TICEBA
Back-up Your Life!

Background

Background – from the world of stem cells

o stem cells against cardiogenic shock

For the treatment of a patient with cardiogenic shock, stem cells from the bone marrow have been used successfully for the first time a short time ago. The treatment was carried out in the cardiogenic clinic of the University of Duesseldorf, Germany, on a 64-year-old patient who had suffered a second heart attack within 14 years and whose condition was extremely critical in spite of the physicians' efforts. When even six weeks after the attack no improvement was in sight and nothing seemed to stop the cardiogenic shock, the physicians around Professor Bodo-Eckehard Strauer from the Heinrich-Heine University in Duesseldorf decided to extract stem cells of the bone marrow from the pelvic bone of the patient and inject it into his coronary vessels after preparation. Four weeks after this transplantation, a visible improvement was noted. The clinic in Duesseldorf has been a pioneer in this field time and again. As early as in 2001, Professor Strauer started the stem cell treatment of the heart that is now spread globally with his team. This had, however, been the first time it was used on a patient with cardiogenic shock.

o Incontinence due to stress cured by treatment with stem cells

With a treatment with the body's own cells, 90 per cent of patients suffering from incontinence due to stress are still continent after one year. On the other hand, this was only correct for ten percent of the patients that had undergone conventional surgery. This is the result of the urine continence treatment the urologist professor Hannes Strasser has been practicing successfully for the last three years. Out of more than 270 persons, 93 percent of the women and 73 percent of the men who had trusted a treatment with adult stem cells could be cured. For this purpose, muscle tissue was extracted from the upper arm; the stem cells were isolated and then injected into the sphincter and the connective tissue of the urethra.

o stem cells against bone defects.

There is a plan to support the healing process of bone defects with the body's own stem cells in the future. Researchers of the orthopaedic university hospital in Heidelberg have developed a procedure in cooperation with the berufsgenossenschaftliche emergency hospital Ludwigshafen, with

the help of which they prepare stem cells obtained via punctuation of the bone marrow directly in the surgery room in the case of bone defects and then return them to the patient in a high concentration and in combination with resorbable bone surrogate substances. The big advantage of this procedure: Patients have to undergo anaesthesia only once. The treatment is currently being used in clinical studies on patients with bone defects that have not healed as well as with circulatory disturbances of the hip joint.

- **skin cells turn into mice**

Stem cells obtained from the skin can be used to clone mice with good success. Researchers around Elaine Fuchs and Peter Mombaerts from the Rockefeller University in New York have reported that. For the experiments, so-called keratinocyte stem cells have been used that can be found on hair follicles and that can be obtained relatively easily.

- **lame dogs walk again**

The regeneration of muscle tissue could soon become one of the next areas of treatment for stem cells. During studies on dogs suffering from a disease comparable to the human Duchenne muscular dystrophy (fatal amyotrophia) an Italian-French team of researchers has achieved remarkable success with the treatment of this inherited muscle disease. The researchers around Giulio Cossu of the University of Milan treated young golden retrievers whose amyotrophia had already begun with stem cells in two different ways. They injected one group with their own stem cells into the blood stream that had been equipped with the gene for the muscle protein dystrophin beforehand in order to correct the inherited defect. They treated a second group with stem cells from a healthy animal and gave them a drug preventing rejection by the immune system. These stem cells constitute a new form of adult stem cells that had shortly before been identified by the Italian researchers. As the scientists reported in the journal “Nature”, the success of the treatment was dramatically positive in some cases.

- **make tendons grow**

Researchers want to create replacements for worn-out tendons with the help of tendons. As the hand surgeon Dr. Susanne Kall from the medical university of Hanover reports, they are supposed to create an adequate replacement from the body itself without the patient having to sacrifice muscles and tendons from other places. Stem cells obtained from the patients’ bone marrow are cultivated and formed into a tendon. At the moment, there still were problems with the stability of the material but the expert estimates that the procedure might be mature enough to be used in practice in five years.

- **stem cells in the case of painful alterations of the mucous membrane after radiation therapy**

In patients that have undergone radiation treatment due to a malignant tumour in the area of the head and neck, time and again painful alterations of the mucous membrane occur, manifesting themselves sometimes massively when speaking, swallowing and eating. The patients lose weight and are

prone to infections. In addition, radiation therapy often has to be interrupted; causing the chances for healung to diminish and the changes of the mucous membrane can lead to the development of chronical damage to the bone substance later on. Therefore, physicians have been looking for ways to prevent the undesirable effectos of radiation. Stem cells could provide potent help. Wolfgang Dorf from the clinic for radiation therapy and radio oncology of the technical university of Dresden, Germany for example has discovered in trials with mice that the side effects of radiation therapy can be significantly reduced using adult stem cells from the bone marrow of grown animals. Stem cells can also help to protect the animals' salivary glands from effects of radiation. A group of researchers around the radiation biologist Coppes from the university clinic in Groningen in the Netherlands has proved this. In these glands, the production of saliva often fails as a result of radiation therapy; the patients then suffer from a dry mouth in addition to the alterations of the mucous membrane. According to the examinations, a few stem cells find their way into the mouth's mucous membrane.
Researches now assume that the stem cells release a growth stimulating cocktail of mediators through which the protecting regeneration processes in the mucous membrane of the mouth are being sped up. One factor for example is the growth factor KGF stimulating keratinocytes that in the meantime has been approved for the treatment of mucositis. Currently, a big study for the abatement of complications due to radiation of tumours in the area of the head and neck ist being carried out. The researchers are now trying to obtain findings about the way in which the stem cells protect the mucous membranes, in connection with the hope to be able to copy this strategy as successfully as possible.

- **rebuild defect intervertebral disks**

„All over Europe, 22 Million people are suffering from continuous backache. Often, herniated vertebral disks and wear-out are the reason and only surgery can help. The practice clinic Dr. Schneiderhan and colleagues in Munich is the first in Germany to use the method of so-called autologous vertebral disk cell transplantation. The term describes the extraction of living cells from the damaged inter-vertebral disks, whose cultivation and later reimplantation. Between extraction and reimplantation a period of about three months passes. The grown mass of cells is then injected into the core of the damaged disk and replaces the destroyed cartilage tissue. As it is the body's own tissue, rejection reactions are not to be expected; furthermore the method has been studied in several international studies since 1999.
„ Thanks to the new cells, the vertebral disk retrieves its original height and functionality", says backbone specialist Reinhard Schneiderhan.

From Harvard

- The stem cell researchers Dr. Markus Frank from the transplantation centre of the Childrens and Brigham Women's Hospital in Boston and his colleague Dr. George Murphy, the principal of the dermatology department have obtained a very important finding in the treatment of cancer. They have identified and systematically eliminated tumour stem

cells of the melanome, one of the most feared cancer diseases. Cancer researchers have been on the track of specific, especially destructive cells for some time – the cancer stem cells, that are suspected to play a key role in the formation of of a tumour (at times may years after the first occurrence) and the development of metastases. The researchers were able to prove that there a few of these cells slumbering in the body even after successful treatment and flare up again one day. Dr. Frank and Dr. Murphy of the Harvard Medical School in Boston have now identified these cancer stem cells and – as the journal Nature published in the issue of the 17th of January - systematically eliminated them. They played on the fact that these cells carry the protein ABCB5 on their cell surface and then used specific antibodies against this protein with the help of which they were able to both distinguish the cancer stem cells from the regular skin cancer cells and even eliminate them. They carried out several experiments in order to prove that it were the cancer stem cells speeding up the growth of the skin cancer. They managed to suppress the growth of the tumour when they eliminated these cells with the antibodies. And upon transplantation of the skin cancer cells into mice, different strengths of cancer development became visible: The ABCB5-positive cancer cells caused a very strong development of tumours, while the ABCB5-negative cells could not generate a significant tumour growth. And also in the cultivation of the cells, differences were shown. ABCB5-positive cancer cells were able to create both ABCB5-positive cancer cells and ABCB5-negative skin cancer cells. A culture of the ABCB5-negative skin cancer cells only produced ABCB5-negative cancer cells and no ABCB5-positive cancer cells. This conclusion of the Harvard researchers is that important as cancer stem cells can not be tackled with the conventional cancer treatments - radiation and chemotherapy. Researchers assume that cytostatics destroy multiplying cells in general, but cancer stem cells multiply rather rarely. Furthermore, they produce transport proteins that pump chemotherapeutical poisons downright out of the cell. And they also endure radioactive radiation, which usually means certain death for cells. The scientists believe that the resistance to radiation is due to a defective control mechanism in the cancer stem cells. In contrast to normal cells, they obviously have lost the important ability to “commit suicide” when their genotype has been damaged too gravely. These fatal characteristics of cancer stem cells lead to the situation – as the researchers assume – that patients are in danger for the development of new tumours and metastases even after relevant treatment at any time. Dr. Frank and Dr. Murphy have managed to take an important step into the future here. (By the way - Dr. Frank is the scientific counsellor of TICEBA.)

- The group of researchers around Dr. Frank and other groups working in the field of ABCB5 stem cells and with stem cells of the skin in general have published fascinating works once again in the year of 2006. The researchers are convinced that the skin is by far the most important organ to obtain especially versatile stem cells. For example it has been shown that stem cells from the skin have muscle-building potential (myogenic) potential, it became evident that they are able to rebuild muscle cells. And they also have an interesting neuronal potential. The special function of

the ABCB5 positive stem cell was shown in its immune modulative / immune suppressive potential in the case of auto immune diseases and their privileged position in the immune system, i.e. in allogenic use there was no rejection reaction..

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