

# *COVID-19 Research*

## *Vaccine development – where are we and where are we heading?*

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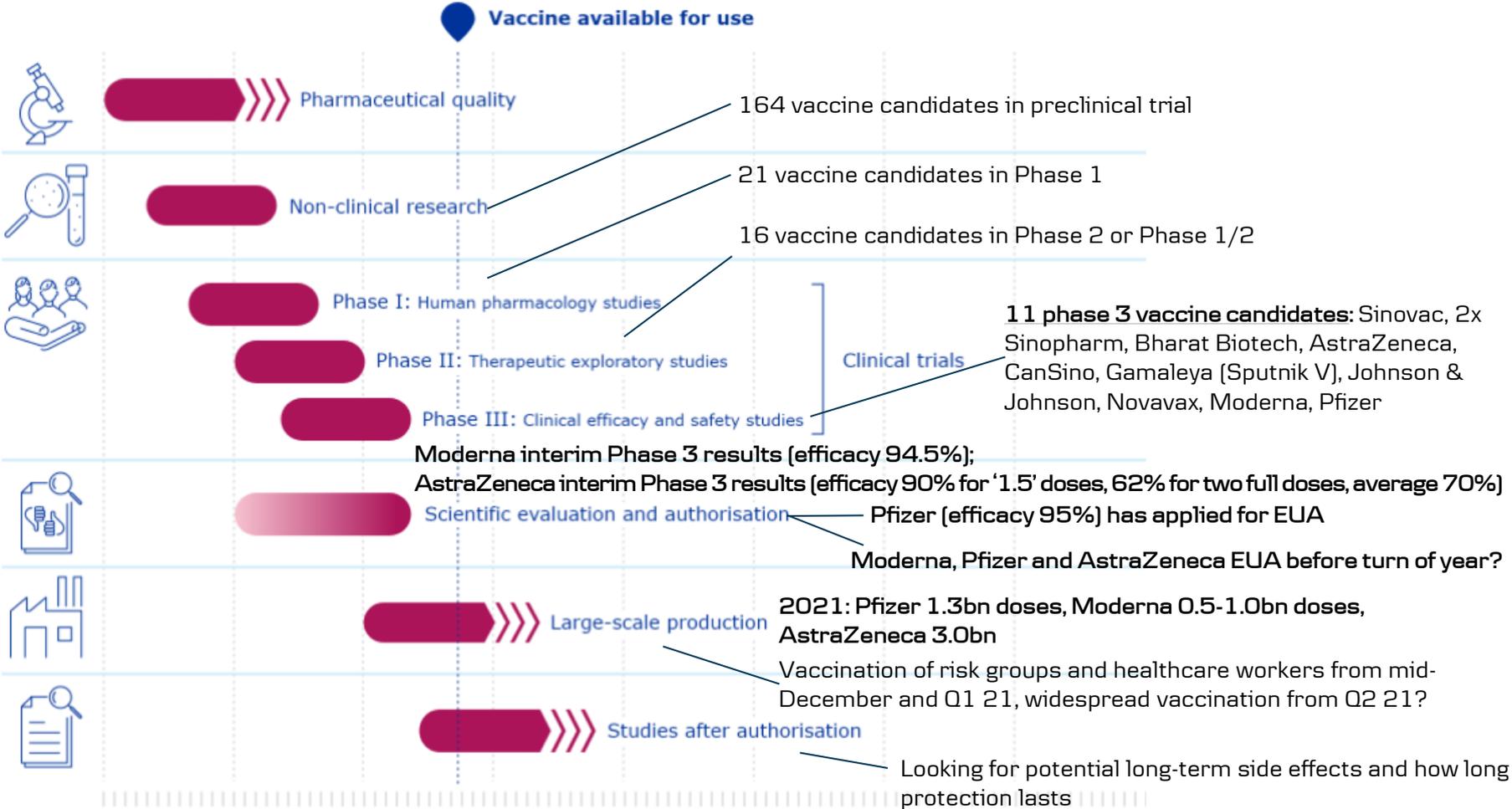
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## Key takeaways

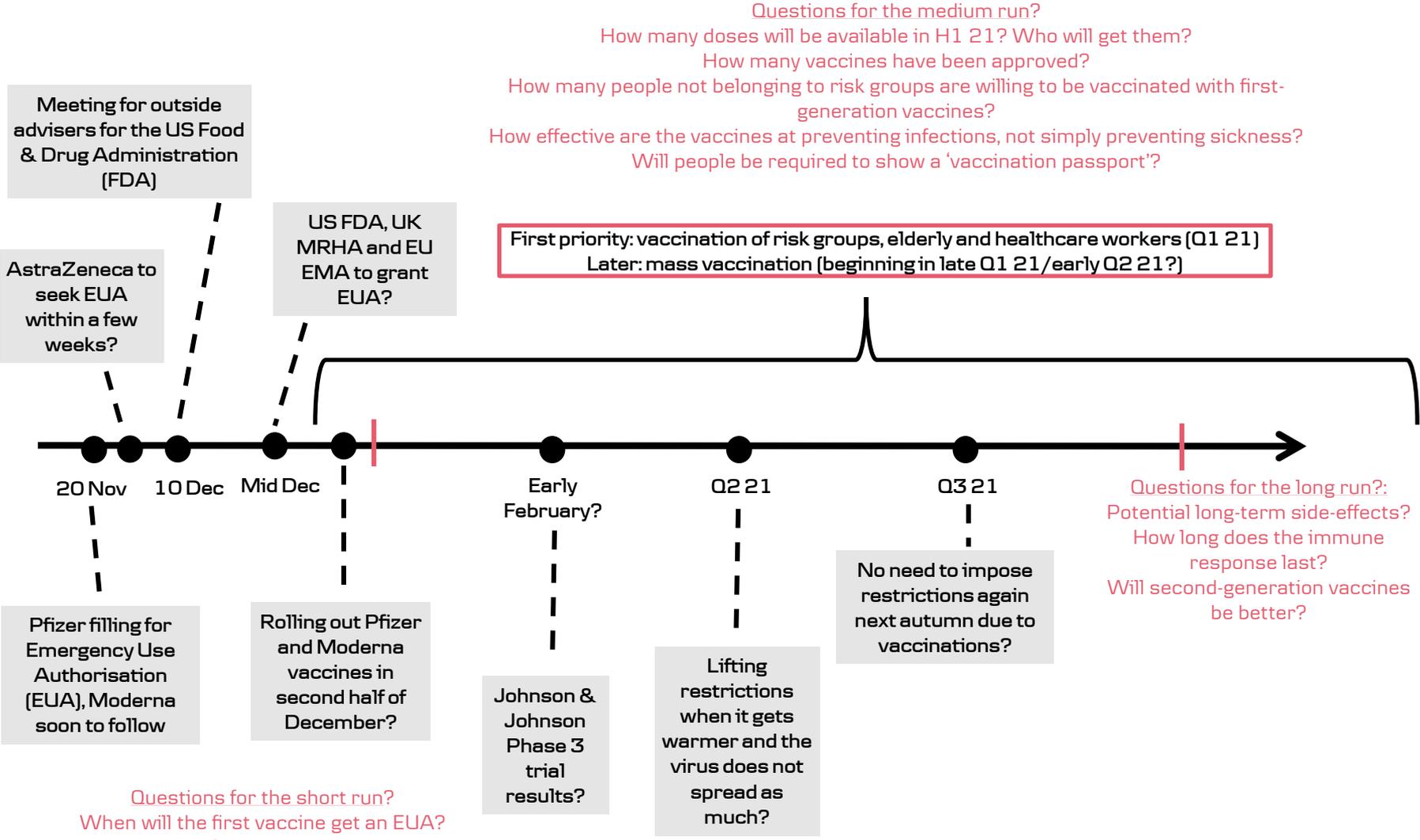
- Today, the University of Oxford/AstraZeneca published interim late stage Phase 3 results showing efficacy of 70% on average. The devil is in the detail, as the efficacy was 90% when the vaccine was given as a half dose followed by a full dose (one month apart). The efficacy was 62% for two full doses one month apart. We have got used to very high efficacies but remember that the US Food & Drug Administration's (FDA) lower bound is 50% and the efficacy of a normal flu shot is 40-60%. In other words, Pfizer's, Moderna's and AstraZeneca's vaccines all seem to us very promising. **Two major advantages of the AstraZeneca vaccine is that it can be stored at 2-8°C for at least six months and that it can produce up to 3bn doses in 2021 (versus 1.3bn for Pfizer and 0.5-1.0bn for Moderna, i.e. a total of c.5bn doses in 2021).**
- On Friday, Pfizer submitted a Emergency Use Authorisation (EUA) request to the US FDA (see [press release](#)). The external advisory committee meeting is set to take place on 10 December, so we believe approval in the US is likely in mid-December (see [FDA](#)). We expect Moderna and AstraZeneca to follow suit as soon as their Phase 3 studies are complete, which may be only a matter of time. It took nine days from Pfizer's interim results to its final results (and two more days for the EUA request).
- In the UK, the approval process may be faster, with [The Telegraph](#) writing yesterday that the approval for using Pfizer's vaccine may arrive in less than a week, according to government sources.
- **It seems to us that we are on track to start a vaccination process for risk groups and healthcare workers in mid-December, with this continuing in Q1 21. In our view, mass vaccination is likely to start in late Q1 21 or early Q2 21.** Supporting this view, Spain's Prime Minister Pedro Sanchez said the vaccination process is likely to begin in January (and he expects a 'very substantial part of the population will be able to be vaccinated, with all guarantees, in the first half of the year' (see [Reuters](#)).
- **On treatment, the US FDA issued an EUA for Regeneron's antibody treatment for mild to moderate cases on Saturday (see [statement](#)).**
- **Conclusion:** While the near-term situation and economic outlook for countries in the northern hemisphere still looks fragile, the continued good news on vaccines and treatments suggests we may be able to put the worst of the COVID-19 crisis behind us in 2021, as governments may not have to impose restrictions next autumn. We expect a more significant easing of restrictions in spring when it gets warmer.

# Vaccine development - where are we?



Sources: EU EMA, Pfizer, Moderna, AstraZeneca, WHO vaccine draft landscape

# Vaccine timeline



Sources: Various national news media and press releases, WHO vaccine draft landscape, FDA

## Vaccines – production capacity, temperature and prices

Company	Phase	Type of vaccine	Number of doses	Production capacity in 2021	Temperature	Price per dose
BioNTech/Pfizer	Seeking for EUA	mRNA	2 Day 0 & 28	Up to 1.3bn doses	-70C initially, 2-8C for 5 days	19.50 USD
AstraZeneca / Oxford	2/3	Adenovirus	2 Day 0 & 28	Up to 3bn doses	2-8C for six months	3-4 USD
Johnson & Johnson	3	Adenovirus	2 Day 0 & 56	1bn	-20C initially, 2-8C for three months	10 USD
Moderna	3	mRNA	2 Day 0 & 28	0.5- 1.0bn doses	-20C initially, 2-8C for 30 days	32-37 USD (small contracts), 25 USD for US government
Novavax	3	Protein + adjuvant	2 Day 0 & 21	2bn	2-8C	16 USD
CureVac	2	mRNA	2 Day 0 & 28	0.3bn	2-8C, 24 hours stability at room	Unknown
Sanofi / GSK	1/2	Protein + adjuvant	2 Day 0 & 21	1bn	2-8C	<10 USD

Sources: Various national news media and press releases from individual companies

# Vaccine agreements – developed countries

Company	Phase	Type of vaccine	Number of doses	US	EU	UK	Japan	Others
BioNTech/Pfizer	2/3	mRNA	2 Day 0 & 28	100m (+500m)	200m (+100m)	30m	120m	Australia: 10m Canada: 20m
AstraZeneca / Oxford	2/3	Adenovirus	2 Day 0 & 28	300m	300m (+100m)	100m	120m	Australia: 84.8m Canada: 20m
Johnson & Johnson	3	Adenovirus	2 Day 0 & 56	100m (+200m)	200m (+200m)	30m		Canada: 38m
Moderna	3	mRNA	2 Day 0 & 28	100m (+400m)	80m (+80m)*		50m	Canada: 56m
Novavax	3	Protein + adjuvant	2 Day 0 & 21	100m		60m	250m	Australia: 40m Canada: 72m
CureVac	2	mRNA	2 Day 0 & 28		225m (+180m)			
Sanofi / GSK	1/2	Protein + adjuvant	2 Day 0 & 21	100m (+500m)	300m	60m		
Sum				800m (+1.6 bn)	1.305 bn (+660m)	340m (+130m)	540m	Australia: 134.8m Canada: 206m
Vaccines per capita				1.22 (+2.43)	1.46 (+0.74)	2.55 (+0.97)	2.14	Australia: 2.63 Canada: 2.72

\* Indicates that deals aren't finalized.

Numbers in parentheses are optional additional purchases.

Vaccines per capita takes required number of shots into account.

Sources: Various national news media and press releases, WHO vaccine draft landscape

# Vaccine agreements – emerging markets

Company	Mexico	Indonesia	Thailand	Brazil	Russia	China	South Africa	Malaysia	Colombia	Peru	Chile	Turkey
BioNTech/Pfizer	34.4m			Negotiating						9.9m	10m	Negotiating
AstraZeneca / Oxford	77.4m	100m	26m	100m								
Johnson & Johnson												Deal to manufacture
Moderna				Negotiating?								
Novavax												
CureVac												
Sanofi / GSK												
Sputnik V	32m			50m	Own production							
CanSino Biologics	35m	20m				Own production						
Sinovac		50m		46m		Own production					20m	(20m)*
Sinopharm		50m				Own production						
Participating in COVAX?		Yes										

Sources: Various national news media and press releases

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