



# International Phenome Centre Network

## *Frequently Asked Questions*

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### 1. ABOUT THE INTERNATIONAL PHENOME CENTRE NETWORK (IPCN)

#### **Q: What is the International Phenome Centre Network (IPCN)?**

A: The International Phenome Centre Network (IPCN) is a research consortium working to transform health care globally and improve disease prevention, detection, and treatment by understanding the dynamic interactions between our genes, environments, microbiomes, diets and lifestyles and their expression in diverse individuals and populations.

A partnership among leading research hubs around the world, the IPCN applies cutting-edge analytical and mathematical approaches to study large, global data sets of rich biological information to unravel the molecular underpinnings of disease risk in individuals and populations. Our aim, through research harmonisation and high-quality data, is to create global atlases of human disease and population health to enhance scientific and clinical understanding in greater detail than previously possible.

Initiated by the Medical Research Council and National Institutes of Health Research-sponsored (MRC-NIHR) National Phenome Centre at Imperial College London, the IPCN includes more than a dozen international partners with regional, multi-institutional hubs in: Australia, Canada, China, Japan, Singapore, Taiwan, the United States and the United Kingdom.

Through adopting a harmonised approach to data collection, the network will enable large data sets to be developed making the network greater than the sum of its institutional parts.

#### **Q: Why was it established?**

A: To scientifically address some of the largest global healthcare challenges that the world faces today.

The world is facing an unprecedented confluence of environmental and lifestyle factors that are dramatically increasing the risks of chronic disease. Global warming and its multiple biological consequences, antimicrobial resistance, aging populations, and the prevalence of lifestyle-related illnesses are systematically affecting world populations

and posing the greatest scientific and public health challenges seen in modern times. Such challenges require global solutions on relatively short timescales that will rely on international cooperation and research alignments.

The International Phenome Centre Network (IPCN) offers an integrated approach that brings together advanced technology platforms and modelling solutions with world-leading clinical research groups to attack these complex and multiple healthcare challenges on timescales that will be congruent with emergent disease risks in an economically-realistic framework.

The mission of the IPCN is to better understand how variation in gene-environment interactions affect disease across the lifespan for different populations. Using robust and harmonised data sets representing the world's diverse populations, this research will inform global public health policies and the development of new therapies.

**Q: Where is it located?**

A: The IPCN is being coordinated from the flagship MRC-NIHR National Phenome Centre at Imperial College London in the UK. Imperial College has driven the creation of the network which now consists of more than a dozen international partners with regional, multi-institutional hubs in: Australia, Canada, China, Japan, Singapore, Taiwan, the United States and the United Kingdom.

**Q: What is the network's vision?**

A: The mission of the IPCN is to better understand how variation in gene-environment interactions affect disease across the lifespan for different populations. Using robust and harmonised data sets representing the world's diverse populations, this research will inform global public health policies and the development of new therapies.

**Q: What does the network expect to see from its work in 5 and 10 years following its establishment?**

A: In 5 years' time (short-term goals):

- Focus on quality control to eliminate erroneous and inconsistent laboratory practices by employing a harmonised approach across multiple institutions worldwide. This will involve establishing a framework for quality, consistency, and accuracy in data generation – from acquisition and processing to interpretation and visualisation.
- Focus on training and educating both scientific and clinical communities on the importance/relevance of the network's approach, and public outreach to broaden awareness of metabolic phenotyping.

In 10 years' time (long-term goals):

- Derive a greater understanding of the biological underpinnings of disease and diagnosis
- Develop clinically-deployable tests to enable rapid, accurate patient diagnosis and stratification.

## **2. IPCN PARTNERSHIPS & FUNDING**

**Q: How is the network funded?**

A: The aspiration is for the network infrastructure, such as internal communications and information sharing, to be self-funded through membership fees. The establishment of the network has been supported by Imperial College London (and its MRC-NIHR National Phenome Centre) together with the corporate partners Waters Corporation and Bruker Corporation. In order to establish research collaborations between partners, members will need to apply for external research funding as usual, either in isolation or in combination with other network member institutions.

**Q: How is the network being organised?**

A: The network is being overseen by a Steering Committee, which will include a representative from each member institution. The Steering Committee will define the research direction of the network and make decisions on governance and strategy.

It is envisaged that in future an Operations Committee, again featuring a representative from each member institution, will be responsible for implementing the strategy and delivering network goals.

**Q: What is the network's plan to expand its partnerships?**

A: Imperial College, Waters and Bruker Corporations are the founding partners of the network. While there are no immediate plans to involve other corporate partners, the network will certainly be interested in developing partnerships with other industries, or with companies whose technologies could complement or contribute towards the goals of the network.

**Q: What is the network's plan to expand its members?**

A: The network is seeking to attract further member research institutions in the field of metabolic phenotyping that share an interest in building a global infrastructure around harmonised research methods and technologies.

**Q: Who will hold leadership roles within the network and what will those roles be?**

A: The anticipation is that the MRC-NIHR National Phenome Centre at Imperial College London will establish the initial infrastructure of the network, but as early as possible the Steering Committee will determine research direction, strategy and goals. In the longer term, the ambition is for the network members to 'own' and lead the network together.

**Q: The network includes two corporate partners, Bruker and Waters. What is their role?**

A: Imperial College, Waters and Bruker Corporations are working together to build the network. The network is reliant on the technology of Waters and Bruker corporations, and they have played a leading role in the early stages of creating the network and continue to be involved in its development.

**Q: How will the network work with external researchers in industry, academia, and government?**

A: The IPCN will conduct and enable fast, efficient, high-quality research by generating and leveraging harmonised data from integrated studies from around the world. With industry and government partnerships and utilising standardised high quality methods, technologies and training, the IPCN enables affordable, timely and relevant research for individual and global health care problems.

The network informs and trains across a wide range of healthcare stakeholders in the relevance of metabolic profiling, phenomics and how precision medicine can be impacted with high-quality research and actionable knowledge

In all, the network enables a united effort from top researchers around the world to enhance collaborative opportunities, and maximise the utility of scientific outcomes for healthcare/research initiatives/funding body priorities.

### 3. IPCN RESEARCH

**Q: What are the research priorities of the network?**

A: Establish a harmonised and validated scientific approach, such that we can collectively improve global health in specific areas of disease and microbiome-related research.

The IPCN measures an individual's health status that enables patient disease stratification and the development of new medicines via metabolic phenotyping. This uniquely comprehensive analysis of biological fluids or tissue samples can be used for predicting, preventing, and treating disease.

**Q: What specific diseases will be a focus of the network?**

A: The IPCN's innovative approach to research will advance precision medicine by better characterising the pathology of disease and the role of the microbiome to improve patient care, clinical outcomes and global health for diseases of worldwide significance, including cancers, mental health issues, stroke, autism, obesity, metabolic diseases and type 2 diabetes.

**Q: How will it conduct research?**

A: By focusing on joint projects in areas of like expertise within the network.

IPCN research will measure an individual's health status that enables disease stratification and the development of new medicines via metabolic phenotyping. This uniquely comprehensive analysis of biological fluids or tissue samples can be used for predicting, preventing and treating disease.

Key technologies that are used include mass spectrometry and nuclear magnetic resonance (NMR) spectroscopy.

**Q: How will the network generate and manage the data it will use for research?**

A: Imperial College and its MRC-NIHR National Phenome Centre have led the way in developing approaches to aggregate and manage data. As this approach scales to other network members, data will be managed with adherence to country-specific regulations.

**Q: What is metabolic phenotyping?**

A: Metabolic phenotyping enables better stratification of disease, which is the molecular sub-classification of disease and disease susceptibility based on biomarkers and a patient's phenotype.

As individuals' bodies and physical states change over time, advanced analytics can monitor the continuum of health (where genetics is what you're born with, phenomics is your current state). This is the future of medicine, as phenotypes tell you what's important to an individual or groups' health both now and as it evolves over time

**Q: There are fields of biology, including genomics, proteomics, and metabolomics, that are working to better understand the origins and pathology of disease. Why is metabolic phenotyping the best approach?**

A: All of these fields are being held back due to a global lack of consistency and harmonisation. The fact that we use a unified experimental design begins to address this across significant research projects and initiates agreed, new approaches at a global level.

**Q: What role does this research play within the broader field of precision medicine?**

A: This approach gives clinicians dynamic data, now, on disease physiology. The immediacy of this information can give better context to genomic data to better curate the genome. Empowering consistently-utilised platform technologies in the research laboratory, providing comprehensive interpretive information that can be clinically deployed. This approach advances precision medicine by going beyond genetics to examine broader array of factors that impact health.

**Q: What kinds of research can best be accomplished using metabolic phenotyping?**

A: Research that seeks to progress understanding of the dynamic interactions between our genes, environments, microbiomes, diets, and lifestyles

**Q: What can a global approach to this research accomplish that previous research efforts have not?**

A: The whole of the network is greater than the sum of its parts. Most data have previously sat within institutional research silos. The network is a new, united approach to focus on the importance of reproducibility, robustness, quality, and harmonised protocols in the laboratory. Samples can be run across several sites to validate, results are more easily comparable across institutions.

**Q: How is the network's research suited to address racial, ethnic, and cultural differences in the pathology and risk of disease?**

A: The network is in a unique position to address this due to the variety and breadth of patient cohorts – using a unified approach, these cohorts are more easily investigated and compared. Diseases are often impacted by local variations (e.g., diabetes is largely driven by obesity around the globe, except in Asia; this unique situation allows the network to deeply probe patient cohorts). We will be able to discern regional differences in disease, or regional factors that impact them. This addresses a truly personalised approach to medicine – a one-size-fits-all approach is not the answer, and the network can affect research in this manner by teasing out local population variations.

**Q: What type of technologies does the network use in its research?**

A: Fundamental technologies are mass spectrometry and nuclear magnetic resonance (NMR) spectroscopy developed by IPCN partners Waters and Bruker Corporations, respectively.

**Q: How will the network's data, methods and research be harmonised across disparate institutions and geographies?**

A: This will be done by replicating the methods and standards of the MRC-NIHR National Phenome Centre at Imperial College London. The Centre has established methodologies representing best practice for the use of mass spectrometry and NMR for metabolic research, and has over 50 person-years' experience of conducting this type of research. By sharing what has been learned and agreeing to a harmonised approach, the network will be able to generate data which is compatible across geographical locations and to the same quality standards.

**Q: What advantages in research speed, efficiency and cost does this research offer?**

A: Through international collaboration, the network allows members to identify synergies, and combine resources and expertise which can be directed towards solving global healthcare challenges. This allows more complex studies to be undertaken than would otherwise be possible. It also allows studies to be completed more quickly, with associated savings in terms of costs and other resources.