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Remodeling of tannic acid cross-linked collagen type I induces apoptosis in ER+ and HER2+ breast cancer cells

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Breast cancer accounts for almost 30$ of new cancer diagnoses and is one of the leading causes of cancer deaths in developed countries. Lumpectomy is a common procedure to remove breast tumors resulting in a tissue void. There are currently no highly regarded surgical techniques to repair these voids. The objective of this project is to develop an injectable tissue regeneration matrix with anti-cancer properties. Collagen type I is a common tissue-engineering scaffold due to its intrinsically bioactive and biodegradable qualities. Collagen is a naturally derived material and, when not cross-linked, is enzymatically degraded. Research efforts targeting the potential of natural compounds in the fight against cancer are growing. Tannic acid (TA) belongs to the class of hydrolysable tannins and is found in numerous plants and foods. TA functions as a collagen crosslinking agent through both hydrogen bonding and hydrophobic effects; thus, as cross-linked collagen is remodeled TA is released. If used as a biomaterial for tissue-engineering purposes, TA-cross-linked collaged type I would not only serve as an attachment scaffold for cells but also function as an extended release anti-cancer treatment. When normal adipocytes attach and grow on TA-cross-linked collagen type I beads the released TA induces apoptosis in ER+ and HER2+ breast cancer cells with minimal impact on normal breast epithelial cells and adipocytes. The TA-induced apoptosis is mediated by caspases 3, 7 and 9. In conclusion, TA-cross-linked collagen beads show promise as a potential tissue regeneration matrix while providing an anti-cancer effect.

Biography

Brian W Booth completed his PhD at North Carolina State University and Post-doctoral studies at the National Cancer Institute/National Institutes of Health. He joined the Institute for Biological Interfaces of Engineering at Clemson University in 2009 and the Department of Bioengineering in 2015. He has published over 30 peer-reviewed articles and chapters.

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