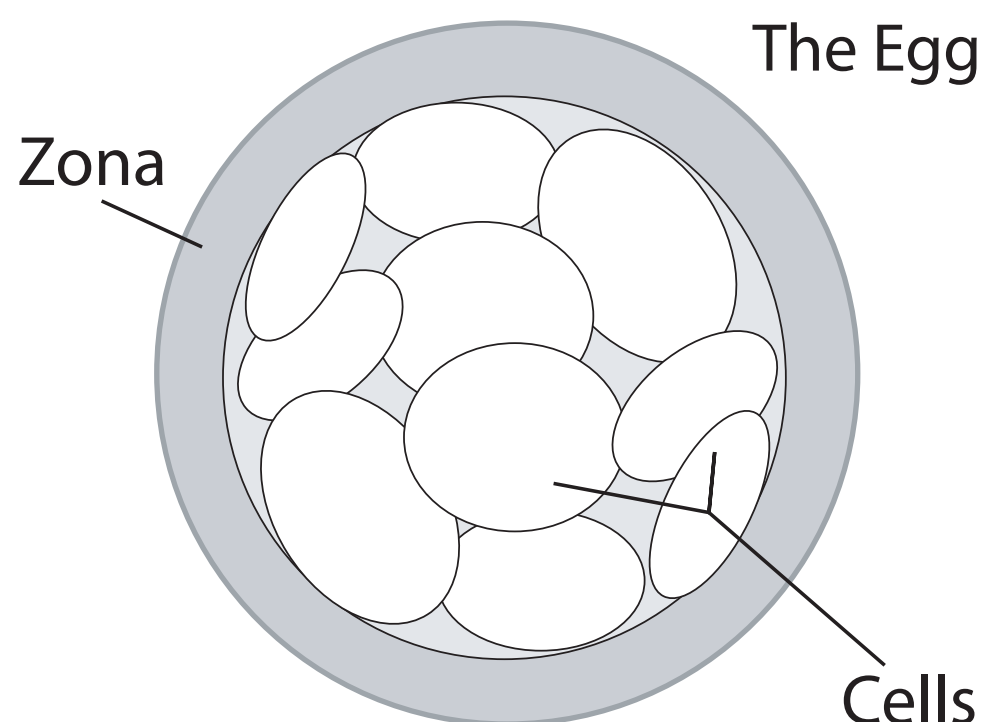


THE POTENTIAL TO BECOME

24 Hours in Stem Cell Research



A 20-minute documentary about one experiment performed by Dr. Ann Kiessling at the Bedford Stem Cell Research Foundation. The experiment is one in a series taking the first look at Human Parthenogenic Stem Cells in the United States. As Dr. Kiessling prepares to “activate” three human eggs, she reveals new insight into this controversial science. Dr. Kiessling and collaborating scientist, Dr. Jose Cibelli, discuss the early stages of embryonic development, the scientific method, and the day-to-day life of a biologist. Bedford Stem Cell Research Foundation is at the forefront of stem cell research and is currently the only laboratory in the US to be performing experiments with human parthenotes.

BIOGRAPHIES

Ann A. Kiessling, PhD

Dr. Kiessling is Associate Professor of Surgery, Harvard Medical School. She studied nursing and chemistry as an undergraduate and received a Master’s Degree in Organic Chemistry and a PhD in Biochemistry / Biophysics from Oregon State University.

The need to conduct research in areas not funded by the federal government, such as such developing the methods to assist men with HIV disease have children, led to the incorporation of the Bedford Research Foundation. The Foundation’s research has more recently been extended to include embryonic stem cells.

Dr. Kiessling is the proud mother of three daughters and a son and an author of *Human Embryonic Stem Cells: An Introduction to the Science and Therapeutic Potential*, the first textbook to be published on this controversial topic.

Education:
BS University of Virginia (Nursing)
BS Central Washington University (Chemistry)
MS Central Washington University (Organic Chemistry)
PhD Oregon State University (Biochemistry/Biophysics)

Jose B. Cibelli, DVM

Dr Cibelli currently holds the position of Professor of Animal Biotechnology at Michigan State University. He heads the Cellular Reprogramming Laboratory in the Departments of Animal Science and Physiology.

Dr. Cibelli is one of the pioneers in the area of cloning with transgenic somatic cells for the production of animals and embryonic stem cells. Dr Cibelli together with his colleagues, were responsible for the generation of the world’s first transgenic cloned calves, the first embryonic stem cells by nuclear transfer and the first embryonic stem cells by parthenogenesis in primates. Dr. Cibelli is also the proud father of two daughters, and the Editor of the book “Principles of Cloning” recently published by Academic Press, 2002.

Education
D.V.M., University of LaPlata, Argentina
Ph.D., University of Massachusetts

About This Video

This video is part of Master's Project at the Harvard Graduate School of Education under the direction of Professor Peter Galison in the History of Science Department, Faculty of Arts and Sciences. To find out more about Allison Kiessling, visit: <http://www.wakingmedia.com>.

A NOTE TO TEACHERS

This production takes an intimate look at one experiment; it examines one aspect of a scientist’s day-to-day work. It is not meant to give an overview of all Stem Cell research, nor its politics or ethics. Dr. Kiessling’s work on Parthenote Stem Cells is a timely way of bringing today’s headlines into the classroom. It is intended to help engage students by bringing relevance and controversy to their studies. How does knowledge of basic biology impact our understanding of a scientist’s work?

The idea of this video is to help students understand what a scientist does and how knowledge of basic biology impacts their work as well as our understanding of their work. This curriculum guide covers four themes as they relate to this video: Biology of Embryonic Development, The Scientific Method, What Does a Biologist Do? And The Stem Cell Controversy. This booklet is meant to inspire discussion, essays, and / or

A BRIEF OVERVIEW OF STEM CELLS

What are Stem Cells?

Stem cells are the reserve supply of replacement cells that multiply when needed for repair. Some, but not all, organs and tissues in the body have a supply of stem cells that respond to damage. Skin is an example. Skin wounds are repaired by skin stem cells; liver damage is repaired by liver stem cells.

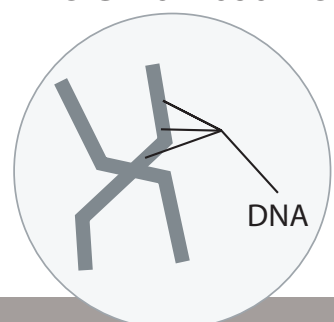
How many kinds of Stem Cells are there?

The answer to this question is not known with certainty. Researchers in the field divide stem cells into three broad categories: adult stem cells, fetal stem cells, and embryonic stem cells. These categories refer to the source of the cells, but do not describe their nature.

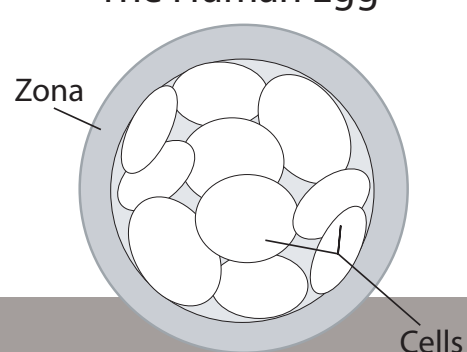
What are Parthenote Stem Cells?

It has been known for many years that human eggs occasionally undergo spontaneous cell divisions. These dividing eggs lead to dermoid cysts and to benign tumors known as teratomas that contain several cell types including skin and hair. If eggs could be routinely stimulated to undergo cell division in the laboratory, this could be an especially valuable source of stem cells that could bypass the moral, ethical, and some of the tissue rejection problems associated with fetal and embryonic stem cells, particularly for the woman donating the egg. For example, a woman with diabetes or spinal cord injury could donate her own eggs for her own stem cells. (© 2005 Bedford Stem Cell Research Foundation - <http://www.bedfordresearch.org>)

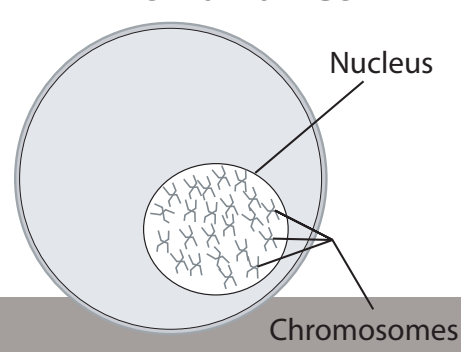
The Chromosome



The Human Egg



The Human Cell



SUGGESTED DISCUSSION QUESTIONS

It is highly recommended to begin a discussion of this video by asking students to recall the most striking elements of the video. Asking students what they observed and what they found confusing will bring into focus the varied interests of the group and create a basis for discussion in each of the following four areas.

WHAT DOES A BIOLOGIST DO?

This discussion looks at the life and career of a scientist. It prompts the students to use the video to examine what a scientist does every day.

1. What kind of scientist is Dr. Kiessling?
2. How does her work impact her life?
3. How is her job different from other jobs?
4. Who is Dr. Kiessling’s boss? Who pays her salary?
5. How does she know if she has done a good job?
6. Do you think she likes her job?
7. What are the positive and negative aspects of being a scientist?

THE STEM CELL CONTROVERSY

This discussion takes a political and ethical perspective on the video. It prompts the students to examine the two main controversies of Stem Cell research as well as weighing these against its potential benefits.

1. What are the two controversies? (cloning & the rights of the embryo)
2. What are the potential benefits of Stem Cell Research?
3. Where do Parthenotes fall with regards to these controversies?
4. How do we weigh these ethical dilemmas against the potential benefits of the research?
5. What are the other controversies associated with Stem Cell research? Why are these more or less important?
6. How does the media portray Stem Cell Research?
7. How do you believe this impacts your point of view, or the point of view of others?

THE BIOLOGY OF EMBRYONIC DEVELOPMENT

These suggestions use the video to create relevance around the importance of understanding DNA replication, and the early stages of embryonic development.

1. What are the key parts of an egg? (DNA, Chromosome, Nucleus, Cell, Embryo)
2. What happens when sperm fertilizes it?
3. Define: Stem Cell, Parthenote, and replication. What function does each play in Dr. Kiessling’s experiment?
4. How is a Parthenote different from an Embryo?
5. Why is this an important difference?
6. What is a “line” of Stem Cells?

THE SCIENTIFIC METHOD

This discussion looks at developing experiments and understanding consequences.

1. What is the scientific method?
2. How do you see it play out in this video?
3. What is Dr. Kiessling’s hypothesis?
4. What does Dr. Kiessling hope to find out in her experiment?
5. What does she find out? Make two lists – things related to her hypothesis and other things.
6. How will Dr. Kiessling know that the cells are successfully dividing?
7. Why does she “stain” the Egg?