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No more guinea pigs in combination drug tests?

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US-based systems biologist V.A. Shiva Ayyadurai has developed a computational protocol that enables faster and more economical 'in silico' testing —Photo: K.V. Srinivasan

Animal lovers have good news: the crucial step of testing combination of drugs on animals can be skipped if a computational tool developed by US-based systems biologist V.A. Shiva Ayyadurai is adopted.

The Mumbai-born, American scientist has developed a computational protocol called CytoSolve, which can model diseases on the computer and enable faster and more economical 'in silico' testing of drug combinations.

Dr. Ayyadurai specialises in systems biology. One grand challenge in the field put forward by the United States National Science Foundation was to computationally model the entire human cell. At MIT, in 2003, Dr. Ayyadurai took on this challenge and created CytoSolve, a computational platform that integrates multiple molecular pathway models to create a model as complex as the whole cell.

CytoSolve can integrate and provide holistic models of complex cellular functions such as nitric oxide production, and also serve as a platform for multi-scale drug development. "CytoSolve has just received pre-IND (investigational new drug) approval," says Dr. Ayyadurai.

The idea for CytoSolve came to him by looking at Siddha medicine, which is about combinations, Dr Ayyadurai says.

Combinations of drugs are increasingly being used to treat diseases. However, as testing one drug could take up to thirteen years and cost around fifty thousand dollars, testing combinations of drugs would only multiply the costs involved, points out Dr. Ayyadurai. Cytosolve finds a way around this and also helps avoid testing on animals. "Cytosolve can model even an inflammation and its application can be used to model complex pathways contributing to major diseases such as cancer, diabetes and fibrosis," he says.

In 1978, before the advent of email, 14-year-old Shiva Ayyadurai developed a full-scale model of the interoffice mail system, which he called "EMAIL," in Newark, New Jersey. He copyrighted this in 1982. However the title 'inventor of email' continues to elude him and instead credit is given to Ray Tomlinson who sent the first message between two computers on ARPANET in 1971.

Dr. Ayyadurai contends that his EMAIL program is much more like the system used today (with inbox, outbox, CC, BCC, and other such features) as compared to the simple message which was sent by Tomlinson. Incidentally, he was the first one to use the term 'email'.

Dr. Ayyadurai's journey into innovation did not stop there. With a PhDs in systems biology, he has developed his ideas based on Siddha principles. With this approach, he went on to build a curriculum around it and developed an online course. This has now been adopted by University of Maryland, where it is being offered as a course, 'systems health'.