

Vaccines have had dramatic health benefits to the world and eradicated disease. What are some reasons people may not want to be vaccinated? Can these concerns be resolved scientifically? What should medical practitioners and scientists do to address these concerns?

There are various reasons why people may choose not to get vaccinated, which can range from personal beliefs and philosophical convictions to individual concerns. For instance, some parents believe that natural immunity is better suited to adapt to a constantly changing environment, and they may perceive vaccines as offering limited protection against non-lethal pathogens and preferring not to introduce chemical or foreign substances into their children's bodies. Additionally, vaccine safety is a significant concern. Vaccines do not cause autism and adjuvants have been used in vaccines for a long time (<https://www.cdc.gov/vaccinesafety/concerns/autism.html>); but some vaccines have had less than 50% efficacy rate [1]. More recently, during the COVID-19 pandemic, some individuals have hesitated to trust governmental authorities; and doubted whether the main reason to promote a specific vaccine was not first financially motivated.

To address concerns about vaccine safety, several strategies can be employed:

1. **Extensive validation** through testing on cell-lines, biological models, or animal studies.
2. **Conducting in-silico research** or hypotheses testing on clinical data (translational analysis) with results that can be easily understandable or interpretable and accessible to the large public.
3. **Acknowledging the contributions** of researchers involved in vaccine discovery only when studies confirming vaccine safety have been published and validated.
4. **Educational Initiatives**: Develop educational programs, or using of social media, to simplify complex scientific concepts. These programs should explain vaccine mechanisms emphasizing their mechanisms of actions.
5. **Highlighting success stories**: Showcases about their significant achievements in eradicating life-threatening or life-changing diseases (e.g. polio, Hepatitis A, Tetanus, etc.)
6. **FDA approval process**: Clarify the FDA approval for vaccines which can span a decade or longer, with the exceptions of COVID 19 vaccines(<https://www.cdc.gov/vaccines/basics/test-approve.html>)
7. **Explain the role of Artificial Intelligence** and Machine Learning: AI expedites vaccine development; therefore, there is a critical need for maintaining rigorous safety standards which guarantee safety and minimize adverse events even with accelerated development cycles with proper communication to people.
8. **Permanent and thorough monitoring** by the FDA and CDC of the safety of the vaccines after they are approved.
9. **The existence of a legal framework** to protect patients against poorly validated or unanticipated side-effects of a vaccine.

[1] I. J. Amanna and M. K. Slifka, "Vaccination Strategies Against Highly Variable Pathogens," *Curr. Top. Microbiol. Immunol.*, vol. 428, pp. 1–30, 2018, doi: 10.1007/82_2018_102