



Learn more about using stem cells  
to treat diseases in animals.

# Jr. Animal Scientist

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# STEM CELLS

# What are Stem Cells?

There are trillions of cells that make up the body of an organism. White blood cells help fight the germs that make you sick, Beta cells make insulin that help control the sugars in your body and Melanocytes give your skin its color. These cells have a specific job to do and one cell can't do what another cell can. There is one type of cell that is different than all of the other cells.

Stem cells have the ability to develop into cells with different skills. Stem cells can replace damaged cells like blood, brain, heart or bone. For example, if part of your muscle is injured, a muscle stem cell can be used to replace the damaged cells and help mend what was injured. Stem cells also can be used to treat many diseases in the body because of their ability to develop into the cells that were injured.

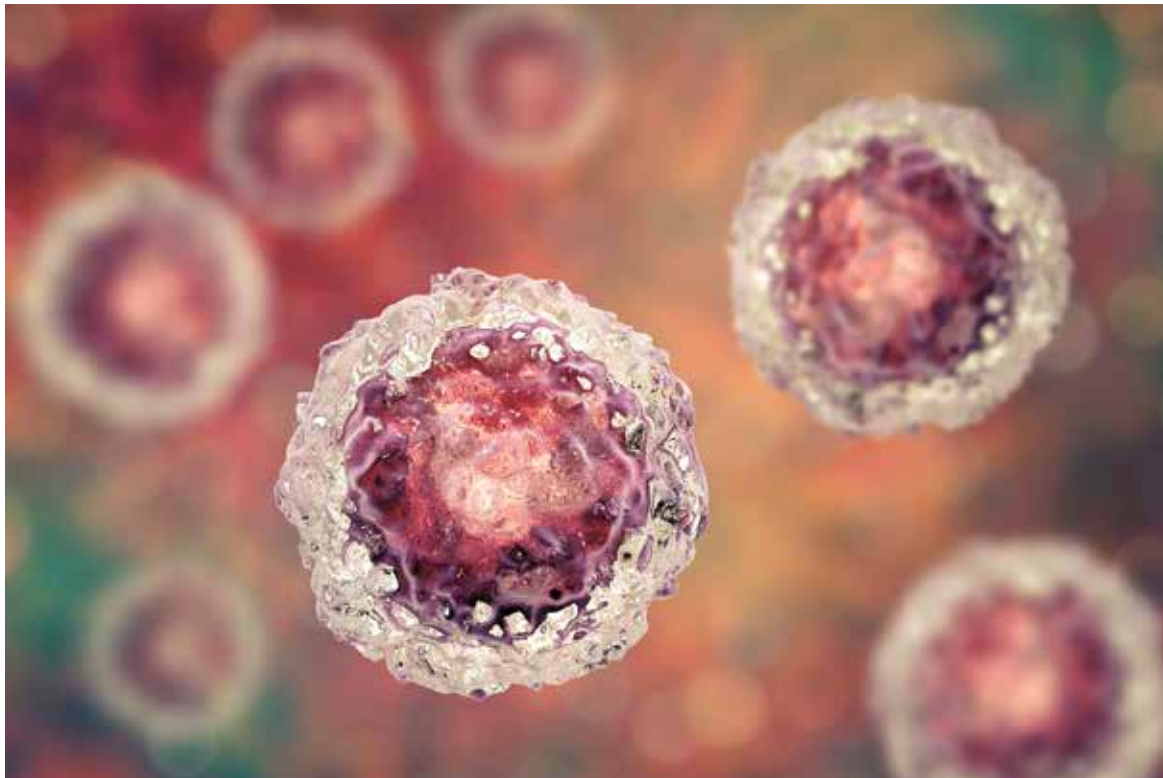


Photo: iStock / Dr\_Microbe



## Fun Fact:

Did you know that using stem cells to replace injured cells is called Stem Cell Therapy?

During nuclear bomb testing, scientist determined that the heart can regenerate itself (very slowly) thanks to stem cells.

Due to stem cells, you get a whole new skin approximately every four weeks, new intestinal lining every few days, and 2 million new red blood cells every second!

Photo: iStock / luismolina

**Fun Fact:**

In the last 20 years, more than 20,000 human patients have received umbilical cord blood transplants.

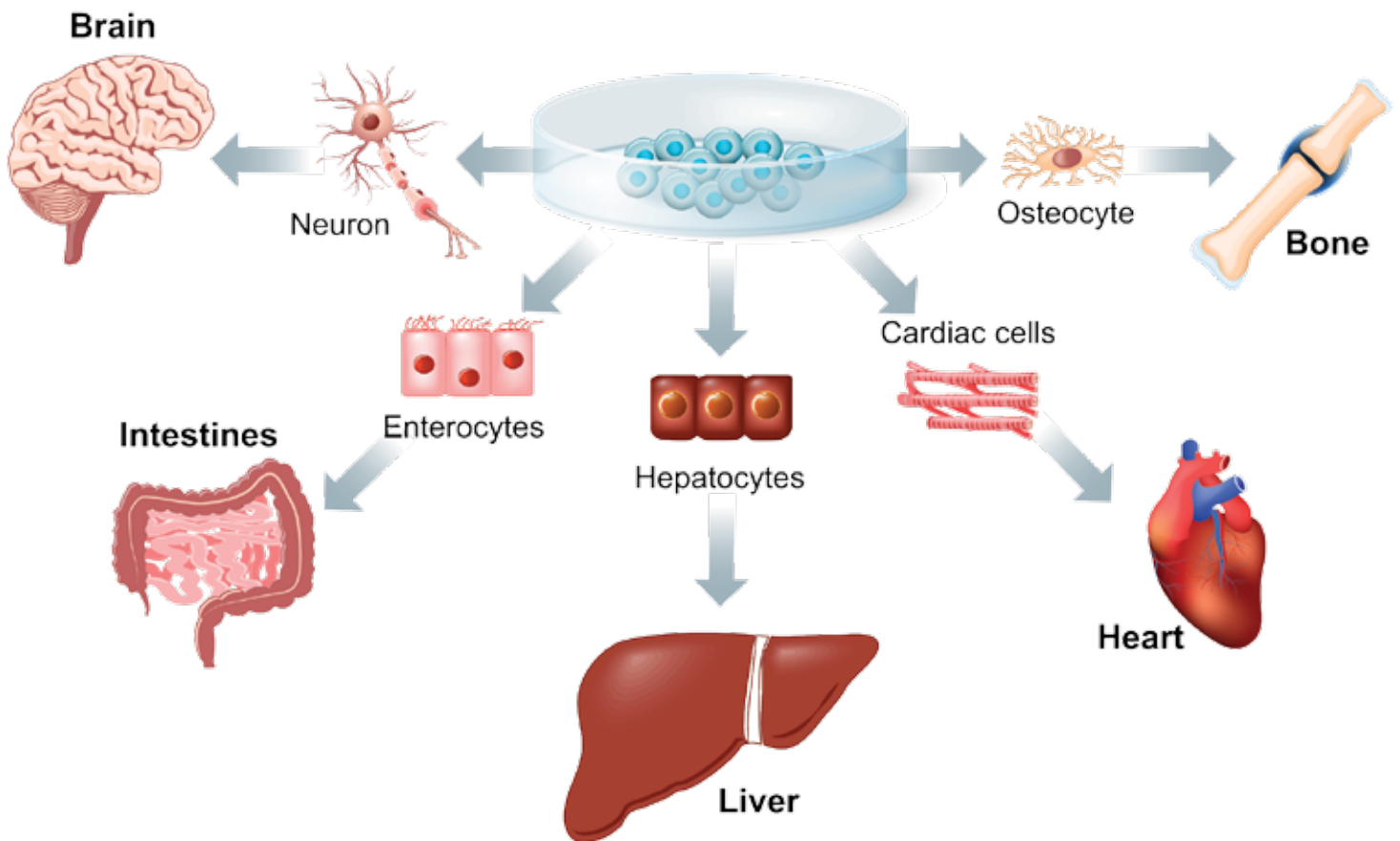
Embryonic stem cells were first used for infertility purposes through in vitro fertilization.

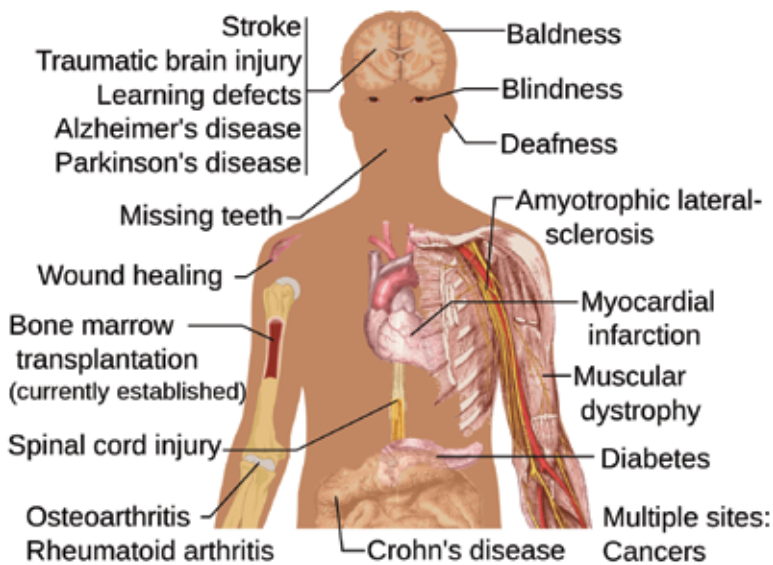


In vitro fertilization (IVF)

# Using Stem Cells to Treat Diseases

## STEM CELL





## Potential uses of Stem Cells

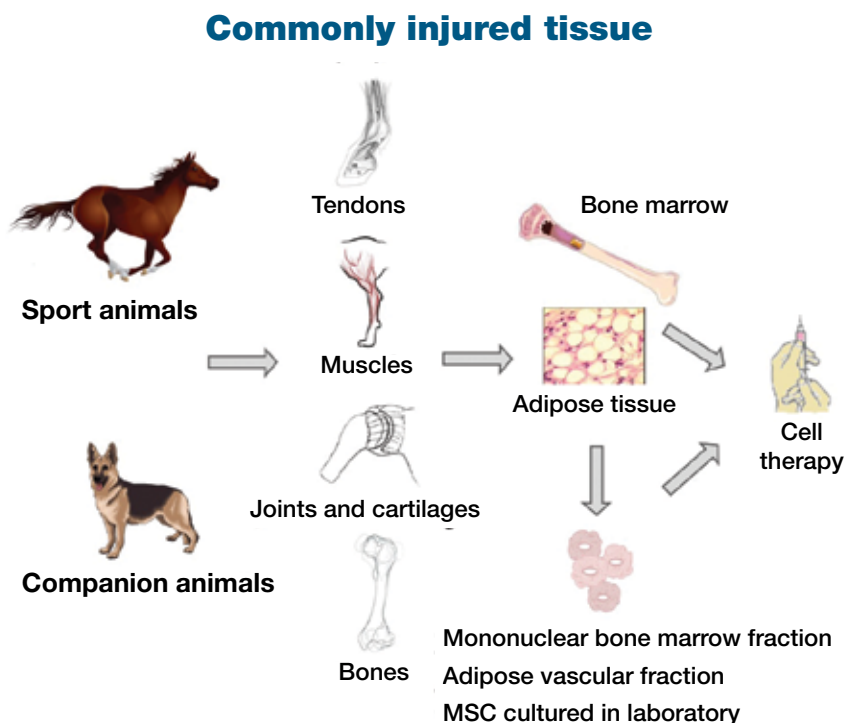
# How Stem cell therapy is used

In human medicine, stem cells can be used for many types of injuries or diseases which include: spinal cord injuries, type 1 diabetes, heart disease or even cancer. With cancer, the body's cells grow in a way that's not normal. These cells spread throughout the body causing problems. Stem cells help fix these problems. The doctors can destroy the cancer cells and replace them with transplanted stem cells.

Stem cell therapy has also been used in veterinary medicine. Tendon injuries can be common in our equine athletes. This type of injury requires a difficult and lengthy recovery. Stem cell therapy can be used to help these horses have a better chance at a full and shorter recovery time.

### Cell therapy applications in veterinary medicine

Companion animals (pets), due to genetic factors, degenerative processes, and inadequate diet, and animals used in sports, such as running and jumping, are subject to several kinds of injuries, which may affect primarily the muscle tissue, causing pain, cartilage wear in joints and spinal disks, tendonitis, fractures, and bone degeneration. Clinical applications and protocols are based on the use of adult stem cells, isolated from fresh bone marrow or adipose tissue, or expanded from these tissues in laboratory. The derived cells, mesenchymal stem cell (MSC), have a high therapeutic capacity.



# How does Stem Cell Therapy Work with Tendon Injuries in Horses?

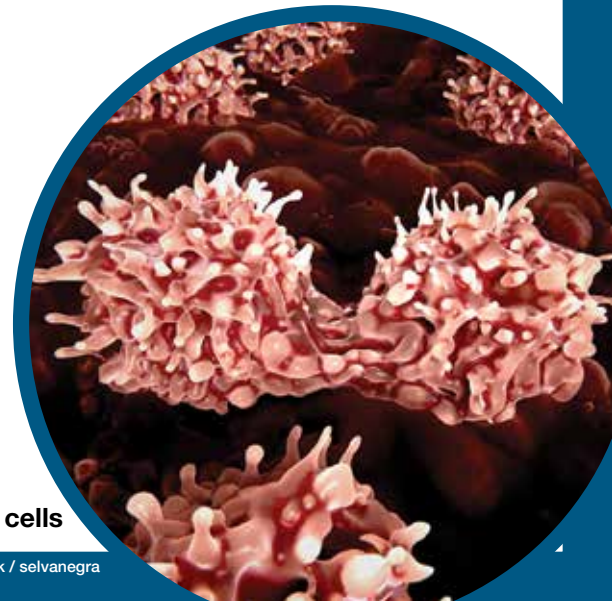
Tendon injuries in horses are very hard to treat because of the formation of scar tissue. Scar tissue is very strong but lacks the flexibility of the healthy tendon tissue and limits the movement for the horse. Stem Cell Therapy can be used to replace the healthy tendon tissue before large amounts of scar tissue forms, improving the long term prognosis and reduce the recovery time for the animal.



Photo: iStock / CasarsaGuru

## What Types of Stem Cells are used for Stem Cell Therapy?

There are many types of stem cells in the body, but some are easier to collect than others. The most common stem cells that are used come from three different places: bone marrow, the bloodstream and the umbilical cord. Umbilical cord cells are less common, but researchers are working hard to improve their use.



Dividing fat cells

Photo: iStock / selvanegra

# Word Scramble

**Unscramble the words to reveal other types of stem cells!**

Answers are at the bottom of the page.

1 BYRNCEMOI \_ \_ \_ \_ \_

2 DCRO \_ \_ \_ \_

3 NCYHMEASELM \_ \_ \_ \_ \_

4 NBEO \_ \_ \_ \_

5 BIAMILUL \_ \_ \_ \_ \_

6 TAF \_ \_ \_

7 AGETEREERN \_ \_ \_ \_ \_

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Answers: 1 = embryonic. 2 = cord. 3 = mesenchymal. 4 = bone. 5 = umbilical. 6 = fat. 7 = regenerate.

# Word Search!

Find the following words in the puzzle.

BLOOD

BONEMARROW

BRAIN

FATCELLS

HEART

HORSE

INJURY

MUSCLE

REGENERATIVECELLS

STEMCELL

TENDON THERAPY

UMBILICALCORD

Z R M H U A H M U S C L E A L F H E  
T I N J U R Y B S T E M C E L L D I  
H A B D Z S R R F A T C E L L S J C  
D G W O M P A A D H U I G C Q G G P  
O U H E A R T I H E V E N E B F M U  
F I E P B U P N V D A B J J Y E B L  
S Q B V A H O R S E T M C P U S F Z  
W V U M B I L I C A L C O R D R N E  
B C L T E N D O N T H E R A P Y O I  
B O N E M A R R O W G H F C S M I P  
R E G E N E R A T I V E C E L L S Z  
H F U R W H F K I T A B L O O D V B

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