

Dieter Falkenhagen, Prof. Doz. Dr. med., Dipl.Phys., Krems, Austria

Research paving the way for therapy and diagnostics

There's no progress without research! This slogan is frequently quoted when it comes to showing ways into the future of human society. One of the most prominent expectations society has in the future is the realisation of a modern health system that comes up to the latest findings of research - an expensive undertaking which should, however, cost as little as possible for the patient. The problem is that research and science are costly processes, very costly! This is especially true for medical research because the newly developed machines and techniques are becoming ever more complex. Moreover they frequently require very expensive test kits for analysing particular factors.

It is an obvious phenomenon that new findings in research result in even more complicated consequences which allow us to elaborate more detailed diagnostic differentiations of the particular symptoms. Such exact differentiation, however, is the key to evaluating a disease in regard to its prognosis and course, and it is especially valuable for the choice or even the development of the right therapy.

There is a vast potential to make new, essential findings in the future. Let us just think of the concepts of "genomics" or "proteomics". With the help of so-called ship-away readers it has become possible to gain uncountable information about the up and down-regulations of genes in the various types of cells. This up and down-regulation of genes shows the increasing or decreasing activity of individual genes. Consequently different proteins are synthesised by the respective cell in an either strengthened or reduced way, which can lead to a pathophysiologically relevant rise or fall of active mediators or receptors, enzymes or hormones. This is the point where the proteomics techniques become relevant. This field will certainly become an important factor in future diagnostics because proteomics techniques allow us to determine hundreds of different agents and substances in suppressed, normal or increased concentration by means of especially developed protein chips. From these findings we can gain essential conclusions about the disease.

The next question is: How can we make a selection of adequate parameters from this flood of information, which give almost 100 % insight of the state of the cell, the tissue or the organism and which, moreover, is financially justifiable?

The answer is bioinformatics. By means of the so-called “systems biology” and thanks to large scale computer terminals with adequate software, bioinformatics fulfil the task of selecting the optimum parameters. Interestingly, it is currently the case that biology is „chasing” the field of bioinformatics forward because the latter have to develop computer programmes and suitable terminals before biology can resolve the problem of optimising the parameters.

One could even claim that these new tools have only just triggered the future of medicine and in this case especially the future of diagnostics.

Therapy seems to be standing at the beginning of a new era as well: the era of cell therapy or „tissue engineering“. Latest findings in the field of cell therapy, including the vast and diverse field of stem cells, give ground for numerous speculations about the use of cell therapy or tissue engineering in many different highly relevant diseases, such as Alzheimer’s disease, stroke or heart attack. The new techniques will give new momentum to the development of biotechnologically produced pharmaceuticals with a highly specified action.

Nevertheless, one thing must never be forgotten despite all the scenarios of the future: Every physician must know his anamnesis and clinical examination perfectly since this is the only way to guarantee a targeted and economically reasonable therapy also in the future.

Thus the field of disease management, i. e. the optimum management of diagnostics and therapy, often in especially established research centres and with consideration of economic issues, will certainly gain importance in the future. Finally, one thing must not be forgotten: it is equally relevant for research and for the future of all of us to find out how this field can be turned into a goldmine.