Diploma Programme

Cases of Academic Misconduct

May 2015
Examination Session

Core Components

Extended Essay / Biology

Infringement: Plagiarism

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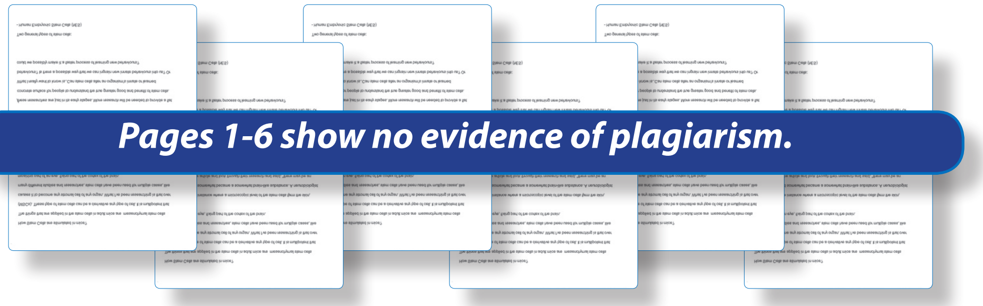

Pages 1-6 show no evidence of plagiarism.

elongation. For the first time we demonstrate that cultured human adipose tissue-derived stem cells (hASCs) respond to the presence of direct-current electric fields. Cells were stimulated for 2-4 hours with DC electric fields of 6 V/cm that were similar to those encountered in vivo post-injury. Upon stimulation, hASCs were observed to elongate and align perpendicularly to the applied electric field, disassemble gap junctions, and upregulate the expression of genes for connexin-43, thrombomodulin, vascular endothelial growth factor, and fibroblast growth factor. In separate related studies, human epicardial fat-derived stem cells (heASCs) were also observed to align and elongate. It is interesting that the morphological and phenotypic characteristics of mesenchymal stem cells derived both from liposuction aspirates and from cardiac fat can be modulated by direct current electric fields. In further studies we will quantify the effects of the electrical fields in the context of wound healing.

Hungry people are often difficult to deal with. A good meal can affect more than our mood, it can also influence our willingness to take risks. This phenomenon is also apparent across a very diverse range of species in the animal kingdom. Experiments conducted on the fruit fly, *Drosophila*, by scientists at the Max Planck Institute of Neurobiology in

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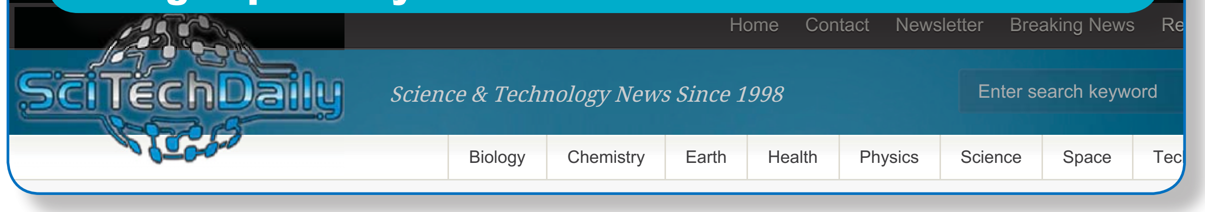
http://scitechdaily.com/hunger-affects-behavior-and-changes-pathways-in-the-brain/



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Animal behavior is radically affected by the availability and amount of food. Studies prove that the willingness of many animals to take risks increases or declines depending on whether the animal is hungry or full. For example, a predator only hunts more dangerous prey when it is close to starvation. This behavior has also been documented in humans in recent years: one study showed that hungry subjects took significantly more financial risks than their sated colleagues.

Also the fruit fly, *Drosophila*, changes its behavior depending on its nutritional state. The animals usually perceive even low quantities of carbon dioxide to be a sign of danger and opt to take flight. However, rotting fruit and plants – the flies' main sources of food – also release carbon dioxide. Neurobiologists in Martinsried have now discovered how the brain deals with this constant conflict in deciding between a hazardous substanc and a potential food source taking advantage of the fly as a great genetic model organism for circuit neuroscience.

In various experiments, the scientists presented the flies with environments containing carbon dioxide or a mix of carbon dioxide and the smell of food. It emerged that hungry flies overcame their aversion to carbon dioxide significantly faster than fed flies – if there was a smell of food in the environment at the same time. Facing the prospect of food,

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hungry animals are therefore significantly more willing to take risks than sated flies. But how does the brain manage to decide between these options?

Avoiding carbon dioxide is an innate behavior and should therefore be generated outside the mushroom body in the fly's brain: previously, the nerve cells in the mushroom body were linked only with learning and behavior patterns that are based on learned associations. However, when the scientists temporarily disabled these nerve cells, hungry flies no longer showed any reaction whatsoever to carbon dioxide. The behavior of fed flies, on the other hand, remained the same: they avoided the carbon dioxide.

In further studies, the researchers identified a projection neuron which transports the carbon dioxide information to the mushroom body. This nerve cell is crucial in triggering a flight response in hungry, but not in fed animals. "In fed flies, nerve cells outside the mushroom body are enough for flies to flee from the carbon dioxide. In hungry animals, however, the nerve cells are in the mushroom body and the projection neuron, which carries the carbon dioxide information there, is essential for the flight response. If mushroom body or projection neuron activity is blocked, only hungry flies are no longer concerned about the carbon dioxide," explains Ilona Grunwald-Kadow, who headed the study.

Biologic scaffolds composed of mammalian extracellular matrix (ECM) promote constructive remodeling of tissues via mechanisms that include the recruitment of endogenous stem/progenitor cells, modulation of the host innate immune response, and influence of cell fate differentiation. Such scaffold materials are typically prepared by decellularization of source tissues and are prepared as sheets, powder, or hydrogels. It is

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ventricular function, induced reverse remodeling, and decreased scar size. This article reviews the current understanding of MSC biology, mechanism of action in cardiac repair, translational findings, and early clinical trial data of MSC therapy for cardiac disease.

An adult stem cell is thought to be an undifferentiated cell, found among differentiated cells in a tissue or organ that can renew itself and can differentiate to yield some or all of the major specialized cell types of the tissue or organ. The primary roles of adult stem cells in a living organism are to maintain and repair the tissue in which they are found. Scientists also use the term somatic stem cell instead of adult stem cell, where somatic refers to cells of the body (not the germ cells, sperm or eggs). Unlike embryonic stem cells, which are defined by their origin (cells from the preimplantation-stage embryo), the origin of adult stem cells in some mature tissues is still under investigation.

Research on adult stem cells has generated a great deal of excitement. Scientists have found adult stem cells in many more tissues than they once thought possible. This finding has led researchers and clinicians to ask whether adult stem cells could be used for transplants. In fact, adult hematopoietic, or blood-forming, stem cells from bone marrow have been used in transplants for 40 years. Scientists now have evidence that stem cells exist in the brain and the heart. If the differentiation of adult stem cells can be controlled in the laboratory, these cells may become the basis of transplantation-based therapies.

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http://stemcells.nih.gov/info/basics/Pages/basics4.aspx

IV. What are adult stem cells?

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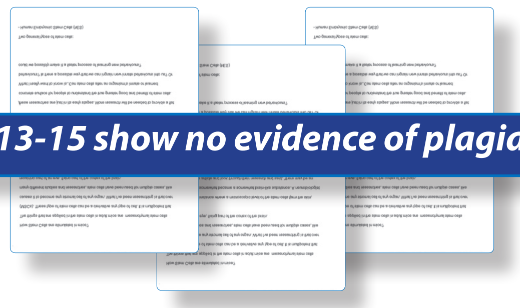
The history of research on adult stem cells began about 50 years ago. In the 1950s, researchers discovered that the bone marrow contains at least two kinds of stem cells. One population, called hematopoietic stem cells, forms all the types of blood cells in the body. A second population, called bone marrow stromal stem cells (also called mesenchymal stem cells, or skeletal stem cells by some), were discovered a few years later. These non-hematopoietic stem cells make up a small proportion of the stromal cell population in the bone marrow, and can generate bone, cartilage, fat, cells that support the formation of blood, and fibrous connective tissue.

In the 1960s, scientists who were studying rats discovered two regions of the brain that contained dividing cells that ultimately become nerve cells. Despite these reports, most scientists believed that the adult brain could not generate new nerve cells. It was not until the 1990s that scientists agreed that the adult brain does contain stem cells that are able to generate the brain's three major cell types—astrocytes and oligodendrocytes, which are non-neuronal cells, and neurons, or nerve cells.



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