

Super Microscope

Watch it online <http://www.kqed.org/quest/television/view/166>
Story length 2:52 minutes

QUEST SUBJECTS

Life Science	Biology Health Environment
Earth Science	Geology Weather Astronomy
Physical Science	Physics Chemistry Engineering

CA SCIENCE STANDARDS

Grade 7

Cell Biology

1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. (a,f)

Structure and Function in Living Systems

5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. (a, b)

Physical Principles in Living Systems

6. Physical principles underlie biological structures and functions. (d)

Grades 9-12

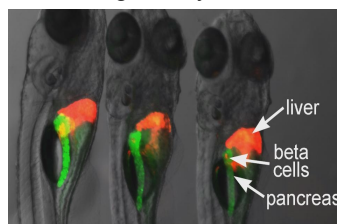
Physiology

As a result of the coordinated structures and functions of organ systems, the internal environment of the body remains relatively stable despite changes in the outside environment. (c)

PROGRAM NOTES

Nikon recently donated three confocal microscopes to the University of California, San Francisco (UCSF) Nikon Imaging Center so that scientists will be better able to examine cells. One research project that has benefited from the new microscopes looks at beta cells in the zebrafish pancreas. The use of this new microscope may speed up the process of finding a cure for type 1 diabetes.

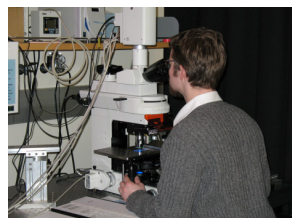
In this segment you will discover...



- how zebrafish beta cells could provide answers for type 1 diabetes in humans.
- what is special about the confocal microscope.
- how scientists might be able to find a cure for type 1 diabetes.

TOPIC BACKGROUND

The Nikon Imaging Center at the UCSF School of Medicine, which opened in September 2006, contains the latest light microscopy imaging technology. The center's goal is to stimulate biological research by providing scientists access to such cutting-edge resources. The center also seeks to promote collaboration among scientists by providing a central location for light microscopy research. The center features specialty Nikon



microscopes with new capabilities. For example, the Nikon confocal microscope shown in the QUEST segment helps scientists see movement inside a single cell and watch a single protein as it moves through the cellular structure. By pointing a set of lasers at a sample, it can create sharp three-dimensional images. Scientists can section a sample using optical slices instead of physically cutting (and destroying) the sample. The scientists can then reconstruct and manipulate the three-dimensional virtual sample on the computer. These instruments will aid studies of brain and heart development, cell movement and many other areas of research.

Ryan Anderson is a developmental cell biologist who is studying how embryos develop, as well as how individual cells behave to construct an embryo. His current work focuses on the zebrafish pancreas in an effort to find a cure for type 1 diabetes. The zebrafish pancreas produces beta cells, much like a human one does. By killing the beta cells in the zebrafish and studying the mechanism by which they regenerate, Anderson hopes to find clues to how, when and where beta cells develop. This will provide a steppingstone to finding a cure for type 1 diabetes in humans.

Previously known as juvenile diabetes, type 1 diabetes is usually diagnosed in children and young adults. The body of a person with type 1 diabetes does not produce insulin, a hormone needed to convert sugar (glucose), starches and other food into the energy the body needs to function. In a healthy person, beta cells in the pancreas release insulin. In people with type 1 diabetes, the beta cells have been destroyed, so the pancreas no longer makes insulin. People with type 1 diabetes usually need insulin shots so that their bodies can use glucose for energy.

Media Enhance Education

Video and audio can be powerful tools for meaningful learning. It all depends on you, the educator. The key to using media effectively is preparation. Make the most of learning opportunities by encouraging students to become active viewers and listeners. Pick and choose from the suggested questions and activities to offer an engaging media experience.

Questioning

Oftentimes, teachers and students become frustrated during a media segment when students can't find the answers to a long list of questions. Provide a limited number of questions or topics for students. This focuses their attention during a media segment, helps to keep them engaged and generally results in higher quality answers. QUEST Ed. has provided a number of options for focus questions ranging from fact based to opinions, as well as "big picture" ideas.

PRE - VIEWING

- What are microscopes used for?
- What types of microscopes are you familiar with?
- What does "autoimmune" mean? How do autoimmune diseases affect the body?
- Do you know anyone with diabetes? What effects does it have on that person?
- What do you think about conducting experiments on animals? Are there situations where you feel it is right and situations where you feel it is wrong?
- Use microscopes in your classroom before viewing the segment. Learn the different parts. If possible, look at a variety of objects through different types of microscopes.

VIEWING FOCUS

NOTE: You may choose to watch the story twice with your students: once to elicit emotional responses and to get an overview of the topic and again to focus on facts and draw out opinions.

- Record any facts you find interesting while you listen.
- What does a developmental cell biologist do?
- What type of fish is Ryan Anderson studying and why?
- What does a confocal microscope allow scientists to do?
- What happens to the beta cells in the pancreas of someone with type 1 diabetes?
- What is the ultimate goal of Ryan Anderson's research with regard to beta cells?
- Is there a cure for type 1 diabetes?

POST- VIEWING – Links to activities mentioned here can be found on the following page.

- **Review** students' answers to the Viewing Focus Questions.
- **Investigate** different objects using the online scanning electron microscope (SEM) simulation. Magnify objects thousands of times for clues to the structure and function of living things.
- **Debate** the ethical issues involved in using animals for medical testing. Divide students into groups and have them discuss the pros and cons. Can they think of circumstances where such medical testing is justified?
- **Make** your own microscope slide. Chose your own mounts and examine specimens under a microscope.

LESSON PLANS / ACTIVITIES



Lawrence Hall of Science

<http://nanozone.org/SEM/SEM.htm>

- What is a scanning electron microscope (SEM)? Choose from a library of objects and see how they look under the SEM. Watch a video about how the SEM works.



Lawrence Hall of Science GEMS Microscopes

<http://www.lawrencehallofscience.org/gems/GEMmicro.html>

- Microscopic Explorations features 10 learning-station activities designed to ignite student curiosity in widely diverse scientific fields. It addresses the care and proper use of classroom microscopes and demystifies these extraordinary instruments.

Home Science Tools Web site

<https://www.hometrainingtools.com/articles/introductory-microscope-experiments-teaching-tip.html>

- Learn how to make your own glass slides to view under a microscope.

ARTICLES / READING

UCSF Nikon Imaging Center

<http://nic.ucsf.edu/edu.html>

- Find detailed information on the mission of the center, equipment and opportunities to participate in workshops on light microscopy techniques.

American Diabetes Association

<http://www.diabetes.org/type-1-diabetes.jsp>

- Learn all there is to know about type 1 diabetes, including treatment, diagnosis and common concerns.

Stainier Lab Research Web site

<http://www.ucsf.edu/dyrslab/endoderm.htm>






- Find out about the research being conducted on zebrafish in the lab where Ryan Anderson works. View pictures of the pancreas, liver and gut of zebrafish.

Look for the



indicating resources from QUEST partner organizations

QUEST QUAD

FIELD NOTES 	FIELD TRIP 
<p>Go outside and ...</p> <ul style="list-style-type: none"> Use a magnifying glass to examine plants and other organisms <ul style="list-style-type: none"> How does a magnifying glass work like a microscope? How is it different? Draw an object or organism without using your magnifying glass. Draw it again using it. How much more detail can you see? 	<p>Visit ...</p> <ul style="list-style-type: none"> Chabot Space and Science Center  10000 Skyline Blvd., Oakland, CA 94619 http://www.chabotspace.org <ul style="list-style-type: none"> Participate in one of many hands-on science field trips experimenting with microscopes, such as Micronauts and Micro-Adventures. http://www.chabotspace.org/vsc/teacher/schoolvisit/default.asp
FIELD RESEARCH 	FIELD TEST 
<p>Find out more about...</p> <ul style="list-style-type: none"> Zebrafish <ul style="list-style-type: none"> Where are they found? How do they develop? Are they commonly used for medical testing? See link in "Field Test" section Type 1 diabetes <ul style="list-style-type: none"> What are the symptoms, treatments and concerns? Is there anything that can prevent the disease? Why is it becoming a problem in children? 	<p>Experiment with...</p> <ul style="list-style-type: none"> Monitoring your sugar intake for a week <ul style="list-style-type: none"> Discuss types of foods with sugar, such as soda, high fructose corn syrup or cookies. Keep track of all you eat or drink that contains sugar. Write down the amount of sugar you consume. Discuss how excess sugar relates to diabetes and how it's becoming a problem among children in the U.S. Observing the development of a zebrafish from egg to live young <ul style="list-style-type: none"> K-12 educators, use the following Web site from the University of Oregon to find information on breeding, raising and observing the development of zebrafish. http://www.neuro.uoregon.edu/k12/zfk12.html

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www.bay.org

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Sciences

www.calacademy.org

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Center

www.chabotspace.org

East Bay Regional Park
District

www.ebparks.org

Exploratorium

www.exploratorium.edu

Girl Scouts of San
Francisco Bay Area

www.girlscoutsbayarea.org

Golden Gate National
Parks Conservancy

www.parksconservancy.org

Lawrence Berkeley
National Laboratory

www.lbl.gov

Lawrence Hall of Science

www.lawrencehallofscience.org

Oakland Zoo

www.oaklandzoo.org

The Tech Museum of
Innovation

www.techmuseum.org

UC Berkeley Natural
History Museums

<http://bnhm.berkeley.edu/>

OTHER WAYS TO PARTICIPATE IN QUEST



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89.3 FM Sacramento**

Fridays at 6:30am and 8:30am



WATCH

**KQED Channel 9
Tuesdays at 7:30pm**

PHOTO CREDITS

Anderson at microscope courtesy of Gabriela Quiros

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