to nearby myofibrils as desmin act as scaffold around the Z disk. We develop an elastic model of the sarcolemma and its links through costameres to the contractile apparatus based on our results.

2099-Pos

Spatial Correlation of Speckle Fluctuations Reveals Thickness and Features of the Ocular Surface Tear Film

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Here we present Fluctuation Analysis of Spatial Image Correlation (FASIC), a non-invasive method for evaluating the complex dynamics of the tear film surface by spatial correlation analysis. Tear film stability and its interaction with the corneal surface play an important role in maintaining ocular surface integrity and quality of vision. Dry Eye Syndrome (DES) refers to abnormalities of tear film secretion and/or stability diagnosed by conventional methods such as the Schirmer test and tear break-up time (TBUT). Several different physical methods have been developed to measure non-invasively the structure and function of the tear film including high-speed videokeratography and dynamic wavefront aberrometry. Interferometry and optical coherence tomography are amongst new proposed methods to measure tear film thickness that have remained in research phase.

With FASIC, a series of images are obtained using a laser illumination and a cMOS camera. The spatial correlation is calculated for every frame. A sinusoidal background due to interference of the tear film appears in this spatial correlation together with other features. We have developed a mathematical model to obtain the thickness of the tear film from this sinusoidal background. The model includes the macroscopic dynamics of small lipid droplets in the tear film. Consistent data with live animal model and human clinical study has been obtained. The authors gratefully thank the support from NIH grant numbers: PHS-5P41-RR003155 and P50-GM076516.

2100-Pos

A Bluetooth Device for Wireless Communication of in vivo Data from Freely Moving Research Animals

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Collecting neurophysiological data through electrodes can impact behavior when the animal is connected to wires and less able to move. In Parkinson's disease there is a clear link between reduction in dopamine availability and Parkinson's symptoms, which include tremor, slowness of movement and postural alterations. To better study the link between dopamine release in the basal ganglia and motor behavior, we are developing the implementation of a Bluetooth wireless technology for the measurement of neurotransmitter release. Data of dopamine release can be collected by means of fast scan cyclic voltammetry in which voltage ramps between 450 mV and +1000 mV are applied at a rate of ~300 V/s to a carbon fiber electrode (CFE) implanted in the striatum. The oxidation and reduction currents can be converted to cyclic voltammograms to identify the dopamine signal. The voltage ramp signals are wirelessly delivered to a remote unit connected to the implanted CFE and the resulting currents are amplified and sampled at 44.1 kHz at the remote unit. Using stereo headset protocol to transmit the data back to the computer, a recording bandwidth of ~1.3 kHz has been achieved. As usual, the voltammetric current collected before dopamine release is subtracted from the voltammetric signal collected after dopamine release within the computer to extract the net oxidation and reduction currents due to dopamine release alone and to generate the cyclic voltammogram. We anticipate that this technology will be useful for the study of the mechanisms of Parkinson's disease and possibly other electrophysiological recordings from freely moving research animals.

2101-Pos

Modeling the Relative Effects of Biofouling, Fibrous Encapsulation and Microvessel Density on Implanted Glucose Sensor Performance

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The formation of a foreign body capsule around implanted sensors is purported as a key contributor to sensor failure. A number of different processes during the wound healing sequence not only decrease the vascular density proximal to sensor but also provide diffusive and bioactive barriers to the transport of analytes from the few remaining vessels that are near the implanted sensor. While a number of surface treatments have mediated this response, the relative contributions of the different stages of wound healing to the attenuation of sensor response have yet to be elucidated. A 1D partial differential equation model was constructed to examine glucose transport through the interstitium and assess the effects that different results of the inflammatory and wound healing processes will have on glucose transport to the sensor surface. By incorporating the effects of biofouling, macrophage adhesion, and fibrous encapsulation, we have been able to recreate subcutaneous glucose traces with attenuated signals and delayed responses that mimic those seen in previous experiments. Such a tool will allow us to probe the characteristic traits of the foreign body capsule (avascularity, dense fibrous matrix, inflammatory cell presence, etc.) to gain a better understanding of what aspects of the wound healing process contribute most to sensor failure. With a more thorough knowledge of the relative contributions of the wound healing process to the decrease of sensor effectiveness, researchers can more rationally address issues of biocompatibility in the design of subcutaneous sensors.

2102-Pos

Jet-Fluid Effects on the Stented-Flow Structure in the Cavity of Cerebral Aneurysm

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The endovascular treatment of cerebral aneurysms using coils and stents, which are metal mesh cylinders, provides a promising alternative to open surgery. Although various analyses on the property of stented flow have been presented [1,2], the flow reduction mechanisms are not completely understood.

Our numerical simulation indicates that the jet flow through stent struts can reduce near the aneurysm mouth but increases the flow speed far from the mouth (Fig. 1). In this work, based on this observation, we reveal the effect of the phenomenon that the pulsed jet flow drives the fluid with different velocity on the flow structure in the aneurysm cavity. As a result, we found a possibility that the shape of aneurysm may induce the self-oscillation of jet flow. We expect that our findings introduce new strategies in stent development and improve the endovascular treatment of cerebral aneurysms.

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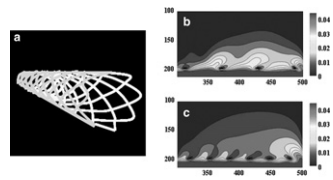

(a) Stent image. (b,c) Velocity distribution of stented flow.

2103-Pos

Development of Non-Viral Gene Delivery Carriers for Ischemic Heart Disease (IHD)

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Ischemic heart disease (IHD) or coronary artery disease (CAD) is a leading cause of death in the United States resulting in a major financial burden to the health care system and is projected to be one of the main contributors to disability by 2020. The poor prognosis of IHD is directly related to a build-up of atherosclerotic plaque that produces narrowing of the coronary artery lumen. The rupture of the artery and/or narrowing of the artery lumen results in myocardial ischemia, which can lead to myocardial infarction or death of the heart muscle tissue. Current treatments include bypass surgery, angioplasty, stent implantation, and pharmacotherapy but unfortunately many patients with IHD remain refractory to pharmacological treatments and are unsuitable candidates for surgical interventions. Also, restenosis of the vessel lumen due to neointimal hyperplasia is a recurrent problem. Gene therapy is a promising alternative to traditional treatment strategies since the delivery of angiogenic cytokines can stimulate neovascularisation in a process known as therapeutic angiogenesis. To this end, we have designed, synthesized, and characterized novel biodegradable polymeric carrier systems for the delivery of therapeutic angiogenic plasmids. The polymers were found to have a MW of ~3.2 kDa. A gel retardation assay showed condensation of DNA at N/P ratios higher than 20/1. The particle sizes of the polymer/DNA complexes were 100-231 nm with surface charges of 0.8-20 mV. Preliminary data with the reporter gene luciferase showed that the complexes produced significantly higher transfection efficiencies and lower cytotoxicities in several cell lines as compared to