Breast Cancer: Current Research

Mini Review Open Access

A Short Note on Prevention of Obesity-Related Breast Cancer

Dhruv Singhal*

Division of Translational Cancer Research, Department of Laboratory Medicine, Lund University, Lund, Sweden

Abstract

Metabolic regulation and obesity caused by overeating are thought to be major risk factors for breast cancer. Both obesity and breast cancer can be traced back to early stages of human development. A natural is flavone found in soybean products called genistein (GE) has been linked to a lower risk of breast cancer and other metabolic disorders. Our review expected to decide the impacts of maternal openness to soybean dietary GE on avoidance of over nutrition-prompted bosom malignant growth further down the road and investigate possible components in various mouse models. By significantly reducing the high-fat diet-induced body fat accumulation, lipid panel abnormalities, and glucose intolerance in the offspring of mice, our findings demonstrated that maternal dietary GE treatment improved metabolic functions in the offspring. Importantly, exposure to GE in the mother's diet effectively delayed the development of female offspring's simulated mammary tumors caused by a high-fat diet. We discovered that, at least partially through regulation of the offspring's gut microbiome, bacterial metabolites, and epigenetic profiles, maternal GE may exert its chemo preventive effects by affecting essential regulatory gene expression in control of metabolism, inflammation, and tumor development. Through dynamically influencing the interaction between early-life gut micro biota, key microbial metabolite profiles, and offspring epigenome, our findings suggest that maternal GE consumption is an effective intervention approach leading to early-life prevention of obesity-related metabolic disorders and breast cancer later in life.

Keywords: Obesity-related breast cancer; High-fat diet; Triple negative breast cancer

Introduction

In the United States and around the world, obesity is now a major health problem. Although there are genetic factors that contribute to obesity, modern dietary patterns like the Western diet or the high-fat diet (HFD) are thought to be a major risk factor for the condition [1]. A number of metabolic syndromes can result from obesity, which is also closely linked to a number of chronic human diseases like diabetes, cardiovascular disease, and cancer, including breast cancer. Obesity or being overweight has been shown to increase the risk of estrogen receptor (ER)-positive breast cancer in postmenopausal women and triple negative breast cancer (TNBC), an aggressive form of breast cancer that mostly affects young premenopausal women, African Americans/Hispanics, and/or people with a BRCA1 germ line mutation [2-3]. Through negative interference with metabolism and inflammation processes, obesity may promote breast tumor genesis [4]. However, the precise mechanisms by which obesity regulates the development of breast cancer have not yet been fully elucidated.

Obesity related breast cancer

Over the past few decades, there has been widespread acceptance of the "Developmental Origins" hypothesis, which is based on the interaction between early developmental plasticity, environmental factors, and the outcome of health and disease [5]. Concerning the developmental roots of obesity and breast cancer, extensive research has been conducted [6-7]. For instance, a maternal nutrition imbalance that includes both overnutrition and undernutrition may result in the offspring's metabolic systems being dysregulated and becoming obese later in life. Due to a high birth weight, epidemiological studies suggest that maternal obesity may also increase the risk of breast cancer in daughters [8]. As a result, the offspring's improved susceptibility to later-life health outcomes like a lower risk of obesity or breast cancer would likely result from the beneficial maternal diets and balanced nutritional status, which would also likely have an impact on early developmental processes and reverse adverse fetal programming.

Over nutrition and under nutrition

Products made from soy beans have a significant positive impact on human health, which is why they are so popular on the global food market. Through regulation of glucose metabolism and control of cholesterol levels, for instance, soybean consumption is linked to a lower risk of diabetes and cardiovascular disease [9-10]. Asian women benefit from their eating habits with a lower rate of breast cancer development and relapse than their Western counterparts, as the Asian Pacific population is the largest consumer of soy food worldwide. Isoflavones make up the majority of soybean's bioactive compounds. Genistein (GE), which makes up approximately 47% of all soy iso flavones found in soybean products, is the most common type [11]. Soybean GE has been shown to prevent a variety of breast cancers in vivo and in vitro in ours and many other labs [12]. Through a variety of mechanisms, including inhibiting adiposeness, inducing apoptosis and differentiation, reducing oxidative stress/inflammation, and so on, the beneficial effects of GE against obesity have been well demonstrated in both human and animal studies. Importantly, GE has demonstrated effects that span generations. Studies have shown that pregnant mice exposed to GE have healthier offspring, including lower rates of obesity, cardiovascular disease, and breast cancer. However, it is still unclear how bioactive GE in the mother transmits its protective effects to the offspring.

The most significant habitat for indigenous intestinal micro biota is

***Corresponding author:** Dhruv Singhal, Division of Translational Cancer Research, Department of Laboratory Medicine, Lund University, Lund, Sweden, E-mail: dsiinghall@gmail.com

Received: 02-Feb-2023, Manuscirpt No; bccr-23-90505; **Editor assigned:** 06-Feb-2023, PreQC No. bccr-23-90505 (PQ); **Reviewed:** 20-Feb-2023, QC No bccr-23-90505; **Revised:** 22-Feb-2023, Manuscirpt No. bccr-23-90505 (R); **Published:** 28-Feb-2023, DOI: 10.4172/2572-4118.1000179

Citation: Singhal D (2023) A Short Note on Prevention of Obesity-Related Breast Cancer. Breast Can Curr Res 8: 179.

the digestive system. The composition of the gut micro biota is greatly influenced by diet and nutrition. There is a clear connection between functional microbial imbalance and obesity, as substantial human and animal studies have demonstrated that high-energy diets alter the composition and diversity of the gut micro biota in obese populations. As a result, symbiosis of the gut bacteria has also been linked to breast cancer, according to recent research. Breast cancer patients' gut microbiome is significantly different from that of healthy women, indicating that certain bacteria may be linked to the development of breast cancer and/or therapeutic responses. Importantly, research has shown that the gut microbiome is primarily formed in infancy. As a result, the micro biota of the mother could be a starting point for the offspring's guts micro biota's early development. Consuming soy can lead to a favorable shift in the microbial communities that live in the gut and the production of beneficial bacterial metabolites, both of which contribute to the soy's ability to protect humans from chronic diseases. According to our previous research, soybean GE is a potent epigenetic modulator that can exert its tumor-suppressing effects through the epigenetic regulation of key tumor-related gene expression. As a result, we hypothesize that maternal dietary GE intervention may result in a dynamic interaction between early-life gut microbiome, Meta bloomed, and epigenetic mechanisms, influencing later health outcomes like the risk of obesity and breast cancer.

Through the mechanistic interaction of maternal GE altered early-life gut microbiome, metabolites, and epigenetic mechanisms, the current studies sought to determine the effects of a maternal soybean GE diet on the prevention of obesity-related breast cancer. Through, at least in part, affecting early-life gut micro biota, important microbial metabolites, and offspring epigenome that may contribute to key regulatory gene expression profile changes in the offspring, our findings demonstrated that the maternal soybean GE diet reduced the risk of HFD-induced metabolic disorders and delayed HFD-accelerated mammary tumor development in female offspring of several mouse models. This research sheds light on the mechanisms by which maternal nutrition-mediated developmental origins of obesity and breast cancer interact with one another, which will make it easier to investigate a novel natural bioactive product-based in utero preventive strategy.

Obesity caused by overeating, characterized by a higher body mass index and metabolic disorders, is now a major risk factor for many chronic human diseases, including breast cancer. The promising prevention strategies that center on maternal dietary intervention are supported by evidence that supports the developmental origins of both obesity and breast cancer. The goal of this study was to figure out how the maternal bioactive soybean GE intervention affected the offspring's epigenetics, gut microbiome, and key regulatory genes/pathways, as well as the prevention of HFD-induced obesity and its associated breast cancer. In the female offspring of several mouse models, our research provides strong evidence that the maternal soybean GE diet is highly effective in reducing HFD-induced metabolic dysregulation and delaying HFD-accelerated mammary tumor development. Mechanistically, maternal GE consumption can have a significant impact on the composition of the early-life gut micro biota, the signature of microbial produced metabolites, the global status of DNA methylation, and subsequent key regulatory gene profiles in the offspring, all of which contribute to the beneficial health outcomes that maternal GE consumption induces in the offspring later in life.

Discussion

Numerous epidemiological and animal studies indicate that maternal diets and nutrition have a significant impact on health outcomes in later life. Because of these factors, the availability of nutrients to the mother throughout her life, including the prenatal and postnatal early stages, may be especially important for changing the offspring's susceptibility to certain diseases and reversing negative fetal programming. One of the most widely used agricultural products in the world is soy. It can be made into tofu, soy sauce, meat substitutes, and other food products as a key source of vegetable protein and oil. Isoflavones are the main bioactive compounds in soy, and GE is the most common iso flavone in foods and supplements made from soy . Studies in experimental animals show that maternal GE may have potential Tran's generational effects in reducing the risk of certain diseases, such as obesity or breast cancer, in the offspring. This is in addition to its significant preventive effects against a variety of human diseases, such as cancer and obesity. These findings are in line with the epidemiological evidence that Asians who consume a lot of soy have a low risk of developing breast cancer over multiple generations. However, there is currently no study that examines the interactions between obesity-related breast cancer and the maternal soybean GE diet and the incidence of the disease in the offspring, as well as the potential mechanisms underlying these phenomena, during early development. In this study, we dealt with these difficulties for the first time.

References

1. Meng QY, Cong HL, Hu H, Xu FJ (2020) Rational design and latest advances of co delivery systems for cancer therapy. Materials Today Bio 7: 100056.
2. Bianchini G, De Angelis C, Licata L, Gianni L (2022) Treatment landscape of triple-negative breast cancer-Expanded options, evolving needs. Nat Rev Clin Oncol 19: 91-113.
3. Al-Mahmood S, Sapiezynski J, Garbuzenko OB, Minko T (2018) Metastatic and triple-negative breast cancer: challenges and treatment options. Drug Deliv Transl Res 8: 1483-1507.
4. Chaudhary LN (2020) Early stage triple negative breast cancer: management and future directions. Semin Oncol 47: 201-208.
5. Bianchini G, Balko JM, Mayer IA, Sanders ME, Gianni L (2016) Triple-negative breast cancer: challenges and opportunities of a heterogeneous disease. Nat Rev Clin Oncol 13: 674-690.
6. Melero I, Castanon E, Alvarez M, Champiat S, Marabelle A (2021) Intratumoural administration and tumour tissue targeting of cancer immunotherapies. Nat Rev Clin Oncol 18: 558-576.
7. Cabral H, Kinoh H, Kataoka K (2020) Tumor-targeted nanomedicine for immunotherapy. Acc Chem Res 53: 2765-2776.
8. Lee H, Kim SW, Kwon DY, Kang HW, Jung MJ, et al. (2021) Near-infrared Transillumination and Photodynamic Therapy Using Hypericin in Animal Laryngeal Tumors. Tissue Eng Regen Med 18: 941-951.
9. Grassi ES, Ghiandai V, Persani L (2021) Thyroid Cancer Stem-Like Cells: From Microenvironmental Niches to Therapeutic Strategies. J Clin Med 10: 1455.
10. Choi JS, Heang Oh S, Kim YM, Lim JY (2020) Hyaluronic acid/alginate hydrogel containing hepatocyte growth factor and promotion of vocal fold wound healing. Tissue Eng Regen Med 17: 651-658.
11. Sinn HP, Kreipe H (2013) A brief overview of the WHO classification of breast tumors, 4th edition, focusing on issues and updates from the 3rd edition. Breast Care (Basel) 8: 149–154.
12. Li CI, Uribe DJ, Daling JR (2005) Clinical characteristics of different histologic types of breast cancer. Br J Cancer 93: 1046–1052.