Video Article

June 2016 - This Month in JoVE: Blueberry Analysis, Impact Testing Football Helmets, Stencil Micropatterning of Stem Cells, and a Test for Soil Plasticity

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Abstract

Here's a look at what's coming up in the June 2016 issue of JoVE: The Journal of Visualized Experiments.

In JoVE Chemistry, just in time for blueberry season, we feature a method for predicting the constituents of blueberries while keeping them intact. Bai *et al.* use near-infrared spectroscopy to obtain spectra of individual blueberries, then use high-performance liquid chromatography (HPLC) to measure their actual contents. They build models that use the near-infrared spectra to predict the levels of sugar, the organic acids that impart tartness, and the anthocyanins that have antioxidant properties. This method aids the selection and distribution of only the most delicious blueberries with guaranteed qualities.

JoVE Engineering includes a test protocol that simulates on-field impacts of football helmets to help reduce the risks of head injuries. Current performance standards for football helmet certification don't require the faceguard to be attached during impact tests; however, attaching a faceguard dramatically changes the helmet's mechanical properties. Therefore, Rush *et al.* propose a modified test that includes the faceguard. They also test two new helmet impact locations. This method provides more robust helmet safety standards that will drive safer helmet designs.

In JoVE Developmental Biology, human pluripotent stem cells (hPSCs) can differentiate into all three developmental germ layers. However, in vitro differentiation of hPSCs tends to be a disorganized process. This month, Sahni *et al.* describe stencil micropatterning-a method that can spatially control stem cell microenvironments and organize their differentiation fates. This elegant method provides a valuable experimental model for tissue organization and patterning in embryonic development.

In JoVE Environment, soil plasticity is a concept inspired by the craft of pottery. It refers to the clay-like behavior of certain soils at particular water content levels. The plastic limit of soil is an important parameter in geotechnology, but traditional assessment methods are highly subjective. Thus, Moreno-Maroto and Alonso-Azcárate present an alternative method based on objective measures. This method allows the plastic limit of soil to be obtained with clear and objective criteria.

You've just had a sneak peek of the June 2016 issue of JoVE. 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 http://www.jove.com/video/5784/

Protocol

Modified Drop Tower Impact Tests for American Football Helmets

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This article provides a novel technique to assess the performance characteristics of American football helmets by inclusion of faceguards during NOCSAE Standard drop tests. Additionally, two more impact locations are proposed to be added to the NOCSAE certification.

Stencil Micropatterning of Human Pluripotent Stem Cells for Probing Spatial Organization of Differentiation Fates

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Human pluripotent stem cells (hPSCs) have the intrinsic ability to differentiate and self-organize into distinct tissue patterns; although this requires the presentation of spatial environmental gradients. We present stencil micropatterning as a simple and robust method to generate biochemical and mechanical gradients for controlling hPSC differentiation patterns.

A Bending Test for Determining the Atterberg Plastic Limit in Soils

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The traditional standardized test for determining the plastic limit in soils is performed by hand, and the result varies depending on the operator. An alternative method based on bending measurements is presented in this study. This allows the plastic limit to be obtained with a clear and objective criterion.

Construction of Models for Nondestructive Prediction of Ingredient Contents in Blueberries by Near-infrared Spectroscopy Based on HPLC Measurements

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We present here a protocol to construct and validate models for nondestructive prediction of total sugar, total organic acid, and total anthocyanin content in individual blueberries by near-infrared spectroscopy.

Disclosures

No conflicts of interest declared.

