Clinical Research Infrastructure
Enhancing UK’s Clinical Research Capabilities & Technologies

- **At least £150m** to establish /develop cutting-edge technological infrastructure, UK wide.

- to bring into practice novel technologies & address major scientific challenges relating to the stratification of diseases or experimental studies in man

- Partnership with the Department of Health, the Wellcome Trust, CRUK, BHF, ARUK, BBSRC, EPSRC and ESRC - ongoing dialogue with Devolved Administrations

- Infrastructure will form part of the national science base

- All UK universities with medical schools are eligible to apply

- Investments will be made in close proximity to clinical investigation and care

- Co-creation/partnership with industry, and interaction with existing clinical research infrastructure is encouraged
Enhancing UK’s Clinical Research Capabilities & Technologies - themes

1. Innovative technologies for stratified and experimental medicine – largest area for funding

2. Dementias research

3. Single cell functional genomics
Enhancing UK’s Clinical Research Capabilities & Technologies - themes

1. Innovative technologies for stratified & experimental medicine:

- Molecular tools and technologies (genomics, proteomics etc) for characterisation and diagnostics - potential to advance stratification and experimental studies in humans.
- Integration of next-generation clinical imaging and clinical sensing in research (MRI, PET, portable/implanted monitoring).
- Ex-vivo analysis of samples, remote sensing of physiological functions, real-time visualisation of disease processes.
2. Dementias

- Up to £50m earmarked for dementias technology enhancements for clinical research.

- Investment to be delivered in two ways:
  - Explicitly aligned with the UK Dementia Platform
  - Aligned with individual HEI dementias research agendas

- In either scenario, a strong case can be made to add value by coordinating work through UKDP.

- Fits well with the concept of UKDP as infrastructure to generate internationally competitive research.
UK Dementias Research Platform (UKDP)

• UKDP will be a national platform, integrating UK strengths in neuroscience, population science and clinical research capability.

• Will build on and connect ongoing MRC cohort/other infrastructure investment (e-health; phenome analysis) to allow:
  ▪ pre-symptomatic characterisation
  ▪ experimental medicine studies in patients with mild forms of dementia
  ▪ consideration of non-CNS influences and comorbidities

• Will include intensive/frequent phenotyping at scale, to help stage neurodegeneration progression and inform patient stratification.

• Linkage to NHS clinical records.

• Data sharing protocols and consenting arrangements in place.
Objectives for UKDP

**Near term**
- Use full range of well-characterised cohorts as a substrate for stratification
- Stage progression using existing measures, eg. cognitive profile
- Additionally measure physiological performance and metabolic change (eg. cardiovascular, lung, kidney)
- Combine physiological data with genetics and imaging

**Mid term**
- Convert cohort subgroups to intervention platforms for EM
- Consider stratifying individuals already at high risk of familial ND for intervention studies (diet or lifestyle or social changes)

**Long term**
- Develop and validate new biomarkers for early diagnosis
- Testing of new pharma approaches to modify disease
Dementias – next steps

• UKDP has been asked to discuss with the community and prepare options at £15m, £25m and £35m investment levels in readiness for EoI submission.

• Individual HEIs also encouraged to submit EoI.

• Areas for consideration include imaging, omics, informatics and cell modelling.

• Goal: world-class UK dementia related research facilities for the next 5-10 years.
New technologies now support the analysis of rare cell populations and cellular heterogeneity at the single cell level – critical to our understanding of biology and disease.

Rare cells are often important in normal function – e.g. circulating tumour cells, stem cells, ‘adaptive’ immune cells.

Heterogeneous cell populations in tissues. Average-cell readouts often obscure important differences occurring at the single-cell level:

- tumour cell populations – molecular and cellular drivers of proliferation and pathology
- regenerative medicine – unpicking regenerative capacity within heterogeneous stem cell populations
- rare diseases - pre-implantation genetic diagnosis of embryos for rare disease prevention

Cell manipulation and imaging
- **Laser capture micro-dissection** and **micro-fluidics** – cell isolation from tissues
- **Flow cytometry (FACS)** – targeted separation and study (e.g. protein networks in single cells)
- Fluorescence **imaging** – measure levels and locations of multiple proteins in individual cells at high temporal resolution

Genomics, transcriptomics
- Single cell PCR, microarrays, DNA and RNA sequencing
- Studying somatic mutations/DNA rearrangements
- Gene expression profiling

Proteomics and metabolomics
- Mass spectrometry (e.g. MALDI and SIMS) can profile complex protein and metabolic mixtures at the single-cell level
Enhancing UK’s Clinical Research Capabilities & Technologies - timeline

- **January 7** – EOI submission deadline
- **January 20** – feedback on outline
- **February 10** – outline submission deadline
- **March 12** – feedback on outline
- **April 14** – full application submission deadline
- **July (end)** – funding decisions