



Stem Cell

A PATIENT EDUCATION eBook

What Patients Need to Know About **MUSE Stem Cells**

What they are, why they're drawing attention, and what the research shows

For educational purposes only. Not FDA approved to diagnose, treat, cure, or prevent any disease.

Before You Begin

FDA Disclaimer | For Educational Purposes Only

MUSE cell products have not been approved by the U.S. Food and Drug Administration (FDA) to diagnose, treat, cure, or prevent any disease or condition. Regulation as a Section 361 HCT/P does not mean the FDA has reviewed or approved a product for safety or effectiveness. Statements in this eBook have not been evaluated by the FDA.

This eBook is provided for educational purposes only. It is not medical advice and is not intended to replace a consultation with a qualified healthcare provider. Individual experiences vary, and no specific result is guaranteed. Always talk with your physician about whether any treatment is right for you.

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CHAPTER 1

About This Guide

Few areas of medicine have generated as much curiosity in recent years as regenerative medicine, and few topics within it have drawn as many questions as MUSE cells. Patients hear about them from friends, online videos, news stories, and social media. Some of what they hear is accurate. Some of it is not.

We wrote this guide to give you a clear, balanced, and honest starting point. It explains what MUSE cells are, where they come from, why scientists find them interesting, what the research does and does not show, how these products are regulated, and how to make an informed decision about any cell-based treatment.

You will notice what this guide does not do. It does not promise results, and it does not claim that MUSE cells treat any particular disease or condition. That is deliberate. The science is promising and moving quickly, but it is still early, and you deserve to see the full picture before making any choices about your care.

Key Takeaway

This guide is designed to inform, not to persuade. A good decision about your health starts with accurate information and an honest conversation with a qualified physician.

CHAPTER 2

Stem Cells 101

Before we talk about MUSE cells, it helps to understand stem cells in general.

Your body is made of trillions of cells, and most of them are specialized. A heart muscle cell beats. A nerve cell carries signals. A skin cell forms a protective barrier. These cells are very good at their jobs, but most of them cannot become a different kind of cell.

Stem cells are different. They have two defining abilities:

- **Self-renewal.** They can divide to make more copies of themselves.
- **Differentiation.** They can develop into one or more specialized cell types.

Throughout life, stem cells help the body maintain and repair itself. They replace blood cells, renew the lining of the gut, and contribute to the turnover of skin and other tissues.

The Main Types of Stem Cells

Scientists group stem cells by where they come from and how many cell types they can become.

- **Embryonic stem cells.** Taken from early-stage embryos. They can become almost any cell type, but their use raises ethical concerns, and in laboratory and animal studies they can form tumors.
- **Induced pluripotent stem (iPS) cells.** Adult cells that scientists reprogram in the lab using genetic factors so they behave like embryonic cells. This discovery earned a Nobel Prize in 2012. Because of the reprogramming, tumor formation remains a concern.
- **Adult (tissue) stem cells.** Found in tissues throughout the body, such as bone marrow and fat. They usually produce a narrower range of cell types related to their home tissue.
- **Perinatal stem cells.** Found in birth tissues such as the umbilical cord, cord blood, and placenta. These tissues are typically discarded after birth, which makes them a widely used, ethically uncomplicated source. They actually fall into the Adult stem cell category as well even though they come from birth tissue.

Mesenchymal Stem Cells (MSCs)

One group of adult and perinatal cells you may hear about is mesenchymal stem cells, often called MSCs (also called mesenchymal stromal cells). MSCs are found in bone marrow, fat, the umbilical cord, and other tissues. Much of their activity in research appears to come from the signals they



release, which can influence inflammation and nearby cells, rather than from turning into new tissue themselves.

MSCs matter to our story because MUSE cells were discovered hiding inside MSC populations.

Key Takeaway

Stem cells can renew themselves and develop into other cell types. They come from several sources, including embryos, adult tissues, and birth tissues, and each source has different strengths and limitations.

CHAPTER 3

What Are MUSE Cells?

A small population of cells with an unusual combination of properties.

MUSE stands for Multilineage-differentiating Stress-Enduring cells. They were first described in 2010 by a research team led by Professor Mari Dezawa at Tohoku University in Japan, in a paper published in the Proceedings of the National Academy of Sciences.

A Discovery Under Stress

The discovery came from an unexpected observation. When researchers exposed cultures of mesenchymal cells to harsh, stressful conditions, most of the cells died. A small group survived. When the team studied those survivors more closely, they found that the cells had a remarkably broad ability to develop into different cell types. That combination, surviving stress and forming many cell types, gave MUSE cells their name.

Where MUSE Cells Are Found

MUSE cells are not created in a laboratory. They occur naturally in the human body, in small numbers. Researchers have identified them in:

- Bone marrow
- Peripheral blood (the blood circulating through your body)
- The connective tissue of many organs
- Fat (adipose) tissue and skin
- Birth tissues, including the umbilical cord

They make up only a small fraction of mesenchymal cell populations (5-10%), typically a few percent of cultured MSCs and a much smaller share of the cells in bone marrow. Some research has reported that the number of MUSE cells circulating in the blood can rise after certain kinds of tissue injury, which has led scientists to suggest they may be part of the body's natural repair system.

How Scientists Identify Them

Scientists find MUSE cells by looking for a specific marker on the cell surface called SSEA-3 (stage-specific embryonic antigen-3). This marker is usually associated with very early, flexible cells. MUSE cells also carry many of the markers found on typical MSCs, which reflects where they live.



Key Takeaway

MUSE cells are a rare, naturally occurring population of stem cells found in the body and in birth tissues. They were discovered in 2010 and are identified by a surface marker called SSEA-3.

CHAPTER 4

What Makes MUSE Cells Different

How MUSE cells compare with other stem cells studied in medicine.

Much of the interest in MUSE cells comes from the way they seem to combine strengths of different stem cell types while avoiding some of their drawbacks. The properties below come mostly from laboratory and animal research.

1. Stress Endurance

MUSE cells survive conditions, such as lack of nutrients and exposure to enzymes, that kill most other cells. In the lab they show an active ability to repair damage to their own DNA. Researchers believe this hardiness may help them survive in damaged tissue environments.

2. Broad Differentiation Potential

The body's tissues develop from three basic layers in the early embryo: the ectoderm (which gives rise to skin and nerves), the mesoderm (muscle, bone, blood vessels), and the endoderm (organs such as the liver and lungs). In laboratory studies, a single MUSE cell has been able to produce cells representing all three layers. Most adult stem cells are far more limited.

3. Low Tumor-Forming Potential

Cells that can become many cell types, such as embryonic and iPS cells, carry a known risk of forming tumors. MUSE cells have shown low activity of telomerase, an enzyme tied to unlimited cell growth, and in animal studies they have not been observed to form tumors. Long-term data in humans are still limited.

4. No Genetic Reprogramming

Unlike iPS cells, MUSE cells are not genetically modified or reprogrammed. They already exist in this state in the body. In fact, research from Professor Dezawa's group in 2011 suggested that MUSE cells may be a main source of the cells that become iPS cells when fibroblasts are reprogrammed.

Side-by-Side Comparison

The table below summarizes general differences reported in the scientific literature. It simplifies a complex field and is meant only as an overview.

	MUSE cells	Typical MSCs	Embryonic stem cells	iPS cells
Where they come from	Occur naturally in adult and birth tissues	Occur naturally in adult and birth tissues	Early-stage embryos	Adult cells reprogrammed in a lab
Ability to form other cell types (lab studies)	Broad: all three germ layers	More limited	Very broad	Very broad
Tumor formation in animal studies	Not observed	Not typically observed	A known risk	A known risk
Genetic reprogramming needed	No	No	No	Yes
Ethical concerns about source	Minimal	Minimal	Significant	Minimal

Key Takeaway

In laboratory and animal research, MUSE cells combine broad differentiation potential with low tumor-forming activity, and they do this without genetic reprogramming. That combination is what sets them apart.

CHAPTER 5

Why MUSE Cells Are Drawing So Much Attention

The scientific reasons behind the growing interest.

Since their discovery, MUSE cells have become one of the most closely watched topics in regenerative medicine. Researchers, physicians, and patients are paying attention for several reasons.

They Appear to Seek Out Damaged Tissue

One of the most discussed findings is called homing. When tissue is damaged, it releases chemical signals. In animal studies, MUSE cells given into the bloodstream have been observed to sense one of these signals, a molecule called sphingosine-1-phosphate (S1P), through a receptor on their surface and to travel toward the damaged area. Typical MSCs given the same way tend to become trapped in the lungs.

If this behavior holds up in people, it could mean cells don't always need to be placed directly at a specific site. That is a big "if," and it is one of the reasons research continues.

They Appear to Be Tolerated by the Immune System

Normally, cells from one person are recognized as foreign by another person's immune system. Organ transplants require careful tissue matching and long-term medications to suppress the immune system.

MUSE cells express a molecule called HLA-G, which is associated with immune tolerance. It's the same molecule the placenta uses to help prevent a mother's immune system from rejecting her baby. In clinical studies in Japan, researchers gave donor MUSE cells to patients without tissue matching and without immunosuppressive drugs. That is unusual for a cell product, and it's a major reason donor-derived MUSE products are being explored.

They May Integrate, Not Just Signal

Many cell therapies appear to work mainly through the signals they release. Animal research suggests MUSE cells may also take up residence in damaged tissue and develop into cells that

match their surroundings. Scientists are still working to understand how often this happens and how much it matters.

A Growing Body of Research

Since 2010, the number of published studies on MUSE cells has grown steadily, with research groups in Japan, the United States, Europe, and elsewhere contributing. A company in Japan has run multiple clinical trials of a donor-derived MUSE cell product. This momentum has made MUSE cells a frequent topic at scientific meetings and in the media.

A Word About Hype

Popularity is not the same as proof. Exciting laboratory and animal findings are an important first step, but many promising ideas in medicine do not pan out in larger human studies. Be cautious of anyone who presents MUSE cells as a proven cure or guarantees results.

Key Takeaway

MUSE cells are drawing attention because of their apparent ability to home to damaged tissue, their tolerance by the immune system, and a steadily growing body of research. These are reasons for interest and further study, not guarantees.

CHAPTER 6

What the Research Shows

An honest look at where the science stands today.

When you read about any medical treatment, it helps to know what kind of evidence stands behind it. Not all studies carry the same weight.

Understanding Levels of Evidence

Medical evidence is often described as a ladder. Each step provides stronger support than the one below it:

1. Laboratory studies	Cells are studied in dishes. Useful for learning how cells behave, but far removed from a living person.
2. Animal studies	Cells are tested in animal models. These help researchers judge safety and biology, but results sometimes don't carry over to humans.
3. Early human studies	Small numbers of people, often without a comparison group. Main goal: is it safe and practical to give?
4. Randomized controlled trials	Patients are randomly assigned to treatment or comparison (such as placebo). Larger trials of this kind are needed to establish effectiveness.
5. Regulatory approval	A regulator such as the FDA reviews all the evidence and approves a product for a specific use.

Where MUSE Cell Research Stands

Most published MUSE cell research is on the first two steps of the ladder: laboratory and animal studies. These studies have taught scientists a great deal about how MUSE cells behave, including their stress endurance, broad differentiation, homing, and immune tolerance.

Human research is on the third step and beginning to reach the fourth. Since the late 2010s, a series of clinical trials in Japan has tested a donor-derived MUSE cell product given by intravenous infusion. Some general points about these studies:

- **They are small.** Most enrolled a few to a few dozen participants.
- **Most focused on safety.** The main questions were whether the product could be given safely and practically.

- **Most had no comparison group.** Only a small number used randomization and a placebo, which are needed to tell whether changes are caused by the treatment.
- **Side effects were reported.** As with any medical procedure, participants in these studies experienced adverse events (mild to moderate), and these were tracked and reported by the investigators.

The Human Studies at a Glance

The table below summarizes the published human studies of MUSE cells we are aware of. All of them were conducted in Japan and used the same donor-derived product, called CL2020, made by Life Science Institute, Inc. from cultured bone marrow mesenchymal cells. In each study the cells were given intravenously, without tissue matching and without immunosuppressive drugs.

Area studied	Study design	Participants	What the researchers reported
Heart attack (acute myocardial infarction)	First-in-human, open-label safety study	Small number of patients	The first published human study of a MUSE cell product. It was designed mainly to assess safety, and the authors reported no serious safety concerns.
Ischemic stroke	Randomized, placebo-controlled; single IV dose given 2 to 4 weeks after stroke	35 (25 treated, 10 placebo)	More treated patients than placebo patients met the study's predefined response measure. Adverse reactions were more common in the treated group, including one serious seizure event. The authors called for further study.
Epidermolysis bullosa (a rare inherited blistering skin disease)	Exploratory open-label study	Small number of adults	Evaluated the safety and feasibility of giving donor MUSE cells intravenously.
ALS (amyotrophic lateral sclerosis)	Phase 2 open-label; IV dose once a month for 6 months	5	Treatment was well tolerated without serious side effects. Changes in function scores were not statistically significant, and the authors recommended a larger controlled trial.
Spinal cord injury (neck)	Phase 1/2a open-label; single IV dose	10	No safety concerns were identified. Two serious adverse events occurred and were judged unrelated to treatment. The authors noted that controlled trials are needed to determine effectiveness.
Newborn brain injury from lack of oxygen (neonatal HIE)	Open-label dose-escalation study, alongside standard cooling therapy	9 newborns	A single IV dose was found to be safe and tolerable in this small group.

Reading These Studies Carefully

- These studies tested CL2020, a cultured, bone marrow-derived product. They did not test NativeMUSE™ or any umbilical cord-derived MUSE product.
- Most were small and had no comparison group, so they cannot show whether the treatment caused any change.
- The fact that a condition was studied does not mean MUSE cells are effective for it. No MUSE cell product is FDA approved.
- Summaries here are simplified. Your physician can help you understand the original publications.

What We Don't Know Yet

- Whether results from small early studies will hold up in large, randomized controlled trials.
- The long-term effects of receiving MUSE cells, over many years.
- The best dose, number of treatments, and method of delivery.
- Who is most and least likely to benefit.
- How results from one product apply to products from different sources or made with different methods.

An Important Point About Sources

The human trials published so far used MUSE cells taken from donor bone marrow-derived cells that were grown (cultured) in a laboratory. Products made from different tissues, such as umbilical cord, or made without culturing, have not been tested in those trials. Because of this, results from those studies cannot be assumed to apply to other MUSE cell products.

Key Takeaway

The science of MUSE cells is promising but early. Most evidence comes from laboratory and animal studies, and human studies have been small and focused mainly on safety. No MUSE cell product is FDA-approved.

CHAPTER 7

Where MUSE Cells Come From

Understanding tissue sources, processing, and donor screening.

Not all MUSE cell products are the same. Two of the most important differences are the tissue they come from and how they are processed.

Bone Marrow vs. Umbilical Cord

MUSE cells can be found in bone marrow, fat, skin, and birth tissues. Each source has trade-offs. Bone marrow must be collected through a procedure, and cells from older adults may differ from those of younger donors. Birth tissue, by contrast, is collected after a healthy delivery and would otherwise be discarded.

What Is Wharton's Jelly?

The umbilical cord connects a baby to the placenta during pregnancy. Inside the cord, surrounding its blood vessels, is a soft, gel-like tissue called Wharton's jelly. It protects the vessels and is rich in mesenchymal cells, including MUSE cells. Because umbilical cords are routinely discarded after birth, Wharton's jelly can be donated without any procedure for the mother or baby.

Cultured vs. Non-Cultured

Many cell products are cultured, which means the cells are grown and multiplied in a laboratory for days or weeks before use. Culturing can produce very large numbers of cells, but it also changes the cells' environment and may change their characteristics (if culturing is taken too far). It is also not permitted in the USA unless a product has FDA approval.

Non-cultured products are not grown or expanded in the lab. They are processed with minimal handling so the tissue keeps its natural characteristics. This difference also affects how a product is regulated, as explained in the next chapter.

Donor Screening and Testing

In the United States, the FDA requires that donors of human cells and tissues be screened and tested to reduce the risk of transmitting infectious diseases. This typically includes a review of the donor's medical and social history and laboratory testing for infections such as HIV, hepatitis B,



hepatitis C, and syphilis. Screening greatly reduces risk, but no screening process can eliminate it completely.

Key Takeaway

MUSE cell products differ by tissue source and processing method. Knowing where a product comes from, whether it is cultured, and how donors are screened helps you ask better questions.

CHAPTER 8

How Cell Products Are Regulated

What "FDA 361" means, and what it doesn't.

In the United States, products made from human cells and tissues are regulated by the FDA under a set of rules found in Title 21 of the Code of Federal Regulations, Part 1271. These products are called HCT/Ps, short for human cells, tissues, and cellular and tissue-based products.

Two Regulatory Pathways

The FDA places HCT/Ps into one of two categories, named after sections of the Public Health Service Act:

- **Section 361 HCT/Ps.** Products that meet specific criteria, including being minimally manipulated (processing doesn't change the tissue's original relevant characteristics) and intended for homologous use (performing the same basic function in the recipient as in the donor). These products must follow FDA rules on donor screening, testing, and manufacturing practices, but they don't go through FDA premarket approval.
- **Section 351 products.** Products that don't meet the 361 criteria, for example because they are more than minimally manipulated, such as by culturing and expanding cells. These are regulated as biologic drugs and require clinical trials and FDA approval (a Biologics License Application) before they can be marketed.

What 361 Status Means for Patients

It's important to be clear about what 361 status does and does not mean.

- **It does mean** the product must meet FDA requirements for donor eligibility, infectious disease testing, and tissue handling.
- **It does not mean** the FDA has reviewed or approved the product as safe or effective for any disease or condition.

The FDA has publicly cautioned patients about clinics that market unapproved stem cell products with claims to treat serious diseases. You can read the FDA's consumer information on regenerative medicine at [fda.gov](https://www.fda.gov). We encourage every patient to review it.

Outside the United States



Rules for cell-based products vary widely from country to country. A product's regulatory status in one country does not carry over to another. If you are considering treatment abroad, ask what regulations apply there and how the product is sourced, tested, and handled. Since R3 Stem Cell has clinics in eight countries outside the USA, our staff knows a LOT about these regulations.

Key Takeaway

Section 361 status means a product must meet FDA rules for donor screening, testing, and handling. It does not mean the FDA has approved the product to treat any disease or condition.

CHAPTER 9

MUSE Cells at R3 Stem Cell

Our approach and what we offer.

R3 Stem Cell is a regenerative medicine provider with more than 80 Centers of Excellence across multiple countries. We offer MUSE cells as part of our range of regenerative options, and we are committed to giving patients accurate information so they can make their own informed decisions.

R3 offers MUSE stem cells in all countries where it has clinics. The offerings include either the licensed Dezawa MUSE stem cell product or a generic MUSE product. In the USA, R3 offers NativeMUSE, which is an FDA compliant 361 HCTP product.

NativeMUSE™

R3 Stem Cell offers NativeMUSE™, a MUSE cell product derived from donated umbilical cord tissue (Wharton's jelly) collected from healthy, screened births.

- **Not cultured or expanded.** The cells are not grown or multiplied in a laboratory.
- **Minimally manipulated.** Processing is designed to preserve the tissue's natural characteristics.
- **FDA 361 compliant.** To our knowledge, NativeMUSE™ is the only MUSE cell product in the United States designed to meet the FDA's Section 361 HCT/P requirements for human cells and tissues.
- **Screened donors.** Donor tissue is screened and tested according to FDA requirements for human tissue donation.

Our Commitment to Research and Safety

R3 Stem Cell Research maintains an IRB-approved observational safety database to track patients' experiences after treatment. An IRB (institutional review board) is an independent committee that reviews research to protect the rights and welfare of participants. You may be invited to take part. Participation is voluntary and helps build the body of knowledge about regenerative treatments.

Our Commitment to You

- Every patient is evaluated by a licensed provider before any treatment.
- We explain the potential benefits, risks, and alternatives as part of informed consent.
- We don't promise or guarantee results.



- We encourage you to ask questions and take time to decide.

Key Takeaway

R3 Stem Cell offers NativeMUSE™, a non-cultured, minimally manipulated MUSE cell product from donated umbilical cord tissue, along with a physician evaluation, informed consent, and an ongoing commitment to safety research.

CHAPTER 10

Is It Right for Me? Making an Informed Decision

How to evaluate any cell-based treatment, including ours.

Choosing whether to pursue a regenerative treatment is a personal decision. The goal of this chapter is to help you make that decision with clear eyes.

Start With a FREE R3 Consultation

Before considering any cell-based treatment, talk with one of our consultant providers about your medical history. Some health conditions, medications, or circumstances may make a treatment inappropriate or require extra caution. Make sure R3's consultant provider knows about all your medical conditions, medications, supplements, and allergies.

Questions to Ask Any Provider

1. Is this treatment appropriate for my situation, and what are my other options, including standard treatments?
2. What are the possible risks and side effects, and how often do they occur?
3. Where do the cells come from, and how are they processed and tested?
4. Is the product cultured or non-cultured, and what is its regulatory status?
5. What does the research show, and what is still unknown?
6. How will the treatment be given, and what should I expect during and after?
7. What are realistic expectations, and how will we track how I'm doing?
8. What is the total cost, and what does it include?
9. Who do I contact if I have a concern after treatment?

Red Flags to Watch For

Be cautious of any provider, in any country, who:

- Promises a cure or guarantees specific results.
- Claims a product is "FDA approved" to treat a disease when it is not.



- Says a treatment works for a long list of unrelated conditions.
- Can't tell you where the cells come from or how they are tested.
- Skips a physician evaluation or a thorough informed consent discussion.
- Pressures you to decide quickly.

Understanding Informed Consent

Informed consent is more than a signature. It's a conversation in which your provider explains the treatment, its potential benefits and risks, alternatives (including no treatment), and what is and isn't known. You should feel free to ask questions, take materials home, and talk with family or your own doctor before deciding.

Key Takeaway

A good decision starts with a provider consultation, honest answers to your questions, and an informed consent process that covers benefits, risks, alternatives, and unknowns.

CHAPTER 11

Understanding the Risks

Every medical procedure carries some risk.

No medical procedure is completely free of risk, and cell-based treatments are no exception. Your physician will review the risks that apply to your specific situation and treatment plan. In general, possible risks may include:

- **Injection or infusion-site reactions.** Pain, swelling, bruising, or redness where the product is given.
- **Infection.** Any procedure that breaks the skin carries a small risk of infection. R3 has seen only a few superficial infections in 30,000 procedures.
- **Immune or allergic reactions.** Reactions to the cells or to other materials in the product.
- **Temporary symptoms.** Such as fever, fatigue, headache, or flu-like feelings in the days after treatment.
- **Disease transmission.** Donor screening and testing greatly reduce, but cannot completely eliminate, the risk of transmitting an infection from donor tissue. R3 has never seen this.
- **No improvement.** A treatment may not produce the result you hope for.

After Treatment

Follow your provider's after-care instructions closely. Contact your provider right away if you notice signs of infection, an allergic reaction, or any symptom that worries you. In an emergency, call 911 or your local emergency number.

Key Takeaway

Cell-based treatments carry risks, including some that are not yet fully understood. Make sure your provider explains them clearly and tells you what to watch for afterward.



CHAPTER 12

Frequently Asked Questions

Q. Are MUSE cells the same as mesenchymal stem cells (MSCs)?

Not exactly. MUSE cells are a small subpopulation found within MSC populations. They share some characteristics with MSCs but show a broader range of properties in laboratory studies.

Q. Are MUSE cells embryonic stem cells?

No. MUSE cells are found naturally in adult and birth tissues. They are not taken from embryos and are not genetically reprogrammed.

Q. Are MUSE cells FDA approved?

No MUSE cell product is FDA approved to diagnose, treat, cure, or prevent any disease or condition. Some products, like NativeMUSE™, are designed to meet FDA Section 361 HCT/P requirements, which is a different category from FDA approval.

Q. Where do R3 Stem Cell's MUSE cells come from?

They come from donated umbilical cord tissue (Wharton's jelly) from healthy, screened births. The tissue is donated after delivery and would otherwise be discarded.

Q. Will my body reject donor cells?

Research suggests MUSE cells are well tolerated by the immune system, and clinical studies in Japan gave donor MUSE cells without tissue matching or immunosuppressive drugs. Immune reactions are still possible, and your physician will discuss this with you.

Q. Can MUSE cells form tumors?

In animal studies, MUSE cells have not been observed to form tumors, and they show low activity of an enzyme linked to uncontrolled growth. Long-term human data are still limited.

Q. What results can I expect?

No one can promise a specific result. Individual experiences vary. R3's licensed consultant providers can discuss realistic expectations for your situation.

Q. How is the treatment given?

The method depends on your physician's evaluation and treatment plan. Your provider will explain how the product is given and what to expect.



Q. Is MUSE cell treatment covered by insurance?

Regenerative treatments that aren't FDA approved are generally not covered by health insurance. Ask your provider about the total cost before treatment.

Q. How do I know if I'm a candidate?

Only a physician who has reviewed your medical history can help you decide whether any treatment is appropriate. Start by scheduling a consultation.

Q. Does R3 Stem Cell offer MUSE cell therapy?

Yes! R3 offers MUSE stem cells in all countries where it has clinics. The offerings include either the licensed Dezawa MUSE stem cell product or a generic MUSE product. In the USA, R3 offers NativeMUSE, which is an FDA compliant 361 HCTP product.

CHAPTER 13

Glossary

Adverse event: Any unwanted medical occurrence during a study or after treatment, whether or not it was caused by the treatment.

Cultured cells: Cells grown and multiplied in a laboratory before use.

Differentiation: The process by which a stem cell develops into a specialized cell type.

Germ layers: The three basic layers of the early embryo (ectoderm, mesoderm, endoderm) from which all tissues develop.

HCT/P: Human cells, tissues, and cellular and tissue-based products, regulated by the FDA under 21 CFR Part 1271.

HLA-G: A molecule associated with immune tolerance, expressed by MUSE cells and by the placenta.

Homing: The movement of cells toward a specific area of the body, such as damaged tissue, in response to chemical signals.

Homologous use: Use of a tissue to perform the same basic function in the recipient as it performed in the donor.

iPS cells: Induced pluripotent stem cells: adult cells genetically reprogrammed in a lab to behave like embryonic stem cells.

IRB: Institutional review board: an independent committee that reviews research to protect participants.

Mesenchymal stem cells (MSCs): Cells found in bone marrow, fat, umbilical cord, and other tissues that can form certain tissue types and release signaling molecules.

Minimal manipulation: Processing that does not alter the original relevant characteristics of a tissue.

MUSE cells: Multilineage-differentiating Stress-Enduring cells: a rare, naturally occurring stem cell population first described in 2010.

Placebo: An inactive treatment used for comparison in clinical trials.

Randomized controlled trial: A study in which participants are randomly assigned to receive a treatment or a comparison.



S1P: Sphingosine-1-phosphate: a signaling molecule released by damaged tissue that MUSE cells can sense.

SSEA-3: Stage-specific embryonic antigen-3: the surface marker used to identify MUSE cells.

Telomerase: An enzyme linked to a cell's ability to keep dividing; high levels are associated with tumor formation.

Wharton's jelly: The gel-like tissue inside the umbilical cord that surrounds its blood vessels.

CHAPTER 14

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About R3 Stem Cell

R3 Stem Cell is a multinational regenerative medicine provider with more than 80 Centers of Excellence across multiple countries. To learn more or schedule a free consultation with one of our expert consultants, contact R3 at +1 (844) GET-STEM or info@r3stemcell.com