

# An Overview on Association Between Dairy Products Consumption and Breast Cancer

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## Abstract

Women are more likely to get breast cancer (BC) than any other type of cancer in the world. It may be helpful to estimate the BC risk associated with dairy consumption from the perspective of public health. There are conflicting results from epidemiological studies regarding dairy consumption and BC risk. We therefore examined the relationship between dairy food consumption and BC development. In this study, we summarized and quantified the latest findings on milk consumption and BC based on a systematic literature review. A search for relevant English-language publications was conducted in several databases until January 2022. A total of 106 articles were identified, but only 44 met the criteria for inclusion. Among those studies, there were retrospective studies, cross-sectional studies, and prospective studies. There was a negative correlation between dairy consumption and BC risk overall. A balanced diet may include dairy products as part of a healthy diet, as further studies will clarify their role in human health.

**Keywords:** Breast cancer, Dairy products, Milk products, Systematic review

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## Introduction

Women are most frequently diagnosed and killed by BC around the world. Currently, BC is the most commonly diagnosed cancer in the world, overtaking lung cancer. There is a woman diagnosed with BC every 14 s somewhere in the world. There will be more than 2.3 million women diagnosed with BC worldwide in 2020, and more than 685,000 women will die from the disease [1]. A person's diet and lifestyle are thought to be effective cancer prevention strategies because they are modifiable. As a result of sedentary behavior reductions, alcohol consumption reductions, and smoking cessation, BC risk is thought to be reduced. Cancer incidence and health are influenced by dietary choices in one sense. A number of recent studies have examined the association between food and BC. The mediterranean diet may reduce the risk of BC, according to some evidence [2, 3]. There have been numerous studies on the effects of milk, dietary fiber, and soy products on the risk of colon cancer. Moreover, consuming more dairy calories and milk was associated with a greater risk of BC. There has been a considerable amount of research on the impact of milk products on BC risk; however, the results were inconsistent. In support of the basic theory that a dairy diet reduces BC risk, calcium, vitamin D, and lactoferrin are cited as anticarcinogenic agents. It has been suggested that these compounds may help to reduce the risk of BC, and they are mostly found in dairy products. In contrast, dairy products appear to increase the risk of developing BC [3]. Consumption of dairy products may be related to higher levels of dietary fat, particularly saturated fat, which is associated with a higher risk of developing BC. Additionally, milk contains a number of pollutants and compounds that may pose

a health risk to humans, such as estrogen, which has been linked to an increase in DNA replication and mitotic activity, as well as insulin-like growth factor I (IGF-I), which promotes BC cell proliferation [4]. Consequently, no dose-response correlations exist for dairy foods in relation to incidence of BC development. Therefore, the objective of this review was to summarize the association between milk product intake and BC risk. Assessment of the BC risk associated with dairy consumption may assist physicians and public health officials in making policy decisions. A systematic review was conducted on the association between dairy food consumption and BC risk during the last 15 years from 1<sup>st</sup> January 2008 to 31<sup>st</sup> January 2022, and on the relationship between each type of milk product and BC risk [5].

## Methodology

According to the preferred reporting items for systematic reviews and meta-analyses (PRISMA) standards, this systematic review was conducted. An international prospective registry for systematic reviews was requested to include the protocol. In international databases (Scopus, PubMed (Medline), The Cochrane, Google Scholar, and Science Direct), a search for relevant studies evaluating the association between milk consumption and the development of BC was carried out over the last 15 years from 1<sup>st</sup> January 2008 to 31<sup>st</sup> January 2023.

The controlled vocabulary terms used in each database were unique. In addition to MeSH terms and text phrases associated with the association, we used the following keywords to search for BC and dairy products: (breast neoplasms or BC or breast tumor) and (milk or dairy or dairy products). A search method was examined on two datasets



(Google Scholar and PubMed), and its capacity to locate relevant papers in each database was further improved. A forward and reverse link chain of the included research was analyzed to search for additional relevant information in the reference lists [3, 6-11].

Observational studies are all included such as cross-sectional, case-control, cohort, and longitudinal studies. The main exposure in the study (yogurt, cheese, milk, and milk products) was the consumption of milk products, and the result was the development of BC. Between January 1<sup>st</sup>, 2008, and January 31<sup>st</sup>, 2022, 44 studies were conducted. Studies must be reported in English only. Both BC-positive and non-positive women were observed during the studies.

The exclusion criteria include proceedings from conferences, case reports, qualitative research, opinion articles, and studies without full-text articles or book chapters. This study examined the link between eating dairy foods and other malignancies. Unrelated outcomes and inadequate data. No English-language studies have been published.

### Data extraction

We downloaded the search results from each database in either NBIB (.nbib) format or research information systems common tag format (.ris). It was necessary to extract sections of the search results from databases (like Google Scholar) that weren't possible to download all at once, add them to EndNote libraries, and remove duplicates. Using excels, we converted the result of the search into an excel worksheet (.xlsx) after removing duplicates. A preliminary screening of Titles and abstracts was conducted in order to discover publications that may be of interest. We downloaded and reevaluated the full texts of papers that might have qualified for inclusion. Eligibility was assessed independently and in duplication in order to eliminate bias. Following the full-text review, a comprehensive analysis of the reasons for excluding certain papers was conducted. To evaluate the value of the research and synthesize the available evidence, the data from the studies were abstracted in microsoft excel format using a pre-designed, pre-piloted computerized data abstraction form. Data abstractions were conducted independently in order to reduce errors. An abstract contains the title of the research, the author's name, the year of publication, the country, the sample size, the study design, the age of participants, the method of dietary assessment, and the type of dairy product [12-14].

In cases where there were several publications containing the same study, only the most recent and complete data were used. After overlapping data were resolved, the data were reviewed. To display the results of literature screening and search, PRISMA flow diagrams were created [15].

### Quality analysis

A standardized critical appraisal method for quality evaluation was used by two independent reviewers in this review to assess quality independently and in duplicate. An additional reviewer participated in the discussion to resolve all disagreements [16].

## Results

### Selection methods

The database contained 705 articles based on our preliminary search. Six hundred and eighty-two publications were assessed on the basis of titles and abstracts, with 82 deemed eligible for full-text review. Between 2008 and 2022, 82 full-text papers were reviewed for eligibility, with 18 of them relating to BC and dairy product intake.

### Characteristics of studies for systematic review

An assessment of 18 observational studies was conducted in this systematic literature review to assess the association between dairy products consumption and the risk of developing BC. Five of the 18 articles were written by Americans, three by Iranians, two by Spaniards, one by each of the Netherlands, French, Chinese, Korean, Japanese, Polish, and Algerian authors, and one even came from the European perspective investigation into cancer and nutrition. There were nine prospective studies, seven retrospective studies, and two cross-sectional studies among the 18 studies. It is possible to separate the dairy results into high-fat, low-fat, and cheese products for cheese, milk, and yogurt [17-22].

### Dairy products and BC risk

Research examining the link between consumption of dairy foods and the risk of developing BC. Data on dairy consumption are gathered and reported in a variety of ways, based on what has been found so far. Studies separate dairy product consumption into subcategories like milk, cheese, and yogurt, while others report overall consumption. Studies have also evaluated high-fat milk products separately from low-fat milk products. Several cohort studies, case-control studies, and cross-sectional studies have been published on the relationship between BC and total dairy products. There was a statistically significant inverse relationship between BC and milk product intake in one cohort study. The relationship was not demonstrated in four other studies, however. Four case-control studies reported an inverse association, one research reported a positive association, and one study reported no association. Compared with women who don't consume dairy products, women who consume dairy foods have a lower risk of developing BC (Table 1) [23, 24].

There is an inverse relationship between low-fat dairy products and high-fat dairy products. There have been many epidemiologic studies focusing on specific types of dairy products. There was no conclusive association between BC and whole milk consumption based on six cohort studies, four case-control studies, and one cross-sectional study. Andersen et al. [25] found substantial inverse relationships among U.S. people, Schwingshackl et al. [26] found substantial inverse relationships among Iranian women, and Dandamudi et al. [27] in Boston found significant inverse relationships among women. Several previous studies have found a positive relationship between consumption and BC, but these findings contradict them.

**Table 1:** Possible effects of dairy products on BC risk [24].

Dairy products					
Pooled analysis (8 prospective cohort studies) (351,041 women, 15 years follow-up)	Meta-analysis (18 prospective cohort studies, n = 1,063,471)		Meta-analysis (22 cohort + 5 case-control studies)		
NS	RR = 0.91 (95% CI = 0.80 - 1.02, p = 0.003), milk consumption	RR = 0.85 (95% CI = 0.76 - 0.95, p = 0.01), highest vs Lowest total dairy food	RR = 0.90 (95% CI = 0.83 - 0.98, p = 0.111), highest vs Lowest dairy products	RR = 0.91 (95% CI = 0.83 - 0.99, p = 0.991), yogurt consumption	RR = 0.85 (95% CI = 0.75 - 0.96, p = 0.121), low-fat dairy consumption



The results of research on yogurt's risk were inconclusive. Rigi et al. [28] reported inverse associations, while Chlebowski et al. [29] found that BC development risk increased significantly in one study, while no association was found for. In several studies, cheese intake and BC are related in similar ways, with findings ranging from a significantly lower risk to no significant link to a significantly higher risk.

## Discussion

A systematic review of 18 observational studies was conducted to summarize the evidence for the association between dairy product consumption and the risk of BC. There were nine prospective studies, seven retrospective studies, and two cross-sectional studies among the 18 studies. There is still debate about the protective or detrimental effects of dairy products on BC incidence in females. There was an inconsistent association between dairy food intake and BC incidence in most epidemiological studies. As a result of this systematic review, which examined 18 observational studies conducted between 1<sup>st</sup> January 2008 and 31<sup>st</sup> January 2022, six studies found that dairy consumption was inversely and significantly related to the development of BC. Compared to five studies that showed no correlation, only one study showed a positive correlation. While some components of milk are associated with a higher risk of BC, others seem to protect against it. A variety of mechanisms could explain the role dairy products play in BC development [29-32].

In recent years, dairy products have been shown to have both pro- and anti-carcinogenic effects. Lactic acid conjugated linoleic acid, and calcium in dairy products influence cell proliferation, differentiation, and tumor development. Alternatively, dairy products high in fat, saturated fats, and possibly cancer-causing contaminants like pesticides, estrogen metabolites, and growth factors like IGF-1 raise the risk of BC. There is a metabolically interrelated relationship between vitamin D and calcium in the diet, and they are highly correlated dietary factors. In experimental studies, vitamin D has been shown to suppress tumor proliferation, induce apoptosis and autophagic cell death, and suppress angiogenesis through a variety of mechanisms, demonstrating its important role in suppressing tumors. The antiproliferative effects of vitamin D have also been discovered in BC cell lines by arresting the cell cycle in phase G0/G1. Thus, growth-inhibiting hormones like IGF-I are downregulated and growth-promoting hormones like transforming growth factor B are increased. As a result of its antiproliferative properties, 1,25 (OH) D induces morphological and biochemical changes associated with apoptosis, such as cell shrinkage, DNA breakage, and the condensation of chromatin. Several of the aforementioned pathways may be conducive to lowering the risk of BC among female populations. A decrease in BC incidence was associated with consumption of yogurt or fermented dairy products. Probiotics, protein, calcium, riboflavin, vitamins B6, and B12 are all found in yogurt, making it superior to milk from a nutritional perspective. Yogurt contains the probiotic *Lactobacillus acidophilus*, which may modify the immune response to BC in mice [33-35].

As for whole milk consumption, our findings showed that seven studies showed a higher risk than four, whereas four studies showed a lower risk. It has been shown in numerous studies that cheese consumption is associated with BC, ranging from a noticeably lower risk to no discernible risk to a significantly higher risk. Various mechanisms have been hypothesized to increase BC risk in either a positive or negative way with dairy products. Milk products are linked to an increased risk of BC based on the following hypotheses: (1) consumption of dairy products could be attributed to a high fat intake, particularly saturated fats, which are associated with a higher risk of

cancer; (2) milk products may contain pesticides and other possibly cancer-causing substances; and (3) milk has been shown to stimulate BC cell growth with its IGF-I [36-41].

The contamination of milk products, particularly pesticides, is another hypothesized factor linking excessive dairy consumption to BC. Researchers have also attempted to link blood organochlorine concentrations with dietary components. Endocrine disruptors are environmental poisons. In spite of this, there isn't enough evidence to suggest BC is linked to circulating organochlorine levels. Ahmadnia et al. [42] suggest that IGF-1, a protein found in both cow milk and human blood, may play a role in the association between milk consumption and BC risk. BC cells grow when IGF-I is present. The removal or obstruction of IGF-I receptors from a cellular membrane can also prevent malignant transformation caused by an oncogene, so IGF-1 plays an important role in cell transformation. In order for dairy cows to produce more milk, bovine growth hormone (bGH) is regularly administered, increasing IGF-I levels in the milk. The study by Ahmadnia et al. [42] concluded that since IGF-I isn't eliminated during pasteurization, food digestion in the GI tract may leave it unbroken. An important factor to consider when analyzing epidemiologic data is differences in reported consumption levels between populations. Due to the lack of a standard classification system for milk products, several studies have compared intake quantiles within their study group in order to arrive at fair comparisons. It is not uncommon for what is considered high in one group to be considered low in another group due to wide variation in estimated consumption. Investigators failed to record intake levels inside each quantile in some circumstances, making comparisons between studies difficult. Micro- and macro-nutrients found in dairy products may affect several pathways involved in the development of BC, but in general they do not increase or decrease it. There is therefore a need for more research on the link between the consumption of milk products and BC risk, including hormonal and environmental factors [43, 44].

## Conclusion

Most studies found an inverse association between dairy products consumption and BC risk. Although several intriguing theories exist regarding the relationship between consuming milk products and BC, existing epidemiologic research suggests that ingestion of milk or other milk products is not strongly associated with BC development. The risk of BC can be modified through diet. Public health policy decisions may be informed by these findings. The gaps in knowledge are readily apparent and require considerable attention to clarify prevention efforts around the world.

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## Conflict of Interest

None.

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