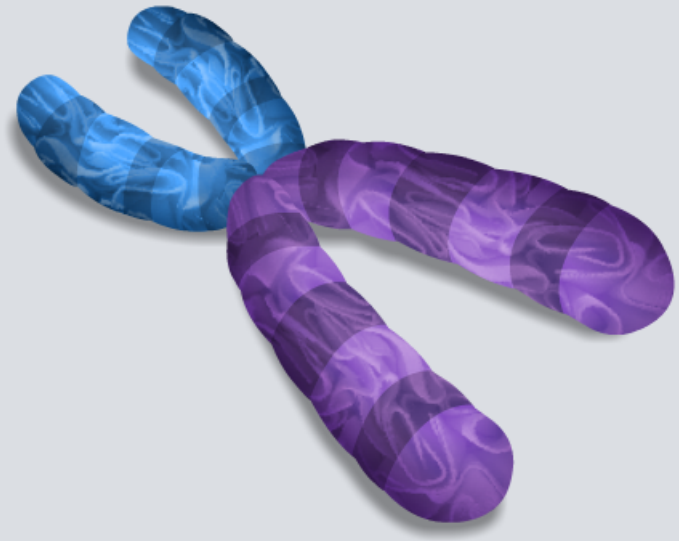
Understanding Genomes



Full genome sequencing

Full genome sequencing involves sequencing not only nuclear DNA, but also the DNA contained within **mitochondria** and **chloroplasts**.

With this vast quantity of information, comparisons can be made between individuals of the same species and between different species.

This gives us insights into evolutionary relationships, and differing responses to medical treatments.

Minisatellites

Genetic fingerprinting

A **genetic fingerprint** is created by looking at an individual's minisatellites. The choice of minisatellite is very important: the profiler needs to choose those minisatellites that show the most variation, to reduce the chance that two individuals could have matching fingerprints.

The main stages involved in genetic fingerprinting are:

1. **Extraction**
2. **Digestion**
3. **Separation**
4. **Hybridization**
5. **Development**

Genetic fingerprinting

Analyzing genetic fingerprints

A profiler can inspect genetic fingerprints by eye to make quick comparisons. This can be a useful tool in forensic science.

The process can also be automated with a computer using the marker bands to calculate the size and distance traveled by the bands in the profile.

It is sometimes necessary to consider the odds that somebody else in the population has the same DNA fingerprint as the one being studied. For instance, to assess the risk of a false criminal conviction.

The Human Genome Project

The **Human Genome Project** (HGP) was an international, publicly funded venture to sequence the three billion bases in the 20,000–25,000 genes of the human genome.

The project ran from 1990 to 2003, when a first full sequence was published. Corrections and further analyses have been added to the results over the following years, and are still being added today.

One of the subsidiary aims of the HGP was to study the ethical and social implications of the project, and to predict and discuss the legal issues that would arise. Can you think of any examples?

Designer drugs

One of the outcomes of the HGP is the development of new drugs. Drugs can be designed using the knowledge of protein structure, gained from the gene sequence information.

This reduces the need for trial and error and allows doctors to tailor specific treatments to their patients, depending on the exact nature of their condition.

Designer drugs can be used to treat the fundamental causes of a disease rather than just the symptoms.

How is a DNA profile created?