PRESS RELEASE

THE HUMAN PROTEIN ATLAS

HPA in the fight against Covid-19

The Human Protein Atlas (HPA) consortium is engaged in the corona epidemic in various ways to aid in the fight against the health consequences of this pandemic outbreak. The program involves both efforts to increase the knowledge-base of the disease and efforts to develop diagnostic tools and therapeutic drugs to combat the pandemic. The work is performed in collaboration at both the national and international level. In the following, some selected programs are described involving the HPA researchers with relevance for the fight against the corona outbreak.

Today, an article was published in bioRxiv (Hikmet et al) describing the presence in the human body of the enzyme Angiotensin I converting enzyme 2 (ACE2), suggested to be the target for coronavirus attachment to the surface of human cells. Based on antibody-based data from the Tissue Atlas (www.proteinatlas.org/ENSG00000130234-ACE2/tissue) and several datasets using transcriptomics, mass spectrometry and single cell genomics, the manuscript presents an overview of ACE2 expression in the entire human body, and reviews the evidence for the presence of this protein in human lung. "Our analysis suggests that the expression of ACE2 in the human respiratory system appears to be limited, and the expression of the receptor in lung or respiratory epithelia on the protein level is yet to be confirmed", says Dr Cecilia Lindskog, senior author on the paper and Director of the HPA Tissue Atlas at Uppsala University. The results raise questions regarding the role of ACE2 for infection of human lungs and highlights the need to further explore the route of transmission during SARS-CoV-2 infection.

In addition, an effort to develop an antibody-based serological assay to detect the presence or absence of antibodies to coronavirus is under development. The program led by KTH Professors Sophia Hober and Peter Nilsson is based on the infrastructure set up in the HPA program to produce all viral proteins encoded in the SARS-CoV-2 genome, with important mutated versions included. These proteins are used in an already established multiplex bead array system at SciLifeLab, in order to allow large-scale screening of human plasma for identification of individuals that already have suffered from the infection and thereby possibly have developed immunity. In the first stage, more than 2,000 Covid-19 patients, in different stages of the disease, as well as personnel in the health care will be screened in order to gain knowledge regarding the humoral immune response and severity of the disease. "We are very happy to be able to contribute in this challenging and tough times. To enable a broad screening of the population for yielding information about immunity will impact the society very positively since this information could help us in deciding who safely could work at the hospitals and with the elderly population" says Sophia Hober, head of the KTH AlbaNova node of the Human Protein Atlas.

Furthermore, a diagnostic laboratory has been set up at Karolinska Institutet (Stockholm) in collaboration with the Science for Life Laboratory to expand the capabilities of viral analysis of swab tests. The program is an international collaboration with the research institute BGI and aims to rapidly double the nations capacity of corona viral detection testing. The program, funded by the Knut and Alice Wallenberg Foundation, is headed by Professor Lars Engstrand (Karolinska Institutet), and aims to set up a national infrastructure to allow automated analysis of the SARS-CoV-2 virus using a nucleic-acid based assay. "We are grateful that our long-term collaboration with BGI as part of the Microbiome and Brain Atlas efforts has allowed us to gain insights and experience from the large-scale diagnostics set-up in the early outbreak in Wuhan", says Professor Mathias Uhlen, Director of the HPA consortium and co-responsible for this new infrastructure for SARS-CoV-2 testing.

Finally, AbClon, a company founded by South Korean scientists and HPA researchers, has recently announced that they have developed antibodies binding to SARS-CoV-2. The company has selected 13 types of antibodies, which were derived from the company's human antibody library using the phage display technology awarded with the Nobel Prize in 2018. The aim is to generate a therapeutic antibody as well as rapid test kits for the virus infection. The treatment is expected to neutralize the virus by binding specifically to a receptor binding domain that binds to the cells. "We have formed a task force to concentrate

on research and development of the therapeutic antibody in order to respond to the COVID-19 pandemic," says Dr Jong-Seo Lee, CEO of the company listed on the South Korean stock-exchange KOSDAQ.

Read the full article about ACE2: Hikmet et al (www.biorxiv.org/content/10.1101/2020.03.31.016048v1)

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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.elixireurope.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

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

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

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: www.ki.se

KTH–Royal Institute of Technology

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

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

Abclon

AbClon was co-founded by Dr Jong-Seo Lee in Seoul, Korea and Dr. Mathias Uhlen (Director of Human Protein Atlas) in Sweden. The company has been listed in KOSDAQ since 2017 and has been developing novel therapeutic antibodies using their proprietary platform technologies including NEST (New Epitope Screening Technology), AffiMab (Affibody-fused bi-specific Ab) and zCAR-T (next generation "switchable" CAR-T). For more information, see: www.abclon.com.