Human protein atlas will help pinpoint disease

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Researchers in Sweden are compiling a remarkable 'atlas' that pinpoints the location of thousands of individual proteins in the body's tissues and cells which will give scientists important insights into the function of different proteins and how changes in the distribution of proteins could be reflected in diseases such as cancer. Professor Mathias Uhlén of the Royal Institute of Technology in Stockholm, who is leading the project, said, "We are trying to map the building blocks of life."

The project is hugely ambitious, relying on the selective identification and mapping of thousands of proteins, many of whose function is not yet known, and has required the development of a massive infrastructure to enable the proteins to be identified in a realistic period of time.

Uhlén was describing the human protein atlas at the European Science Foundation's 3rd Functional Genomics Conference in Innsbruck, Austria, on 1-4 October. Functional genomics describes the way in which genes and their products, proteins, interact together in complex networks in living cells. If these interactions are abnormal, diseases can result. The Innsbruck meeting brought together more than 450 scientists from across Europe to discuss recent advances in the role of functional genomics in disease.

The protein atlas team first uses the human genome – the sequence of all the 20000 or so genes in human cells – to encode individual proteins. They then develop 'antibodies' – protein molecules that recognise specific targets – against each of these proteins. The antibody that

recognises a given protein is then labelled with a marker to render it visible under a microscope and is exposed to samples of different tissues and cells. The antibody binds to the proteins and in this way the location of the protein can be detected.

"To do this systematically requires a lot of automation and robotics," Uhlén said. "We have six software engineers writing codes just to keep track on the samples. The project is generating 400 gigabytes of data every day." There is a 100-strong team working on the project, with a site due to be set up soon in India, and with antibody-producing sites in Korea and China.

"To get an idea of how far we have come, in our first year we produced on antibody," said Uhlén. "This year we are hoping we can make 3000." The programme was launched in 2003, and with sufficient funding the first full version of the atlas could be available by 2014, Uhlén believes.

The team has so far mapped the location of around 5000 proteins in human cells and tissues. The researchers are also investigating whether certain common cancers – colon, prostate, lung and breast – have different protein profiles to normal tissue. In this way new 'biomarkers' could be identified – molecules which indicate that a tissue or cell is in a diseased state, which could alert doctors to the early stages of a disease.

Source: European Science Foundation