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Dairy Products and Risk of Prostate Cancer

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Abstract

Prostate cancer is the second most prevalent cancer in males globally. Dietary decisions may significantly influence prostate cancer development; in particular, consuming more dairy products has increased the risk of developing prostate cancer. Recently, calcium consumption, a modifiable dietary element, has been postulated as a prostate cancer risk factor. *In vitro* and animal research evidences showed that greater calcium levels may increase risk. There are a lot of epidemiologic studies investigating the association between prostate cancer and milk drinking, according to the present state of the research on this issue. Multiple studies have demonstrated the positive relationship between milk consumption and the risk of prostate cancer development and prostate cancer death. However, there is a paucity of research on the relationship between of milk consumption and the risk of developing prostate cancer. Observational studies have a continuing disagreement regarding the influence of dairy products on prostate cancer risk. In contrast, very little experimental research investigates this subject. This review focuses on the relationship between milk intake categorized by its fat content and the chance of developing prostate cancer.

Keywords: Diary products, prostate cancer, insulin-like growth factor-1(IGF-1), estrogen

Introduction

Dairy products include a variety of bioactive substances and the different nutrients found in milk that have an impact on human health [1]. The fat content of various milks varies, and processing methods like fermentation of milk, which results in high levels of saturated fatty acids in specific dairy products, have been related to the development of cancer [2]. Products made from fermented milk may promote the development of gut bacteria that fight cancer. Additionally, some milks are lactose-free and offer a high concentration of minerals and vitamins for those who are lactose intolerant [3]. Therefore, when producing milk and dairy products, it is crucial to distinguish between the type of milk and the quantity. Available fats and milk processing techniques [4]. The Food Frequency Questionnaire (FFQ) had a few questions to evaluate dairy consumption by fat content in the majority of prior epidemiological investigations [5]. (other than milk) and techniques for fermentation among chronic illnesses breast cancer the second-leading cause of cancer death in males in the United States and the most prevalent non-skin cancer [6]. Looking into dairy products is a fascinating area of inquiry [6]. The impact of milk consumption on the risk of prostate cancer in observational studies is still up for debate [6]. Dietary Guidelines for Americans 2015–2020 advise choosing low–fat dairy products [7]. Although a recent meta-analysis of prospective studies found a favorable link of prostate cancer risk with low-fat milk consumption and an inverse relationship with whole milk consumption, The most persuasive observational study Numerous epidemiological and ecological research have looked into the connection between milk consumption and prostate cancer [7, 8]. However, just a few experimental research have gone farther into this

subject [7, 8]. Estrogen levels can influence the emergence of prostate cancer. It has been hypothesized that milk consumption may raise progesterone and estrogen levels in the blood [9]. There is some evidence to suggest that milk may lower your risk of getting some malignancies [10]. For instance, taking part in a dairy program at school is linked to a lower risk of colon cancer. Calcium, vitamins, and vital amino acids are all found in milk [11]. It is also regarded as a crucial component of healthy diets all over the world. Milk consumption may have certain health benefits, and clinical advice for eliminating milk from the diet may be impractical [12]. Regarding the consumption of dairy products that may affect the risk of developing prostate cancer, there are presently no formal clinical advice [13]. Numerous reviews with similar qualities have been done in the past [1, 14]. This review focuses on the relationship between milk intake categorized by its fat content and the chance of developing prostate cancer.

Milk (skim or whole milk)

Research on milk's impact on the risk of prostate cancer is being done in additional studies. instead of researching the effects of full or skim milk [15]. Bosetti and colleagues found that consuming milk and dairy products frequently increased the risk of prostate cancer in one of their studies [16]. In an ecological investigation to look at the incidence and mortality of prostate and testicular cancer in connection to worldwide eating patterns [16]. Prostate cancer mortality has been linked to diets high in milk and cheese [16]. There was a significant positive connection between milk consumption and elevated prostate cancer mortality in a different ecological investigation [15]. According to one study, increasing milk consumption was associated with an increased risk of prostate cancer [11, 17]. But according to an another study, increasing milk consumption was associated with an increased risk of prostate cancer [5]. Milk consumption in middle age was not linked to an increased incidence of prostate cancer or prostate cancer that had spread [18]. One study found a link between milk or cheese consumption and a lower risk of prostate cancer [18]. Dairy products and the chance of developing advanced or deadly prostate cancer were not linked [18]. There is no correlation between drinking unfermented or fermented milk, regardless of its fat content, and developing prostate cancer, according to a study done in a population in northern Sweden [11, 18]. Another American study raises the possibility of a link between drinking milk with 2 percent fat and advanced prostate cancer [18]. Although the study's authors speculate that this connection might have arisen by mistake [19].

Milk Stimulates Growth of Prostate Cancer Cells

Due to the high estrogen and metabolite content in cow's milk. It has been proposed that milk may promote the development of cancers that respond to estrogen [18]. particularly prostate and breast tissue Milk contains insulin-like growth factor-1 (IGF-1), a known mitogen for specific cancer cells, in addition to hormones [11, 20]. There is no doubt that cultures with minimal milk intake have a reduced incidence of hormone-stimulated cancers [21]. However, the fact that in such civilizations makes it difficult to evaluate these statistics [21]. The diet consists primarily of vegetables and very little meat [21]. The tumorigenic potential of milk has been the subject of numerous investigations in Japan which eats lots of fish [12]. As a result, people consume more omega-3 fatty acids [22]. According to epidemiology, dairy products might cause cancer [1]. For many species, and even for various individuals within a same species, the ideal ratio for maintaining health varies substantially [23]. or the same individual at several periods Consuming dairy products could upset this delicate equilibrium, which could be harmful to some people or to certain subgroups (such as gender, age group, or physical condition) [13]. After consumption, these ingredients' alizarism may change how they behave. This leads to yet another challenge when comparing the outcomes of various persons [24].

The experiment unequivocally shown that cow's milk functions as a promoter for tumor growth and metastasis in mice treated with carcinogens [25]. The use of dairy products by people in communities that are known to have been exposed to greater than normal levels of the starting ingredient is not known to have any known effects on them [25]. An unresolved problem is how promoting dairy products affects people [25]. In a recent case-control study discovered that milk consumption doubled the risk of prostate cancer [26]. Additionally, research demonstrates that cow's milk promotes tumor growth

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and metastasis in rodents exposed to starting carcinogens [14]. Although there are no data on the potential impact of dairy consumption on people from communities that are known to have experienced greater than normal amounts of starting agents, dairy consumption may have a stronger influence in these people [27, 28]. In addition, cow's milk, its composition, and two commercial milk replacements were tested for their effects on human cells isolated from hormone-sensitive malignancies while going through a simulated digestive process [29, 30]. Both have estrogen receptors, as is known [29, 30]. The majority of the 15 trials on LNCaP E2 prostate cancer cells alone at a concentration of 10-8 M resulted in a doubling of the growth rate of these cells. Cow's milk digestion promotes cell proliferation [29, 30]. Akin to how much the digestion of whole milk stimulates growth, the casein component of milk likewise does the same [2]. The proliferation of pancreatic cancer AsPC-1 cells and MCF-7 breast cancer cells was unaffected by digested milk and casein [31]. It was discovered that IGF-1, either alone or in conjunction with digested cow's milk or almond milk, had no effect on the proliferation of LNCaP cells. It is possible that any stimulation brought on by supplementary IGF-1 is overpowered in these growth settings by an autocrine impact [32]. Two intriguing outcomes of soy milk include: 1) Prostate cancer cell proliferation is inhibited by almond milk. decreased the growth rate by 34%, but had no impact on pancreatic or breast cancer cells and 2) Prostate and pancreatic cancer cell growth was detected in soy milk, but it was small and not statistically significant [33]. It undeniably promotes the development of breast cancer cells [4]. This is in line with earlier studies finding that soybean extract and pure phytoestrogens stimulated the development of MCF-7 [18]. Additionally, Genistein was found by Hsieh et al. to activate MCF-7 cell growth and boost pS2 expression. Rats with surgically excised ovaries were given MCF-7 implants [34]. A combination of phytoestrogens extracted from soy milk were used to examine changes in the overall gene expression of MCF-7 cells [5]. and contrasted them with the modifications brought on by 17β-E2 and cow's milk [19]. They discovered that the genetic imprint left by soy and the genetic fingerprint left by E2 were identical. begins with 7,12 dimethylbenz[a] anthracene to promote tumor growth in mice [35]. The findings presented here lend credence to the idea that consuming dairy products may encourage the development of prostate cancer [13, 14]. Nevertheless, they both affect breast cancer in the same way [36]. There is just one kind of breast cancer cell studied [30]. Other breast cancer cells could very well exhibit sensitivity [37-39].

Milk and Prostate Cancer

PC risk is also associated with a diet high in milk and dairy products, animal fat, and sugars, with high calcium content [40]. Higher per capita milk consumption is likely associated with higher PC incidence and mortality, according to a 2007 World Cancer Research Fund report [40]. Milk, along with relevant sources of proteins and other macromolecules, provides numerous nutrients and bioactive molecules to promote their growth and development [41, 42]. Consumption of milk has always been associated with decreased infant mortality, increased fertility, increased children's BMI, and adolescent growth [43]. However, milk consumption only during adolescence was associated with a 3.2-fold increased risk of advanced prostate cancer in a cohort of 8894 Icelandic men [44]. According to the findings of a 2016 meta-analysis conducted by researchers from the People's Republic of China, the consumption of dairy products has no significant effect on the mortality risk increase for any cancer, and small daily consumption of dairy products may even reduce the risk, based on a non-linear model [45]. Nonetheless, the same study concludes that fat milk consumption by men may significantly increase the risk of PC-related mortality. Thus, milk consumption is directly associated with increased PC mortality [14, 42]. According to some authors, a 35 g/day increase in milk protein consumption was associated with a 32% increase in PC risk. In some cohort studies, the adverse effects of milk are less conclusive. According to the National Cancer Institute (USA), over 2.6 million people in the United States have survived PC, and adopting healthy lifestyle habits may have improved their prognosis. Recommendations for reducing the risk of PC progression include limiting the consumption of meat and dairy products, especially those high in fat [1, 46].

Early Life Milk Consumption and Cancer Risk

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Dairy products are widely consumed worldwide and contain various substances that have been shown to affect cancer risk [47]. A high calcium intake has been shown to inhibit prostate cancer cell proliferation while promoting colorectal epithelial cell differentiation and apoptosis [20]. In addition to IGF-1 pathway, dairy products are associated with increased IGF-1 concentration in adults, stimulating cell proliferation [47]. A recent meta-analysis found that adulthood milk consumption was associated with an increased risk of prostate cancer but a decreased risk of colorectal cancer [47]. However, dairy consumption was not associated with an increased risk of breast cancer, pancreatic cancer, lung cancer, or ovarian cancer [48]. Thus, although dairy consumption is associated with cancer risk differently depending on the type of cancer, it is implicated in developing certain cancers in adults [49]. Milk and other dairy products are also commonly consumed in early life, with the American Dietary Guidelines recommending that children and adolescents consume 2–3 cups of dairy products per day, depending on their age [49]. Notably, the development and progression of cancer span decades and rapid cell division and growth characterise childhood and adolescence [34]. Thus, diet during these stages of life may significantly affect the earliest carcinogenesis stages [50]. This premise is supported by observations that childhood and adolescent diet influences established cancer risk factors, such as height and age at menarche [51, 52]. Calcium and IGF-1 in dairy products play essential roles in development and growth during childhood and adolescence, and several studies have examined the relationship between dairy consumption in early life and cancer risk [37]. A meta-analysis systematically summarises the associations between milk and other dairy product consumption and cancer risk [15]. According to this meta-analysis, milk consumption during childhood and adolescence may not be associated with breast, prostate, and colorectal cancer risks later in life [53]. Nevertheless, the results are inconsistent, and a meta-analysis has not yet been conducted [25]. Given the limited number of studies in our meta-analysis and the high degree of heterogeneity, additional research is required for a definitive conclusion [8, 54].

Conclusion

In conclusion, consuming dairy products is a significant risk factor for developing prostate cancer in Japan. The data may provide additional insight into the effects of a high intake of fat, calcium, and IGFs. Additional research is required to determine which components of dairy products contribute to this elevated risk. The consumption of dairy products should be considered when comparing Japanese and Western diets regarding the prostate cancer risk. Contradictory, inconsistent, and omitted from potential justifications or culpable mechanisms are reviews of studies selected based on defined research criteria that directly relate to dairy consumption and prostate cancer. Despite this, most reviews indicate a positive association between milk consumption and the occurrence or elevation of prostate cancer risk. However, there is substantial evidence in the scientific literature (not reviews) linking dairy consumption to prostate cancer, disease progression, and possibly disease onset. Through this literature review, we have understood the various mechanisms triggered by nutrients found in milk and its derivatives that may increase the risk of prostate cancer in its consumers. However, additional research is required to determine which harmful derivatives and in what quantities are necessary for tumour progression and initiation. A better understanding of cancer and this signalling pathway could lead to developing more effective and tumour-specific drugs and identifying preventative measures for cancers with a higher incidence in humans, such as breast cancer. According to the analysis of the available data, it is possible to establish a link between the consumption of dairy products and the progression of prostate cancer and possibly its onset; therefore, dairy products should be reduced or eliminated from men's diets.

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