

UK Biobank Biomarker Panel

In order to enhance further the value of the UK Biobank resource to researchers, UK Biobank is measuring a wide range of biochemical markers from biological samples collected at baseline in all 500,000 participants.

The biomarkers selected for assay have been chosen because they are established risk factors for disease (e.g., lipids for vascular disease, sex hormones for cancer), diagnostic measures (e.g., HbA_{1c} for diabetes and rheumatoid factor for arthritis) or characterize phenotypes not otherwise well assessed (e.g., biomarkers for renal and liver function). See the table for the list of biomarkers to be measured.

UK Biobank's Enhancements Working Group (see Appendix 1) has been responsible for developing the present panel following extensive consultation with relevant experts (see Appendix 2) to identify biomarkers that are likely to be of most scientific relevance for studying a wide range of diseases.

The biomarkers are being measured in UK Biobank's purpose-built facility in Stockport using analytical methods that are robust, reliable and cost-effective.

Table 1. Biomarkers currently included in the panel

Biomarker	Sample Type	Supplier	Instrumentation	Analysis method
Cardiovascular:				
Cholesterol	Serum	Beckman Coulter	AU5800	CHO-POD
Direct Low Density Lipoprotein	Serum	Beckman Coulter	AU5800	Enzymatic selective protection
HDL-Cholesterol	Serum	Beckman Coulter	AU5800	Enzyme immunoinhibition
Triglyceride	Serum	Beckman Coulter	AU5800	GPO-POD
Apolipoprotein A	Serum	Beckman Coulter	AU5800	Immunoturbidimetric
Apolipoprotein B	Serum	Beckman Coulter	AU5800	Immunoturbidimetric
C-reactive Protein	Serum	Beckman Coulter	AU5800	Immunoturbidimetric - high sensitivity
Lipoprotein (a)	Serum	Randox	AU5800	Immunoturbidimetric
Bone and joint:				
Vitamin D	Serum	DiaSorin Ltd.	LIASON XL	CLIA
Rheumatoid factor	Serum	Beckman Coulter	AU5800	Immunoturbidimetric
Alkaline Phosphatase	Serum	Beckman Coulter	AU5800	AMP (IFCC)
Calcium	Serum	Beckman Coulter	AU5800	Arsenazo III
Cancer:				
SHBG	Serum	Beckman Coulter	Unicel Dxl 800	Two step sandwich immunoassay
Testosterone	Serum	Beckman Coulter	Unicel Dxl 800	One step competitive
Oestradiol	Serum	Beckman Coulter	Unicel Dxl 800	Two step competitive
IGF-1	Serum	DiaSorin Ltd.	LIASON XL	CLIA
Diabetes:				
HbA1c	RBC	Bio-Rad	VARIANT II Turbo	HPLC
Glucose	Serum	Beckman Coulter	AU5800	Hexokinase
Renal:				
Cystatin C	Serum	Siemens	ADVIA 1800	Latex enhanced immunoturbidimetric
Creatinine	Serum	Beckman Coulter	AU5800	Enzymatic
Total protein	Serum	Beckman Coulter	AU5800	Biuret
Urea	Serum	Beckman Coulter	AU5800	GLDH, kinetic
Phosphate	Serum	Beckman Coulter	AU5800	Phosphomolybdate complex
Urate	Serum	Beckman Coulter	AU5800	Uricase PAP
Creatinine (enzymatic)	Urine	Beckman Coulter	AU5400	Enzymatic
Sodium	Urine	Beckman Coulter	AU5400	ISE
Microalbumin	Urine	Randox	AU5400	Immunoturbidimetric
Potassium	Urine	Beckman Coulter	AU5400	ISE
Liver:				
Albumin	Serum	Beckman Coulter	AU5800	BCG
Direct Bilirubin	Serum	Beckman Coulter	AU5800	DPD
Total Bilirubin	Serum	Beckman Coulter	AU5800	Photometric colour
Gamma Glutamyltransferase	Serum	Beckman Coulter	AU5800	IFCC
Alanine aminotransferase	Serum	Beckman Coulter	AU5800	IFCC
Aspartate aminotransferase	Serum	Beckman Coulter	AU5800	IFCC

APPENDICES

Appendix 1: Enhancements Working Group and UK Biobank Coordinating Centre team

Professor Paul Elliott (Chair; London)
Dr Ioanna Tzoulaki (Secretariat; London)
Professor Mark Caulfield (London)
Professor Rory Collins (Oxford; UK Biobank)
Dr John Gallacher (Cardiff)
Professor Alan Silman (Manchester)
Professor Nick Wareham (Cambridge)

Dr Naomi Allen (UK Biobank; Oxford)
Mr Daniel Fry (UK Biobank; Manchester)
Dr Tim Peakman (UK Biobank; Manchester)
Dr Michael Hill (Oxford)
Prof Cathie Sudlow (UK Biobank; Edinburgh)
Dr Shilla Mutamba (UK Biobank; Manchester)
Dr Simon Sheard (UK Biobank; Manchester)

Appendix 2: Experts consulted for biomarkers to be included (in addition to members of the Enhancement Working Group)

Professor Jane Armitage (University of Oxford)
Professor Peter Burney (Imperial College, London)
Dr Karen Canfell (University of Sydney, Australia)
Dr Robert Clarke (University of Oxford)
Professor John Danesh (University of Cambridge)
Dr Paul Foster (Moorfields Eye Hospital, London)
Dr Silvia Franceschi (International Agency for Research on Cancer, Lyon, France)
Dr Marc Gunter (Imperial College, London)
Professor Ian Hall (University of Nottingham)
Dr Anna Hansell (Imperial College, London)
Dr Nick Harvey (MRC Life-course Epidemiology Unit, University of Southampton)
Dr Debbie Jarvis (Imperial College, London)
Professor Tim Key (University of Oxford)
Professor Michael Kidd (Flinders University, Adelaide, Australia)
Professor Dave Leon (London School of Hygiene & Tropical Medicine, London)
Professor Gordon Lowe (University of Glasgow)
Dr Teri Manolio (National Institute of Health, Bethesda, USA)
Professor Stephen MacMahon (George Institute, University of Sydney, Australia)
Professor Naveed Sattar (University of Glasgow)
Professor Liam Smeeth (London School of Hygiene & Tropical Medicine, London)
Professor David Strachan (St George's Hospital, London)
Professor Martin Tobin (University of Leicester)
Professor Paolo Vineis (Imperial College, London)
Professor Cyrus Cooper (MRC Life-course Epidemiology Unit, University of Southampton)