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02-P399 Effects of Fluid Shear Stress and Melatonin on 3T3-L1 Preadipocytes

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Obesity is a worldwide disease caused by the excessive proliferation of adipocytes. Physical loading is an important regulator of fat tissue. It is known that giving mechanical stimulus, such as Fluid Shear Stress (FSS), may inhibit the proliferation and differentiation of adipocytes. In addition, some studies have been conducted to elucidate whether melatonin treatment induces apoptosis on 3T3-L1 preadipocytes. Here, we studied how preadipocytes are affected when both FSS and melatonin are given at the same time. Preadipocytes were cultured in Dulbecco's modified eagle's medium (DMEM) using 5% calf serum at 37℃ in a humidified 5% CO_2 incubator. For physical loading, preadipocytes were stimulated with a maximum dynamic fluid shear stress of 1 Pa at 1 Hz for 2 hours with/without melatonin. The groups were divided into four groups; the control, melatonin treatment of 1 mM, FSS only, and combination of FSS and 1 mM melatonin. All groups had a fixed duration time of 2 hours. ERK, p-ERK, COX-2, caspase-3, PPAR gamma and C/EBP beta proteins were assessed by Western blot analysis. GAPDH was used as a control. We found that the combined FSS and melatonin treatment activated the EKR/MAPK pathway but not COX-2. Furthermore, the expression of caspase-3 was increased when the melatonin treatment was given while FSS decreased this activation. Combination of FSS and 1mM melatonin group significantly decreased PPAR gamma and C/EBP beta compared to other groups. In summary, we suggest that both FSS inducing exercise and melatonin treatment may help treat obesity by inhibiting adipogenesis.

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02-P400 A new Miniaturized Optically Accessible Bioreactor to investigate the microbiota-gut-brain axis: magnetic characterization of the chambers

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In the last decades, an intriguing concept referred as microbiota-gut-brain axis suggests a connection between our intestinal microflora, named microbiota, and neurodegenerative disorders. Recently, an ERC project named MINERVA has been funded with the aim of developing the first engineered microbiota-gut-brain platform to investigate the hypothesis of such connection. The platform will be based on several organ-on-chip millifluidic devices that model the individual biological systems involved in the microbiota-neurodegeneration axis, connected between each other. As the first step towards the goal of engineering the entire platform, we developed a Miniaturized Optically Accessible Bioreactor (MOAB) that represents the basic functional unit of the organ-on-chip platform MINERVA. The MOAB has already been extensively validated for advanced cell modelling in several fields including neuroscience [1] and cancer [2]. Perfusion, accommodation of 3D cellularised constructs [3] and optical accessibility to fluorescence diagnostics [4] are its three main features. In this work, we performed an experimental analysis on the MOAB to investigate the influence on cell viability and growth of the static and closed magnetic field produced by the magnets. Such magnets are used to push the elastomeric seal that guarantees against leakage from the culture chambers. We used a MOAB without magnets as control. We seeded cells of the neuroblastoma cell line SHSY-5Y on 3D miniaturized scaffolds. We assessed cell viability by MTS assay and cell proliferation by trypan blue dye, at 48 hours of perfused cell culture in the MOAB and in the control bioreactor. The magnetic field intensity to which the cell constructs were exposed inside the chambers, predicted numerically, ranged from 320 to 570 mT. Cell viability and proliferation resulted comparable between the constructs exposed to the magnetic field and the controls. Given that hydraulic sealing provided by the magnets resulted significantly greater and that the magnets do not influence cell viability, the MOAB bioreactor with the magnetic closure will be selected as the basic functional unit for future development of the MINERVA platform.

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References

1. Tunesi et al, Frontiers in aging neuroscience, 2016
2. Marturano-Kruik et al, PNAS, 2018
3. Laganà, Raimondi, Biomedical Microdevices 2012
4. Raimondi et al, J Appl Biomater Funct Mater, 2015