Testing for genetic variations using Quantitative PCR analysis (polymerase chain reaction)

Scottish secondary school curriculum:

Curriculum for Excellence Higher Biology

Working through the experiment and associated background material will revise and consolidate some key areas in the 'DNA and the genome' Unit in addition to understanding PCR itself. It is designed to be carried out sometime after Topic 2 'Gene expression' has been studied (rather than immediately after PCR in the course support notes) and it may be helpful to have also covered mutations in Topic 3 'Genome'.

Curriculum for Excellence Higher Human Biology

Working through the experiment and associated background material will revise and consolidate some key areas in Topic 2 'Structure and function of DNA' in the 'Human Cells' Unit in addition to understanding PCR itself. It is designed to be carried out sometime after Topic 2 has been studied.

Teacher notes

The experiment can be run over a number of lessons – about 2-3 hours in total - but can be condensed by just doing key activities. Some of the preparatory work could be done at home. These pages cover the necessary background material, and are designed for self-study. Alternatively, the content can be presented by the teacher in the classroom.

Preparatory pages:

- Testing for genetic variations using Quantitative PCR analysis (polymerase chain reaction)
- DNA to protein
- From DNA to RNA: transcription
- From RNA to protein: translation
- Gene variant
- Other variations – copy number
- Getting into the laboratory
- Thermal Cycling
- The PCR machine
- PCR setup video
- How many copies of a gene
- And now for our genetic tests
- Interpreting the data you'll get
- Using control samples
- So, let's do the experiment!

Students may like to pool data for the two genetic tests and three populations so that comparisons between populations can be made, or, where time allows, they may like to collect all the data themselves.

Teacher notes for ‘Collected data’ page

Questions refer to population A with the CYP2D6 *4 primer so it may be useful for all students to do this.

Students could then share results to check for errors by comparing replicates (should only be small variations in C_t values) and to compare populations. For example, each student/group could do both tests for one of the populations A, B or C, performing two replicates for each.