

HL Immune System 2

A. The Principle of Vaccination

1. The secondary response is much **faster** & **stronger** than the primary response.
2. We want to take advantage of this fact.
 - a. expose a person to a dead/weakened/related pathogen (injection)
 - b. this person develops many memory cells against the antigen
 - c. if exposed later to the pathogen, the person is unlikely to become ill
3. If the disease is very serious, you may want to vaccinate against it
 - a. bacterial diseases: diphtheria, whooping cough, tetanus
 - b. viral diseases: measles, polio, rubella
4. The deliberate exposure is usually an injection. To avoid becoming ill from this, the pathogen is weakened or killed, or a related strain is used (cow pox for small pox)
5. A second vaccination is sometimes given (booster shot) .

B. Monoclonal Antibodies

1. Process
 - a. Inject a mammal with the antigen
 - b. The mammal plasma cells will produce antibodies against the antigen
 - c. Extract the plasma cells
 - d. Fuse them with B-cell tumor cells (really!)
 - e. The resulting hybridoma cells will grow in culture & produce the Antibodies!

2. **Example 1 (blood typing)**

Inject a mouse with human type A blood cells. It makes antibodies against the human red blood cell. Extract the plasma cells. Fuse them with the B cell tumor cells. Grow them in culture. They will make antibodies against Human type A blood. This can be used to blood type a person. (If it clumps with their blood, they have type A cells.)

3. **Example 2 (pregnancy test)**

Obtain monoclonal antibodies against HCG. Fix them in place on a test stick. Add urine. If HCG is present in the urine, it will attach to the antibodies. The test is designed to give a color showing a positive test.

4. **Example 3 (Treatment of Rabies)**

- a. Rabies usually kills humans before the immune system can control it.
- b. Strategy: Vaccinate and give monoclonal antibodies
- c. the monoclonal antibodies protect until the vaccination induces the immune system to produce antibodies.

5. **Example 4 (Diagnosis of Malaria)**

- a. A test plate is coated with monoclonal antibodies for the antigens in the malarial parasites
- b. A sample is left on the plate long enough for antigens to bind to the antibodies.
- c. The plate is rinsed off.
- d. Any bound antigens are detected using more monoclonal antibodies with enzymes attached that cause color change.
- e. This is called an ELISA test.
- f. It can be used to measure the level of infection or the strain of malaria in humans or mosquitos.