Stem Cells

Common Questions

More information can be found on
Dr. Stetson's website at www.sportsmedicinedr.com

WHAT ARE STEM CELLS?

Stem cells are unique cells found in almost all tissues of the human body. They are unique because of two key features which other cells in the body cannot do, they are able self-replicate and differentiate. Self-replication or self-renewal means that stem cells can divide to create more stem cells. Differentiation means stem cells can become other types of cells. What is so exciting about stem cells is that they have the potential to turn into many different types of cells but how this is done is the big question.

HOW DO STEM CELLS DIFFER FROM OTHER CELLS IN THE BODY?

Stem cells are very different from other cells in our body in that they can grow or differentiate into many different other types of cells including muscle, bone, heart, kidney and even nerves. That is why stem cell therapy is so exciting and has so much potential!

ARE THERE DIFFERENT TYPES OF STEM CELLS?

There are different types of stem cells and not all stem cells are the same. They form in different tissues in the body and where they form determines where they can be used as treatments. Stem cells from a fetus are called embryonic stem cells and they have the ability to grow into all different types of cells of the body. Adult stem cells come from fully grown humans but may not be as versatile and durable as embryonic stem cells.

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WHAT ARE EMBRYONIC STEM CELLS?

Some types of stem cells are called embryonic stem cells and can grow into many different types of cells, not just one specific type. These types of stem cells are taken from an early fetus in the first week after fertilization and are the most versatile since they can develop into all cells of a developing fetus. No other cell type in the body has the natural ability to generate so many different types of cells than embryonic stem cells.

WHY ARE EMBRYONIC STEM CELLS SO CONTROVERSIAL?

Because human embryonic stem cells are taken from human embryos that were fertilized in fertility clinics but never implanted in a woman's uterus, several questions have been raised about the ethics of embryonic stem cell research. The National Institute of Health (NIH) published guidelines in 2009 for human stem cell research and stated that these embryos created by in vitro fertilization can be used only when the embryo is no longer needed. However, some groups do not feel that these embryos should be used at all because they have the potential to become human beings.

ARE THERE ALTERNATIVES TO USING EMBRYONIC STEM CELLS?

An alternative to using embryonic stem cells is adult stem cells. However, adult stem cells may not be able to produce all cell types and so are not as versatile as embryonic stem cells. Adult stem cells can only be manipulated to produce certain cell types which limits how these adult stem cells can treat certain conditions and diseases.

WHAT ARE UMBILICAL CORD STEM CELLS?

Umbilical cord stem cells are found in the placenta after childbirth and contain various types of stem cells. These cells come from the blood that remains in the placenta after delivery and so contain mostly stem cells for the blood which are called hematopoietic. There are also mesenchymal stem cells in the placenta, but they are much lower in number.

WHAT ARE MESENCHYMAL STEM CELLS?

Mesenchymal stem cells are found in many of our body's tissues, and they have the capability to differentiate or turn into cells that support our skeleton like bone, muscles, cartilage, and connective tissue. They are found in our bone marrow and our fat which is called adipose tissue. These types of cells have the potential to treat osteoarthritis and loss of cartilage in our joints unlike

any other current treatments. However, much of the research work is still in its early stages and not available for clinical use.

WHAT DOES IT MEAN A STEM CELL IS "PLURIPOTENT"?

A pluripotent cell can differentiate or turn into any type of cell in the body. Not all stem cells have this capability and embryonic stem cells are the only ones with this capability.

WHAT ARE INDUCED PLURIPOTENT STEM CELLS?

Induced pluripotent stem cells are also referred to as iPSCs and are adult stem cells that have been reprogrammed via genetic engineering to an embryonic or a beginning state. This allows these cells to differentiate into any type of cell in the body. In 2007, scientists developed a way to generate these cells without the use of human eggs and they have become very important in regenerative medicine and research to treat diseases.

HOW ARE STEM CELLS HARVESTED?

Stem cells can be taken from your bone marrow, fat, or from a donor. Those that come from bone marrow are called bone marrow derived stem cells and they are usually taken from the hip or pelvis. Fat derived or what are called adipose derived stem cells are usually taken from the lower abdominal region.

WHAT IS STEM CELL DIFFERENTIATION?

Stem cells have the capability to turn into many different types of cells and this process is called differentiation. A stem cell will usually change or differentiate into a more specialized cell, and this occurs in the early stages of the development of the fetus where fetus stem cells turn into all different types of other special cells which make up our heart, brain, muscles and all other parts of our body.

HOW DO STEM CELLS REPAIR DAMAGED TISSUES?

Adult stem cells can be activated in many ways and that is the subject of current research. If they can be activated in such a way, they can be turned on or differentiated into daughter cells which can theoretically help in tissue repair of damaged tissues. How these adult stem cells are activated is the tricky part and that is what we are trying to understand with current research.

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WHAT IS STEM CELL THERAPY?

Stem cell therapy is also known as regenerative medicine where the body can promote and repair the healing of damaged cells using stem cells or its derivatives. Researchers can grow stem cells and manipulate them in the laboratory into specific types of cells such as heart, blood, muscle, or cartilage. These specialized cells can be injected or implanted into a person's heart, knee or other body part, and these healthy new cells can help repair or replace the damaged cells or tissues. Stem cell therapy has been used for many years for the treatment of many blood disorders such as leukemia and current research is being done for many other disorders such as osteoarthritis.

WHAT CONDITIONS CAN STEM CELL THERAPY POTENTIALLY TREAT?

Stem cell therapy has been shown to be very effective in the treatment for blood disorders such as leukemia and lymphoma. Current research is being conducted on how it can be used for nerve cells and paralysis, osteoarthritis and degenerative cartilage, heart muscle and heart failure, as well as many other conditions. It has the potential to revolutionize the treatment of many health conditions, but more research needs to be done before these treatments will be available.

HOW IS STEM CELL THERAPY ADMINISTERED?

Depending on what is being treated, stem cell therapy is usually injected directly into the area where there is damaged tissue. For example, for knee osteoarthritis, research studies are being done where stem cells are injected directly into the knee joint to help reduce inflammation, reduce pain, and possibly regenerate damaged articular cartilage.

ARE THERE ANY RISKS ASSOCIATED WITH STEM CELL THERAPY?

With any treatments, there always risks and stem cell therapy is no different. Researchers must be sure that the stem cells will differentiate or turn into the proper cell and not turn into another type of unwanted cell type. There is also the potential for stem cells to grow irregularly or out of proportion to what is needed. The body can also mount an immune response or a rejection of the tissue. In addition, with any type of treatment which requires an injection, there is the risk of an infection.

HOW DOES STEM CELL THERAPY DIFFER FROM TRADITIONAL TREATMENTS?

Stem cell therapy differs from traditional treatments in that the stem cells have the potential to help repair or even replace damaged tissue. Our current medical treatments often do not have this capability, that is why stem cell therapy holds so much potential for the future.

HOW LONG DOES IT TAKE FOR STEM CELLS TO WORK?

Depending on how stem cells are being used, the length of time before it works can vary tremendously. For knee osteoarthritis, preliminary studies are showing effects within four to six weeks which is similar to other treatments. However, it is not clear whether these stem cell injections for the knees are rebuilding articular cartilage or just reducing the symptoms of arthritis. More research needs to be done before these types of injections can be recommended for osteoarthritis.

IS STEM CELL THERAPY A PERMANENT SOLUTION?

At this time stem cell therapy is still experimental for many conditions including osteoarthritis of the knee and other joints. It has been shown to be very effective in treating blood disorders including leukemia and lymphoma and there is hope that it can be effective for many other conditions in the future.

CAN STEM CELL THERAPY BE COMBINED WITH OTHER TREATMENTS?

Stem cell therapy for osteoarthritis is still considered experimental and because of that, it can be combined with other therapies such as bracing, physical therapy and even surgery. However, research studies will need to be done to determine what is the best combination of treatments when stem cells are used.

HOW ARE STEM CELLS USED IN TREATING OSTEOARTHRITIS?

Stem cells have shown some promise in treating osteoarthritis of the knee and other joints. Early clinical trials have shown promise in reducing the symptoms of osteoarthritis including pain and swelling. However, what we don't know is whether the stem cells just reduce the symptoms of osteoarthritis or actually regenerate cartilage. Future research will give us more information but at this point it does not appear that cartilage is regenerated.

HOW MANY STEM CELL INJECTIONS ARE NEEDED?

At this time stem cell injections for the treatment of osteoarthritis are experimental and no one knows for sure if only one or multiple injections are necessary. The results also may vary depending on the patient and the degree of osteoarthritis. Future research will hopefully give us more information but for now, stem cell injections for osteoarthritis should be approached with caution.

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HOW IS STEM CELL RESEARCH REGULATED?

Here in the United States, the governing body for scientific research is the National Institute of Health or also called the NIH. In 2009, the NIH published guidelines for human stem cell research to help scientists and researchers doing stem cell research. These guidelines state that embryonic stem cells from embryos created by in vitro fertilization can be used only when the embryo is no longer needed and has been donated with informed consent from donors.

CAN STEM CELLS BE PATENTED?

Stem cells are patentable here in the United States but not in Europe. The United States Patent and Trademark Office has issued over 1000 patents for stem cells, including patents for human embryonic stem cells.

WHAT ARE THE LATEST ADVANCEMENTS IN STEM CELL RESEARCH AND THERAPY?

There are many significant advancements that have been made in stem cell research in recent years and there are more to come. The techniques for turning stem cells into nerve tissue or heart muscle show significant promise in treating conditions such as nerve damage from injuries or the heart muscle from disease. More research is also being done to treat Parkinson's, certain cancers and blood and immune disorders.

WHAT ROLE DOES THE IMMUNE SYSTEM PLAY IN STEM CELL THERAPY?

The immune system plays a very important role in any type of therapy. Researchers are working on ways to use stem cells to stimulate the immune system to help destroy cancers and other diseases in our systems without the use of toxic chemotherapy drugs. The development of the CRISPR gene editing system has been a breakthrough in scientific research and allows better disease modeling and the potential for personalized medical approaches.

ARE STEM CELLS SAFE?

Without any new treatment, there are always risks and the use of stem cells is no different. There is a chance that the body can have an immune reaction or even an infection can develop with the injection of the stem cells. All stem cell treatment should be done by a licensed physician under strict guidelines and supervision to minimize these risks.

WHAT IS THE FUTURE OF STEM CELL RESEARCH IN THE NEXT DECADE?

In the next 10 years there will no doubt be significant advances in stem cell research using not only embryonic stem cells but also induced pluripotent stem cells (iPSCs) which are an alternative to embryonic stem cells that reduces the ethical concerns. New techniques are being developed everyday that some day will help us grow all types of human tissues in the laboratory to be used to help fight disease and degeneration of our bodies.

DOES INSURANCE COVER STEM CELL THERAPY?

At this time most insurance companies do not cover stem cell therapy for most conditions. There are a few exceptions, for example the treatment of certain blood disorders such as leukemia and lymphoma where bone marrow stem cell therapy has been found very useful. However, for most other conditions such as the treatment of osteoarthritis, stem cell therapy is still considered experimental and is not covered by insurance.

IS STEM CELL TREATMENT EXPENSIVE?

Yes, stem cell therapy can be expensive as it is a new treatment, and most insurance companies do not cover the cost of the procedure. The cost can vary as there are different techniques that are used, and the preparation kits can also vary in price. As more research is done and its effectiveness is proven, it may be covered by more insurance companies. However, for now, it is still considered experimental by many insurance companies, and they are unwilling to pay for it.

HOW IS STEM CELL TREATMENT DIFFERENT FROM TRADITIONAL DRUGS?

Stem cell therapy is very different from traditional drugs because it is using your own body or the cells from someone else to regenerate new tissue which traditional drugs cannot do. This is a new frontier in medicine and much more work needs to be done but the future is promising for this type of treatment. Traditional drugs are usually made synthetically through chemical processes and although useful, do not cure everything so that is why stem cell therapy is felt to have so much potential.

IS STEM CELL TREATMENT REGULATED BY THE FDA?

The Federal Drug Administration or FDA does regulate stem cell products and treatment. As of April 2024, the only FDA approved stem cell products are blood-forming stem cell products from umbilical cord blood. These products are approved for use in patients with blood production

disorders. The FDA has also approved stem cell therapy with bone marrow transplants for blood and immunes disorders. At this time there are no other FDA approved treatments using stem cells. Stem cell therapy requires significantly more testing for safety and efficacy before receiving approval for use.

ARE THERE ANY LONG-TERM RISKS ASSOCIATED WITH USING STEM CELLS?

The long-term risks of stem cell therapy are really unknown at this time. Further research studies are currently being done but as of now, the risks appear to be very small.

WHAT IF I HAVE ANY OTHER QUESTIONS?

If you have any other questions, more information can be found on Dr. Stetson's website at www.sportsmedicinedr.com or just call Dr. Stetson's office, we are always happy to answer any questions you may have.

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