

New Vaccines in the Future

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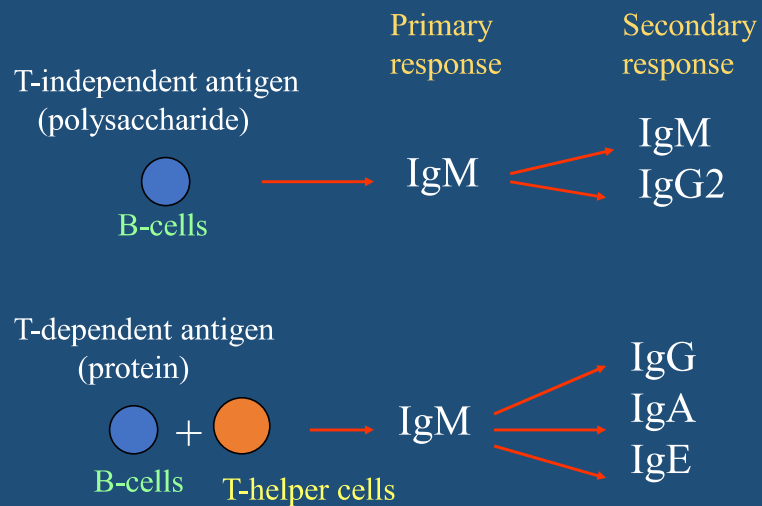
New Technologies in the Development of Vaccines

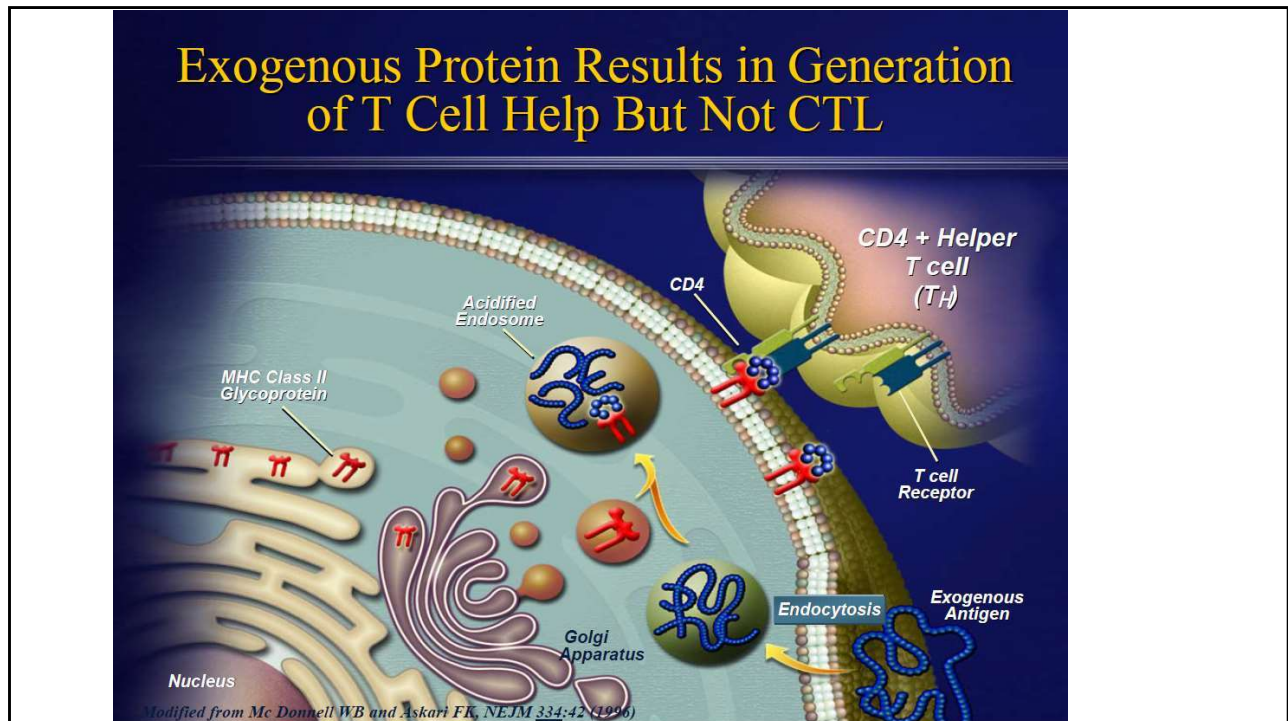
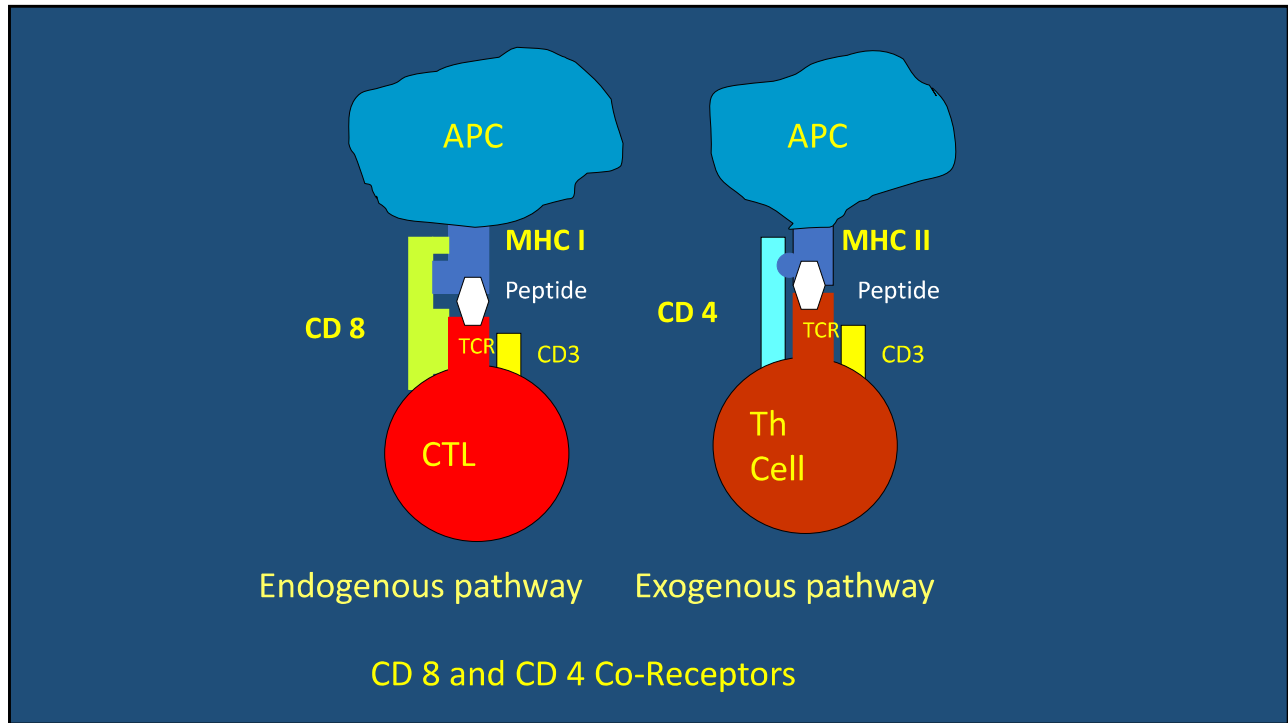
- Toxoid e.g. tetanus, diphtheria
- Inactivated vaccine e.g. whole cell pertussis, JE vac, Hepatitis A, IPV, CoronaVac
- Lived attenuated vaccine MMR, Varicella, OPV
- Protein subunits :
 - extraction e.g. influenza,
 - synthetic recombinant e.g. hepatitis B, Shingrix (Zoster vaccine)
- Viral-like particle e.g. HPV
- Non-replicating viral vector e.g. ChAdOx1-S Covid vaccine
- Replicating viral vector e.g. Imojev, Dengvaxia
- RNA vaccine e.g. Pfizer/BioNTech Comirnaty
- DNA vaccine

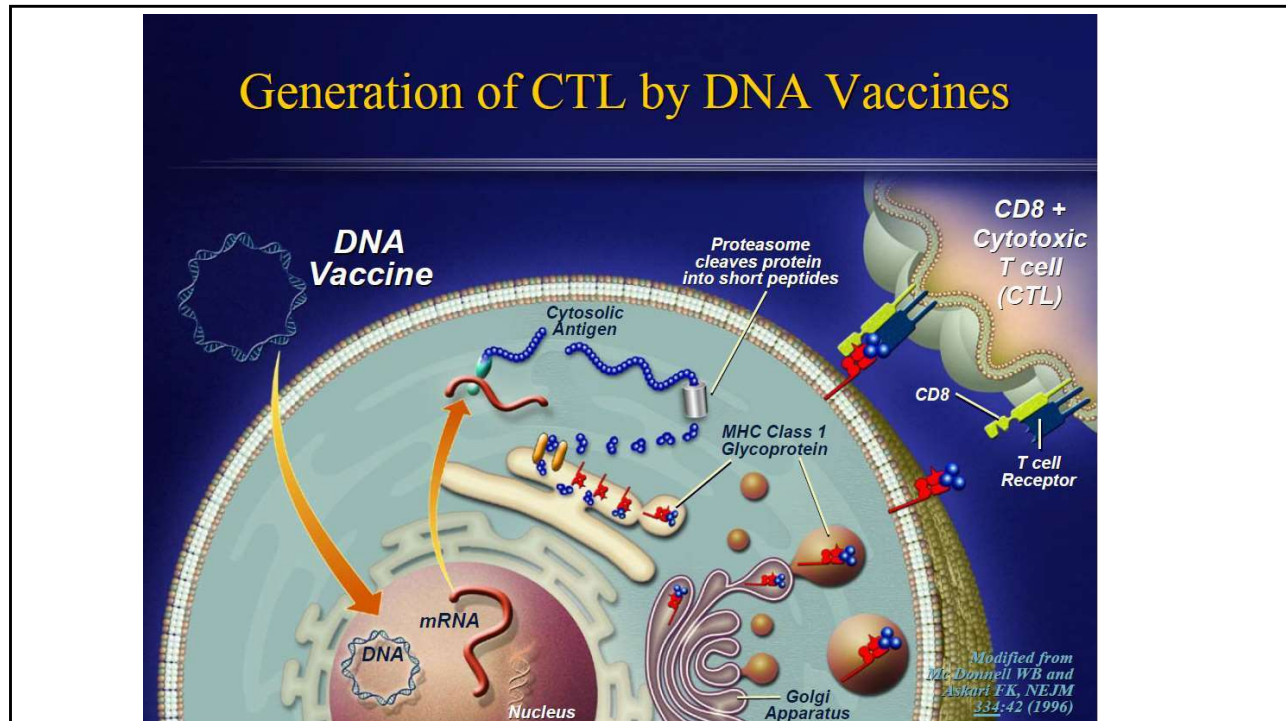
Mucosal vs Systemic Viral Infection

	Superficial, mucosal	Systemic
Pathogens	Rotavirus, RSV Influenza	MMR, Polio Varicella
Viremia	No	Yes
Incubation	1-4 days	8-14 days
Protection after infection	Incomplete short-live	Complete long-live
Immunity	IgA, mucosal surface	Memory B T cell

Antibody Response







Disease Models in Which DNA Vaccines Have Demonstrated Efficacy

Infectious Diseases		Cancer
<p>Viruses</p> <ul style="list-style-type: none"> • HIV • Influenza • Rabies • Hepatitis B,C,D • Ebola • Herpes Simplex • Papilloma • CMV • Rota • Measles • LCMV • St. Louis Enceph 	<p>Parasites/Protozoa</p> <ul style="list-style-type: none"> • Malaria • Mycoplasma • Leishmania • Schistosoma • Taenia ovis • Toxo. gondii 	<ul style="list-style-type: none"> • Breast (Her2/neu) • Colon • Prostate • Myeloma • Lymphoma • E7-Induced • Fibrosarcoma
<p>Bacteria</p> <ul style="list-style-type: none"> • B. Burgdorferi • C. tetani • M. Tb • S. typhi 		<p>Allergy</p> <ul style="list-style-type: none"> • House Dust Mite • Peanut • Experimental Airway Hyperresponsiveness
		<p>Autoimmune Disease</p> <ul style="list-style-type: none"> • Diabetes • EAE (MS model)

mRNA vaccines in Research at Univ. Penn

- Viral infections
 - All coronaviruses; such as SARS, MERS
 - Genital Herpes (HSV-2)
 - Hepatitis C
 - HIV
 - Influenza
 - Norovirus
- mRNA vaccines for Cancer
- mRNA for Genetic Diseases
- Bacterial infections
 - Leptospirosis
 - C. difficile
 - Tuberculosis
- Parasites
 - Malaria
- mRNA for Heart Failure
- mRNA for Heart Attack and Stroke

Vaccines for Rota virus

- Rotarix (GSK) Monovalent, human, live attenuated rotavirus containing G1P[8] two doses
- Rota Teq (MSD) Pentavalent vaccine contains five rotavirus strains produced by reassortment from human and bovine(G1, G2, G3, G4, P[8]) three doses
- Rotavac (Bharat Biotech) live attenuated, monovalent vaccine containing a G9P[11] 3 doses
- Rotasiil (Serum Institute of India) human bovine reassortment G1, G2, G3, G4, G9
- Lanzhou lamb (Lanzhou Institute of Biotech Products) G10P[12] lamb rotavirus strain