Characteristics of genomic DNA

Genome varies in: 1) base composition
2) complexity
3) gene composition

Base composition

GC content varies widely in prokaryotes (- for adaption to different environments)
BUT less variation in eukaryotes.

DNA melt curves - measure transition from dsDNA to ssDNA using UV absorption.

T_m - the temperature at which HALF the DNA is single stranded.

- the higher the GC content of the genome the larger the T_m (GC pairs have 3 H-bonds and AT pairs have only 2 H-bonds)

Melt curves differences are caused by: 1) differences in GC composition between species
2) identical GC composition but different distribution of nucleotides

Density gradient centrifugation - At very high speeds molecules of different densities separate into discrete bands in a Caesium Chloride (CsCl) gradient.

- The higher the GC content the heavier the DNA (GC - 9C, 2O, 8N; AT - 10C, 2O, 7N)

Density gradient centrifugation may reveals distinct bands. Low density bands of DNA are called **satellite DNA** and are composed of highly repetitive DNA with a low GC content.

Complexity

Reassociation analysis (Bimolecular reaction): cool denatured (ss) fragmented DNA slowly, the complementary sequences will eventually reassociate by base pairing

Reassociation rate of any two pieces of ssDNA will depend on - the size of the genome
- the **complexity** of the genome

(As larger genome contains more DNA needed to be reassociated; in more complex genome, sequences present in less copies – more time needed to find each other)

Reassociation is dependent on their concentration and follows second-order kinetics. The kinetics can be displayed as a **C_0t curve**, where C_0t = DNA concentration (C_0) multiplied by the incubation time (t).

Presence of repeated DNA sequences alters the shape of the C_0t curve

Repetitive DNA

Tandem – repeat units are placed next to each other in an array
— includes satellite, megasatellite, minisatellite, microsatellite

Interspersed – repeat units are randomly distributed around the genome
— Includes RNA transposons/retroelements, DNA transposons