Vaccination

Live attenuated vaccine	Killed or inactivated vaccine	Subunit, recombinant, polysaccharide, and conjugate	Toxoid	mRNA
Microorganism rendered nonpathogenic but retains capacity for transient growth within inoculated host. MMR and varicella vaccines can be given to people living with HIV without evidence of immunity if CD4+ cell count ≥ 200 cells/mm3.	Pathogen is inactivated by heat or chemicals. Maintaining epitope structure on surface antigens is important for immune response. Mainly induces a humoral response	All use specific antigens that best stimulate the immune system.	Denatured bacterial toxin with an intact receptor binding site. Stimulates immune system to make antibodies without potential for causing disease.	A lipid nanoparticle delivers mRNA, causing cells to synthesize foreign protein (eg, spike protein of SARS-CoV-2). Induces cellular and humoral immunity
Pros: induces cellular and humoral responses. Induces strong, often lifelong immunity. Cons: may revert to virulent form. Contraindicated in pregnancy and patients with immunodeficiency.	Pros: safer than live vaccines. Cons: weaker cell-mediated immune response; booster shots usually needed.	Pros: targets specific epitopes of antigen; lower chance of adverse reactions. Cons: expensive; weaker immune response	Pros: protects against the bacterial toxins. Cons: antitoxin levels decrease with time, thus booster shots may be needed.	Pros: high efficacy, safe in pregnancy. Cons: local and transient systemic (fatigue, headache, myalgia) reactions are common. Rare myocarditis, pericarditis particularly in young males.
Examples: Adenovirus (nonattenuated, given to military recruits), typhoid (Ty21a, oral), polio (Sabin), varicella (chickenpox), smallpox, BCG, yellow fever, influenza (intranasal), MMR, rotavirus.	Examples: Hepatitis A, Typhoid (Vi polysaccharide, intramuscular), Rabies, Infiuenza (intramuscular), Polio (SalK).	Examples: HBV (antigen = HBsAg), HPV, acellular pertussis (aP), Neisseria meningitidis (various strains), Streptococcus pneumoniae (PPSV23 polysaccharide primarily T-cell–independent response; PCV13 conjugated polysaccharide produces T-cell–dependent response), Haemophilus infiuenzae type b, herpes zoster.	Examples: Clostridium tetani, Corynebacterium diphtheriae.	Examples: SARS-CoV-2

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Published 4th January, 2024.
Last updated 4th January, 2024.

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