Genetic basis of generation of diversity in the immune response

A typical antibody molecule:

- Has two identical **heavy chains** and two identical **light chains**.
- The two **antigen-binding sites** are identical, each formed by the N-terminal region of a light chain and the N-terminal region of a heavy chain.
- Each **variable domain** of the antigen-binding site can be split into 3 regions of sequence variability termed the **complementarity determining regions (CDRs)** and 4 regions of relatively constant sequence termed the **framework regions(FR)**
- Both the tail (Fc) and hinge region are formed by the two heavy chains

Immunoglobulins classes: depending on the amino acid sequence of the constant region of the heavy chain: (IgG- gamma heavy chains IgM -mu heavy chains
IgA -alpha heavy chains IgD- delta heavy chains
IgE-epsilon heavy chains)

The main stages in B cell development:

- All of the stages shown occur independently of antigen.

Stem cell → pre B-cell → immature naïve B cell → **mature naïve B cell**
\----------in bone marrow----------/ \-----circulation through peripheral /
\ lymphoid organs----------/

- naïve B cells first activation by antigen → effector cells & memory cells
- second or later activation by antigen: memory cells and naïve B cells → effector cells & new memory cells

(The effector cells produce and secrete antibodies with a unique antigen-binding site.)