Video Article

May 2013: This Month in JoVE

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Abstract

Here's a look at what's coming up in the May 2013 issue of JoVE - The Journal of Visualized Experiments.

What came first: the chicken or the egg? This fundamental question lacks a vital component of reproduction: the sperm. Before anything can happen, a sperm cell must swim to the egg and fuse with it. These events are largely dependent on signal transduction pathways mediated by calcium ions (Ca^{2+}). Therefore, to study sperm function, it is useful to measure changes in Ca^{2+} concentration in spermatozoa. This can be facilitated by calcium-sensitive fluorescent dyes, which Mata-Martínez *et al.* use in four fluorometric techniques to monitor Ca^{2+} dynamics in human sperm: conventional fluorometry, stopped flow fluorometry, flow cytometry, and single cell imaging.

Moving along to another part of the male reproductive tract, we feature an article concerning prostate cancer, one of the leading causes of cancer deaths in men in the United States. In human prostate cancer cells, an enzyme called arginine deiminase (ADI) was recently demonstrated to induce autophagy, a mechanism of cell death in which a cell essentially eats its own components. To further study this mechanism, Changou *et al.* developed an imaging-based approach using quantitative 3D fluorescence microscopy, allowing them to precisely track morphological changes as cells undergo autophagy. This technique will help researchers study potential therapeutics for prostate cancer.

In JoVE Bioengineering, past articles have presented methods for isolating silk-producing glands from spiders, producing recombinant spider silk proteins in bacteria, and spinning purified proteins into fibers for potential biomedical applications (Jeffrey *et al.*, 2011; Hsia *et al.*, 2012). This month, Lang *et al.* present a new application for spider silk: making air filter devices with a nonwoven mesh of electrospun recombinant spider silk proteins. If commercial filters are coated with a layer of spider silk, their filtering efficiency may be improved. The authors demonstrate how to electrospin the fibers, treat the nonwoven silk meshes, and analyze the meshes using scanning election microscopy (SEM). Finally, the authors demonstrate air permeability and filter efficiency.

In JoVE Clinical & Translational Medicine, Heckman *et al.* demonstrate a method for determining the lowest dose of ultraviolet light that will cause erythema (sunburn) in an individual. UV light is often used to treat various skin conditions, such as psoriasis, acne, and eczema; because not all people are equally sensitive to UV light, this method can help determine the appropriate dose to administer. A Daavlin patch is used to control both the area and duration of UV exposure on the skin. The next day, changes in skin color are assessed to determine the lowest UV dose required to cause erythema.

In JoVE Neuroscience, Piotrowska-Nitsche and Caspary demonstrate how to culture slices of embryonic mouse neuroepithelium and perform live imaging of various fluorescent markers. This method allows researchers to monitor cell behavior, such as single cell divisions, *in situ* and in real time.

You've just had a preview of some of JoVE's highlights for the month of May. Visit the website to see the full-length articles, plus many more, in JoVE: The Journal of Visualized Experiments.

Video Link

The video component of this article can be found at https://www.jove.com/video/5080/

Protocol

Minimal Erythema Dose (MED) Testing

Carolyn J. Heckman[1], Rachel Chandler[2], Jacqueline D. Kloss[3], Amy Benson[2], Deborah Rooney[2], Teja Munshi[1], Susan D. Darlow[1], Clifford Perlis[4], Sharon L. Manne[5], David W. Oslin[2]

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This article describes how to conduct minimal erythema dose (MED) testing in order to determine the lowest dose of ultraviolet radiation that will cause erythema (burning) when administered to an individual.

Measuring Intracellular Ca^{2+} Changes in Human Sperm Using Four Techniques: Conventional Fluorometry, Stopped Flow Fluorometry, Flow Cytometry and Single Cell Imaging

Esperanza Mata-Martínez[1], Omar José[1], Paulina Torres-Rodríguez[1], Alejandra Solís-López[1], Ana A. Sánchez-Tusie[1], Yoloxochitl Sánchez-Guevara[1], Marcela B. Treviño[2], Claudia L. Treviño[1]

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Intracellular Ca^{2+} dynamics are very important in sperm physiology and Ca^{2+}-sensitive fluorescent dyes constitute a versatile tool to study them. Population experiments (fluorometry and stopped flow fluorometry) and single cell experiments (flow cytometry and single cell imaging) are used to track spatio-temporal [Ca^{2+}] changes in human sperm cells.

Air Filter Devices Including Nonwoven Meshes of Electrospun Recombinant Spider Silk Proteins

Gregor Lang, Stephan Jokisch, Thomas Scheibel

Biomaterials Research Group, **University of Bayreuth**

Spider silk fibers display extraordinary mechanical properties. Engineered *Araneus diadematus* Fibroin 4 (eADF4) can be processed into nonwoven meshes using electrospinning. Here, the eADF4 nonwoven meshes are used to improve the performance of air filtering devices.

Ex vivo Live Imaging of Single Cell Divisions in Mouse Neuroepithelium

Karolina Piotrowska-Nitsche[1,2], Tamara Caspary[1]

[1]Department of Human Genetics, **Emory University School of Medicine**, [2]Department of Experimental Embryology, **IGAB Polish Academy of Sciences**

Here we develop the tools necessary for *ex vivo* live imaging to trace single cell divisions in the mouse E8.5 neuroepithelium

Quantitative Analysis of Autophagy using Advanced 3D Fluorescence Microscopy

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Autophagy is a ubiquitous process that enables cells to degrade and recycle proteins and organelles. We apply advanced fluorescence microscopy to visualize and quantify the small, but essential, physical changes associated with the induction of autophagy, including the formation and distribution of autophagosomes and lysosomes, and their fusion into autolysosomes.

Disclosures

No conflicts of interest declared.

