A PICTURE OF HEALTH

Thousands of people in Manchester and the north west of England will be the first to undergo detailed imaging of their brains, hearts, bones and blood vessels, as part of a major enhancement to the UK Biobank project.

The images will help scientists to study a wide range of diseases including dementia and cancer, and heart, bone and brain disorders.

It is hoped that UK Biobank participants, who first volunteered for the project around six years ago, will help again to create the most detailed study of its kind ever undertaken.

Building work is completed on the multi-million pound imaging centre at the UK Biobank headquarters in Cheadle, Stockport in preparation for the start this spring. Two magnetic resonance imaging (MRI) scanners (weighing 7 and 5 tons, respectively) will obtain many of the crucial images.

This next phase of the UK Biobank project is the biggest and boldest yet. Researchers have never attempted to image so many people and the additional information it provides for research may help to transform understanding of illnesses that cause disability, pain and premature death.

The scanning centre, and other developments within the Resource, will help maintain UK Biobank's presence at the heart of health research for decades to come.

ABOVE: Imaging will provide data on a wide range of illnesses, including dementia.

RIGHT: The next phase - taking delivery of a new MRI scanner.

Professor Rory Collins, UK Biobank Principal Investigator, said: ***"UK Biobank is one of the major health research success stories of recent decades. It is inspiring that so many people want to contribute in this way to tackle disease.***

"Adding this detailed extra information from imaging will help in many ways. For instance, it should identify early changes that increase the risk of developing a disease, and it may suggest new ways to slow that process, or to prevent the disease altogether."

The project aims to image 100,000 participants over the course of the next few years from around the UK.

The first invitations go out in early Spring, with thousands more to follow. Once the Manchester imaging centre is up and running, the same exercise will be repeated in other centres around the country over the next few years. This will give many participants the opportunity to help in this pioneering piece of research.

More information on our website at **www.ukbiobank.ac.uk**

RESEARCH HIGHLIGHTS

Q: What do these cities have in common? Aberdeen; Cambridge; Cardiff; Edinburgh; Exeter; Glasgow; Hong Kong; Leicester; Limburg, Netherlands; Linkoping, Sweden; London; Manchester; Nottingham; Oxford; Philadelphia, USA; Sydney, Australia.

A: They are all home to research using the UK Biobank Resource.

Studies include:

Rheumatoid arthritis: UK Biobank data are being used to study rheumatoid arthritis, a common type of arthritis that causes pain, stiffness and disability. The illness affects more than 600,000 people in the UK. Researchers know that some people are more prone to the disease because of their genes, but lifestyle factors such as smoking are important. Using UK Biobank information, researchers will create the world's largest pre-clinical group of patients, who have antibodies to the disease but as yet have no symptoms. This will allow them to ask lots of questions about how and why the disease develops.

"...retina allows easy non-invasive observation..."

Eye images: The eye images provided by UK Biobank participants are being used to investigate diabetic retinopathy (the commonest cause of vision loss in working age individuals), age-related macular degeneration (commonest cause of vision loss in the elderly) and glaucoma (commonest cause of vision loss globally). They are also helping scientists study myopia and retinal detachment, hypertension, stroke, cardiovascular disease and neurodegenerative diseases. The retina is one of the few places in the human body that allows easy, non-invasive observation of blood vessels, and there is mounting evidence that features associated with retinal vessels are early indicators of disease.

Prostate Cancer: UK Biobank data will help scientists to clarify what factors (including height and weight, diet, alcohol intake, physical activity) are associated with risk of developing prostate cancer and the mechanisms through which they may exert an effect.

Depression: Researchers will use UK Biobank data to study the role diet may play in causing depression, an illness that is common and costly to the individual and society. Genetic makeup accounts for about 1/3rd of the risk and environmental factors for about 2/3rds, of which psychosocial adversity and stress are important. Little is known about how diet and obesity-related disorders may impact on depression though it is thought that they do. It is possible diet could be modified to offset the biochemical consequences of genetic risk.

Cancer, heart disease, diabetes and shift work: Researchers expect UK Biobank data to help them gain a better understanding of the possible relationship between shift work and disease. They will compare participants who did and did not report shift/ night work against a wide range of illnesses. Previous studies have been inconclusive, but some researchers posit that disturbed patterns of certain hormones due to electric light at night, disturbed sleep or other lifestyle risk factors could put some workers at higher risk of disease.

"...world's largest pre-clinical group of rheumatoid arthritis patients..."

Reproductive timing and wellbeing in women: Reproductive timing in women (ages at first period and menopause) is associated with various diseases, such as type 2 diabetes, cardiovascular disease and breast cancer. Data from UK Biobank participants will provide an excellent opportunity to confirm these associations and identify their mechanisms. The team will also identify factors that influence risk of early menopause, which is one of the leading causes of infertility in the western world and becoming an increasing problem as more women choose to delay having children until their 30s.

BLOOD ANALYSIS

The UK Medical Research Council, Wellcome Trust, British Heart Foundation and Diabetes UK have provided a further £10 million to UK Biobank to allow analysis of blood samples to take place.

Experts have helped UK Biobank to draw up a list of the most useful blood tests which will be of interest to a wide range of researchers. They include biomarkers which are strong risk factors of disease (e.g. cholesterol for heart disease); early diagnostic markers of disease; and biomarkers that can help characterise liver function and kidney function (e.g. liver enzymes as markers for liver function, creatinine and protein for kidney function). As with other aspects of the project, and in accordance with the original consent, there will be no feedback of individual results to participants.

"This is a fantastic commitment by the funders to UK Biobank," says **Professor Rory Collins**, pictured, UK Biobank Principal Investigator. ***"It means that the scientists themselves will not have to find the funding to do these commonly sought tests, which will make UK Biobank an even more attractive resource to use."***

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Improving the health of future generations

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UK BIOBANK PARTICIPANT NEWSLETTER **MARCH 2014**

Hello and welcome **to your 4th annual UK Biobank Newsletter. You have received this Newsletter because you have agreed to participate in UK Biobank. We are very grateful for your continued support of this exciting health resource.**

UK BIOBANK CONTRIBUTES TO PIONEERING HEALTH RESEARCH

Researchers studying a wide range of common and painful diseases have made extensive use of the UK Biobank Resource during its first full year of operation.

Illnesses such as arthritis, heart disease, chronic lung disease, tinnitus and hearing disorders were among the first to benefit from the detailed health information provided to UK Biobank by its participants.

The data are also stimulating new approaches to research. Scientists are finding new ways to analyse the vast amount of eye data, for instance, which could provide clues to the development of some serious disorders such as dementia long before they become a medical problem.

Will you help? Our goal is to scan 100,000 participants.

Almost 900 scientists from around the world have registered with UK Biobank during its first 18 months. There have been 123 applications to use the Resource and some of these studies are already finished and their results published. Results will be fed back into the Resource so that others can benefit from them.

UK Biobank becomes more valuable as it follows participants' health for longer. Many thousands more researchers can be expected to use the Resource in the coming years as the information it includes becomes increasingly detailed.

Meanwhile, a feasibility study to collect images of brain, heart, bone and blood vessels of 100,000 participants starts in Manchester this year. Genotyping of all half million participants is also underway and the first tranche of hospital data is now available. (No information provided to scientists will identify individual participants.)

Coupled with health and well-being information already provided at assessment, it is possible to see how detailed and valuable the UK Biobank Resource is becoming for health-related research everywhere.

Activities are planned in 2014 to promote the Resource further to the scientific community.

Follow us at: www.ukbiobank.ac.uk

Keep in touch

UK Biobank becomes of more use to scientists the older it gets and the more health and related information it collects. To keep you informed about results and other developments - such as how you may be able to help further – we need your up-to-date contact details.

Allowing us to keep in touch by email is the easiest and cheapest way of maintaining contact. Emails cost just a fraction of postal costs and the money we save can be spent on improving the resource. If you are new to email, or have recently changed your email address, please do let us know by clicking through to the 'Update your details' section of our website.

If you do not have email, please make sure we have your correct home address. You can tell us of any changes by using the reply envelope enclosed with this Newsletter, or by calling 0800 0 276 276 (free from most landlines, 8am-7pm Monday-Saturday), or 02920 765597.

Thank you for supporting UK Biobank. Your help is already making a difference.

www.ukbiobank.ac.uk

Thank you for taking the time and trouble to participate in UK Biobank

Many of you may have been given or will have bought a tablet, e-reader or smart phone recently and will now have access to the internet. To make sure we can stay in touch with you, UK Biobank needs your latest contact details including an email address and mobile phone number, if you have one. If you have recently changed your email address or phone number or if you wish to provide an address or number for the first time, you can do this by visiting the UK Biobank website (**www.ukbiobank.ac.uk**). You will need your Participant ID, found on the letter or email that came with this Newsletter. You may find it useful to keep a note of your PID for future reference.

I regularly speak with researchers involved in using and improving this resource. Many are astonished that such a resource exists, all are excited about the future, and they are grateful to you for your help. So may I, on their behalf, thank you for your continued support - whether or not you are reading this Newsletter with the latest electronic technology or not!

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HAS WORK AFFECTED YOUR HEALTH?

Most people spend a large part of their life at work. We know that sometimes the work they do and the substances they may encounter at work can lead to health problems – either when they were working or after they retire.

During your assessment, if you were still working, you may have told us what your current job was then. We now want to find out more about all the major jobs you have done over your working lifetime, whether you are still working or have retired.

We have designed a brief questionnaire for collecting this information which will allow you to build up a job history for yourself.

This will help us to investigate if and how work has affected the health of UK Biobank participants.

We will be contacting you later in 2014 asking you to complete this online questionnaire so please watch out for your invitation which may come by email, text and/or letter.

This questionnaire will be designed so you can complete it when you are 'on the move'. A great way to put your new tablet, e-reader, laptop or smart phone to use!

Can you help scientists find ways to prevent dementia?

This spring we'll be inviting participants to complete a series of short cognitive tests. The tests have been specifically selected to help scientists understand the likely causes of dementia, and all are quick, interesting and enjoyable to do. Some of these tests were done when participants joined the study whilst others will be new. UK Biobank intends to repeat these tests periodically so that it can find out why some people's cognitive health changes more than other people's, as this will help understand how to prevent dementia in the future.

Dr John Gallacher, who helped design the tests says:
"Our mind is probably our most valuable asset. The prospect of preventing dementia is really exciting and I believe that helping UK Biobank to achieve this goal is a great investment in all our futures."

ACTIVITY & HEALTH – 15,000 PARTICIPANTS AND COUNTING!

Many links between health and activity are already known but there is still much to find out. More than 15,000 participants have so far helped us do that – by wearing an activity monitor, the size of a wrist watch, for a week. Invitations to wear the device will continue to be sent out over the coming year. If you would like to wear one, we do need an up-to-date email and postal address. More information can be found on our website at: **www.ukbiobank.ac.uk/physical-activity-monitor/**

Scientists are developing new techniques to make the most of information collected in this way.

"There may be subtle links between activity, or inactivity, and a wide range of common illnesses that we are currently unaware of," said project manager **Rob Gillions**.

FOLLOW UP OF HEALTH BOOSTS UK BIOBANK RESOURCE

UK Biobank has reached another major milestone – with information about participants' hospital admissions now available to help research.

These data provide considerable detail about the reasons why people are admitted to hospital, or attended as an outpatient. They include coded data about the time spent in hospital, including diagnoses and operations.

Like all other information collected by UK Biobank, these data will not be provided to scientists in ways that could identify individual participants.

The current data release covers hospitals in England for admissions between April 2006 and March 2011. Data for the period prior to this (back to 1997) and data from Scotland and Wales will be available in the coming months.

Information about people's hospital stays is collected by the NHS for a wide range of reasons – such as to support healthcare, improve treatments and to help the health authorities plan ahead.

But it is also very valuable to health researchers, particularly, as in the case of UK Biobank, when it can be viewed alongside other detailed information provided by participants.

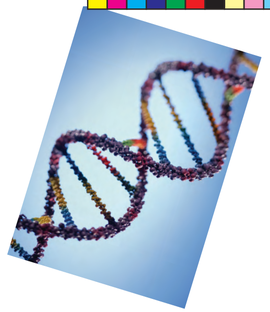
"We are doing all that we can to make UK Biobank as valuable as it can be to health researchers," said **Dr Cathie Sudlow**, UK Biobank Chief Scientist. ***"Hospital data are crucial to providing as full a picture as possible of the health and wellbeing of our participants.***

Professor Cathie Sudlow, UK Biobank Chief Scientist

"Access to data on the number and types of health conditions that people develop will allow scientists to start asking why some people get particular illnesses and others do not."

Please take a look at a summary of these data at the UK Biobank Data Showcase. You can do this by going to the UK Biobank website home page and clicking on Data Showcase. Please do get in touch if you have questions.

Genetics study targets lung disease



UK Biobank is undertaking detailed DNA analysis of its 500,000 participants.

This will help scientists to better understand the complex interaction of lifestyle and genes in causing heart disease, dementia, cancer and a wide range of other life-threatening and disabling disorders.

This genetic analysis ('genotyping') project, costing over £20 million, will examine several hundred thousand genetic 'markers' on each UK Biobank participant and create in total more than 400 billion (yes, billion!) possible points of data.

The work is being done under strict controls by the Affymetrix company, which is not provided with information that can identify participants. Data will become available through UK Biobank over the course of the next two years.

The Department of Health and the UK Medical Research Council have each contributed £10million towards the project, with the British Heart Foundation (BHF) providing a further £1million.

Minister for Universities and Science **David Willetts** said: ***"This new investment will allow the study to truly reach its potential and maximise the value of its data."***

Professor Peter Donnelly, Director of the Wellcome Trust Centre for Human Genetics, at the University of Oxford, said ***"UK Biobank's power is in its size and the richness of information already collected on participants, coupled with this additional data from genotyping. The work will provide information on genes, but also on the DNA between them, thought to play an important role in switching them on and off.***

"This research is going to provide completely new clues to the biological processes that lead to diseases, and new ideas for successful intervention and treatment," he said.

The UK Biobank Resource will also help to explain why some people respond better to treatments, or have worse side effects. ***"This is about homing in on biological mechanisms underlying disease that we're as yet unaware of, and to disentangle those processes to tackle a wide range of common illnesses,"*** said **Professor Donnelly**.

DNA is extracted from blood stored by UK Biobank. The genetic data are returned to UK Biobank so that approved researchers conducting bona fide health-related research in the public interest can study the relevance of genetic differences, together with other health and lifestyle factors (such as diet and activity levels) in many different diseases.

Rt Hon David Willetts MP, left, Minister for Universities and Science, is given a tour of the UK Biobank blood storage facilities by Dr Tim Peakman, UK Biobank's deputy Chief Executive Officer.

Improving the health of future generations ***- cancer, heart disease, stroke, diabetes, arthritis, dementia, osteoporosis, lung, kidney and eye disorders, depression, neurological disorders...***