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Dietary Bioactive Compounds on Breast Cancer Prevention

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Description

Research in the last decades' haven driven a paradigm shift in the approach to physical activity and exercise prescription in breast cancer survivors. Clinical guidelines have moved from bedrest dogma and avoiding strenuous activity in the upper limb to recommending Resistance Exercise (RE). In recent years, scientific evidence has shown that RE in the upper extremities can even have a preventive effect on Breast Cancer-Related Lymphedema (BCRL). This knowledge was achieved thanks to systematic reviews with meta-analyses analyzing variables related to RE programs on lymphatic response and volumetry. However, other variables related, such as inflammation or acute responses, have been less addressed. The hypothesis presented in this paper is that there are both acute and chronic inflammatory and lymphatic response to exercise, systemic effects such as arm volume and body composition changes and unknown physiologic mechanics which contribute to BCRL prevention. Capsular contracture is a common complication associated with breast implants following reconstructive or aesthetic surgery in which a tight or constricting scar tissue capsule forms around the implant, often distorting the breast shape and resulting in chronic pain. Capsulectomy (involving full removal of the capsule surrounding the implant) and capsulotomy (where the capsule is released and/or partly removed to create more space for the implant) are the most common surgical procedures used to treat capsular contracture.

Skin Immune

Various structural modifications of the implant device including use of textured implants, submuscular placement of the implant, and the use of polyurethane-coated implants and surgical strategies (including pre-operative skin washing and irrigation of the implant pocket with antibiotics have been and/or are currently used to help reduce the incidence of capsular contracture. In this article, we review the pharmacological approaches both commonly practiced in the clinic and experimental reported in the scientific and clinical literature aimed at either preventing or treating capsular contracture, including pre- and post-operative intravenous administration of drug substances, systemic (usually oral) administration of drugs before and after surgery, modification of the implant surface with grafted drug substances, irrigation of the implant or peri-implant tissue with drugs prior to implantation, and incorporation of drugs into the implant shell or filler prior to surgery followed by drug release *in situ* after implantation. The integration of precise detection, long-term prevention and effective treatment are beneficial to monitor cancer bioactivity and prevent malignant metastasis for breast cancer patients. Herein, a novel fluorescence probe is designed and synthesized which contains a fluorophore (naphthalimide), a linker and a non-steroidal anti-inflammatory drug (ibuprofen). The specific optical imaging, prevention and treatment effects of breast cancer are relied on the introduction of a powerful cyclooxygenase-2-specific inhibitor, ibuprofen, which makes IBLN possible to successfully differentiate breast cancer cells from normal cells. In addition, fluorescent cellular imaging agent naphthalimide also has anticancer effects via inducing Lysosomal Membrane Permeabilization (LMP). The multi-functional ibuprofen-derived fluorescence inhibitor IBLN realizes the imaging, prevention and treatment for breast cancer, which the selectivity and anticancer effects would be strengthened compared to the single naphthalimide or ibuprofen. Therefore, we envisage that the multi-function strategy in IBLN would be attractive way to explore potential reagent for fluorescence-visible breast cancer therapy *in situ*. Surgical removal remains the predominant treatment strategy for Triple-Negative Breast Cancer (TNBC). However, risks that include high locoregional recurrence and remote metastasis threaten patient survival and quality of life after surgery. In this study, a hydrogel based on poly (ethylene glycol) dimethacrylate and sericin methacryloyl was fabricated by photopolymerization to fill the resection cavity and prevent recurrence. The obtained hydrogel exhibited mechanical properties compatible with breast tissue and facilitated postsurgical wound management by promoting tissue regeneration. The DNA methylation inhibitor decitabine and poly (lactic-co-glycolic acid)-encapsulated phytochemical Gambogic Acid (GA) were loaded into the hydrogel. The as-prepared hydrogel promoted fast release of DEC and sustained release of GA, leading to gasdermin E-mediated tumor cell pyroptosis and activating antitumor immune responses. Inducing postsurgical tumor cell pyroptosis inhibited local tumor recurrence and lung metastasis. While the dual-drug-loaded hydrogel system cured less than half of tumor-bearing mice, the cured mice survived for over half a year.

Malignant Therapy

Antiestrogen endocrine therapy, commonly known as BC chemoprevention, is an effective method of BC prevention. In multiple randomized trials, two selective estrogen receptor modulators tamoxifen and raloxifene, and two aromatase inhibitors exemestane and anastrozole have reduced BC incidence by in high-risk women. An estimated of the US women between 35 and 79 years of age may qualify as high risk for BC, yet a small percentage of these women will ever have a formal BC risk assessment or a discussion of endocrine prevention options. The etiology of under-utilization of endocrine prevention of BC is multifactorial infrequent use of BC risk assessment tools in the primary care settings, insufficient knowledge of BC risk assessment tools and antiestrogen agents among primary care providers, concerns of side effects, inadequate time for counseling during primary care visit, and lack of predictive biomarkers may play significant roles. Many small studies incorporating risk assessment tools and decision-making aids showed minimal success in enhancing endocrine prevention. One critical factor for underutilization of endocrine prevention is low uptake of endocrine prevention by high-risk women even when appropriately recommended. Furthermore, adherence to BC endocrine prevention is unsatisfactorily low. Despite the current infrequent usage, endocrine prevention has the potential to reduce the public health burden of BC significantly. Innovative approaches like finding new agents, alternative dosing and schedule of currently available agents, transdermal medication delivery, increased public and professional awareness, and policymakers' commitments may bring the desired changes. Several studies have made strong efforts to understand how age and parity modulate the risk of breast cancer. A holistic understanding of the dynamic regulation of the morphological, cellular, and molecular milieu of the mammary gland offers insights into the drivers of breast cancer development as well as into potential prophylactic interventions, the latter being a longstanding ambition of the research and clinical community aspiring to eradicate the disease. In this review we discuss mechanisms that react to pregnancy signals, and we delineate the nuances of pregnancy-associated dynamism that contribute towards either breast cancer development or prevention. Further definition of the molecular basis of parity and breast cancer risk may allow the elaboration of tools to predict and survey those who are at risk of breast cancer development. These findings indicate that our hydrogel system is an excellent biocompatible platform for postsurgical TNBC therapy. Breast Cancer (BC) is the most common non-cutaneous malignancy among women worldwide and is a significant cause of morbidity, mortality, and national health care expenditure. Unfortunately, with few exceptions like alcohol consumption, obesity, and physical activity, most BC risk factors are unmodifiable.