

SYSTEMS BIOLOGY

USING DATA TO PERSONALIZE MEDICINE AND PATIENT TREATMENT

- Medicon Valley is home to some of the world's leading research groups within systems biology
- Tap into the unique health data collected over the past decades in Denmark and Sweden
- Using the power of data to predict disease patterns and the effectiveness of drugs

What is systems biology?

Systems biology is the study of how different components, such as molecules, genes or cells, in a biological system interact and how their interaction shapes the function and behavior of the system.

Using computational models, systems biologists analyze the impact of different variables on biological systems. Variables could be genetic variations or the vast amounts of phenotypic data found in e.g. patient records and biobanks. By running correlations of such data, it becomes possible to reveal undiscovered disease trajectories.

Systems biology essentially applies the principles of Big Data to life science. Just like retailers use data from a range of sources to predict which additional goods an individual is likely to purchase, systems biologists use data to forecast the likelihood of an individual developing a certain disease and to assess whether a drug is likely to have the desired effect on a patient.

Why focus on systems biology?

Systems biology has the potential to revolutionize the treatment of complex diseases like cancer as it allows doctors to design highly personalized patient treatments.

By providing a highly accurate means of predicting and measuring the efficacy of drugs on different patient groups, systems biology also plays an important role in determining the commercial viability of a new drug. Moreover, it opens up the possibility for offering preventative treatments to certain patient groups and

for gaining a better understanding of how environmental factors affect health.

Denmark and Sweden have a long history of collecting longitudinal health data sets through the social security number systems. Structuring this data and creating models and platforms to analyze it would provide a strong foundation for researchers to describe the effects of genotype on phenotype including the non-uniform response to interventions for diseases.

Strongholds in Medicon Valley

The patient registries in Medicon Valley and existing competencies within systems biology provide a unique opportunity to create a world-class research environment.

There are already several strong academic research centers directly related to systems biology in the region including:

- DTU Systems Biology, Technical University of Denmark
- The Novo Nordisk Center for Protein Research, University of Copenhagen
- Create Health – A Strategic Center for Translational Cancer Research, Lund University
- The Bioinformatics Center, University of Copenhagen
- Department of Biomedical Sciences, University of Copenhagen
- Computational Biology & Biological Physics, Lund University
- Lund University Diabetes Centre, Lund University
- The Division of Applied Microbiology, Lund University



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