

Types of Vaccines and Their Pros and Cons

Type	Description	Major Pros	Major Cons
Live, attenuated	Whole pathogen treated to decrease pathogenicity but maintain immunogenicity; may still replicate	Low number of doses usually very effective Minimal need for adjuvant* Supplies B and T epitopes	Cold chain required Chance of reversion of attenuating mutation
Killed or inactivated	Whole pathogen killed or inactivated to block replication but maintain immunogenicity	No possibility of reversion No cold chain required Supplies T and B epitopes	Cannot replicate so requires boosters and adjuvant Does not induce robust Tc responses
Toxoid	Chemically inactivated toxin of pathogen	No need to use whole organism	Only effective if disease caused solely by toxin
Subunit	Pathogen protein or polysaccharide purified from natural sources or synthesized using recombinant DNA methods	Avoids use of whole organism Can be manipulated to increase immunogenicity	Can be costly to produce May not be as immunogenic as natural pathogen component Does not induce robust Tc responses
Peptide	Pathogen peptide purified from natural sources or synthesized using recombinant DNA methods	Avoids use of whole organism Composition is known Very stable	Epitope size and number restricted May require coupling to a carrier protein
Recombinant DNA vector	Virus-based vector containing recombinant DNA of pathogen antigen. Vaccinee is infected with the viral vector and the pathogen DNA is transcribed and translated within the vaccinee's cells like a viral protein.	Avoids use of natural pathogen Replicates like a pathogen to produce large amounts of immunogen Supplies T and B epitopes Minimal need for boosters and adjuvant	Possible side effects due to vector components Anti-vector antibodies raised during priming may necessitate boosting with a different vector
Naked DNA	Small plasmid containing recombinant pathogen DNA. Plasmid is injected into a vaccinee and the pathogen DNA is taken up by the vaccinee's cells and transcribed	Easy and inexpensive to manipulate Induces B, Th and Tc responses Plasmid sequences may act as adjuvant	Integration of plasmid into host cell genome may induce tumorigenesis