

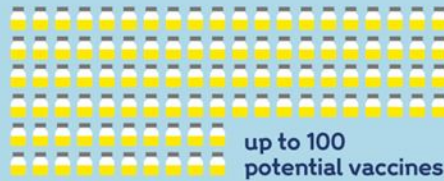
# Development of COVID 19 Vaccine

## The 5 stages of vaccine development

A vaccine usually takes more than 10 years to develop and costs up to \$500 million

### 1. Discovery research

2-5 years



### 2. Pre-clinical

2 years



### 3. Clinical development

Phase I Is it safe?

1-2 years



Phase II Does it activate an immune response?

2-3 years



Phase III Does it protect against the disease?

2-4 years



### 4. Regulatory review and approval

1-2 years



### 5. Manufacturing and delivery



Manufacturing vaccines requires specialist facilities that are highly regulated and expensive to develop. It usually starts following Phase II clinical trials to develop the thousands of doses needed for Phase III trials.



Manufacturing starts



= 10 years and costs \$500 million

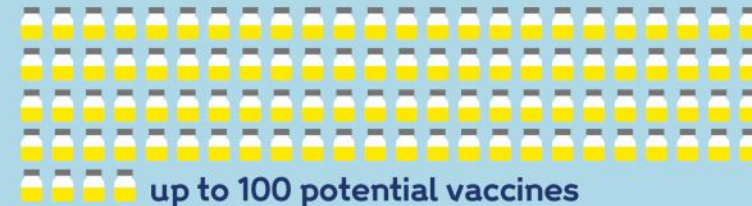
Sources: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5518734/>  
<https://www.weforum.org/agenda/2020/04/why-a-coronavirus-vaccine-takes-over-a-year-to-produce-and-why-that-is-incredibly-fast/>  
<https://www.nejm.org/doi/full/10.1056/NEJMp2005630>



## Developing a COVID-19 vaccine at speed

### 1. Discovery research

A few months



Manufacturing starts

### 2. Pre-clinical

A few months or skipped altogether



### 3. Clinical development

Phase I Is it safe?

3 months



Phase II & III combined: Does it protect against the disease?

8 months



### 4. Regulatory review and approval

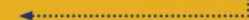
3 months



### 5. Manufacturing and delivery



Manufacturing capacity will have to be developed from the outset of the process to be able to produce the billions of doses of COVID-19 vaccine the world needs.



Sources: [https://apps.who.int/gpmb/assets/pdf/COVID\\_19\\_Press\\_Release\\_GPMB\\_9Mar.pdf](https://apps.who.int/gpmb/assets/pdf/COVID_19_Press_Release_GPMB_9Mar.pdf)  
<https://www.weforum.org/agenda/2020/04/why-a-coronavirus-vaccine-takes-over-a-year-to-produce-and-why-that-is-incredibly-fast/>  
<https://www.nejm.org/doi/full/10.1056/NEJMp2005630>



# VARIOUS COVID 19 VACCINE TIMELINE

