Rafa Muñoa
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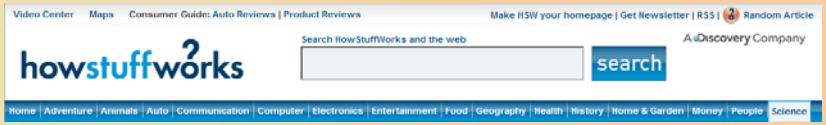
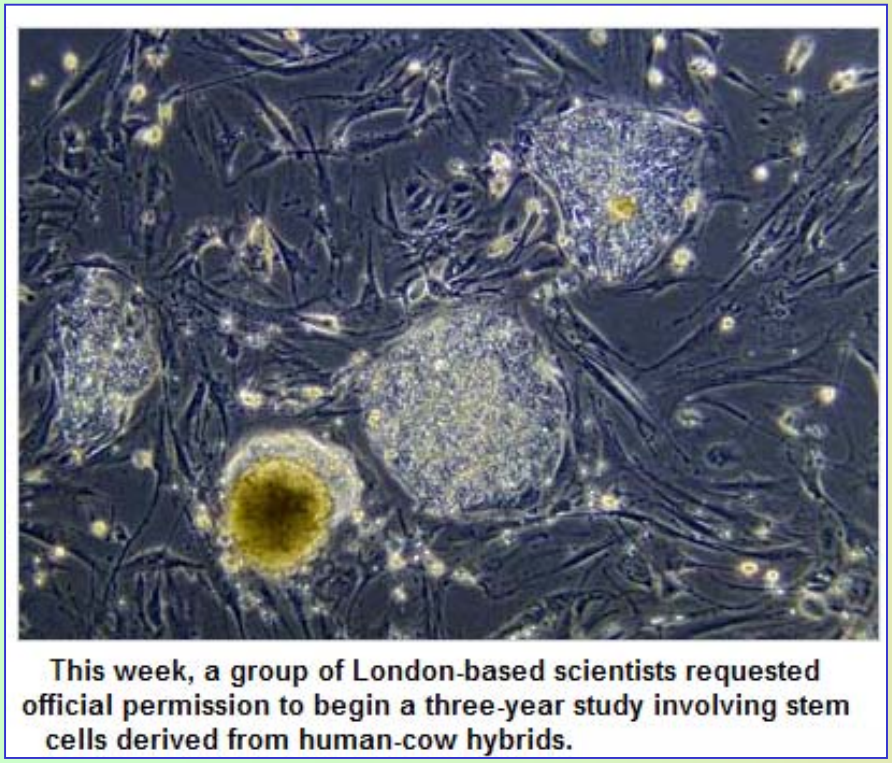
Stem Cells





This week, a group of London-based scientists requested official permission to begin a three-year study involving stem cells derived from human-cow hybrids.

Stem Cells Basics

Stem cells are pluripotent, which means that they can develop into every cell, every tissue and every organ in the human body.

Their almost limitless potential has made stem cells a significant focus of medical research.

There are two types of stem cells: embryonic stem cells and adult stem cells.

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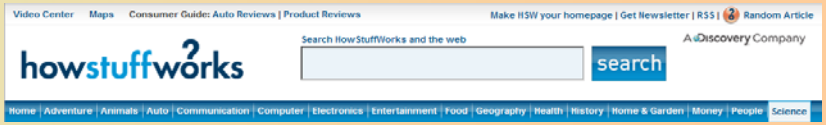
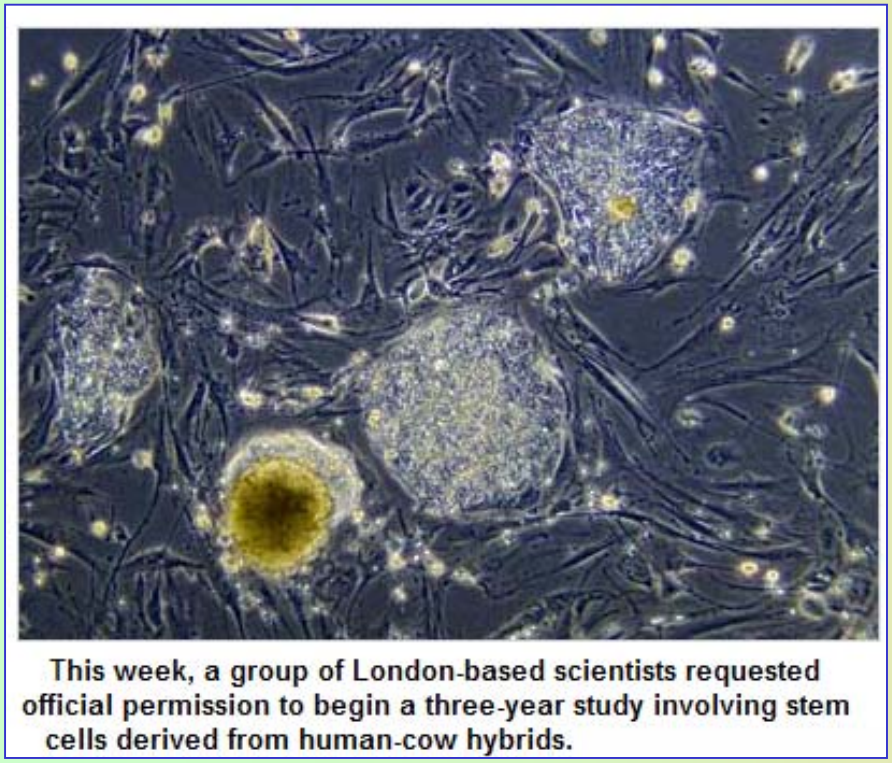


Stem Cells Basics



This week, a group of London-based scientists requested official permission to begin a three-year study involving stem cells derived from human-cow hybrids.

Embryonic stem cells come from an embryo -- the mass of cells in the earliest stage of human development that, if implanted in a woman's womb, will eventually grow into a fetus.

When the embryo is between three and five days old, it contains stem cells, which are busily working to create the various organs and tissues that will make up the fetus

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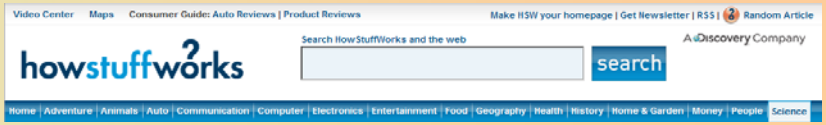


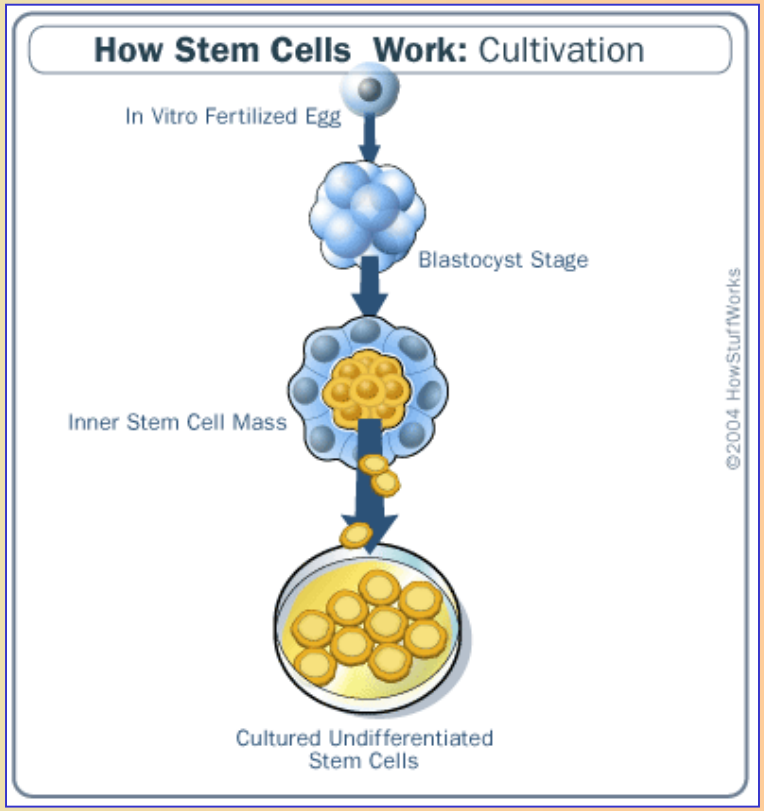
Photo courtesy Michael Vernon, West Virginia University

Blastocyst

Stem Cells

An embryo that has developed for three to five days is called a **blastocyst**. A blastocyst is a mass of about 100 or so cells.

Scientists remove stem cells from the blastocyst and culture them (grow them in a nutrient-rich solution) in a Petri dish in the laboratory



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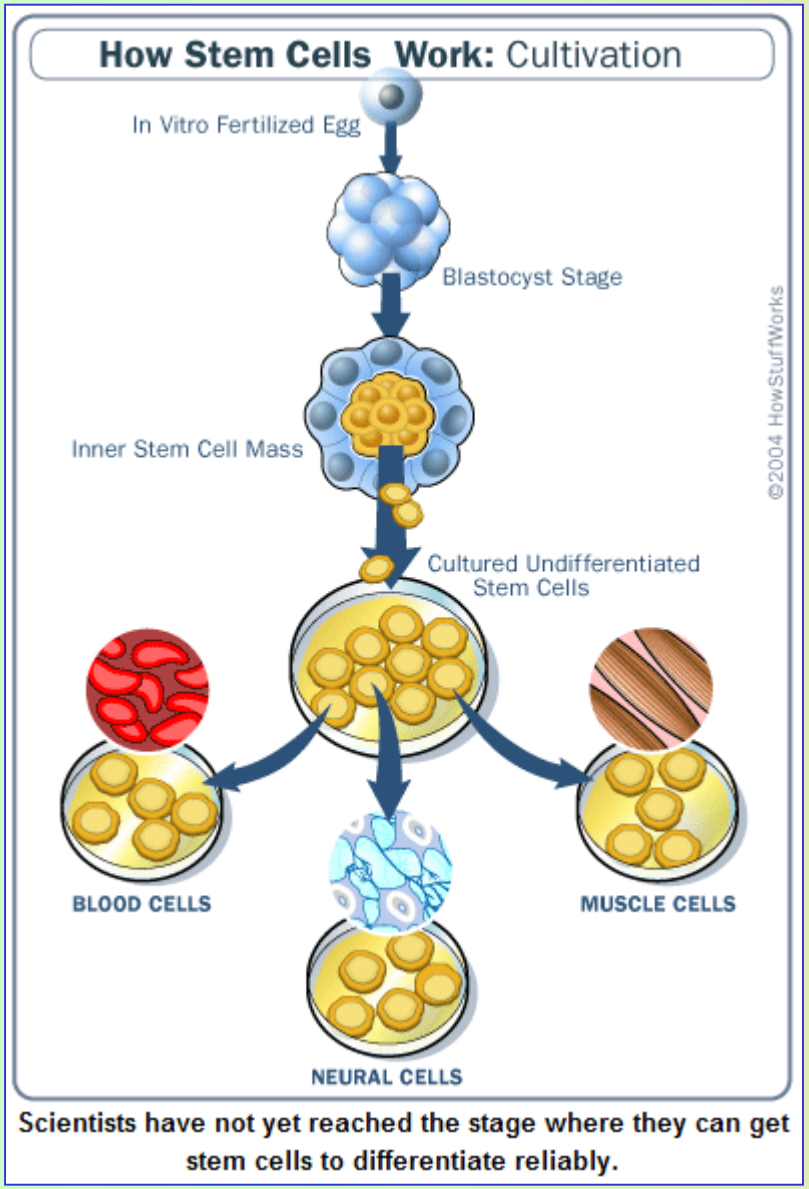
Stem Cells



Scientists have not yet reached the stage where they can get stem cells to differentiate reliably.

Challenges

Ideally, scientists would like to be able to grow a particular type of cell in the laboratory and then inject it into a patient, where it would replace diseased tissue.

But stem cells are not yet being used to treat disease because scientists still haven't learned how to direct a stem cell to differentiate into a specific tissue or cell type (brain vs. liver, for example) and to control that differentiation once the cells are injected into a person.

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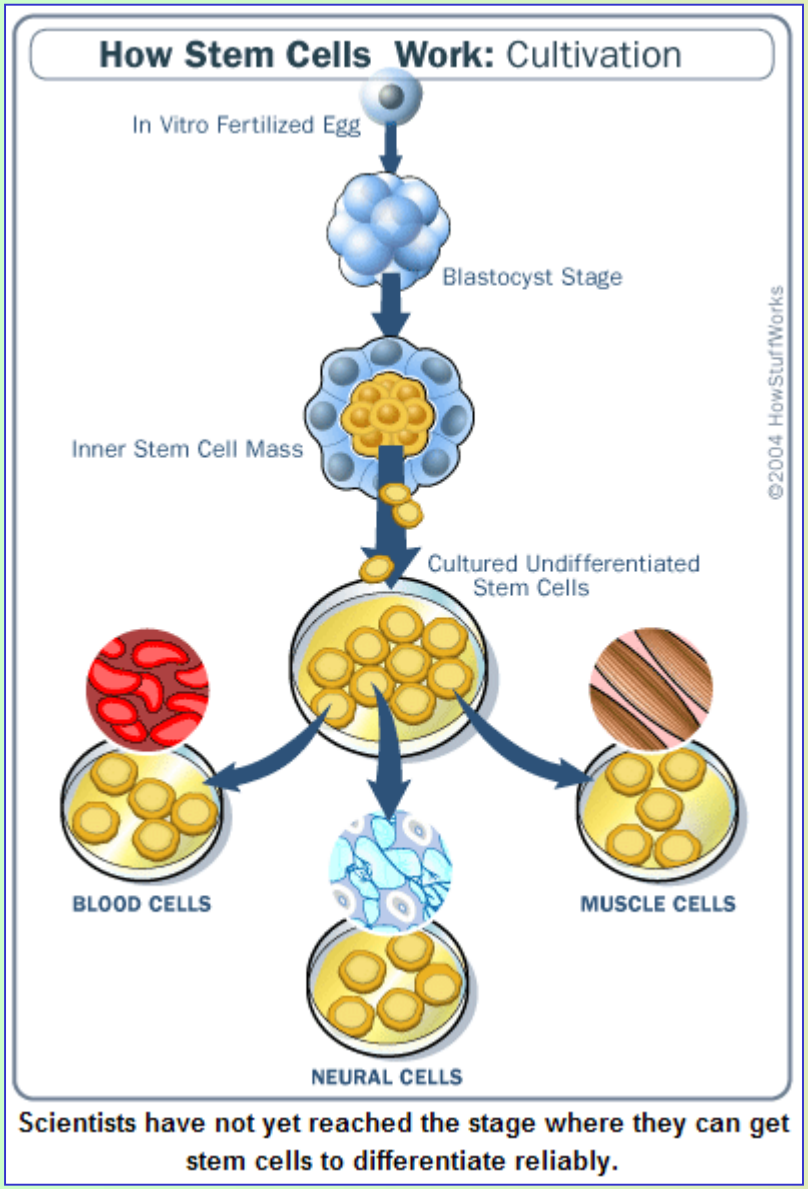
Stem Cells



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Challenges

Scientists do know that turning genes on and off is crucial to the process of differentiation, so they have been experimenting by inserting certain genes into the culture dish and then using those genes to try to coax stem cells to differentiate into specific types of cells.

But some sort of signal is needed to actually trigger the stem cells to differentiate. Scientists are still searching for that signal.

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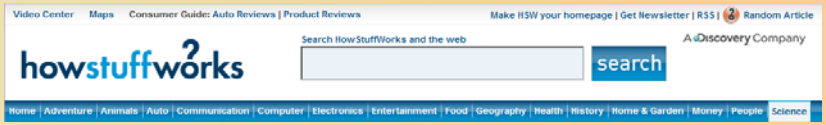

Photo courtesy University of Wisconsin Board of Regents

Culture trays containing human embryonic stem cells are viewed under a microscope in developmental biologist James Thomson's research lab at the University of Wisconsin in Madison

Applications

- To test new medications for safety and effectiveness

- to repair cells or tissues that have been damaged

Eventually, scientists might even be able to grow entire organs in a laboratory to replace ones that have been damaged by disease

Controversy

Stem cell research has become one of the biggest issues dividing the scientific and religious communities around the world. At the core of the issue is one central question: **When does life begin?**