

STEM CELL INFORMATION SHEET

What are stem cells?

Stem cells can be divided into two broad types of cells: embryonic and adult stem cells. Embryonic stem cells are derived from the early embryonic tissue which we do not use for ethical reasons.

Adult stem cells are obtained from adult tissue and are found in most tissue types and act as the repair system for the body, replenishing and maintaining the bodies organs and tissues. Fat is an easy source to obtain stem cells.

Stem cells are defined by two properties: First, they can self-regenerate, that is they can divide and give rise to more stem cells of the same kind. Second, they can mature or differentiate into specialised cells that carry out a specific function, such as in the skin, muscle, or blood.

Stem cell science shows much promise for the future treatment of a wide range of diseases and conditions, but much of the research is still in early stages. There is good cause for hope, but progress is slower than the media often suggests.

Tissue specific stem cells

Tissue specific stem cells are undifferentiated cells found in the tissues and organs of the body. They are capable of self-renewal. Their differentiation is mainly restricted to forming the cell types of that tissue or organ. The chief role of tissue specific stem cells is to maintain and repair the tissue in which they are found. Skin stem cells, for example, give rise to new skin cells, ensuring that old or damaged skin cells are replenished.

It now appears that all tissues contain adult stem cells. Most tissues contain only small numbers of stem cells. The exception is fat, bone marrow and umbilical cord blood which contains relatively high numbers of stem cells. In each tissue, adult stem cells are used to produce new mature cells as old ones die in the natural processes of ageing. They may also be activated by disease or injury.

To date the majority of research and clinical trials has been carried out on hematopoietic stem cells isolated from bone marrow, umbilical cord blood, and on mesenchymal stem cells which can be sourced from fat and bone marrow, and some other tissues. Mesenchymal stem cells are the stem cells that form our fat, muscle, bone and cartilage, they can also differentiate into nerve cells.

Mesenchymal stem cells are particularly interesting to clinicians because in addition to their capacity to differentiate into the multiple cell types listed above, they also have anti-inflammatory and immune-suppressing properties. This means that mesenchymal stem cells could be useful as therapies for diseases caused by immune attack on specific tissues. Harvesting MSCs from adipose tissue through simple, minimally invasive surgery is relatively easier, painless and poses minimal risk to the patient compared to all other possible methods.

Adipose-SVF Treatment

Autologous adipose-stromal vascular fraction- stem cell treatment is a refinement of fat transfer that has been used in cosmetic surgery since 1983 and is considered extremely safe. Refinement comes as the fat cells are removed leaving the stromal vascular fraction (SVF) cells, which contain mesenchymal stem cells. The remaining cells include important immune regulating cells, early mesenchymal cells, and many growth factors and cytokines. Vast numbers of these cells are available in fat and we routinely transfer hundreds of millions of these cells for each patient.

Once separated from adipose tissue we do not manipulate the SVF cells. They are injected unchanged. We do not culture the cells. We do not use any animal products. A large body of scientific evidence suggests that adipose-SVF may act by replacing lost or damaged cells, reducing inflammation, improving the function of cells at the site and recruiting cells from other parts of the body to assist in these processes.

There is at present no benefit is payable, either by Medicare or by a health fund for adipose-SVF treatment. You may be able to claim a tax refund of 20% of the cost, if your total health costs are above \$2,000 in a year. We recommend seeking independent advice in this area.

How to increase stem cell survival

Even if stem cells have an intrinsic capacity to create new tissue, they are unlikely to do so if the recipient environment is not conducive to regeneration.

What can patients do to increase cell survival?

Anything that improves general health, immune status and circulation will improve the effectiveness of stem cell treatment.

1. Exercise - Has been shown to increase the number of stem cells in the circulation. A vigorous circulation is essential for cell growth.
2. Diet - Everything that you eat will have an impact on cell survival. Fruit and vegetables rich in antioxidants and phytonutrients will actively support an optimal environment for cell growth. Saturated fats and high GI carbohydrates have been shown to be inflammatory and have a negative effect.
3. Supplements - There are many supplements that look very promising. These include:-
 - Resveratrol
 - Carnatine
 - Colostrum Fish Oil
 - Vitamins, Minerals and Antioxidants

Treatment

This is a same day procedure with the stem cells administered on the same day.

A blood sample of 40 ml of blood may be collected by the treating doctor. This will be processed to make Platelet Rich Plasma (PRP). The PRP may be used to treat the SVF after it has been harvested.

Fat harvest is performed by a mini-liposuction under a local anaesthetic for pain relief. Typically, 100 -150 ml of fat in a one-off treatment for osteoarthritis is all that is required. This fat will then be processed at the clinic under sterile conditions.

- Stem cells have been traditionally been harvested from fat using the enzyme collagenase and/or other reagents which we have previously performed. Our clinic now uses the latest and cleanest method to obtain our stem cells - ultrasonic cavitation.

- Ultrasonic cavitation separation of stem cells and SVF from fat is clean and quick and does not require any chemicals or reagents. Ultrasonic cavitation produces a shockwave that strips the stem cells from the fat and tissue. This clean method also provides a significant increase in cell numbers compared to the traditional methods using collagenase.
- The stem cells may then be further activated with the addition of growth factors obtained from your own blood (platelet rich plasma (or PRP)) on the day depending on the Dr's assessment.
- The cells are then administered back to the patient through one or more of the following modes of administration.
 - **Intravenous** : Administered through a standard intravenous drip
 - **Intra-articular** : Injected directly into a joint using ultrasound guidance

This is approximately a 1½ to 3 hour outpatient procedure. The differences between this and other stem cell procedures are:

- Less painful than a bone marrow transplant
- More adult stem cells per unit volume can be harvested
- No ethical or moral issues in harvesting adipose (fat) tissue
- Clean separation of cells using no chemicals

Adverse effects

Adult stem cell clinics have treated many patients now and have not seen any major adverse events. While this treatment appears to be 100% safe we are ever vigilant and routinely collect follow up data looking for possible adverse events. Follow up questionnaires can be tedious and inconvenient for you but they are very important to your health and that of others who will be treated. We thank you in advance for your patience and contribution to medical knowledge.

Minor adverse events have been observed on the day of the procedure in a small percentage of patients and include: slight fever, rash, euphoria followed by a transient depression, cramps in the toes and feet, and the common side effects of the liposuction procedure.

Common liposuction short-term side effects may include: abdominal pain, bruising (may last up 2 weeks), some bleeding/discharge for 24 - 48 hours.