The leading vaccine candidates

Pfizer/BioNTech/Fosun Pharma

Type of vaccine: messenger RNA (mRNA)
Progression of the vaccine:

Things to note:

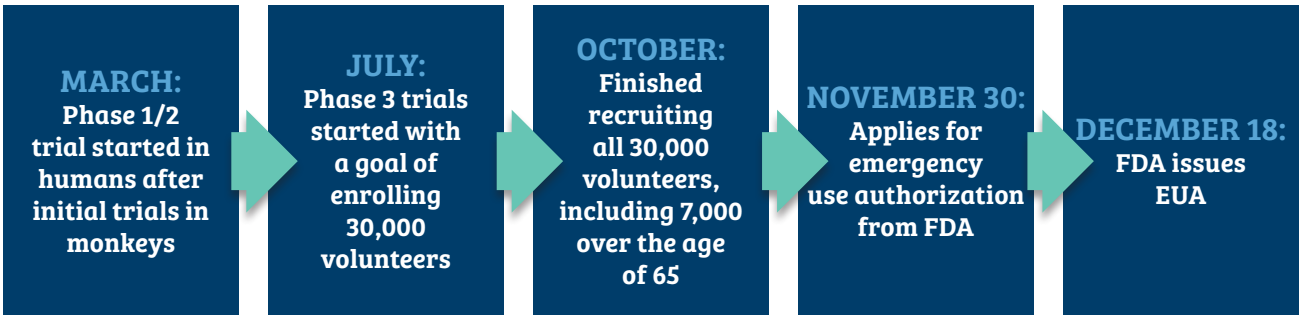
- mRNA falls apart if it's not stored at very cold temperatures, so this vaccine must be stored at -70°C, which is a different storage requirement than any other vaccine commonly found at medical offices or hospitals, and presents unique challenges.
- The vaccine can be stored in the refrigerator for five days.
- Beginning in October, Pfizer gained approval to test the vaccine on children as young as 12.
- It requires two doses, 21 days apart.

Data so far:

- This trial released preliminary data on Nov. 8, 2020, which showed that the vaccine is >90% effective at preventing COVID-19. Researchers will continue surveillance for a full two months after all participants receive their second dose of vaccine, and more information should be coming very soon. This vaccine is quite likely to be the first to gain emergency use authorization. The FDA is meeting to review Pfizer's EUA application Dec. 10.
- Dec. 8: FDA review confirms safety and efficacy of Pfizer and BioNTech coronavirus vaccine. It appears to be on the cusp of regulatory clearance.
- Dec. 11: FDA approves emergency use authorization, making this vaccine the first approved for distribution in the United States

Moderna

Type of vaccine: mRNA
Progression of the vaccine:



Things to note:

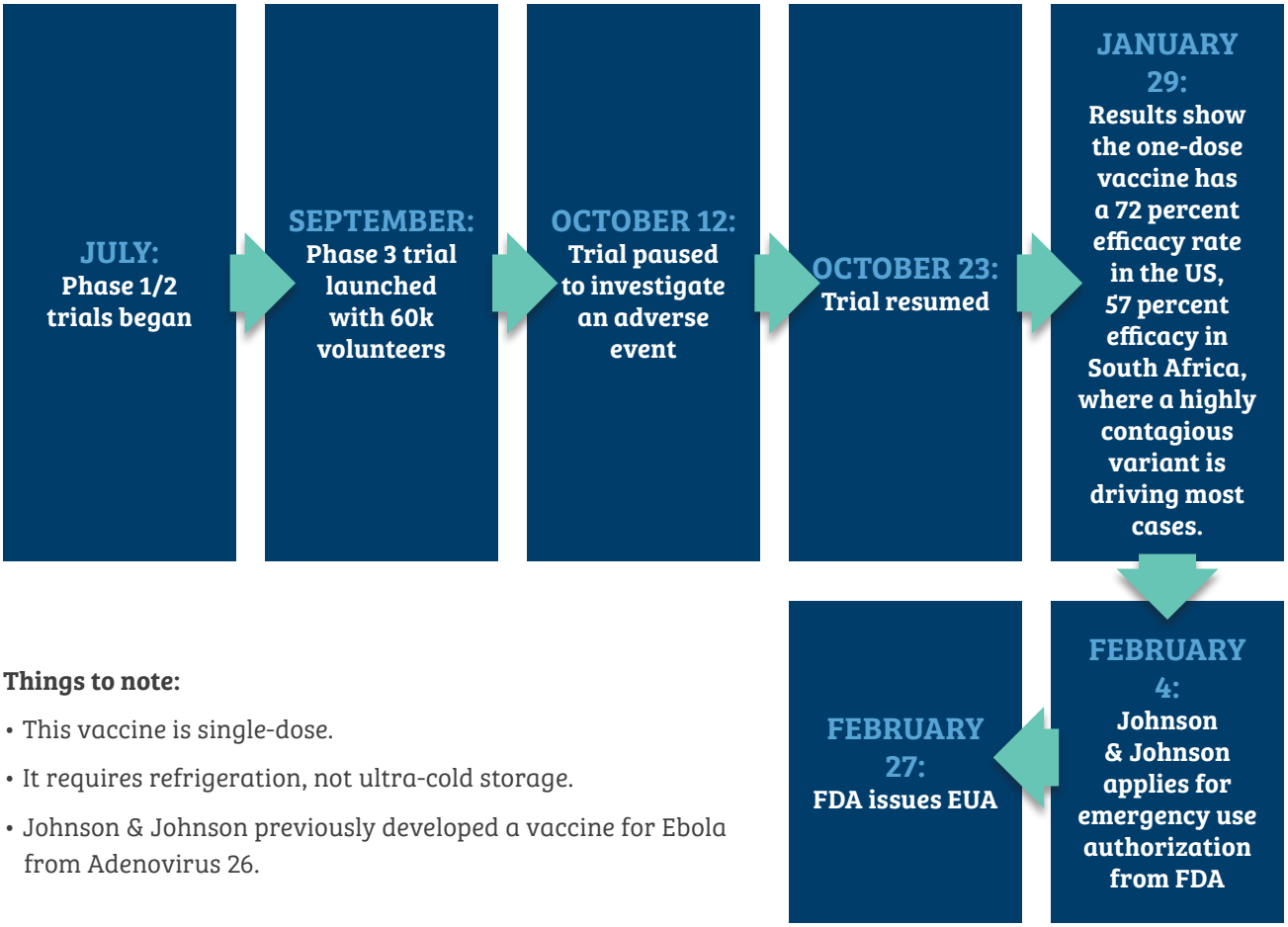
- Like the Pfizer vaccine, this is an mRNA vaccine; however it can be stored at -20°C (as opposed to the Pfizer vaccine that must be stored at -70°C).
- It can be stored in the refrigerator for 30 days, and at room temperature for 12 hours.
- This trial has enrolled older adults, as well as adults with chronic conditions that put them at high risk for COVID-19.
- Requires two doses, 28 days apart.

Data so far:

- A preliminary report on Phase 1 data was published in the NEJM in July 2020, and another Phase 1 report describing the vaccine's use in older adults was published in September, also in the NEJM. In both articles, Moderna reported that the vaccine generated a robust immune response and was well tolerated. As of Oct. 22, nearly all (25,650 out of 30,000) participants had received both doses of the vaccine.
- On Nov. 16, Moderna released preliminary results showing that its vaccine is 94.5% effective.
- On Nov. 30, Moderna announced it was applying to the Food and Drug Administration for an emergency use authorization. If it receives authorization, the first injections of its vaccines could start in late December.
- Dec. 18: FDA issues EUA

Johnson & Johnson

Type of vaccine: made from Adenovirus 26, or Ad26 for short
Progression of the vaccine:



Things to note:

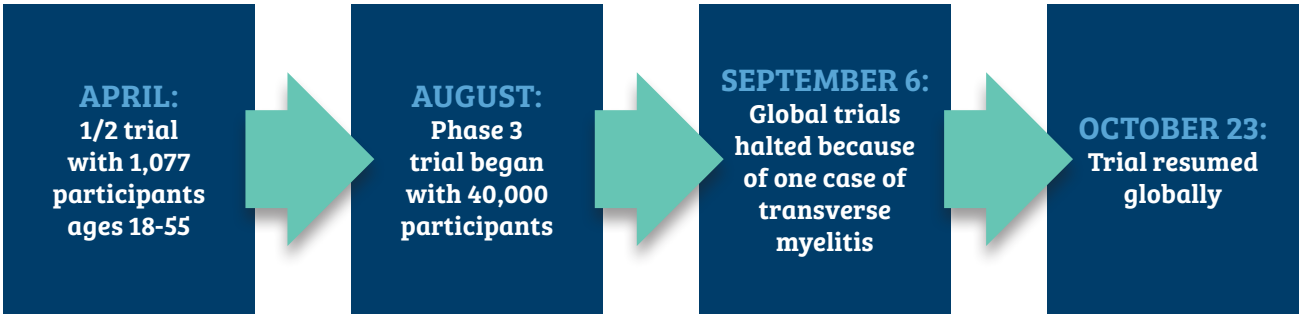
- This vaccine is single-dose.
- It requires refrigeration, not ultra-cold storage.
- Johnson & Johnson previously developed a vaccine for Ebola from Adenovirus 26.

Data so far:

- The company released Phase 1/2a data in September, which showed that the vaccine generated an immune response and was well tolerated.
- The company has not yet published Phase 3 data.
- Dec. 17: Phase 3 trial fully enrolled with 45,000 people
- Jan. 29: Results show the one-dose vaccine has a 72 percent efficacy rate in the US, 57 percent efficacy in South Africa, where a highly contagious variant is driving most cases.
- Feb. 4: Johnson & Johnson applies for emergency use authorization from the U.S. Food and Drug Administration. An FDA committee is scheduled to discuss the request Feb. 26.
- The U.S. Food and Drug Administration issued emergency use authorization Feb. 27 to Johnson & Johnson, making it the third available COVID-19 vaccine in the United States and the only one-dose vaccine available.

AstraZeneca

Type of vaccine: based on a chimpanzee adenovirus called ChAdOx1
Progression of the vaccine:



Things to note:

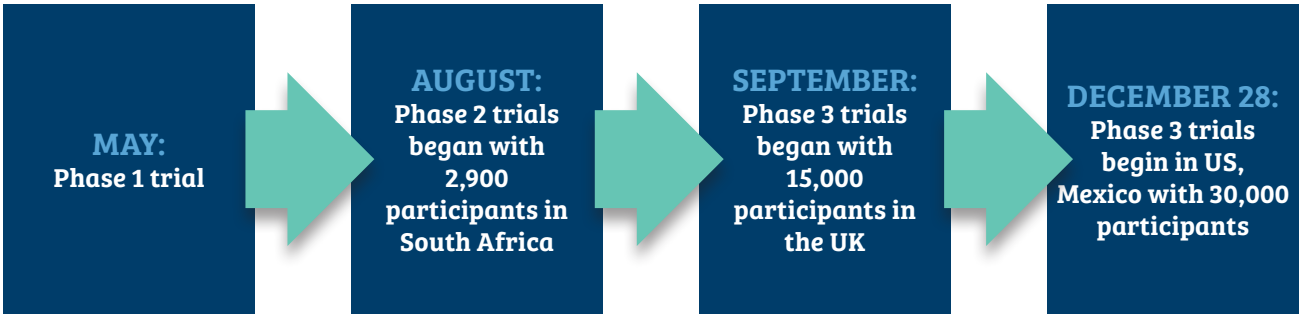
- The Phase 1/2 trial was single-blind and compared the COVID-19 vaccine with a meningococcal vaccine, rather than with a placebo; the Phase 3 trial is double-blind placebo-controlled.
- The vaccine requires two doses, 28 days apart.
- It requires refrigeration, not ultra-cold storage.
- Two reports of neurological symptoms were reported by participants in this trial, both in the UK. In July, one participant developed neurological symptoms, which were then found to be due to an underlying diagnosis of multiple sclerosis, unrelated to the vaccine. The second case involved a previously healthy 37-year-old woman who developed transverse myelitis in September; an independent regulatory body ultimately determined that there was not su!cient evidence to link the vaccine to her symptoms.
- One participant in this trial in Brazil died; however, that person had received the placebo and there was no connection between the trial and the death.

Data so far:

- Phase 1/2 trials showed a good immune response as well as good safety data.
- CEO of AstraZeneca has said results are expected by the end of December
- Questions raised about results of initial trials; AstraZeneca pushed back against the criticism and said more data will be gathered.
- Dec. 27: CEO of AstraZeneca says data will show the vaccine is 95 percent effective at preventing COVID-19 infections
- Jan. 29: EU regulators authorize use of AstraZeneca's vaccine in adults throughout the European Union.

Novavax

Type of vaccine: coronavirus proteins (no genetic material) are attached to microscopic particles
Progression of the vaccine:



Things to note:

- If trials are successful, the company expects to deliver 100 million doses by the first quarter of 2021 for use in the United States.
- It requires two doses, 21 days apart.
- Technology is similar to what's used in Shingles and HPV vaccines.

Data so far:

- Early data showed a strong immune response in both humans and monkeys.
- Jan. 30: CEO Stanley Erck is hoping the U.S. Food and Drug Administration will consider using the company's U.K. data to speed up rollout of its vaccine, rather than waiting until later in March.

Vaccine candidates at a glance

	Pfizer	Moderna	Johnson & Johnson	AstraZeneca	Novavax
Type of vaccine	mRNA	mRNA	Adenovirus 26	ChAdOx1 (Chimpanzee adenovirus)	Protein
In phase 3?	Y	Y	Y	Y	Y
# of doses	2	2	1	2	2
Time between doses	21 days	28 days	n/a	28 days	21 days
Storage	-70˚C	-20˚C	2-8˚C	-20˚C	2-7˚C