



The importance of wider routine assays

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Value of biomarkers



DIAGNOSIS -

PREDICTION – of complication or outcome (CVD,
DM, NASH, dementia, etc)

PATHOPHYSIOLOGY – Identify causal pathways

RESPONSE – Guide therapy choice



34 Biomarkers in Red Blood Cells, urine and serum
Measurement in baseline and repeat assessment samples

Liver

- Albumin
- Direct Bilirubin
- Total Bilirubin
- GGT
- ALT
- AST

Renal

- Creatinine
- Cystatin C
- Total protein
- Urea
- Phosphate
- Urate
- Creatinine
- Sodium
- Potassium
- Albumin

Bones & Joints

- Vitamin D
- Rheumatoid factor
- Alkaline Phosphatase
- Calcium

Diabetes

- HbA1c
- Glucose

Cardiovascular

- Cholesterol
- Direct LDL-c
- HDL-c
- Triglyceride
- ApoA
- ApoB
- CRP
- Lp(a)

Cancer

- SHBG
- Testosterone
- Oestradiol
- IGF-I

NT proBNP: Natriuretic Peptides Studies Collaboration (2016) *Lancet D/E*
hs troponin: Willeit.....Sattar (2017) *JACC*

NT proBNP >> HDL-c for many outcomes e.g. CHD DEATH

	No. of		Risk ratio (95% CI)		
	Cohorts	Events	Top vs. bottom third of NT-proBNP (■)	Bottom vs. top third of HDL-cholesterol (□)	
Individual outcomes					
CHD	34	4716	1.75 (1.50, 2.05)	1.90 (1.68, 2.15)	
Fatal CHD	21	1044	2.49 (1.79, 3.49)	1.48 (1.22, 1.80)	
Non-fatal CHD	34	3643	1.55 (1.33, 1.81)	2.04 (1.77, 2.35)	
Stroke	29	3760	1.85 (1.59, 2.14)	1.37 (1.15, 1.63)	
Ischemic stroke	16	2565	1.73 (1.40, 2.14)	1.47 (1.19, 1.81)	
Hemorrhagic stroke	14	534	1.67 (1.28, 2.20)	1.05 (0.79, 1.40)	
Unclassified stroke	12	465	2.10 (1.53, 2.88)	1.30 (0.94, 1.79)	
Heart failure	14	2008	3.30 (2.55, 4.26)	1.28 (1.08, 1.51)	

Infectious agent	Seroprevalence in 10,000 UK Biobank (%)	Published prevalence in UK (%)
HSV-1	70%	60–70%
HSV-2	16%	10%
VZV	92%	90%
EBV	95%	90%
CMV	58%	50%
HHV-6	91%	80–90%
HHV-7	95%	80–90%
KSHV	8.1%	5–7%

Infectious agent	Seroprevalence in 10,000 UK Biobank (%)	Published prevalence in UK (%)
HBV	2.5%	0.5%
HCV	0.3%	0.4%
HIV	0.2%	<0.2%
HTLV1	1.6%	1%
HPV 16 & 18	4.4%	1–3%
BKV & JCV	75%	50%
MCV	67%	70-80%
<i>C.Trachomatis</i>	21%	15-25%
<i>H.Pylori</i>	32%	50–60%
<i>T.gondii</i>	28%	20-50%

Method

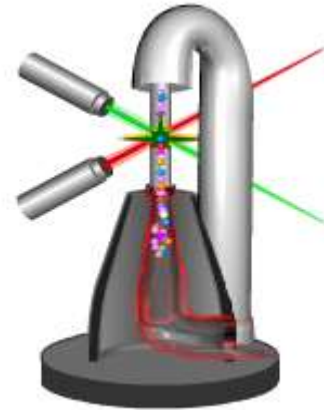
- Luminex technology to measure antigens to 20 pathogens
 - Bespoke panel
 - Small serum volume (10 ul)
 - Automatable high through-put

Validation and pilot

- Collaboration with German Cancer Research Centre (DKFZ)
- Validation of assay's Luminex vs. standard methods
- Pilot study to measure sero-prevalence of pathogens in 10,000 UK Biobank samples

Timeline

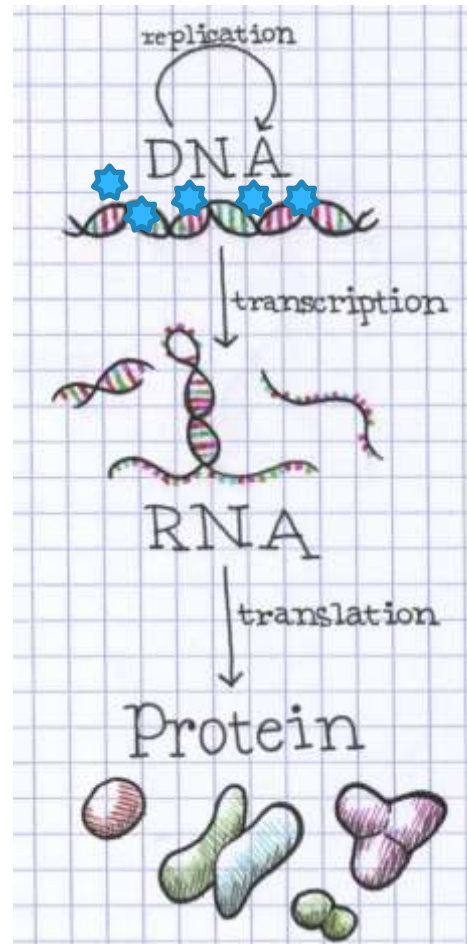
- Timeline: 3 years to measure 500,000 participants in UKB laboratory (subject to funding)



Many more platforms/ options

Epigenomics

Chemical changes to the DNA and histone proteins of an organism



Cell behaviour

Genomics

All the sequences in the genetic material of an organism

Transcriptomics

RNA species present in a cell at a given point in time

Proteomics

Proteins and their modifications expressed in a cell at a given point in time

Metabolomics

The small-molecule complement of a biological sample

Biomarkers galore, more opportunities but huge challenges ahead

- Lots of established assays coming
- Submitted applications for infectious agents
- Developing application for cardiac biomarkers

- Opportunities for new assays –
 - ◆ Wide choice
 - ◆ Robustness, coverage, scientific value and value for money

