Diagnosis before disease breaks out

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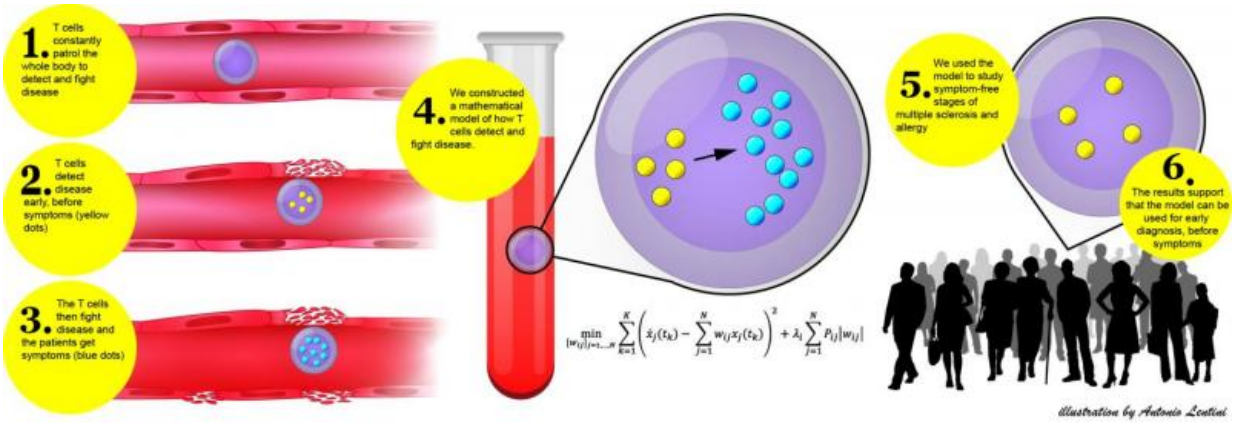

Using bioinformatics the research team constructed a mathematical model for the genetic activation of T-cells, which was used to identify the genes that initiate the activity. Credit: Antonio Lentini/LiU

Many patients with serious diseases are not helped by their medications because treatment is started too late. An international research team led from Linköping University is launching a unique strategy for discovering a disease progression in its earliest phase.

The study, to be published in *Science Translational Medicine*, has been led by Professor Mikael Benson and Dr Mika Gustafsson at the Centre for Individualized Medication (CIMed).

"We're addressing one of the biggest problems in healthcare, one that

leads to a great deal of suffering and enormous costs in terms of drugs and drug development. An important reason for this is that treatment is often not started until the patient has enough symptoms for a diagnosis using conventional methods," says Prof Benson.

The new strategy is based on analysing T-cells, a type of white blood cell that constantly patrols around the body, combatting microbes and healing damaged tissue.

The research team studied the genetic activity of T-cells from ten inflammatory, malignant and metabolic diseases. The study used technology that enables simultaneous analysis of each of the human body's 20,000 genes. The results showed that the genetic activity in all the diseases differed from healthy samples.

Using bioinformatics they then constructed a mathematical model for the genetic activation of T-cells, which was used to identify the genes that initiate the activity.

"We assumed that these types of genes could be used to make an early diagnosis. To test this, we studied T-cells from early, symptom-free stages of multiple sclerosis and pollen allergy. This confirmed that these genes can function as disease markers even when the patient does not have any symptoms," says Dr Gustafsson.

The authors of the article propose that these genes should be tested diagnostically in large studies, for instance the study initiated by US President Obama, where one million Americans will be monitored over several years.

"Earlier diagnostics helps make treatment more effective. In the long term this will increase the interest in regular health checks, which aim to discover, treat and prevent disease at an early stage. Compare it to how

we view vehicle inspection and service. It's strange that we have a more efficient method for managing the health of cars than that of people," says Prof Benson.

More information: "A validated gene regulatory network and GWAS identifies early regulators of T cell–associated diseases," by M. Gustafsson et al. stm.sciencemag.org/lookup/doi/ … scitranslmed.aad2722

Provided by Linköping University