

# THE HUMAN PROTEIN ATLAS

## Immune cell map arms researchers with new tool to fight deadly diseases

**Stockholm, December 19, 2019**

A first-ever map of the human body's immune cells has been created by scientists in Sweden, providing medical research with a detailed description of the proteins in human blood. The open-access database offers medical researchers an unprecedented resource in the search for treatments for diseases.

Published today in the journal *Science*, the Blood Atlas resource is the latest database to be released by the Human Protein Atlas program, which is based at the Science for Life Laboratory (SciLifeLab), a joint research center aligned with KTH Royal Institute of Technology, Karolinska Institutet, Stockholm University and Uppsala University.

KTH Professor Mathias Uhlén, director of the Human Protein Atlas, says that this open-access resource will facilitate future efforts to combat disease. "The immune cells are involved in fighting all human diseases – in particular cancer, infectious diseases and autoimmune diseases" Uhlén says. "With a comprehensive map identifying all proteins in these blood cells, researchers around the world will be able to deepen their understanding of human biology and develop new, more effective therapies targeting these diseases."

The Blood Atlas resource provides a detailed view of the proteins in individual blood cells in relationship to the presence of these proteins in other parts of the body, determining which proteins are unique to different types of blood cells. A thorough analysis of blood cell RNA expression profiles has enabled the identification of approximately 1,500 genes with elevated expression in various immune cells, confirming well-known immune proteins, but also identifying new targets for in-depth analysis. Uhlén says the corresponding proteins are interesting to study further in order to explore the biological functions linked to the function of each blood cell type.

To illustrate the usefulness of this resource in understanding the function of specific genes across cells and tissues, the paper describes the cellular distribution of genes known to cause primary immunodeficiencies. Co-author Petter Brodin, a researcher in the Department of Women's and Children's Health at Karolinska Institutet and SciLifeLab says: "This resource is very important for anyone interested in understanding the function of individual genes, for example in patients with primary immune deficiency diseases."

The results are presented in an updated version 19 of the Human Protein Atlas ([www.proteinatlas.org/blood](http://www.proteinatlas.org/blood)) providing an open-access knowledge resource to allow exploration of the expression profiles across human immune cell populations and all major tissues and organs. The

Blood Atlas also contains information about the proteins actively secreted by various cells into human blood as reported recently by Uhlén and research colleagues in *Science Signaling*.

The project was a combined effort of SciLifeLab, the departments of Hematology and Women's and Children's Health at Karolinska University Hospital, Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark, and the Department of Immunology, Genetics and Pathology, Rudbeck Laboratory, Uppsala University. Major funding for the research was provided by the Knut and Alice Wallenberg Foundation.

Read the full article: Uhlen et al "A genome-wide transcriptomic analysis of protein-coding genes in human blood cells" **Science** (December 20, 2019)

Related article: Uhlen et al "The human secretome" **Science Signaling** 12, eaaz0274 (November 26, 2019)

<https://science.sciencemag.org/content/366/6472/eaax9198>

## About

### Human Protein Atlas

The Human Protein Atlas (HPA) is a program based at the Science for Life Laboratory (Stockholm) and started in 2003 with the aim to map all of the human proteins in cells, tissues and organs using integration of various omics technologies, including antibody-based imaging, mass spectrometry-based proteomics, transcriptomics and systems biology. All the data in the knowledge resource is open access to allow scientists both in academia and industry to freely use the data for exploration of the human proteome. Version 19 consists of six separate parts, each focusing on a particular aspect of analysis of the human proteins: (i) the Tissue Atlas showing the distribution of the proteins across all major tissues and organs in the human body; (ii) the Cell Atlas showing the subcellular localization of proteins in single cells; (iii) the Pathology Atlas showing the impact of protein levels for survival of patients with cancer; (iv) the Blood Atlas showing the profiles of blood cells and proteins detectable in the blood; (v) the Brain Atlas showing the distribution of proteins in human, mouse and pig brain; and (vi) the Metabolic Atlas showing the presence of metabolic pathways across human tissues. The Human Protein Atlas program has already contributed to several thousands of publications in the field of human biology and disease and it has been selected by the organization ELIXIR ([www.elixir-europe.org](http://www.elixir-europe.org)) as a European core resource due to its fundamental importance for a wider life science community. The HPA consortium is funded by the Knut and Alice Wallenberg Foundation.

For more information, see: [www.proteinatlas.org](http://www.proteinatlas.org)

### Knut and Alice Wallenberg Foundation

The Knut and Alice Wallenberg Foundation is the largest private financier of research in Sweden and also one of Europe's largest. The Foundation's aim is to benefit Sweden by supporting basic research and education, mainly in medicine, technology, and the natural sciences. The Foundation can also initiate grants to strategic projects and scholarship programs.

For more information, see: [kaw.wallenberg.org](http://kaw.wallenberg.org)

### **Science for Life Laboratory**

Science for Life Laboratory, SciLifeLab, is a research institution for the advancement of molecular biosciences in Sweden. SciLifeLab started out in 2010 as a joint effort between four universities: Karolinska Institutet, KTH Royal Institute of Technology, Stockholm University and Uppsala University. The center provides access to a variety of advanced infrastructures in life science for thousands of researchers creating a unique environment for health and environmental research at the highest level.

For more information, see: [www.scilifelab.se](http://www.scilifelab.se)

### **KTH**

Since its founding in 1827, KTH Royal Institute of Technology in Stockholm has grown to become one of Europe's leading technical and engineering universities, as well as a key center of intellectual talent and innovation. We are Sweden's largest technical research and learning institution and home to students, researchers and faculty from around the world dedicated to advancing knowledge.

For more information, see: [www.kth.se](http://www.kth.se)

### **Karolinska Institutet**

Karolinska Institutet is one of the world's leading medical universities. Our vision is to advance knowledge about life and strive towards better health for all. As a university, KI is Sweden's single largest center of medical academic research and offers the country's widest range of medical courses and programs. Since 1901 the Nobel Assembly at Karolinska Institutet has selected the Nobel laureates in Physiology or Medicine.

For more information, see: [ki.se](http://ki.se)

### **Uppsala University**

Uppsala University is the Nordic region's oldest university – founded in 1477 – and is ranked among the top 100 universities in the world. Uppsala University is divided into three disciplinary domains: humanities and social sciences, medicine and pharmacy, and science and technology. These in turn consist of nine faculties and nearly 50 departments in total.

For more information, see: [www.uu.se](http://www.uu.se)