

## Living Heart Project – Virtual Heart

Medicine Technique: with the simulation of operations on human body the researchers want to eliminate the dangerous side-effects of medications.

With a real computer model of human heart the vitamins without risk in arbitrary variation and turned to individual characteristic can be tested. A similar virtual organ would make to that the medication development quicker and safer. Bases for an international research team are to work together in “Living Heart Project”.

In operation phase the laboratory development, animal investigation and clinical studies continue for new drug. It costs but scarcely the manufacturers put several hundred million in the development. With that it makes straightway one of the 50 vitamins (active substances) really in the pharmacy. Most of the media fail while they first manifest complex side-effects in the body.

These abuses the researchers want to shut off – Philipp Kügler belongs to the group. The mathematics professor tests at the institute of applied mathematics and statistics of the University of Hohenheim with computer simulations as medications work on the heart activity. The researcher knows that after the taking of medicine relatively often heart rhythm disturbances occur.

The data for Kügler’s computer model come from heart muscle cells which grow from stem cells. Therefore patient specific cell materials practically stand at disposal unlimited. The medicine researchers can on that investigate the effects of different substances. However the cultured heart muscle cells do not still portray all the properties of their natural prototype

authentically. “These gaps however becomes smaller and smaller” opines Kügler.

In order to research on the characteristics of heart muscle cells in model, these are charged on the electrodes of a chip. This records the propagation of electrical signal of the cells which get the heart muscle contracted. The results are the rhythm of the heartbeats. If now an active substance is given on the cells, the chip also records their reaction as for example heart rhythm disturbances.

The test results for the electrical signal transmission must now in the language of mathematic are translated and are analyzed in the medium mathematical tools. After that a step by step correction of the model equations is possible. This arrangement reconciles the mathematical model to the real raised data, so we can make it exact – clarifies Kügler.

As the next step practice tests stand in a queue, the researchers expect that the results out of the mode for individual cells and cell unions confirm on the experiments. As the model stands a test, Kügler wants to carry over this in living heart project from the cell level to the whole heart. But we first of all must have trust in the model on the plane of individual cell. Then we can carry over the properties of individual parts on the whole organ when that succeeds the pharmacy undertakings test on the possible side effects of the active substances (vitamins) on human heart. What the efficient computer model is able to perform in individual case, the Berliner researchers have shown shortly with the discovery of a new type effective principle for pain remedy. They develop at nerve receptors the set on pain remedy so that the side-effects and sickness crop up.

The team of the medicines of Berliner Charite and computer specialists of Zuse Institute had to analyze that morphine similar molecules and their reciprocal action with upload receptors. Vitamin variants at the computers are so tiny adaptable at the given things in nervous system till the simulations delivers an optimal solution. These have been evaluated already in experiment. Now the researchers expect that the pharmacy industry takes over the arrangement for the development of forbearing.

### **The Living Heart Project**

The objective of the project is the development of virtual heart model. Afterwards people want to test risks and side-effects of new vitamins.

- Researchers, developers of medicine technology and international regulatory authority for this work together.
- The project goes back to the initiative of Firm Dassault Systems. The fate of the younger sister of a leading manager gave the impulse. The girl was born with a severe heart defect and had to bear with numerous operations on her person whose success was very difficult to predict.

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