Med Cell Europe AG: medicine from a patient's own adipose tissue

Med Cell Europe AG, which is headquartered in Münchwilen, Switzerland, and a member of the BioLAGO bioregion, is the only private stem cell bank in Europe that isolates adult stem cells from customers' adipose tissue. The biotech company, which was founded in 2010, is also active in research. The focus, amongst other things, is on the transformation of stem cells into insulin-producing cells and cytotoxicity tests to explore potential damage to stem cells caused by UV rays, for example.

Adult stem cells are undifferentiated cells found throughout the body that replenish dying or damaged cells of various organs and tissues. Many researchers see them as one of the potential and most promising therapeutic options in the future. Stem cells can be obtained from many different areas of the human body.

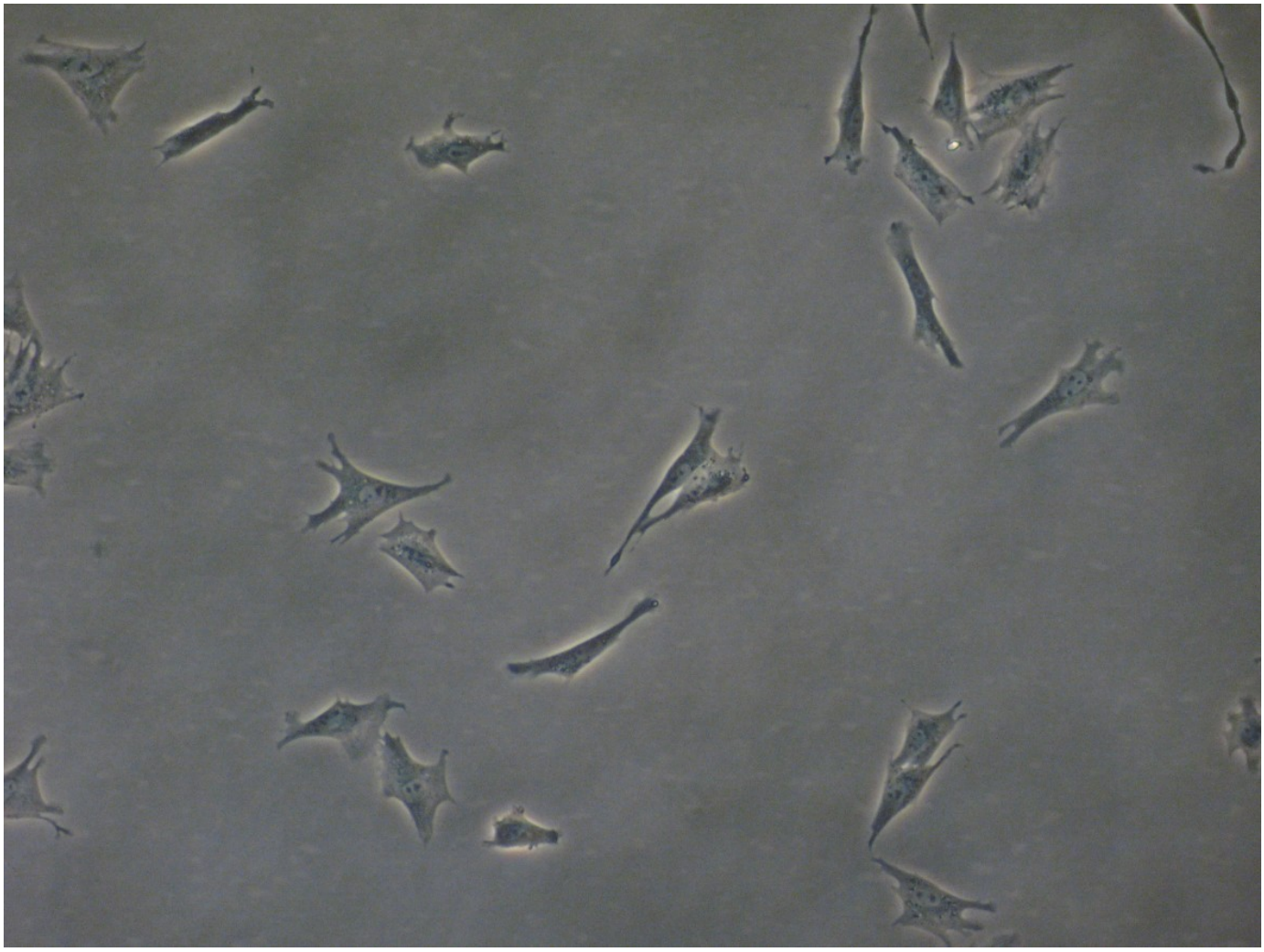
Med Cell Europe AG concentrates specifically on stem cells from adipose tissue. There are several reasons for this: "In contrast to bone marrow stem cells, the removal of stem cells from adipose tissue is less painful," said Dr. Miriam Reif, Chief Medical Director of Med Cell Europe AG. The removal of stem cells from the bone marrow is always associated with the removal of a "lot of unwanted cells, including blood cells and fibroblasts that do not have the potential to divide". Adipose tissue stem cells can be collected from people of any age. "Umbilical blood cells can only be obtained at birth and only in very small quantities," said Dr. Miriam Reif. A few years ago, adipose tissue was identified as a rich source of adult stem cells, which can be differentiated into many different cell types if required, including cartilage, bone, tendon, ligament, muscle, nerve and many other cell types.

Differentiation into insulin-producing cells

Peter Kellner, Chief Executive Officer and Chairman of Med Cell Europe AG.

Different research projects determine the current daily work of Med Cell Europe AG. This has enabled the company to develop a method by which stem cells can be transformed into insulin-producing cells. These are then re-implanted in a suitable location in the body. Med Cell Europe AG exclusively uses mesenchymal stem cells obtained from a patient's own adipose tissue.

In general, stem cells can be distinguished from other cells by their differentiation potential. Differentiation is the development of cells or tissues from a less specialised into a more specialised state. Mesenchymal stem cells (MSCs) are capable of forming bone, cartilage and adipose tissue as well as differentiating into islets of Langerhans. These are clusters of cells in the pancreas, which sense blood sugar levels as well as produce and secrete insulin.



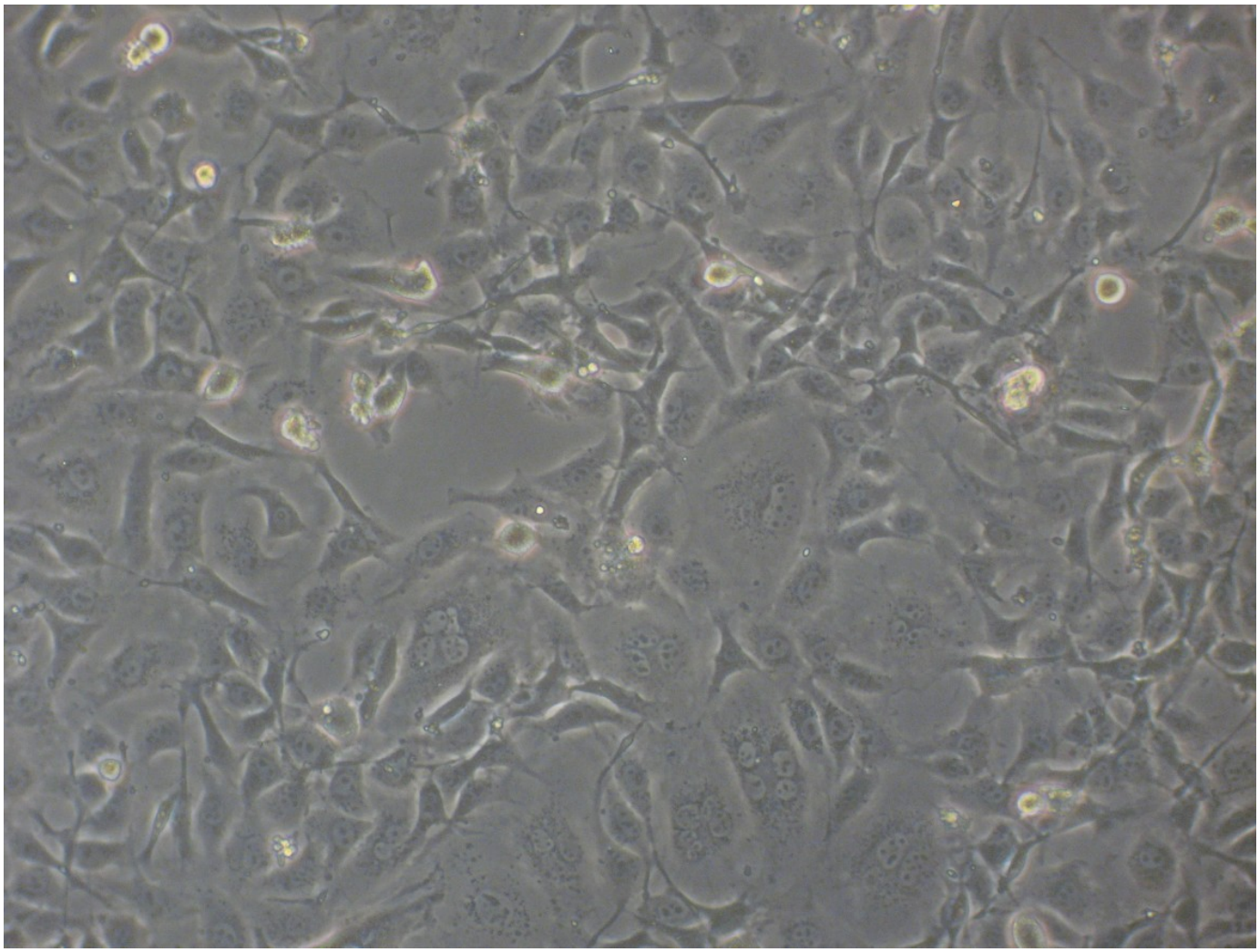
Mesenchymal stem cells that have been cultivated for 12 hours.

"The transformation involves a minimal change of nutrients that are provided to the cells," says Dr. Steven Kellner, CEO of Med Cell Europe AG. It is also important that the cells are not manipulated in any way, whether through the introduction of foreign genetic material or other so-called inductions. The transformation takes seven to 21 days and leads to a high yield. "As the cells behave differently in cultures from their physiological environment, we try to perform this transformation in special biospheres or gel droplets," says Steven Kellner. Med Cell Europe AG obtained the biospheres from one of its cooperation partners, Professor Daniele Vigo, a basic researcher at the University of Milano, and developed them further.

Uncertainty still exists as far as the site of implantation is concerned. In a patient with type 1 diabetes, which is an autoimmune disease, special care needs to be taken to protect the new insulin-producing cells against the patient's immune system. "One idea, for example, is to implant the cells below the kidney capsule, which is a place with reduced immune activity," stated Steven Kellner. For purely practical reasons, Med Cell Europe AG follows the idea of encapsulating the cells in the aforementioned biospheres and the simple injection into subcutaneous tissue.

Although Med Cell Europe AG has already achieved a breakthrough with this method, the company is still quite far from being able to carry out clinical trials to test the efficiency of insulin-producing cells in humans. "Issues like insulin quantity, application site and survival still need to be clarified," said Dr. Miriam Reif.

Characterisation of toxic influences



Mesenchymal stem cells isolated from adipose tissue.

Another research activity of Med Cell Europe AG is the cytotoxicity testing of MSCs and their differentiated cells with the goal of elucidating the harmful effects such as UV radiation or changes in the pH.

All cells have a biological value, but this can change due to external influences, which could damage the tissue, and lead to it losing its structure and hence also its functions. For example, cytotoxicity tests measure the release of the enzyme adenylate kinase (AK) from dead cells. "This protein is secreted into the culture medium when the cells die," says Dr. Steven Kellner. The enzyme actively phosphorylates adenosine diphosphate (ADP) in order to form adenosine triphosphate (ATP). ATP is then measured using bioluminescent reactions. The amount of adenylate kinase increases as cytolytic activity increases, which results in higher light emission. Repeated samples may be removed from the culture medium, which allows the kinetic analysis of cell death. The cytotoxicity tests also serve as a guide for the possible damage of stem cells by drugs. "Drugs like painkillers are tolerated well by the native stem cells," said Dr. Miriam Reif. Amongst other things, the tests are therefore carried out with more sensitive cell lines such as liver cells.

Transformation into heart muscle cells

In another project, Med Cell Europe AG is working on a new concept for application in the field of pharmacology, i.e. in connection with the transplantation of MSCs in patients with coronary heart disease, where the blood vessels become clogged, resulting in the death of myocardial tissue. “The treatment of coronary heart disease with stem cells is particularly focused on the proteins that the stem cells produce,” said Dr. Steven Kellner. Stem cells produce a variety of active substances and secrete them into their environment. In the case of cardiac muscles, it is mainly anti-inflammatory and blood circulation-enhancing substances that are released. “The advantage of this therapy would be that it treats the causes of heart disease and not just the symptoms,” said Dr. Steven Kellner. The intravenous injection of the cells would lead to the distribution of the cells to various locations in the body, which is why in life-threatening conditions the direct injection of stem cells using heart catheters would be preferred. “The stem cells would then secrete their active substances to the surrounding heart muscle for a period of six to eight weeks before they themselves would be transformed into myocardial cells,” says Kellner.

In future, the young company intends to advance and intensify its research activities. “We are very interested in cooperating with partners from industry, science and institutions of higher education,” says Peter Kellner, Chairman and CEO of Med Cell Europe AG.

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