

## **Immunology Position Available: Now Accepting Applications Practical Applications of Immunology**

### **History of Vaccines**

- **Variolation:** inoculation of smallpox into skin (eighteenth century)
- **Vaccination:**
  - Inoculation of cowpox virus into skin
  - Inoculation with rabies virus (Pasteur)

### **Vaccines for Persons Aged 0–6 Years**

- Hepatitis B
- Rotavirus
- DTaP
- *Haemophilus influenzae* type b
- Pneumococcal
- Inactivated poliovirus
- Influenza
  
- MMR
- Varicella
- Hepatitis A
- Meningococcal

### **Types of Vaccines**

- **Attenuated whole-agent vaccines**
  - MMR vaccine
- **Inactivated whole-agent vaccines**
  - Salk polio vaccine
- **Toxoids**
  - Tetanus vaccine
- **Subunit vaccines**
  - Acellular pertussis
  - Recombinant hepatitis B
- **Nucleic acid (DNA) vaccines**
  - West Nile (for horses)

### **The Development of New Vaccines**

- Culture pathogen
- rDNA techniques
  - In plants
- Adjuvants
- Deliver in combination

### **Safety of Vaccines**

- Therapeutic index

- Risk-versus-benefit calculation

### **Diagnostic Immunology**

- **Sensitivity:** probability that the test is reactive if the specimen is a true positive
- **Specificity:** probability that a positive test will *not* be reactive if a specimen is a true negative
- **Immunologic-based tests**
  - Guinea pigs with TB injected with *Mycobacterium tuberculosis*: site became red and slightly swollen

### **Monoclonal Antibodies (Mabs)**

- **Hybridoma:** “immortal” cancerous B cell fused with an antibody-producing normal B cell
  - Produces **monoclonal antibodies**
- **Chimeric Mabs:** genetically modified mice that produce Ab with a human constant region
- **Humanized Mabs:** Mabs that are mostly human, except for mouse antigen-binding sites
- **Fully human antibodies:** Mabs produced from a human gene on a mouse

### **Hemagglutination**

- **Hemagglutination** involves agglutination of RBCs
- Some viruses agglutinate RBCs in vitro
- **Hemagglutination inhibition:** antibodies prevent hemagglutination

### **Enzyme-Linked Immunosorbent Assay**

- Also called ELISA
- Enzyme linked to Ab is the indicator

### **Serological Tests**

- Direct tests detect antigens (from patient sample)
- Indirect tests detect antibodies (in patient’s serum)
- **Precipitation:** soluble antigens
- **Agglutination:** particulate antigens
- **Hemagglutination:** agglutination of RBCs
- **Neutralization:** inactivates toxin or virus
- **Fluorescent-antibody technique:** antibodies linked to fluorescent dye
- **Complement fixation:** RBCs are indicator
- **ELISA:** peroxidase enzyme is the indicator