IV. Mutagenesis

Mutations cause a change in the sequence of DNA base pairs, this occurs either by the substitution of one base for another (these are known as point mutations) or by the insertion or deletion of a base or sequence of bases (these are known unsurprisingly as, insertion or deletion mutations).

Mutations arise as a result of environmental factors or errors that occur during synthesis: replication errors, insertions/deletions, UV induced base pair alterations, strand breaks and covalent crosslinking.

As the integrity of DNA is vital to the survival of the cell and reproduction there needs to be high fidelity replication (a good process) and repair mechanisms in place to correct any DNA damage that may occur.

A. Point Mutations

There are two main types of point mutations

Transitions: where a purine replaces another purine (A to G mutation) or a pyrimidine replaces another pyrimidine (C to T mutation)

Transversions: where a purine replaces a pyrimidine (C to G mutation) or a pyrimidine replaces a purine (A to C mutation)

1. Spontaneous DNA damage

   a. Deamination

      i. Of cytosine to form uracil which base pairs with adenine

      ii. Of adenine to form hypoxanthine which will base pair with cytosine

      iii. Of guanine to form xanthine which will base pair with thymine

   b. Depurination

      This is the loss of purine bases which results from the cleavage of the bond between the purine base and deoxyribose. This leaves a apurinic (AP) site in the DNA

2. Base mispairing

   An amino group (–NH₂) which is a hydrogen bond donor is able to tautomerise to an imino group (–NH) becoming a hydrogen bond acceptor