

First **stem cell treatment** for heart patients

The first results of an experimental treatment with stem cells for patients with a severe type of cardiovascular disease was published in 2009. A researcher from Rigshospitalet was behind this study; the first of its kind in the world

Cardiovascular diseases are a huge problem in many countries - with regard to the personal implications, treatment and economy. Most patients with a narrowed coronary artery of the heart can be treated satisfactorily with medicine, coronary angioplasty (PCI) or a by-pass operation (CABG); but not all. Therefore Danish doctors have researched in stem cell treatment for heart patients - and this treatment has now proved successful

The first clinical results of stem cell treatment in 31 patients with serious coronary artery disease showed that after just six months patients receiving treatment with stem cells increase their physical work capacity and improve the pumping power of their heart muscle. Heart pain in connection with strenuous physical activity is more than halved and patients' consumption of pain-relieving heart medicine can be reduced. Patients in the study also experienced a generally improved quality of life; and the stem cell treatment was free of any side-effects. Furthermore, the study showed that the more cells patients were treated with, the greater the effect of the treatment.

The Cardiac Stem Cell Lab at Rigshospitalet is behind the study. In the past six years, the lab has worked on establishing stem cell treatment as a new treatment option for heart patients.

Patients recover better with stem cells

Before the stem cell treatment, patients taking part in the research project suffered from severe coronary artery diseases with severe heart pain and reduced quality of life, even though they had had one or more by-pass operations or coronary angioplasties. The stem cells, isolated from the patient's own bone marrow, were injected directly into the heart muscle through a vein in the groin. In order to be able to carry out the treatment, it was necessary to increase the number of stem cells by cultivating them in the stem cell laboratory established at Rigshospitalet.

The results are an important first step towards establishing this type of stem cell treatment as a new programme for patients suffering from a serious heart disease. In 2009 the study was supported by the Lundbeck Foundation, Aase og Ejnar Danielsens Fond, the Danish Heart Foundation and the Research Committee of Rigshospitalet and others.

A new comprehensive experiment with stem cells, taken from the patient's belly fat and injected directly into the heart, is about to start up.

▶▶ [Read more on www.hjertemedicin.rh.dk](http://www.hjertemedicin.rh.dk)

A hole in the immune system discovered

In 2009 a research group from Rigshospitalet discovered a serious hole in the immune system. In future the discovery will lead to improved diagnostics and treatment of infectious diseases

Infections are one of the most common causes of disease. Most people suffer from infections, which either pass on their own or can be treated with medicine. However some people are hampered by recurring life-threatening infections; infections that respond poorly to medical treatment.

The year 2009 saw a breakthrough in research into the human immune system, as a group of researchers from the Laboratory of Molecular Medicine at the Department of Clinical Immunology at Rigshospitalet collaboratively with Bispebjerg Hospital and the University of Copenhagen discovered a defect in human infection defence. It turned out that the defect is due to a congenital defect in the human immune system and this could explain why some children and adults are suffering from recurrent life-threatening pneumonia and subsequent chronic lung disease.

The congenital defect occurs in 1 out of 10,000 Danes, who lack the defence protein Ficolin-3 and who are therefore unable to activate a part of their body's defence mechanism against infections.

More intensive treatment

Researchers expect the discovery to have a substantial medical and scientific impact. For the first time it will now be possible to diagnose this new type of immune defect disease. This can be done by a simple gene test or a functional test conducted on the patient's blood. In addition, the discovery means that treatment of patients lacking Ficolin-3 can be intensified and corrected, and that medicine that could compensate for the lack of Ficolin-3 can be developed.

The discovery was published in one of the most prestigious medical journals in the world, "The New England Journal of Medicine" no. 25, June 2009.

The craft of skull base surgery

Only very few people master this skill, and even fewer are able to learn it in their daily work as neurosurgeons. However this was rectified by a new 2009 initiative where, for the first time, neurosurgeons met in Denmark for a special course in skull base surgery

Practising skull base surgery is an extremely difficult task. In fact, so difficult that it is almost impossible to perform on living patients. Relatively few neurosurgeons have experience in performing this complicated surgery, in which surgeons access the lower part of the skull and operate between vital nerves and blood supply.

Within skull base surgery, Rigshospitalet provides treatment equal to the best international levels, and consultants Lars Poulsen and Kåre Fugleholm from the Department of Neurosurgery at Rigshospitalet are two of the neurosurgeons in Denmark who have mastered the technique and are most experienced in it. Therefore, in 2009 they initiated continuing training for their colleagues from around the world in cooperation with one French and two British neurosurgeons in the "Copenhagen Skull Base Course"; the first of its kind in Denmark.

Massive interest from all over the world

In practice, participants were lectured in turn in the various surgical accesses that can be used in operations on the lower part of the skull.

Then participants practised the surgery - not on living patients, but on heads from corpses donated to the University Institute of Medical Anatomy, Copenhagen. The other materials used on the course were sponsored by enterprises, and the course directors all worked for free.

In 2009, twenty neurosurgeons from all over the world took part in the course, but twice as many specialists wanted to participate. Therefore we are repeating the success in 2010 - and in the years to come, as long as people are interested. In addition, the Department of Neurosurgery is now offering a Fellowship Programme, where international neurosurgeons, are offered an individual three-month residency, where they can observe and assist surgeons in operations in the skull base at Rigshospitalet, study surgical anatomy and in this way qualify themselves for the difficult procedure.

▶▶ Read more on www.neurokirurgi.rh.dk

School of **radiotherapy**

Rigshospitalet's Department of Radiotherapy is one of Europe's largest and one of the world's leading departments within radiotherapy. In 2009 the department established a school with the newest and most advanced form of radiotherapy for brain tumours - RapidArc

Intensity-Modulated Radiation Therapy (IMRT) and Image Guided Radiotherapy (IGRT) are some of the radiotherapy treatment techniques used up to now for patients suffering from brain tumours. With these techniques, it is possible to determine where a cancer tumour is positioned in the body and in this way radiate it efficiently. Rigshospitalet's Department of Radiotherapy was the first department in Scandinavia to provide such treatment.

Now the latest acquisition has arrived - RapidArc - a 3D treatment technique, uniting extreme precision with a treatment period 2-8 times faster than what has previously been possible. This new technique means improved quality of treatment, shorter treatment time for patients and therefore fewer radiation injuries.

Teaching at international level

In 2009 experience with the new treatment technique was so good that the world's first international RapidArc school was established at Rigshospitalet. At the school, doctors and physicists teach their colleagues from all over the world about this new technique, and this cements cooperative relations across national borders.

The RapidArc technique is part of a long-term strategy to extend radiotherapy at Rigshospitalet. Each day the Department of Radiotherapy treats about 250 patients and, as the only place in Denmark, the department offers stereotactic treatment of all kinds for brain tumours - a treatment with great precision of about 1.5-2mm accuracy.

Over a ten year period the department has doubled its number of patients, the quality of treatment has improved, and waiting time has been phased out. In order to further improve treatment of brain tumours, a number of research projects have been initiated within advanced radiotherapy.

▶▶ [Read more on www.radioterapi.rh.dk](http://www.radioterapi.rh.dk)

A record year for kidney transplants

Extraordinary collaborative efforts between several departments increased the number of kidney transplant operations at Rigshospitalet significantly in 2009. And now there are ambitions to further increase the number of transplants

Cooperation, coordination and dedication are the reasons why Rigshospitalet can describe 2009 as a very good year for kidney transplant operations. In 2009, 77 patients received a new kidney at Rigshospitalet; against the normal 55-60 kidney transplants. The numbers of kidneys from both deceased donors and from living donors have increased. And these great efforts must be kept up and preferably extended in the years to come.

Part of the reason for the increase is that there has been focus on expanding the number of living donors. In 2009 a dedicated programme was established to streamline the process donors go through after having registered. This means shorter waiting time for patients, but it requires greater flexibility from doctors and nurses.

Furthermore, completely new transplant techniques are being used in the Blood Bank in the Department of Clinical Immunology and in the Department of Nephrology. With these new methods, living donors can be used in many cases, even though their tissue type or blood type does not match the patient who is to receive the kidney.

Rigshospitalet expects and hopes that the high number of kidney transplant operations can be maintained and preferably increased in the years to come.

Facts on kidney transplants

Each year 170-190 kidney transplant operations are performed in Denmark. In 2009 the number was 231. Kidney transplants are carried out at Skejby Sygehus, Herlev Hospital, Odense University Hospital and Rigshospitalet.

Rigshospitalet performs kidney transplants on virtually all age groups - from around 18 months and upwards, provided that the patient is otherwise well enough to go through with the treatment, which weakens the immune system for a period.

The first successful kidney transplant was carried out in the US in 1954 between two identical twins. In Denmark kidney transplant operations have been performed since 1964.

▶▶ [Read more on www.nefrologi.rh.dk](http://www.nefrologi.rh.dk)

Simulator training makes better surgeons

In 2009 training with a computer-based surgery simulator helped make doctors in training better and faster at operating than doctors trained in the traditional manner

Why practise on living patients, when you can gain experience as a surgeon through a computer and learn to operate faster and more safely? This question was answered in 2009 with a breakthrough in medical and educational research.

An experiment by the Department of Gynaecology showed that training with simulators in endoscopic surgery provides such good results that by practising on a simulator doctors can become just as competent as if they had operated on 40 patients. Furthermore, doctors became 50% faster at performing surgery than their colleagues, who had 'only' operated on real patients. By training with surgery simulators, young doctors improved their performance in the actual operation situation.

Virtual reality makes perfect

The study, which received great attention in Denmark and abroad, led to another experiment, in which all doctors in their first year of specialist training in gynaecology on Zealand are now being offered six months of simulator training.

The training comprises courses, theory and tests before the doctors start the simulator training and finally have to operate on real patients. Course content is based on the expectations of a number of specialists regarding what they believe future medical specialists should be able to do. And this very composition of theory and practice in simulators provides doctors with optimal education and training.

The purpose of introducing simulator training permanently in specialist training in gynaecology is to develop a standard and structured surgical training programme, aiming to achieve a higher level among young doctors and thereby increase productivity. Two factors which lead to better surgeons and greater patient safety.

▶▶ Read more on www.gyn.rh.dk

Diagnosics of the future arrive at Rigshospitalet

Imagine if we could look at the DNA of a patient, make a accurate diagnosis and customise a much more effective treatment than we can provide today? It sounds like a dream, but reality came closer in 2009 with the Genomic Medical Unit

We already know a lot about genomics, and in 2009 we got the technology as well. The opening of the Genomic Medical Unit paves the way for customised diagnostics and treatment at Rigshospitalet.

The Genomic Medical Unit is a part of development of a new technology, where focus is on all the mechanisms in the cell at the same time, instead of the traditional focus on separate individual factors. Even though patients with the same disease are clinically categorised in the same group, it is likely they are suffering from a particular disease for two completely different reasons. This new technology can be applied to diagnostics and to improve classification of disease sub-groups, thereby leading to more differentiated treatment.

The new Genomic Medical Unit enables doctors and researchers to examine the entire DNA pattern, and not only a substance or a gene. The methodologies are based on DNA microarrays and the so-called Next Generation Sequencing (NGS), with which we can find new sub-groups of diseases.

New unit provides better knowledge-spillover

Our long-term ambition is to be able to map the DNA sequence of a patient using NGS, and make a precise diagnosis so that we can customise individual treatment. Doctors and researchers expect genomic medicine to become an independent speciality over time.

With this new unit, a complete infrastructure for the clinical departments is being established and it provides a place for young doctors, in particular, to research in gene technology and diagnostics, and at the same time apply their results in treatment. This increases knowledge transfer, so in the future Rigshospitalet can provide new and more effective diagnostics for patients. The new infrastructure constituted by the Genomic Medical Unit, will not only benefit Rigshospitalet, but other hospitals in the Greater Copenhagen Area will also have access to the unit's facilities.

▶▶ [Read more on www.kb.rh.dk](http://www.kb.rh.dk)

Rigshospitalet in brief

Rigshospitalet is a highly specialised hospital, organised under the Capital Region of Denmark. With a few exceptions, Rigshospitalet covers all medical specialist areas

Management and organisation

The hospital is managed by a Board of Management with a Hospital Director and two Assistant Directors (a Hospital Medical Director and a Hospital Nursing Director) with staff functions for finance and planning, for staff, for human resource development and quality improvement, and for IT and public relations. In 2009 Rigshospitalet employed about 8,000 full-time employees.

Rigshospitalet is divided into six treatment centres and two interdisciplinary centres. Each centre has a number of departments. Each centre is run by a manager with independent administrative and financial responsibility. Also a Nursing Head of Centre/Centre Head Laboratory Technologist is part of the management of the clinical centres.

Information and contact

Find information about the individual centres, departments and units on www.rigshospitalet.dk.