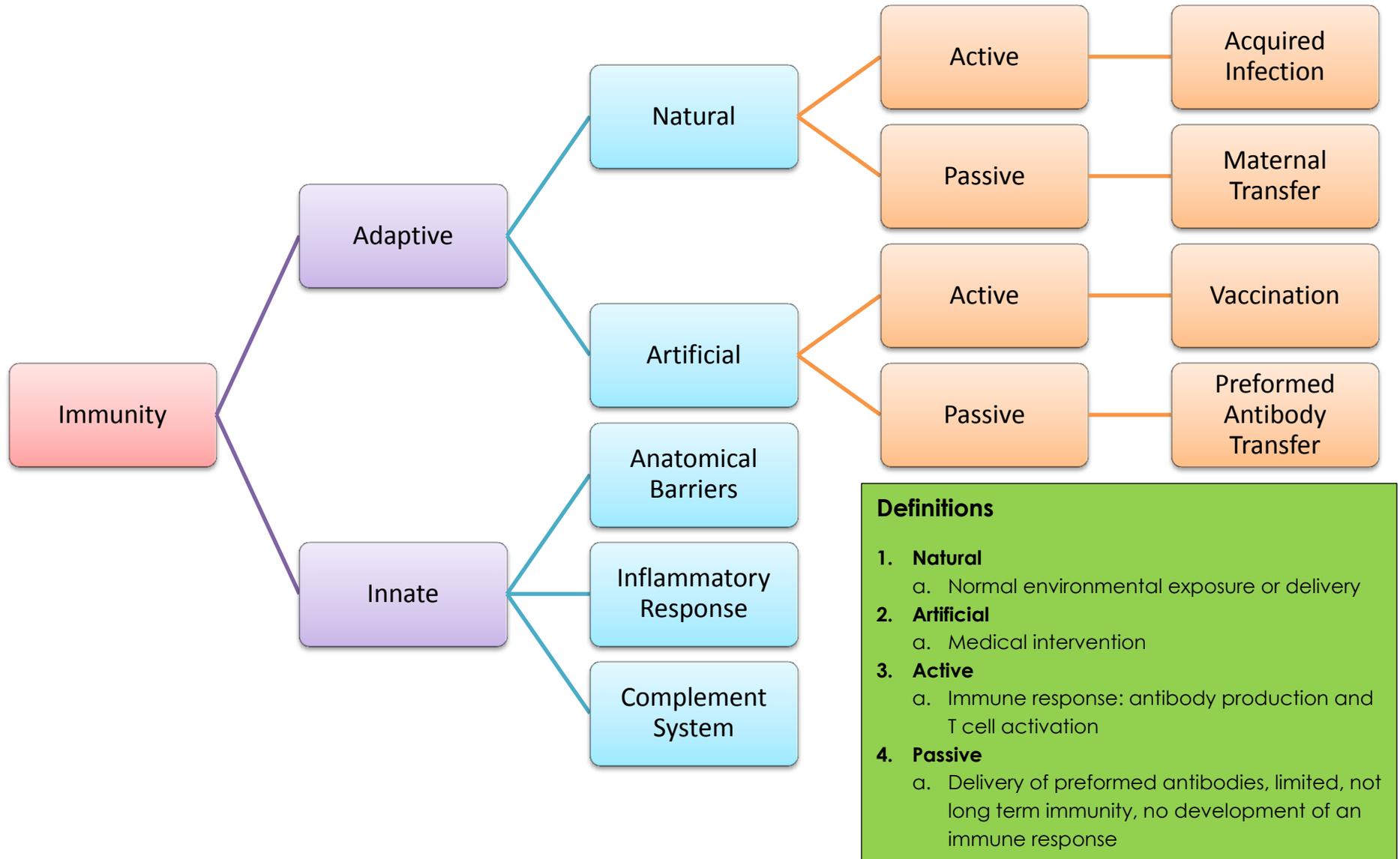


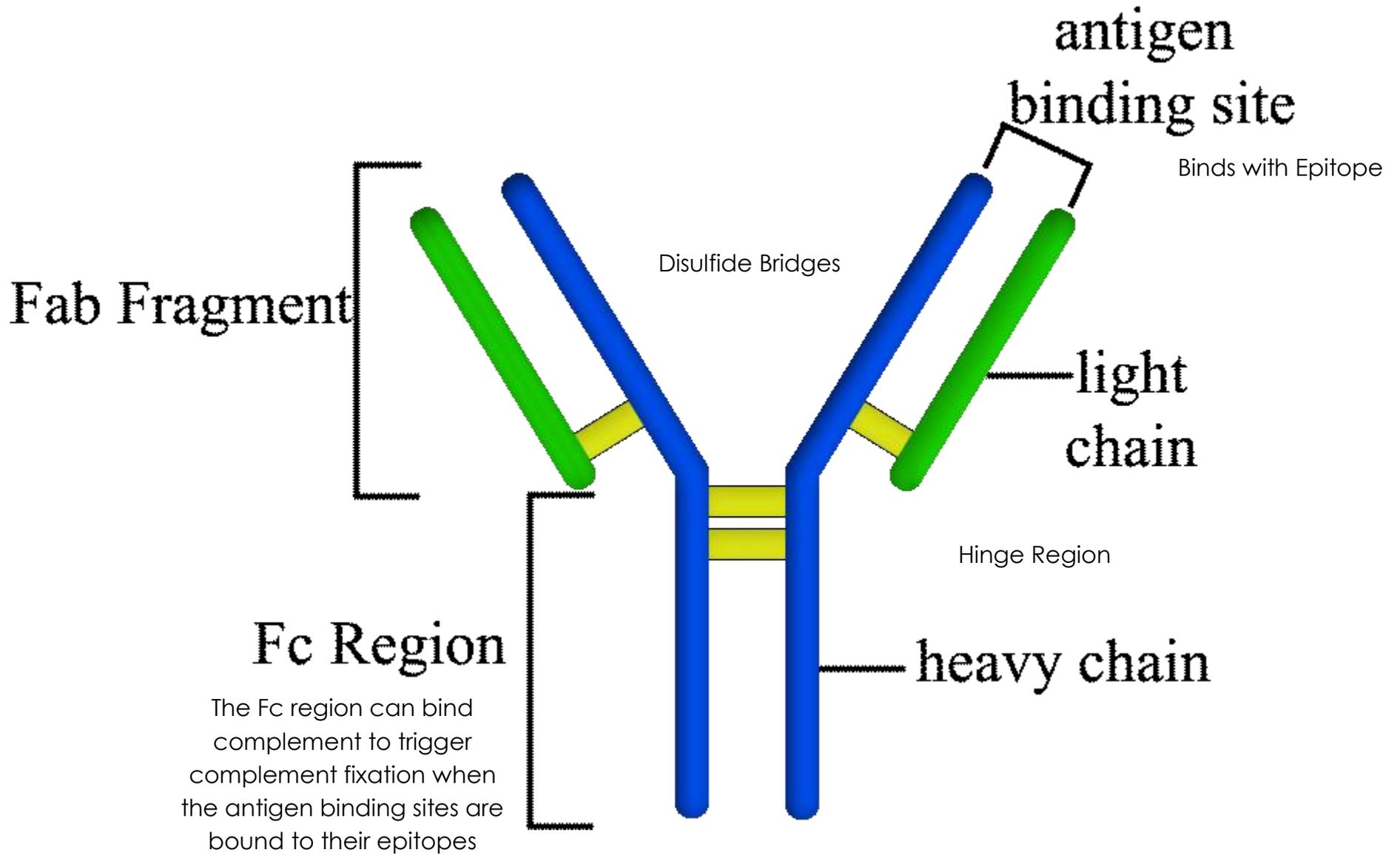
Immunology

Definition of Immunity

Immunity is the state of having sufficient biological defenses to avoid infection, disease, or other unwanted biological invasion. It is the capability of the body to resist harmful microbes from entering it



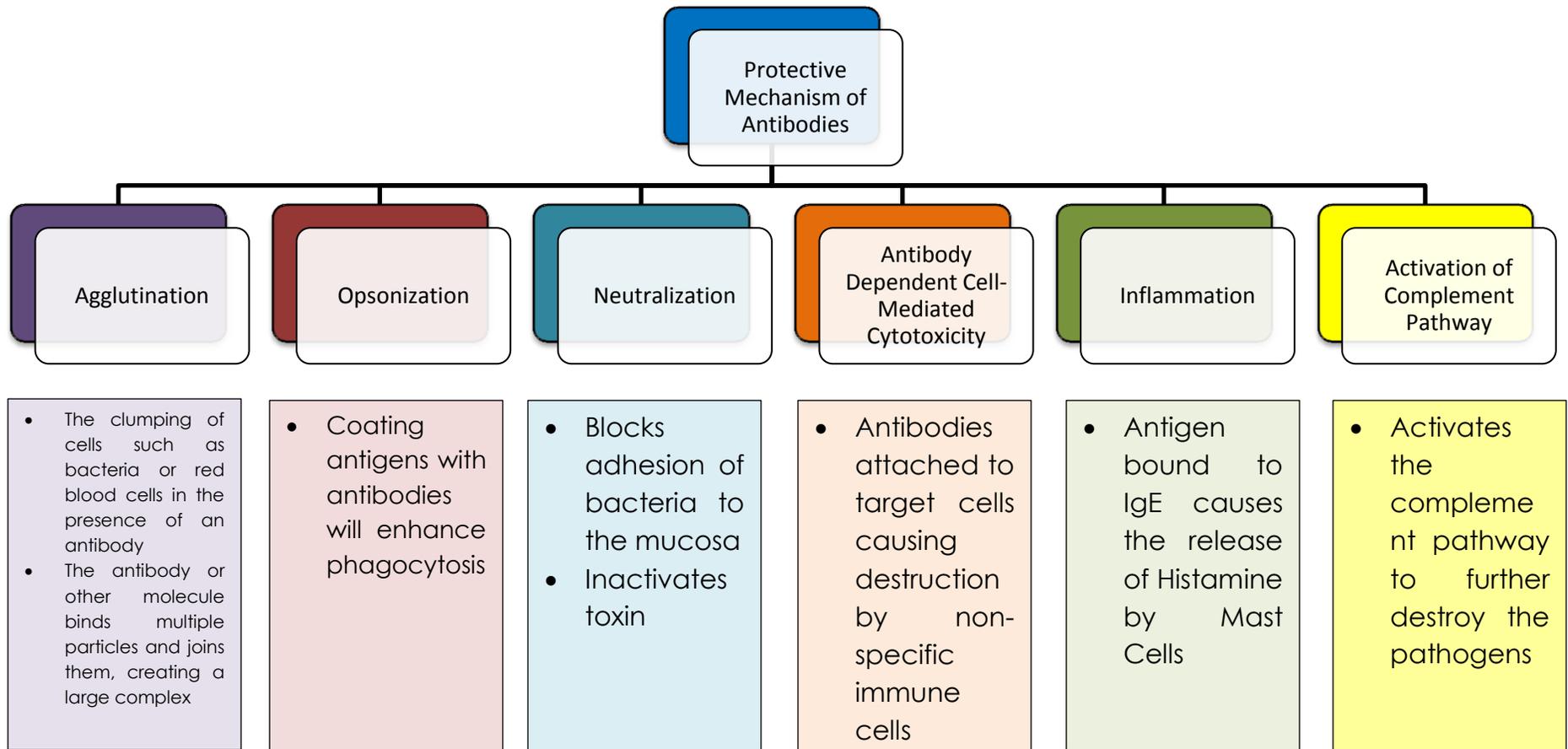
Molecular Structure of Immunoglobulin



Types of Immunoglobulin

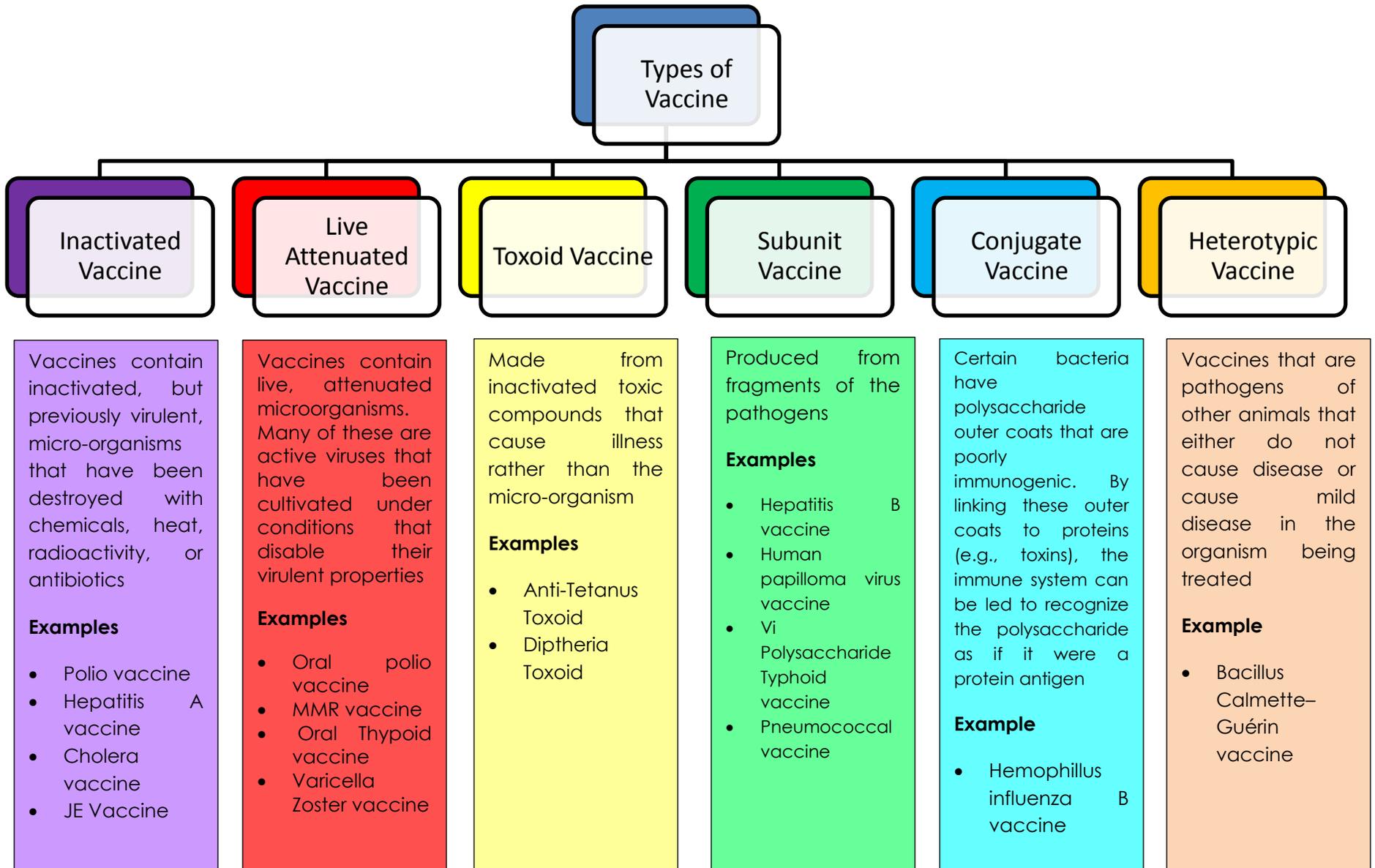
| IgG | IgA | IgM | IgD | IgE |
|--|---|---|--|--|
| <ol style="list-style-type: none"> 1. The most versatile <ol style="list-style-type: none"> a. Can carry out almost all functions of Ig <ol style="list-style-type: none"> i. Opsonization Enhance phagocytosis ii. Antibody Dependent Cell-mediated Cytotoxicity (ADCC) Fab – Target cells (tumours/microbes) Fc – NK cells, so NK will release substance to destroy the target cells iii. Activation of Compliment system iv. Neutralization of Viruses and toxins 2. All are MONOMERS 3. Involved in chronic Inflammation 4. Differ from each other based on <ol style="list-style-type: none"> a. No of disulfide bonds b. Length of hinge region 5. The most abundant 6. The only Ig can pass placenta <ol style="list-style-type: none"> a. Receptor on placental cell for Fc region of IgG 7. Binds to macrophages, PMNs and Lymphocytes | <ol style="list-style-type: none"> 1. Can be either <ol style="list-style-type: none"> a. Monomer – IgA1 <ol style="list-style-type: none"> i. 2 valencies b. Dimer – IgA2 <ol style="list-style-type: none"> i. 4 valencies 2. Major Ig found in colostrum of milk <ol style="list-style-type: none"> a. Protects neonate intestines from infection 3. Second most abundant 4. Types <ol style="list-style-type: none"> a. IgA1 <ol style="list-style-type: none"> i. Monomer ii. Found in serum b. IgA2/sIgA <ol style="list-style-type: none"> i. Dimer <ol style="list-style-type: none"> 1. Having J chain 2. Having Secretory piece/T piece <ol style="list-style-type: none"> a. Helps in transport in mucous b. And protects from degradation ii. Therefore important for 1st line immune response | <ol style="list-style-type: none"> 1. Structure <ol style="list-style-type: none"> a. PENTAMERIC structure b. 10 valencies c. All heavy and light chains are identical 2. Found in matured B Lymphocytes <ol style="list-style-type: none"> a. Once activated, undergo class switching 3. Third most abundant 4. 1st to produce during immunization 5. Fix compliment 6. Types <ol style="list-style-type: none"> a. Membraneous <ol style="list-style-type: none"> i. Monomer <ol style="list-style-type: none"> ii. 1st fetal Ig to be made iii. 1st Ig produce by virgin B lymphocytes after exposed to antigen b. Secreted <ol style="list-style-type: none"> i. Pentameric 7. Increase level indicates <ol style="list-style-type: none"> a. Recent infection 8. Involved in Acute Inflammation-agglutination | <ol style="list-style-type: none"> 1. Exists only in MONOMER <ol style="list-style-type: none"> a. 2 valencies 2. 2nd last to be found in serum 3. Uncertain role 4. Primarily found on B cells <ol style="list-style-type: none"> a. Receptor for antigens b. Antigen specific BCR (B Cell Receptor) 5. Has extra amino acids at C terminal for anchoring to plasma membrane | <ol style="list-style-type: none"> 1. Exist in MONOMER <ol style="list-style-type: none"> a. 2 valencies b. Extra domain in constant region 2. The least common in serum 3. Binds tightly to Fc receptors of <ol style="list-style-type: none"> a. Basophils b. Mast Cells <ol style="list-style-type: none"> i. Binds of antigen to these receptors, numerous mediators involved in allergic reaction will be released 4. Involved in allergic reaction 5. Involved in parasitic infection <ol style="list-style-type: none"> a. Binds to Fc receptor of Eosinophils b. Upon binding, stimulate destruction of helminthes |

Results of Antigen- Antibody Binding



Vaccines

- Biological preparation that improves immunity to a particular disease.
- A vaccine typically contains an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of the microbe, its toxins or one of its surface proteins.



Vaccinations in Malaysia

| Types of Vaccine | Features | Administrations | Major Side Effects | Contraindications |
|---|--|---|---|---|
| Bacillus Calmette–Guérin vaccine | <ul style="list-style-type: none"> • Types of heterotypic vaccine • Protects against <ul style="list-style-type: none"> ○ Military TB ○ TB Meningitis • Provides 60-80% immunity | <ul style="list-style-type: none"> • Intradermal injection <ul style="list-style-type: none"> ○ At insertion of Deltoid muscle • Given <ul style="list-style-type: none"> ○ After delivery ○ 6 years of age if no scar | <ul style="list-style-type: none"> • Keloid formation over injection site • BCG Adenitis | <ul style="list-style-type: none"> • Symptomatic HIV children |
| Hepatitis B Vaccine | <ul style="list-style-type: none"> • Types of subunit vaccine • Provides 85-90% immunity | <ul style="list-style-type: none"> • Intramuscular injection at <ul style="list-style-type: none"> ○ Vactus Lateralis • Given <ul style="list-style-type: none"> ○ After delivery ○ 1, 6 months old ○ 6 years old | <ul style="list-style-type: none"> • Fever • Flu like symptom • Rarely <ul style="list-style-type: none"> ○ Erythema multiforme ○ Urticaria | <ul style="list-style-type: none"> • Severe hypersensitivity to Aluminium |
| DTaP Vaccine | <ul style="list-style-type: none"> • Consists of <ul style="list-style-type: none"> ○ Diphtheria ○ Tetanus ○ Pertussis | <ul style="list-style-type: none"> • Intramuscular injection at <ul style="list-style-type: none"> ○ Vactus Lateralis • Given at <ul style="list-style-type: none"> ○ 2, 3, 5, 18 months old ○ Booster given at <ul style="list-style-type: none"> ▪ 6, 12 years old | <ul style="list-style-type: none"> • Local swelling and redness • Acute encephalopathy • Anaphylaxis | <ul style="list-style-type: none"> • Severe hypersensitivity towards <ul style="list-style-type: none"> ○ Alluminium ○ Thiomersal |
| Inactivated Polio Vaccine | <ul style="list-style-type: none"> • Provides 95% immunity towards poliovirus | <ul style="list-style-type: none"> • Intramuscular/ Subcutaneous injection • Given at <ul style="list-style-type: none"> ○ 2, 3, 5, 18 months old | <ul style="list-style-type: none"> • Local swelling | <ul style="list-style-type: none"> ***OPV • Sensitivity towards <ul style="list-style-type: none"> ○ Neomycin ○ Streptomycin • Within 3 weeks post-tonsillectomy • Diarrhea and vomiting |

| Types of Vaccine | Features | Administration | Major Side Effects | Contraindications |
|---|--|--|---|---|
| Haemophilus Influenzae B Vaccine | <ul style="list-style-type: none"> Type of conjugated vaccine Offers 95-100% immunity | <ul style="list-style-type: none"> Intramuscular injection at <ul style="list-style-type: none"> Vactus Lateralis Given at <ul style="list-style-type: none"> 2, 3, 5, 18 months old | <ul style="list-style-type: none"> Local reaction | NA |
| Measles Vaccine | <ul style="list-style-type: none"> Type of attenuated vaccine Offers 100% immunity Contain traces of <ul style="list-style-type: none"> Neomycin Polymycin | <ul style="list-style-type: none"> Subcutaneous injection at <ul style="list-style-type: none"> Anterolateral fat of the thigh Given at <ul style="list-style-type: none"> ONLY in Sabah 6 months old | <ul style="list-style-type: none"> URTI symptoms Fever between day 5 – 10 post vaccination Febrile fit Encephalopathy | <ul style="list-style-type: none"> Sensitive towards <ul style="list-style-type: none"> Neomycin Polymycin Anaphylaxis after egg ingestion |
| MMR Vaccine | <ul style="list-style-type: none"> Contained <ul style="list-style-type: none"> Mumps Measles Rubella | <ul style="list-style-type: none"> Subcutaneous injection at <ul style="list-style-type: none"> Anterolateral fat of the thigh Given at <ul style="list-style-type: none"> 12 months old 12 years old | <ul style="list-style-type: none"> Fever Arthritis | <ul style="list-style-type: none"> Severe reaction towards <ul style="list-style-type: none"> Eggs Neomycin |

Absolute Contraindication of Live Attenuated Vaccines

- Immunosuppression
 - Malignancy
 - Prolonged steroid therapy
 - Chemotherapy
- Another live vaccine (include BCG) has been given <4 weeks before
- Pregnancy

Other Malaysia's Ministry of Health Vaccines

| Types of Vaccine | | Features | Indications | Administration |
|--|----------------------------------|--|---|--|
| Pneumococcal Polysaccharide Vaccine | | <ul style="list-style-type: none"> Type of subunit vaccine Provides 56-81% immunity | <ul style="list-style-type: none"> Immunosuppression Asplenia Nephrotic syndrome Chronic lung disease | <ul style="list-style-type: none"> Intramuscular/ Subcutaneous injection Single dose Booster at 3-5 years old |
| Cholera Vaccine | | <ul style="list-style-type: none"> Types of inactivated vaccine 80-90% efficacy after 6 months 60% efficacy after three years | <ul style="list-style-type: none"> Endemic cholera | <ul style="list-style-type: none"> Oral 3 doses for 2-6 years old 2 doses for >6 years old |
| Meningococcal Vaccine | | <ul style="list-style-type: none"> Type of subunit vaccine 90-95% efficacy | <ul style="list-style-type: none"> Umrah and Hajji pilgrims | <ul style="list-style-type: none"> Intramuscular injection Single dose |
| Japanese Encephalitis Vaccine | | <ul style="list-style-type: none"> Type of inactivated vaccine Efficacy of >95% | <ul style="list-style-type: none"> Given in Sarawak | <ul style="list-style-type: none"> Subcutaneous injection In 3 doses Given at <ul style="list-style-type: none"> 9, 10, 18 months Booster at 4 years old |
| Rabies Vaccine | | <ul style="list-style-type: none"> Type of inactivated vaccine | <ul style="list-style-type: none"> Exposed to rabies | <ul style="list-style-type: none"> Intramuscular injection |
| Typhoid Vaccine | Vi Polysaccharide Vaccine | <ul style="list-style-type: none"> Type of subunit vaccine Offers 60-80% immunity | <ul style="list-style-type: none"> Food handlers | <ul style="list-style-type: none"> Intramuscular injection Single dose |
| | Oral Typhoid Vaccine | <ul style="list-style-type: none"> Type of live attenuated vaccine | | <ul style="list-style-type: none"> Oral 3 doses, 2 days apart Boosters every 3 years |
| Varicella Zoster Vaccine | | <ul style="list-style-type: none"> Type of live attenuated vaccine Offers 70-90% protection | <ul style="list-style-type: none"> Non-immune susceptible healthcare worker who comes in contact with VZ patient Asymptomatic to mildly symptomatic HIV children Children with leukemia in remission | <ul style="list-style-type: none"> Subcutaneous injection |
| Hepatitis A Vaccine | | <ul style="list-style-type: none"> Type of inactivated vaccine Provides 95% efficacy | | <ul style="list-style-type: none"> Intramuscular injection 2 doses, 6 months apart |

Differences Between Oral Polio Vaccine and Injectable Polio Vaccine

| Oral Polio Vaccine (Live Attenuated Vaccine) | | Injectable Polio Vaccine (Inactivated Vaccine) | |
|--|---|---|--|
| <ul style="list-style-type: none"> Elicited immunity from the GI tract First line defense against Polio infection | | <ul style="list-style-type: none"> Elicited immunity from the bloodstream Second line defense against Polio infection | |
| Advantages | Disadvantages | Advantages | Disadvantages |
| <ul style="list-style-type: none"> 100% immunity against polio infection Vaccine present in stool <ul style="list-style-type: none"> People who came in contact with immunized patient may get immunity (Contact Immunity) Best for endemic polio infection | <ul style="list-style-type: none"> Permanent paralysis (vaccine induced poliomyelitis) The weakened virus can revert to its original virulence form Stringent storage and transport requirement If given during diarrhea/ vomiting, the dose need to be repeated after 1 month If given within 3 weeks after tonsillectomy may cause <ul style="list-style-type: none"> Vaccine induced bulbar poliomyelitis | <ul style="list-style-type: none"> 95% immunity against polio infection DOES NOT cause paralysis Best for non-endemic region Will never revert to its original form | <ul style="list-style-type: none"> Doesn't provide contact immunity |