

Video Article

# September 2014: This Month in JoVE - Visualizing Coral, Injecting Hydra, Engineering Corneal Implants, and Assessing Traumatic Brain injury in Children

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## Abstract

Here's a look at what's coming up in the [September 2014 issue](#) of JoVE: [The Journal of Visualized Experiments](#).

As summer comes to an end in the Earth's northern hemisphere, [JoVE Environment](#) takes us to the southern Caribbean Sea where year-round warm temperatures support the growth of corals, which are marine invertebrates in the phylum *Cnidaria*. Although coral reefs occupy less than 0.1% of the ocean floor, they are home to about 25% of all marine life. These delicate ecosystems provide a wealth of natural resources but they are vulnerable to environmental threats, including climate change. To better predict how environmental factors will affect coral reefs, [Sivaguru et al.](#) have developed a way to construct 3D images of coral with fine details of the coral structure. This method can help establish a baseline for healthy coral and to visualize changes caused by different environmental conditions.

In [JoVE Biology](#) we examine *Hydra*, which are freshwater relatives of coral and also in the phylum *Cnidaria*. Named after the multi-headed serpent that was killed by Hercules in Greek mythology, *Hydra* have been the subject of tissue regeneration studies since the 1700s. But it wasn't until 2006 that transgenic manipulation techniques were developed for *Hydra*. [Juliano et al.](#) demonstrate how to microinject *Hydra* embryos with plasmid DNA and to generate stable transgenic lines. Transgenic *Hydra* can then be used in studies of cell fate, gene expression, and tissue regeneration.

In [JoVE Bioengineering](#), we examine methods for regenerating tissues of the cornea, the clear front window of the eye. The edge of the cornea, or the limbus, is critical for corneal health. It prevents the ingrowth of blood vessels, thus keeping the cornea clear, and it is the source of stem cells that renew the outer corneal epithelium. If the corneal limbus is damaged or diseased, blindness can result, so in this issue, [Ortega et al.](#) focus on methods for bioengineering the corneal limbus. Using microstereolithography and electrospinning, they create membranes that mimic the limbus. When these membranes are placed on corneal wound models, a new multi-layered corneal epithelium forms. This may lead to therapeutic devices that can regenerate the corneal epithelium and preserve vision in conditions that affect the limbus.

In [JoVE Clinical & Translational Medicine](#), we feature a protocol on concussions, which may have long-term physical and psychological effects. Although concussions are very common sports-related injuries in children, there is surprisingly little known about how a young brain responds to a concussion. Therefore, [Reed et al.](#) have developed methods for assessing cognitive performance, balance and various agility/motor skills. This may help optimize the treatment and rehabilitation of pediatric concussions.

You've just had a sneak peek of the [September 2014 issue](#) of JoVE. Visit the website to see the full-length articles, plus many more.

## Video Link

The video component of this article can be found at <https://www.jove.com/video/5509/>

## Protocol

### Generation of Transgenic *Hydra* by Embryo Microinjection

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Stably transgenic *Hydra* are made by microinjection of plasmid DNA into embryos followed by random genomic integration and asexual propagation to establish a uniform line. Transgenic *Hydra* are used to track cell movements, overexpress genes, study promoter function, or knock down gene expression using RNAi.

## A Multi-Modal Approach to Assessing Recovery in Youth Athletes Following Concussion

Nick Reed<sup>1,2,3</sup>, James Murphy<sup>1</sup>, Talia Dick<sup>1</sup>, Katie Mah<sup>3</sup>, Melissa Panicia<sup>3</sup>, Lee Verweel<sup>3</sup>, Danielle Dobney<sup>3</sup>, Michelle Keightley<sup>1,2,3</sup>

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This article provides an overview of a multi-modal approach to assessing recovery following concussion in youth athletes. The described protocol uses pre- and post-concussion assessment of performance across a wide variety of domains and can inform the development of improved concussion rehabilitation protocols specific to the youth sport community.

## Combination of Microstereolithography and Electrospinning to Produce Membranes Equipped with Niches for Corneal Regeneration

Ilida Ortega<sup>1</sup>, Farshid Sefat<sup>1</sup>, Pallavi Deshpande<sup>1</sup>, Thomas Paterson<sup>1</sup>, Charanya Ramachandran<sup>3</sup>, Anthony J. Ryan<sup>2</sup>, Sheila MacNeil<sup>1</sup>, Frederik Claeyssens<sup>1</sup>

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We report a technique for the fabrication of micropockets within electrospun membranes in which to study cell behavior. Specifically, we describe a combination of microstereolithography and electrospinning for the production of PLGA (Poly(lactide-co-glycolide)) corneal biomaterial devices equipped with microfeatures.

## Multimodal Optical Microscopy Methods Reveal Polyp Tissue Morphology and Structure in Caribbean Reef Building Corals

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An integrated suite of imaging techniques has been applied to determine polyp morphology and tissue structure in the Caribbean corals *Montastraea annularis* and *M. faveolata*. Fluorescence, serial block face, and two-photon confocal laser scanning microscopy have identified lobate structure, polyp walls, and estimated chromatophore and zooxanthellae densities and distributions.

## Disclosures

No conflicts of interest declared.