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Zafirlukast-PLGA ELECTROSPUN FIBERS ON A SILICONE BREAST IMPLANT AS BIOCOMPATIBLE SCAFFOLD FOR CAPSULAR CONTRACTURE REDUCTION

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In Brazil, breast cancer is the second most frequent type of cancer. Of the many patients requiring mastectomy, the majority is opting for silicone implant-based reconstruction. Once a breast implant is inserted in the body, a capsule of connective tissue, mainly of fibroblasts, starts to be produced. One option of successful treatment of capsular contracture is diminishing inflammation by pharmacological inhibition. Some reports indicated that zafirlukast (Accolate, AstraZeneca Pharmaceuticals), a leukotriene antagonist, effectively reverse capsular contracture following breast augmentation. In this study, in an attempt to reduce the extent of capsule formation, electrospun zafirlukast-PLGA (poly(lactic-co-glycolic acid) scaffolds were evaluated as a potential biocompatible implant coating. Furthermore, the biological compatibility of the scaffolds was analyzed with the 3T3 fibroblast cell line and RAW 264.7 macrophage cell line. The electrospun fiber mats were produced using a solution of 18% poly L-lactic acid-co-glycolic acid (PLGA) in hexafluoro-2-propanol and acetone (6:1) containing 0.25% zafirlukast. The morphology of the microfibers was analyzed by scanning electron microscopy (SEM) and their diameter was calculated using ImageJ. The scaffolds were seeded with either 3T3 fibroblast cells, RAW 264.7 macrophages or a mixture of both types of cells. Cell viability was evaluated by Wst-8 and Live/Dead assay. The SEM images show that the scaffolds have uniform, randomly distributed fibers, without beads. The PLGA-zafirlukast fibers presented an average diameter of 0.927?0.31µm, significantly higher when compared to PLGA only fibers which presented a diameter of 0.593 ? 0.19 µm. The contact angle measurements showed an increase of the value from 87.13 ± 5.48 for the PLGA fibers to 93.58 ± 2.96 when zafirlukast was added to the fibers. Deposition of the fibers on the breast implant further increased the hydrophobicity to 111.88 ± 4.11. The Wst-8 assay showed that the fibroblasts and macrophages proliferated on the scaffolds. However, the cells that were cultivated on the PLGA showed diminished adherence and viability at day 3 and 7 when compared to the cells cultivated on culture plate, as expected. The addition The PLGA scaffolds diminished the number of live 3T3 cells from 99.7% (control) to 85.9% (PLGA scaffold) as seen by the live/dead assay. No differences were observed between the numbers of live macrophages in all groups. Taken together, the results indicate that the modification of the breast implant with PLGA fibers diminishes the fibroblast and macrophage viability. No significant effect was seen with the addition of zafirlukast, probably due to the low dosage. Development of technologies for the optimal and sustained dosing of anti-inflammatory agents from polymeric fiber mats that can be wrapped around breast implants during surgery is expected to cause a new trend in medical implant application.