The Generation Scotland Donor DNA Databank

Introduction
The Generation Scotland Donor DNA Databank (GS:3D) is a research project funded through a grant award of £170,000 from the Chief Scientist Office. Professor Marc Turner (Clinical Director of SNBTS Edinburgh and Aberdeen Centres) is Chief Investigator and Professor David Porteous (Medical Genetics, University of Edinburgh) is Principal Investigator. Other SNBTS Clinical Investigators who supported the study were Dr Rhona Watkins, Dr Sam Rawnlinson and Dr Peter Forsyth. The aim of the study was to collect an ethically approved set of samples and data from thousands of blood donors throughout Scotland. This would establish a large, well managed resource of "control" samples of genetic material (DNA) from healthy people, to be made available to medical researchers for comparison with samples from patients who have any disease that has a genetic component.

Research into human disease often involves comparing genetic changes in patients (cases) with unaffected individuals (controls). If a particular genetic variant is found more often in cases than controls, it may contribute to disease risk. However, large groups of cases and controls are required for this kind of study. It can be very time-consuming and expensive to collect appropriate control DNA samples and this can hamper progress. Case samples will be unique to each disease study, but the same control samples can be used across many studies. Until now, the choice of control samples from the Scottish population has been limited.

GS:3D will lead to an improvement in the statistical power of many human genetics studies and avoid duplication of effort and expense. This project is complementary to other large population-based genetic studies, such as the Generation Scotland Scottish Family Health Study and the UK Biobank, and should facilitate replication of other findings in the field of medical genetics. There is some further background information about GS:3D on the website www.generationscotland.org.

Project Methods
Volunteers were eligible to participate if they were a) not first time donors, b) aged between 17 and 70, and c) fulfilled the stringent selection criteria for blood donors. Following introduction to the study, volunteers were given an information leaflet, a consent form, and a basic paper questionnaire about their age, sex and family origin. The paper questionnaire used optical mark read (OMR) technology similar to that used by the National Lottery. The consent form was completed before any samples were taken or questionnaires completed. Volunteers then returned the completed questionnaire, to which a spare SNBTS barcode label was added.

As part of the routine blood donation processing procedure, blood is filtered, and the used filters are an excellent source of genetic material (DNA). Filters marked as being part of the study were sent from the SNBTS Process & Testing laboratories in Edinburgh and Glasgow to the research laboratory (Wellcome Trust Clinical Research Facility (WTCRF), University of Edinburgh) for extraction (see pic 1). Blood samples taken from the prefiltration pouch were also received for preparation of plasma. Questionnaire data were entered on to a secure research database by OMR scanning (see pic2). Following anonymisation, there was no retained link to the SNBTS records about the donor. The collection of samples and data aimed to maximise the research benefit of each individual’s participation, while minimising disruption to the SNBTS and maintaining acceptability to the donor.

Key Results
After many months of planning, recruitment began in January 2008 and the rate of accrual to the study was up to 250 per week, until recruitment came to an end on 31st July. A total of 5,934 participants were recruited to the study by SNBTS donor services staff. A wide geographic area was covered, (see map), with samples collected from donation sessions in more than 140 locations. Participants had 28 days after participation to reflect on the study and exercise their right to withdraw. Only two people had to be taken out of the study because they asked to withdraw.

Recruitment progressed efficiently, with considerable enthusiasm to participate shown by the blood donors. 88% of participants recorded their ethnicity as “White-Scottish”, and 98% were in one of the “White” categories. 71% of participants had either three or four grandparents born in Scotland. Ethnicity data was in good agreement with the 2001 Census. The use of blood donors is therefore a highly effective way to collect a large scale resource of control DNA, both in terms of cost and efficiency.

Acknowledgements
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What Next?
DNA extraction and measurement of quantity and quality of the GS:3D samples is ongoing in the WTCRF Genetics Core laboratory, and is due to be complete by the end of 2008. Researchers wishing to use the GS:3D resource can apply through the Generation Scotland Access Policy, currently being finalised with reference to Wellcome Trust and Medical Research Council guidance. The resource is available for hypothesis-driven analyses and with appropriate ethical approval. The first few hundred DNA samples have already been used as controls, in support of colon cancer research and other applications are pending.

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