Antigens

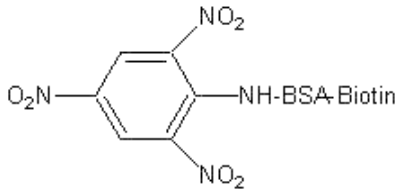
By
Dr. Gouse Mohiddin Shaik

Antigens

- Antigen
  - Anything that can react with product of immune response
- Immunogen
  - Anything that can induce specific immune system it can be cell mediated or humoral or both

Antigens

- All immunogens are antigens
- An antigen is only immunogenic under certain circumstances
  - Example – antigens of blood transfusion
- Haptens



  - It can react with product of immune response but can not elicit immune response
  - Example – TNP group of TNP-BSA

Immunization schedule

National Immunization Schedule — جدول التطعيمات الوطني

الزيارة Visit	التطعيم Vaccine	التاريخ Date	الأسم والتوقيع Name & Signature	الختم Stamp	تاريخ الزيارة التالية Next Visit Date
عند الولادة At Birth	• BCG درن • Hepatitis B التهاب كبدي (ب)				
عمر شهرين 2 months	• IPV شلل أطفال معطل • DTaP الثلاثي البكتيري • Hepatitis B الالتهاب الكبدي (ب) • Hib المستدمية النزلية • Pneumococcal Conjugate (PCV)* البكتيريا العقدية الرئوية* • Rota** فيروس الروتا**				
عمر ٤ شهور 4 months	• IPV شلل أطفال معطل • DTaP الثلاثي البكتيري • Hepatitis B الالتهاب الكبدي (ب) • Hib المستدمية النزلية • Pneumococcal Conjugate (PCV)* البكتيريا العقدية الرئوية* • Rota** فيروس الروتا**				
عمر ٦ شهور 6 months	• OPV شلل الأطفال الفموي • IPV شلل أطفال معطل • DTaP الثلاثي البكتيري • Hepatitis B الالتهاب الكبدي (ب) • Hib المستدمية النزلية • Pneumococcal Conjugate (PCV)* البكتيريا العقدية الرئوية*				
عمر ٩ أشهر 9 months	• Measles الحصبة المفرد • Meningococcal Conjugate quadrivalent (MCV4) الحمى الشوكية الرباعي المقترن				
عمر ١٢ شهر 12 months	• OPV شلل الأطفال الفموي • MMR الثلاثي الفيروسي • Pneumococcal Conjugate (PCV)* البكتيريا العقدية الرئوية* • Meningococcal Conjugate quadrivalent (MCV4) الحمى الشوكية الرباعي المقترن				
عمر ١٨ شهر 18 months	• OPV شلل الأطفال الفموي • DTaP الثلاثي البكتيري • Hib المستدمية النزلية • MMR الثلاثي الفيروسي • Varicella الجديري المائي • Hepatitis A الالتهاب الكبدي (أ)				
عمر ٢٤ شهر 24 months	• Hepatitis A الالتهاب الكبدي (أ)				
عند دخول الصف الأول الإبتدائي First class primary school age	• OPV شلل الأطفال الفموي • DTaP (Td)*** الثلاثي البكتيري (الثنائي البكتيري)*** • MMR الثلاثي الفيروسي • Varicella الجديري المائي				

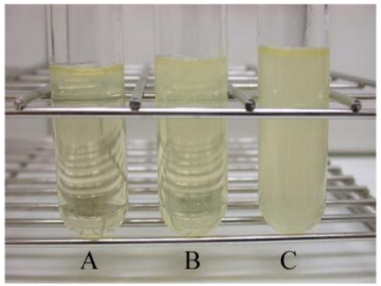
* لقاح البكتيريا العقدية الرئوية (PCV١٣).
** لقاح الروتا الأحادي.

* Pneumococcal Conjugate (PCV13).
** Monovalent Rota vaccine.

مع تحيات وكالة الصحة العامة - برنامج التحصين الموسَّع

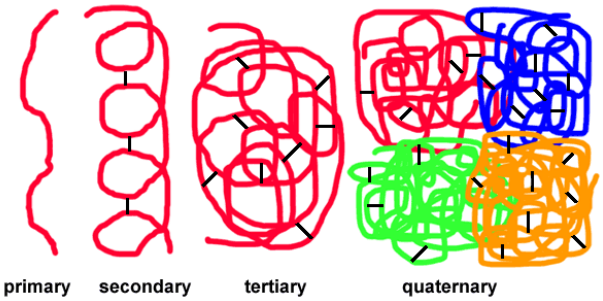
Factors effecting immunogenecity

- Foreignness
  - Self and non-self discrimination
- Size
  - Large molecules are better immunogens compared to small
  - Less than 10 KD are generally weak immunogens or acts a haptens
- Physical form
  - Particulate forms are more immunogenic than soluble



Factors effecting immunogenecity

- Chemical composition
  - More complex molecules are better immunogens
  - Polymer of different a.a is better than polymer of same a.a (poly L-lysin)
  - Primary structure forms – sequence determinants
  - Secondary, tertiary and quaternary structure forms – confirmatory determinants



Factors effecting immunogenecity

- Degradability
  - Degradable molecules are more immunogenic
  - Ag processing by APC
- Genetics of Biological system of host
  - Species differences
    - Pneumococcal polysaccharide do not have good response in rabbit but in mice very good response
  - Individual differences
    - Responders vs non responders

Factors effecting immunogenecity

- Age
  - Infants don’t have good response
  - Young and adult have good response
  - As we age immunity is lost also
  - Vaccines are given at childhood
- Method of administration
  - Dose
    - Optimal concentration is required
    - Too much Ag. Can lead to tolerance
    - Too less will be diluted and can not be useful

Factors effecting immunogenecity

- Method of administration
  - Dose
  - Route
  - Subcutaneous > Intramuscular > Intravenous > Intragastric (IgA)

Factors effecting immunogenecity

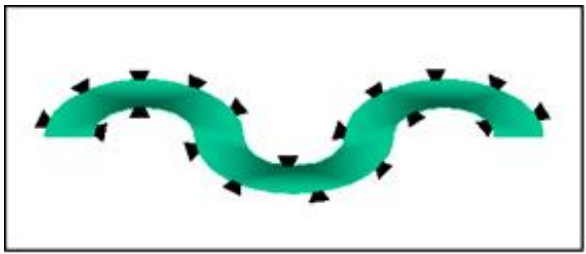
- Adjuvant
  - Substances that enhance immune response to Ag
  - Causes local inflammation
  - Example – complete freunds adjuvant, AlOH…

Factors effecting immunogenecity

- Chemical nature
  - Proteins
    - Are very good immunogens
  - Polysaccharides
    - Have large structure and variablity
  - Nucleic acids
    - In some disease conditions we can see antibodies against DNA (lupus)
  - Lipids
    - Some glycolipids and phospholipids can be immunogenic

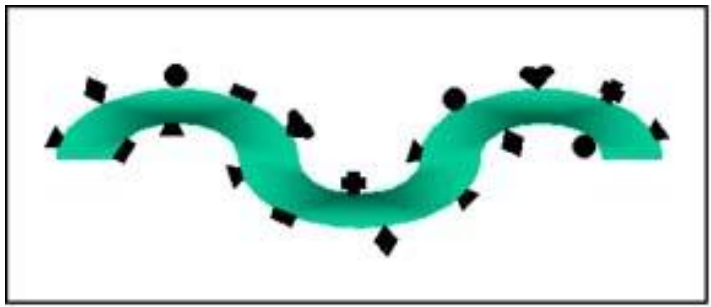
Types of antigen

- T-independent – don't need T cells
  - Example polysaccharides
  - Properties
    - Polymeric structure
    - Same epitope many copies
    - Poly clonal B cell activation
    - Resistant to degradation
  - Protein example
    - Flagella
    - Many copies of flagellin



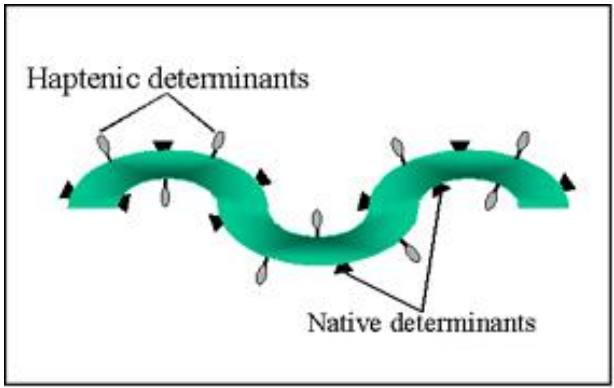
Types of antigen

- T-dependent – need T cells
  - Example Proteins
  - Proterties
    - Different kinds of epitopes not too many copies of each one
  - example
    - Microbial proteins
    - Altered self proteins…



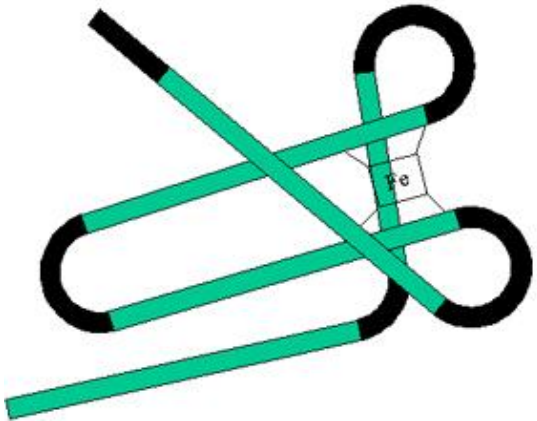
Types of antigen

- Hapten-carrier conjugates
  - Immunogenic molecule to which hapten is covalently attached
  - Have 2 classes of determinants
    - Native determinants of immunogenic molecule
    - Haptenic determinants of hapten



Antigenic determinants

- Antigenic determinants recognized by B cells and Ab.
- Composition
  - Proteins, Polysaccharides, nucleic acids, haptens
  - Sequence determinants (linear)
  - Conformational determinants (3D)
- Size
  - 4-8 a.a or sugar molecules

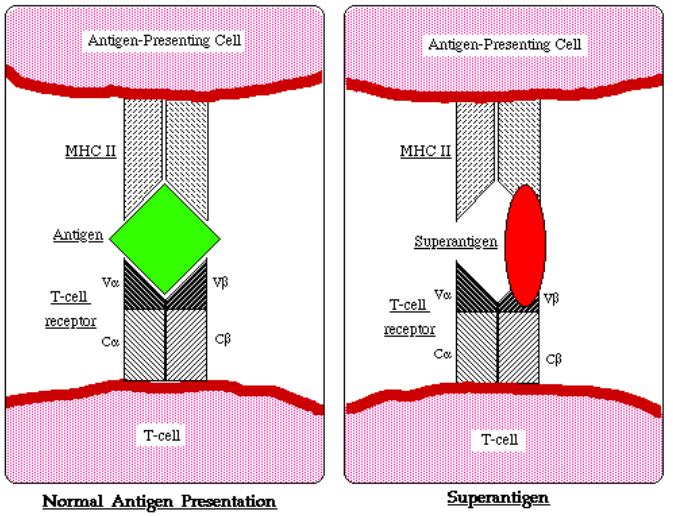


Antigenic determinants

- Antigenic determinants recognized by T cells
- Composition
  - By enlarge proteins
  - Some lipids also
  - No conformational determinants
  - Only Sequence determinants
    - Processed
    - MHC context is required
- Size
  - 8-15 a.a residues
  - Limited by the ability to bind to MHC

Super antigens

- Antigens capable of activating large population of T cells are called superantigens
- Usually <1% T cells are engaged
- There can be more than 20% of T cells are engaged in case of super antigens
- Huge amount of cytokines will be released leading to organ failure
- Example
  - Staph. Enterotoxin
  - Staph. Toxic shock toxin
  - Strep. Pyrogenic exotoxin



Sequestered antigens

- Antigen that is normally hidden from the immune response is called sequestered antigens
  - Examples include
    - Myelene basic protein (MBP) of nerves
    - Eye lens protein
    - Spermatozoa.

Humoral immunity

Next class……..