DNA Extraction at UK Biobank

During the initial recruitment of participants (2007-2010), samples were collected that could yield DNA. DNA extraction was deferred until such a time that a project required DNA and it was anticipated that the cost of extraction would be reduced.

In early 2013, DNA extraction begun on buffy coat samples and genotyping was performed on a custom Affymetrix Axiom array\(^1\).

**Overview of process**

DNA is extracted from 850 µl buffy coat (recovered from 9 ml of whole blood) on a customised TECAN Freedom EVO® 200 platform. The system incorporates peripheral equipment to provide a fully integrated DNA extraction solution;

- 2 x Promega Maxwell® 16 Instruments for DNA extraction
- 1 x Trinean DropSense® 96 for DNA quantification
- 1 x Brooks Tube Auditor™ for volume measurement
- 1 x Liconic STX44 Automated Incubator to ensure DNA is kept at correct temperature after extraction

**DNA Extraction Chemistry**

UK Biobank uses a customised version of the Promega Maxwell® 16 Blood DNA Purification Kit (AS1010), which uses magnetic bead technology to purify the DNA. The kit and protocol have been modified to optimise the DNA yield from a larger than typical volume of buffy coat (850µl); this includes additional lysis and wash buffer and an additional pass through the extraction process. DNA concentration and quality (assessed via 260/280) is assessed in each sample. The average DNA concentration is for is 37 ng/µl and 260/280 is 1.91 for ~275,000 DNA samples.

**Quality Control**

Several quality control checks are performed at UK Biobank to ensure the DNA extracted is of good quality;

- DNA concentration check – plates automatically pass extraction if >80% of the samples have a concentration >10 ng/µl
- DNA purity check – plates automatically pass extraction if >80% of the samples have a 260/280 between 1.8 and 2.2
- Inclusion of an extraction negatives on each plate
- Inclusion of blind spiked duplicate samples

**DNA for future projects**

50 µl of DNA is being utilised in the UK Biobank Genotyping project. The remaining DNA is split into two 425 µl aliquots and stored at UK Biobank for use in future projects. In addition to the DNA concentration and 260/280 recorded for each aliquot, the concentration obtained via PicoGreen at Affymetrix is recorded. The DNA concentration is used to ensure enough DNA can be provided for future projects.

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\(^1\) Detail on the Axiom array available from [http://www.ukbiobank.ac.uk/scientists-3/uk-biobank-axiom-array/](http://www.ukbiobank.ac.uk/scientists-3/uk-biobank-axiom-array/)