Life Sciences in the UK: Building on the UK Biobank Experience

John Bell
Life Sciences Industrial Strategy
– A report to the Government from the life sciences sector
Highlights of the Life Sciences Strategy

• Strengthen Science base, support higher risk science
• Enhance Clinical trials and translational science
• Facilitate the scaling of innovative companies
• Establish capacity for discovery and manufacturing new generation of therapeutics (cells, viral vectors, nucleic acid based therapy)
• Resolve the adoption problem in the NHS
• Create three new industries in Life Sciences in the UK
‘Establish the basis for three new Life Science Industries in the UK’

GENOMICS:
Sequencing Technology
Precision medicine
Target Discovery
Genotype; Phenotype
Public Health

Investment £600m
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Large Scale clinical datasets optimised for applications in clinical trials RWD, AI and algorithms for drug discovery, improved diagnostics and increasing efficiency of health care

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**EARLY DIAGNOSIS**
New approach to medicine enabled by new technology and completely new care pathways. Relevant to Diagnostics, Digital and Pharma. Can only be developed in a single payer environment. Enabled by range of new technologies

Investments: £300m to create infrastructure.
Genomics

- Sequencing 500,000 genomes in UKB
- Commissioned sequencing of 100,000 rare disease genomes pa by Gel each year for NHS
- Modernizing Microbiology to convert PHE microbiology to sequencing,
- Neonatal screening
- Cancer sequencing 50,000 genomes pa
- Expand platforms to BGI and Oxford Nanopore
- Obtain polygenic risk scores on 5 million people.
Large Scale Genomics

UK Biobank 500,000 SNPS 820k completed Exomes; 2 years Genomes 2 years

Consented and linked to routine health care data

GeL 100,000 genomes in cancer and rare disease completed 100,000 rare disease patients for 5 years

Early diagnostic Cohort 5 million participants SNP panel in all for Polygenic risk score followed by sequencing, Repeated sampling of high risk populations
Big Data Driving AI enabled clinical decisions

- Digital Pathology
- Imaging
- Therapies
- Clinical Phenotype
- Lab tests
- Digital monitoring
- Genomics

Algorithms for diagnosis, therapeutic responses, natural history, clinical decision support
Creating a Unique Digital Environment for Health

• Data assets on 65 million people
• Complete GP records for 15 years for all 65 million
• Coded hospital admission data
• Registries and cohorts
• Genomic enrichment in 5 million
• Hospital data improving
• Networks for Digital pathology and Radiology AI

• Strong Machine learning community: Turing Institute and BDI
• Novel approach for raising capital for curation and structuring ‘FLATIRON in a healthcare system’
• National standards
• NHS Digital
• Digital Hubs
Early Diagnostic Cohort

• Create 5 million person cohort
• Enable the testing of new diagnostic tools for early diagnosis
• Create high risk subcohorts using Polygenic Risk scores and environmental data for most common diseases
• Recruit and test new therapeutic interventions for early disease
• Enable digitally enabled behaviour change and public health interventions.
This proposal looks to harness new early diagnostics and enhanced risk stratification to enable research into interventions in early disease, especially in pre-symptomatic stage.

Consented 5 million healthy individuals aged 30-75

Consented to participate and provide access to NHS health records

Engaging digital environment with Apple, enables easy recruitment for clinical trials + behaviour change studies

Polygenic risk scores on all 5 million + enter into digital environment.

Discovery cohort 1 million people

Repetitive annual samples

Genetically risk stratified digital cohort 4 million people

Repeated invitro testing and imaging in high risk sub-pop

Case control studies on samples

Therapeutic trials in high-risk subpopulation

1 million give repeated blood sample

Information to NHS patient record

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