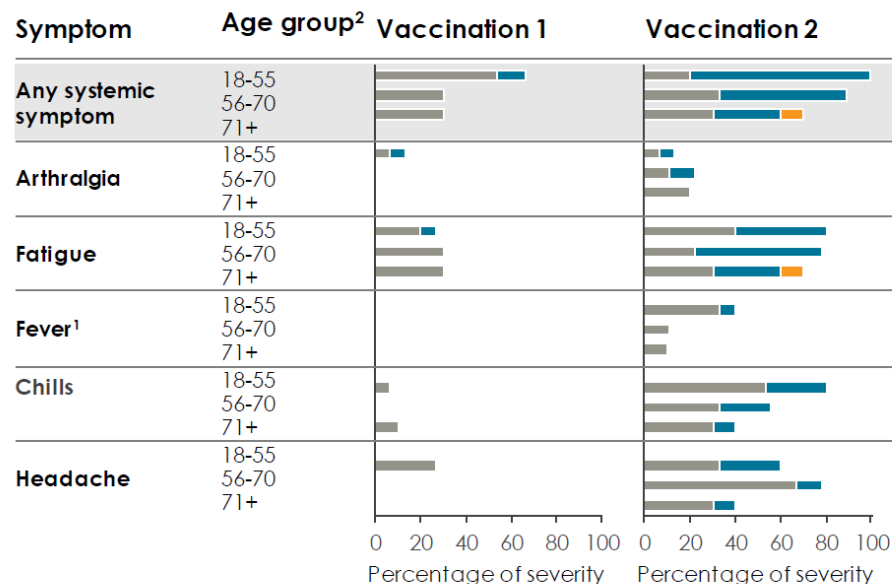
Résultats de l'étude de Phase 1 du vaccin mRNA-1273 de MODERNA - Données dans différents groupes d'âge - 1

100 µg mRNA-1273 well-tolerated across age groups

Phase 1: No Vaccine-Related SAEs Have Been Reported

Solicited Local and Systemic Symptoms Followed for 7 Days Post-vaccination

Majority of symptoms resolved within 2 days, some persisted as long as 5 days



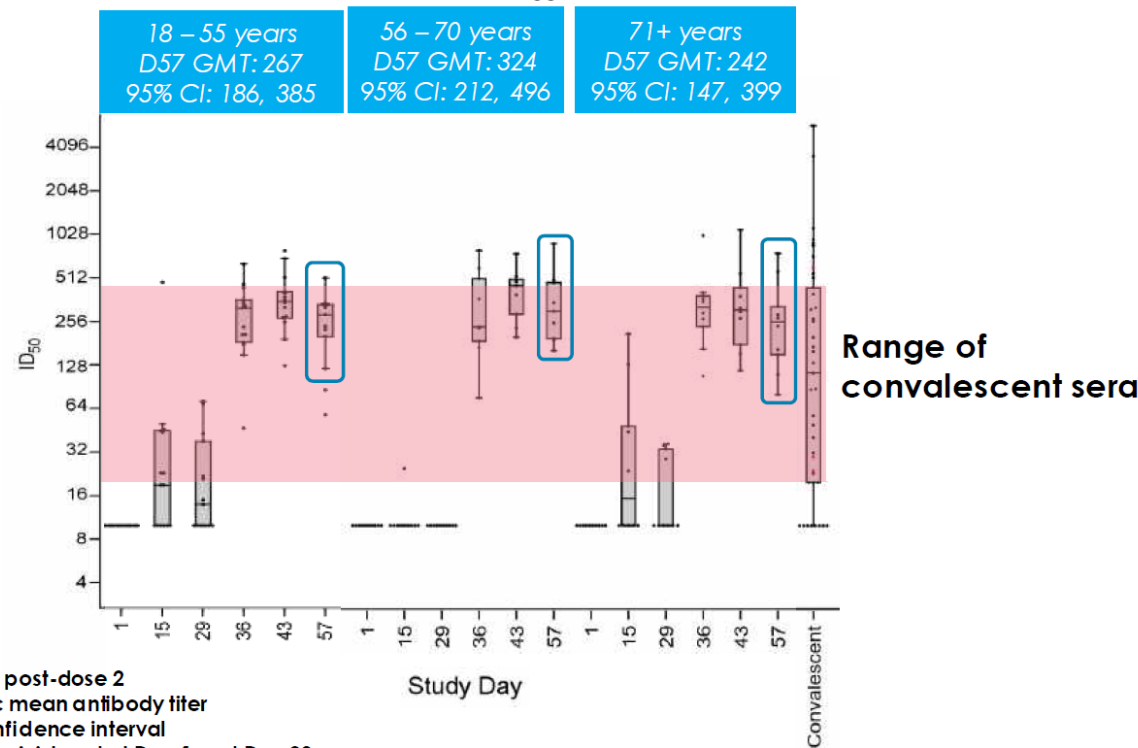
1. Fever percentages reflect the number of subjects with at least one measurement available in the data system as the denominator. This denominator may differ from other systemic symptoms, which are solicited in-clinic at the post-dose assessment

2. 18-55: N=15; 56-70: N=10; 71+: N=10; N = All subjects receiving Dose 1 with any solicited event data recorded in the database

Résultats de l'étude de Phase 1 du vaccin mRNA-1273 de MODERNA - Données dans différents groupes d'âge - 2

Distribution of antibody titers in pseudovirus neutralization assay comparable across age groups

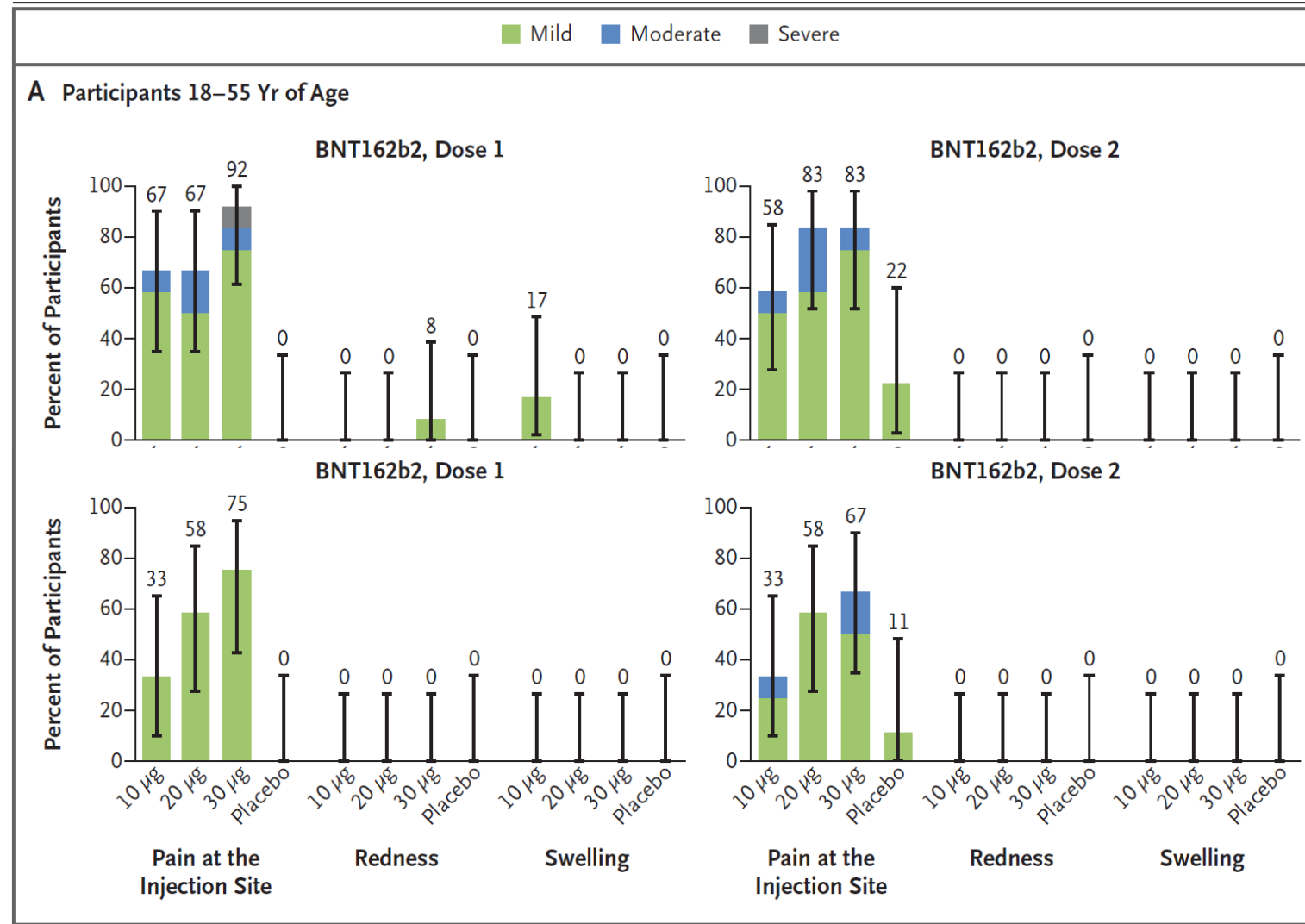
Pseudovirus neutralization assay titers (ID₅₀)- 100 µg at Day 1 and Day 29



D57: one month post-dose 2
GMT: geometric mean antibody titer
95% CI: 95% confidence interval
Vaccination administered at Day 1 and Day 29

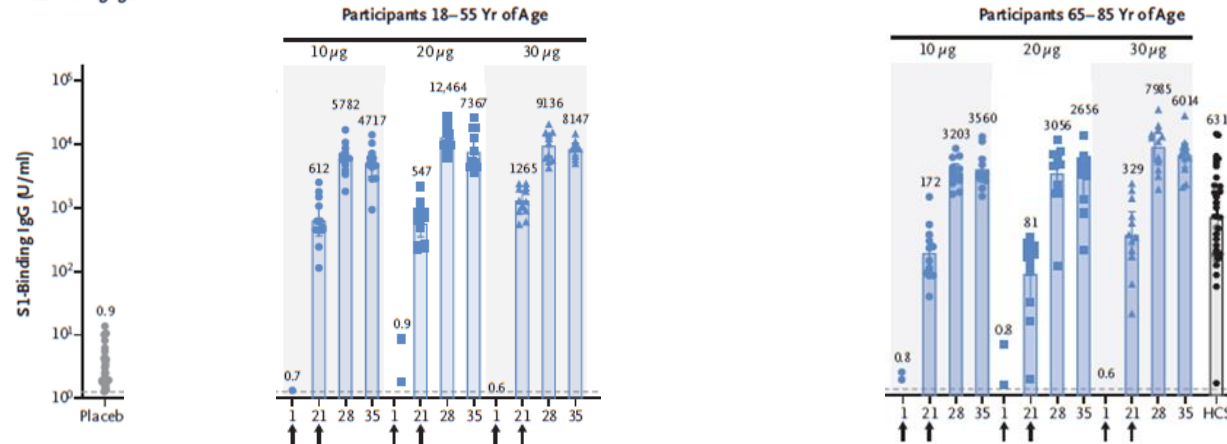
- After second vaccination, pseudovirus neutralization responses were detected in all participants
- Pseudovirus neutralization titers were comparable across age groups
- Pseudovirus neutralization titer for 56-70 and 71+ YOA above convalescent sera median titer at Day 57

Résultats de l'étude de Phase 1/2 du vaccin BNT162b2 de BioNTech/Pfizer - Données dans différents groupes d'âge -1

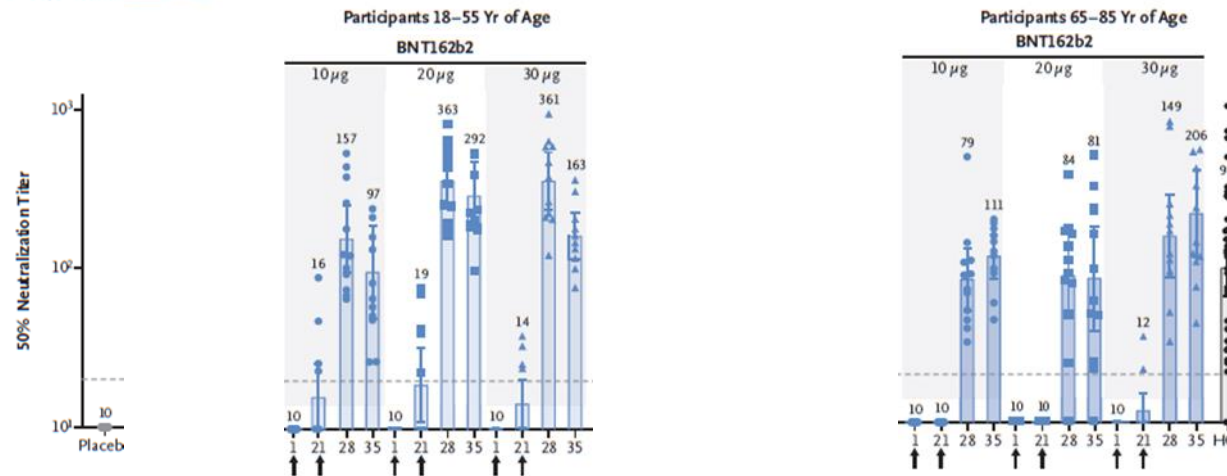


Résultats de l'étude de Phase 1/2 du vaccin BNT162b2 de BioNTech/Pfizer - Données dans différents groupes d'âge - 2

A S1-Binding IgG



B 50% Neutralization Titer



Une avalanche de résultats communiqués par voie de presse depuis le 9 novembre...

Le vaccin de BioNTech/Pfizer est efficace à plus de 90%

Le vaccin russe Sputnik est efficace à 92%

Le vaccin MODERNA est efficace à 94,5%

Le vaccin de BioNTech/Pfizer est efficace à plus de 95%

...

qui dit plus???

Points d'attention

Pas encore de revue par les pairs

Durée de la protection?

Protection chez les personnes âgées et vulnérables?

Protection contre la transmission

Sécurité à moyen et long terme

Calendrier de déploiement des vaccins?

Autorisation probable des vaccins BioNTech/Pfizer et

Moderna avant la fin de l'année par FDA et EMA

Utilisation aux EU en décembre

Utilisation en Europe en janvier