Update on Vaccines for COVID-19. Help is on the Way!

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Objectives

• Vaccines currently in clinical trials globally and how they work
• Results of phase 3 vaccine trials thus far
• Vaccine administration priorities
• Vaccine acceptance
Coronavirus Vaccine Tracker

Phase 1 | Phase 2 | Phase 3 | Limited | Approved
---|---|---|---|---
41 | 17 | 13 | 7 | 0

- Vaccines testing safety and dosage
- Vaccines in expanded safety trials
- Vaccines in large scale efficacy trials
- Vaccines approved for limited use
- Vaccines approved for full use

12-2-20

New York Times Coronavirus Vaccine Tracker
## Coronavirus Phase 3 Clinical Trials

<table>
<thead>
<tr>
<th>Protein Subunit Vaccine</th>
<th>mRNA Vaccine</th>
<th>Adenovirus Vector Vaccines</th>
<th>Whole inactivated Virus Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novavax (US)</td>
<td>Moderna/NIH (US)</td>
<td>University of Oxford/ AstraZenica (UK)</td>
<td>Sinovac (China)</td>
</tr>
<tr>
<td>Sanofi/GSK (France, UK)</td>
<td>Pfizer/BioNTech (US, Germany)</td>
<td>CanSinoBio/Beijing Institute of Biotechnology (China)</td>
<td>Wuhan Institute of Biological Products/ Sinopharm (China)</td>
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<tr>
<td>Anhui Zhifei Longcom Biopharmaceutical (China)</td>
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<td>Gamaleya Research Institute (Russia)</td>
<td>Beijing Institute of Biological Products/ Sinopharm (China)</td>
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<td>Johnson &amp; Johnson/ Janssen Pharmaceuticals (US)</td>
<td></td>
</tr>
</tbody>
</table>
mRNA in liposome

Antigen presenting cell

Antigen presenting cell expresses vaccine antigen

B lymphocyte

Antibody mediated immunity

Cell mediated immunity

T lymphocyte
Pfizer/BioNTec COVID Vaccine

• Study began 7/28/20 (149 sites)
• 43,538 people enrolled (40% underrepresented minority)
• Final analysis: 170 cases of COVID
• 95% effective to prevent symptomatic infection
• 94% effective in >65 year olds
• No serious adverse adverse effects
• 9 of 10 severe cases in the placebo group
• Submitted Emergency Use Authorization 11/23/20
• FDA review meeting 12/10/20

NCT04470427
Moderna COVID Vaccine

- Study began 7/28/20 (99 sites)
- 30,000 people enrolled (35% underrepresented minority)
- Interim analysis: 196 cases of COVID
- 94.1% effective to prevent symptomatic infection
- No serious adverse adverse effects
- All 30 severe cases in the placebo group
- Submitted Emergency Use Authorization 11/30/20

NCT04368728
RNA Vaccine with Virus Vector

Virus vector

Antigen presenting cell

Antigen presenting cell expresses vaccine antigen

B lymphocyte

T lymphocyte

Antibody mediated immunity

Cell mediated immunity
Oxford/Astrazenica COVID Vaccine

- Study began 8/31/20 (99 sites)
- Study population: >18 yo medically stable and at increased risk for COVID-19
- Interim analysis: 11,636 people enrolled, 130 COVID cases
- 62% effective in full dose, full dose regimen (N=8,895)
- 90% effective in half dose, full dose regimen (N=2,741)
- No serious adverse effects

NCT04516746
Vaccine Hesitancy

- There is no simple strategy that can address all of the barriers to vaccine acceptance.
- Perception and vaccine decision making are often intuitive, made at the unconscious level and more influenced by emotions and beliefs than facts.
- Campaigns that address knowledge deficits alone have not been effective in decreasing hesitancy and improving vaccine acceptance.

McDonald et al. Human Vaccines and Immunotherapeutics 14:1, 2018.
Vaccine Hesitancy

- Heightened emotions in the pandemic:
  - dramatic societal changes
  - loss of loved ones
  - isolation and loneliness due to social distancing
  - trepidations about the management of pandemic
  - fear of contracting the virus
  - fears over vaccine safety
  - financial hardships

**Vaccine Hesitancy**

• **Counteracting negative emotions:**
  - Negative emotions related to fear: highlight feelings of control through vaccination
  - Risk and severity of COVID are exaggerated: communicate risk of contracting and morbidity
  - “Anti-vaxers”: point out how misinformation is manipulative through negative emotions

• **Activating positive emotions:**
  - Altruism and benefits to the community
  - Return to closer interactions with loved ones and friends

COVID-19 Vaccine Priorities

• Advisory Committee on Immunization Practices (ACIP) of the CDC met December 1, 2020

• First priority for vaccines:
  – Healthcare personnel
  – Residents of long term care facilities

Morbidity and Mortality Weekly Report Vol. 69, 12-3-20

COVID-19 Vaccine Priorities
CDC Advisory Committee on Immunization Practices

• Science
  – COVID-19 disease burden
  – Balance of benefits and harms of vaccine

• Implementation
  – Values of target group
  – Feasibility

• Ethics
  – Maximize benefits and minimize harms
  – Promote justice
  – Mitigate health inequities
  – Promote transparency


• Modeled outcomes of vaccines including cumulative infections, hospitalizations and deaths based on effect of:
  – manufacturing and deployment efficiency
  – vaccine hesitancy and acceptance
  – epidemic severity
  – vaccine efficacy
Real World Impact of COVID-19 Vaccine

• The reproduction number (R₀) is a major determinant of vaccine effectiveness in a population.

• The benefits of a vaccine will decline substantially in the event of manufacturing or deployment delays, significant vaccine hesitancy, or greater epidemic severity (R₀).

• To maximize vaccine impact resources should be invested in:
  – encouraging adherence to mitigation approaches
  – vaccine production and distribution programs,
  – promote public confidence in COVID-19 vaccines
Sources of Reliable Information

Erie County Department of Health
https://www2.erie.gov/health/

New York State Department of Health
https://health.ny.gov

US Center for Disease Control
https://www.cdc.gov

Johns Hopkins Coronavirus Resource Center
https://coronavirus.jhu.edu/map.html

New York Times