

## Unit 9 - Immunological Memory

### Introduction

The immune system to work successfully it must recognize a large number of microorganisms and molecules that it has never seen before, and it must decide how to respond to them. It should also differentiate between self and non self antigens such as viruses, bacteria, parasites and toxins. The body to defend itself against non self specific invading pathogen it has developed a resistance referred as immunity. Immunity have a memory for most invading pathogens invaded before, and for this invading pathogen they form memory cells that can last for decades. During the second invasion the immune system remembers pathogen it has seen before leading the rapid proliferation of memory cells and stimulates the release of antibodies. These antibodies are capable of eliminating the pathogens before disease occurs referred as immunological memory. It is also proved that in vertebrates exposed to antigens in early life has resistance for the same antigen causing illness later. The concept of vaccination is based on immunological memory.

### Recognition

The immune system uses a large number of highly specific B and T cells to recognize antigen. The number of possible distinct antigens is to be in the range  $10^{12}$  to  $10^{16}$ . B and T cell receptors are stimulated by antigen. Typically around  $10^5$  B cells of an individual are stimulated by antigens. B-cells that are activated but not differentiate into plasma cells are transformed into memory B-cells. These memory cells can provide memory for longer period.

This was explained by theories like:-

- Memory cells live for a long time
- Memory cells are restimulated at some low level
- Small amounts of the antigen are retained in lymph nodes
- Related environmental antigens provide cross-stimulation

### Response

B and T cells that are stimulated by antigen divide, during division B cell receptor sometimes mutates leading to increase in the affinity of its daughter cells for the antigen. This B cells change into plasma cells and secrete antibodies which eliminate the antigen. Once the antigen is cleared the B cells with increased affinity for the antigen are selected for keeping memory for an antigen.