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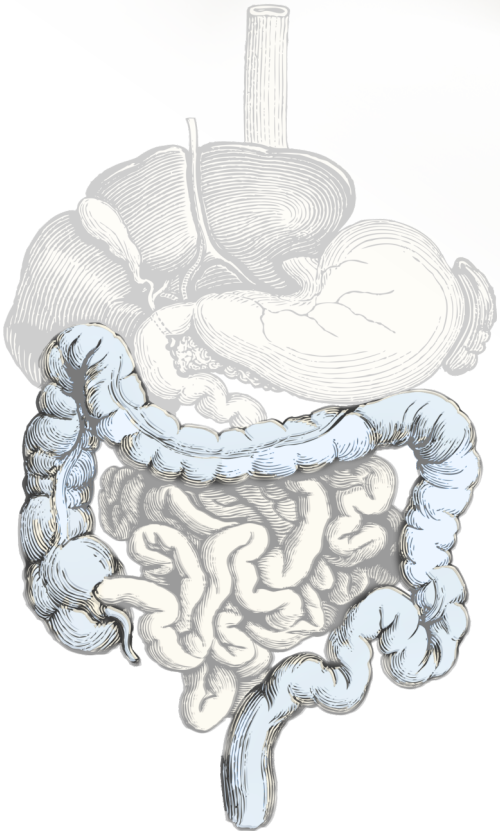
This review aims to summarise recent systematic reviews and meta-analyses on dairy intake and colorectal cancer risk, including findings from the 2025 WCRF, AICR and WKOF joint report.

A publication for health professionals

Dairy and colorectal cancer: **Current knowledge**



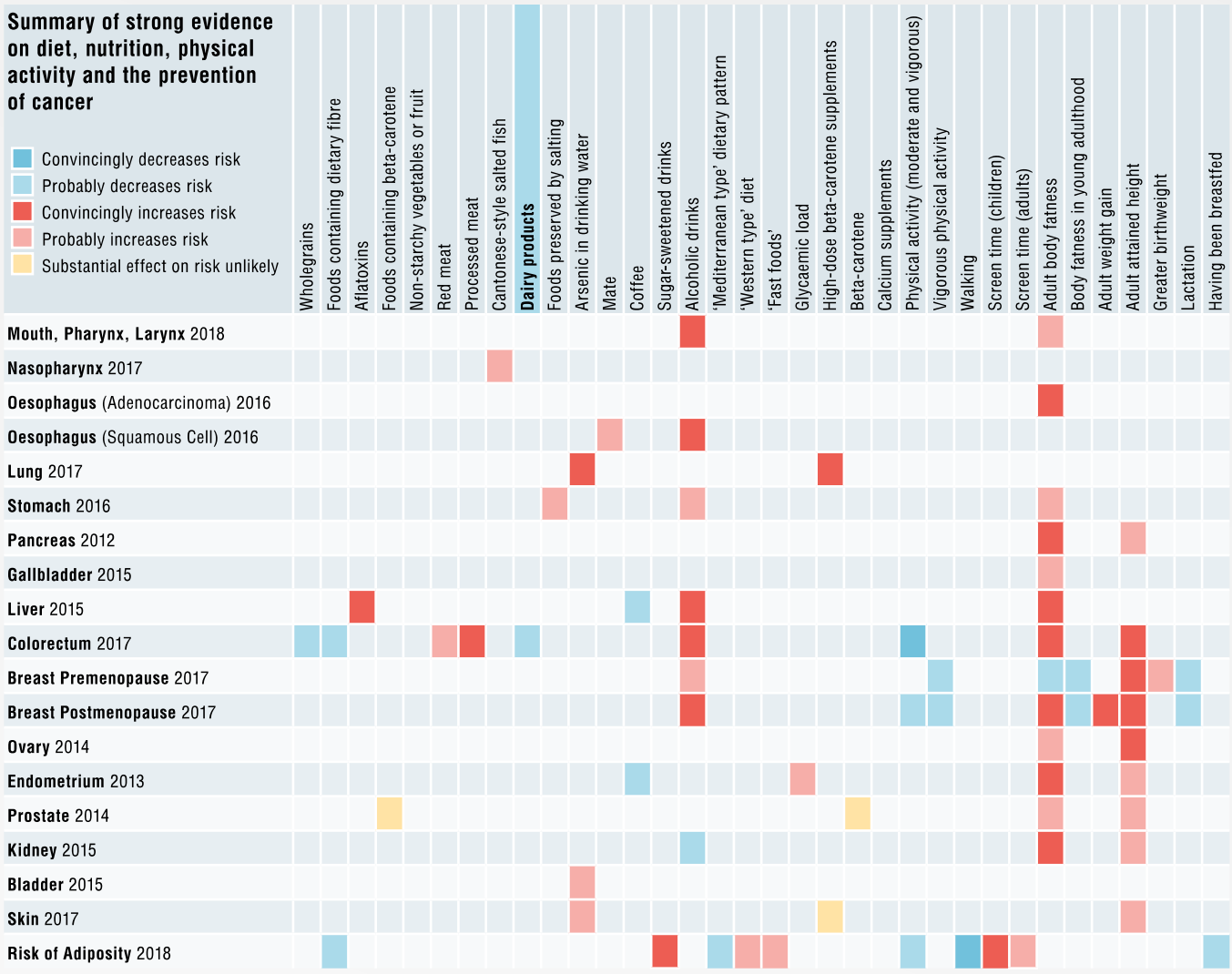
THE LINK BETWEEN NUTRITION AND CANCER IN PERSPECTIVE

The link between cancer and diet and nutrition factors can be investigated from many angles. The term 'cancer' refers to a large number of diseases of differing pathophysiology and affecting different organs and cell types. However, what is common among all types is uncontrolled cell differentiation. Diet and nutrition are among the modifiable factors related to the initiation, progression, management and prognosis of many cancers.[1-5]

The initiation phase of cancer is of particular importance in public health nutrition as it can inform recommendations for cancer prevention. It is estimated that about 40% of cancer cases could be prevented through diet and lifestyle. In the most authoritative report in this regard to date, the World Cancer Research Fund (WCRF) summarised strong evidence (i.e. evidence graded as convincing or probable) linking food, nutrition and physical activity to cancer in matrix format as shown in Table 1.[6]

Various cancers (as well as overweight/obesity as an end point) are listed in rows, while risk factors related to diet, nutrition (in terms of foods, food groups or nutrients) and physical activity are included in columns. Cells where columns and rows intersect – indicating strong evidence for an association between one of these lifestyle factors and cancer – are colour coded: shades of blue for decreasing the risk of developing a particular cancer, and shades of red for increasing risk.

Table 1: Strong evidence linking diet, nutrition and physical activity with various cancers[6]



Source: WCRF 2018. World Cancer Research Fund/American Institute for Cancer Research. Continuous Update Project: Diet, Nutrition, Physical Activity and the Prevention of Cancer. Summary of Strong Evidence. Available at: wcrf.org/cupmatrix [Accessed on 26 June 2025]

Dairy products are presented as a single entity that incorporates total milk, cheese and calcium intakes. The only strong link between dairy and cancer was for a protective role of dairy products in the development of colorectal cancer.

Table 2 summarises the risk reduction with regard to colorectal cancer attributable to dairy intake, as included in the WCRF Continuous Update Project (CUP) report on the associations between meat, fish and dairy intake and cancer risk.[7]

Table 2: Dose–response meta-analyses linking dairy intake to colorectal cancer [7]

Dairy 'exposure' measured	Amount of dairy intake per day	Risk estimate (95% confidence interval)	Interpretation
Total dairy	400 g	0.87 (0.83–0.90)	A statistically significant 13% decreased risk of colorectal cancer when total dairy intake is increased by 400 g/d
Milk	200 g	0.94 (0.92–0.96)	A statistically significant 6% decreased risk of colorectal cancer per intake of 200 g/d of milk
Cheese	50 g	0.94 (0.87–1.02)	A non-significant association between the risk of colorectal cancer per daily 50 g increase in cheese intake
Dietary calcium	200 mg	0.94 (0.93–0.96)	A statistically significant 6% decreased risk of colorectal cancer per 200 mg per day increase in dietary calcium

Several international dietetics and nutrition associations (e.g. in the UK)[8] have subsequently adopted the WCRF findings, with specific reference to the protective role of dairy in the development of colorectal cancer.

Emerging insights into colorectal cancer sparked further research into the association between dairy and this disease. The possibility of differential effects of different dairy products in the initiation of cancer has also been a focus of recent research.

The aim of this review is to summarise findings of systematic reviews, meta-analyses and umbrella reviews focused on the links between dairy intake and the development of colorectal cancer, published since the mentioned WCRF reports from 2018. Findings from a 2025 report jointly published by the WCRF, the American Institute for Cancer Research (AICR) and the Wereld Kanker Onderzoek Fonds (WKOF) from the Netherlands are also incorporated in the review.[9]

COLORECTAL CANCER: AN OVERVIEW

Colorectal cancer refers to cancer of the colon and/or rectum, and is often also called bowel cancer. It is the third most common cancer worldwide, contributing to 10% of all new cases in 2022.[9] Despite the strong link to diet and lifestyle and intense research, it still ranks second as cause of cancer mortality worldwide.[9] Although the majority of cases are diagnosed in people older than 50, the rates of early-onset colorectal carcinoma and adenoma are rising.[9-12]

Some research groups hypothesise that different anatomical regions in the colorectal complex may have different cancer aetiologies.[13] Another relatively recent research development involves investigating precursor cancer markers in the study of the association between diet and the initiation of cancer.[14]

The major and changing burden of colorectal cancer morbidity and mortality, as well as new insights into the pathophysiology of the disease, necessitates ongoing research in unravelling this dairy–disease relationship.

DAIRY AND ITS LINK TO COLORECTAL CANCER

Dairy is a complex food group and includes many different products. For practical reasons, early exploratory studies into the link between dairy intake and colorectal cancer did not distinguish between the different products. However, it is conceivable that different products may have different associations with cancer.

The absence of strong evidence to support the (protective) association between colorectal cancer and individual dairy products is clear from a review of systematic reviews and meta-analyses by Jeyaraman et al.[15] The authors distinguished between 19 dairy classes that had been reported on in earlier studies (Figure 1) and found that for 12 of these products, meta-analyses involved studies of which the designs were of low to moderate quality (i.e. there was 'heterogeneity' among the studies), with insufficient prospective investigations. The grey bars represent meta-analyses reporting no association with colorectal cancer, whereas the green bars refer to studies that showed a decreased risk.

Nonetheless, the protective role of the intake of 'all dairy products' and 'milk' with regard to the development of colorectal cancer seems established, based on meta-analyses that showed decreased risk.

In a more recent systematic review and meta-analysis of observational studies, Guo et al.[14] included research that differentiated between intake of total dairy, total milk, non/low-fat milk, fermented dairy products, yoghurt and cheese. The authors concluded that the intake of fermented dairy products – specifically yoghurt and cheese – was significantly associated with decreased risk of conventional and serrated precursors of colorectal cancer. No significant associations were found for consumption of total milk or non/low-fat milk. In quantitative terms, the relative risk (RR) decreased by 12% per 200 g increment in daily total dairy consumption (RR = 0.88; 95% CI: 0.81–0.95). Risk decreased by 8% per 50 g increment of daily yoghurt intake (RR = 0.92; 95% CI: 0.85–0.99). The authors note that at the time of the review,

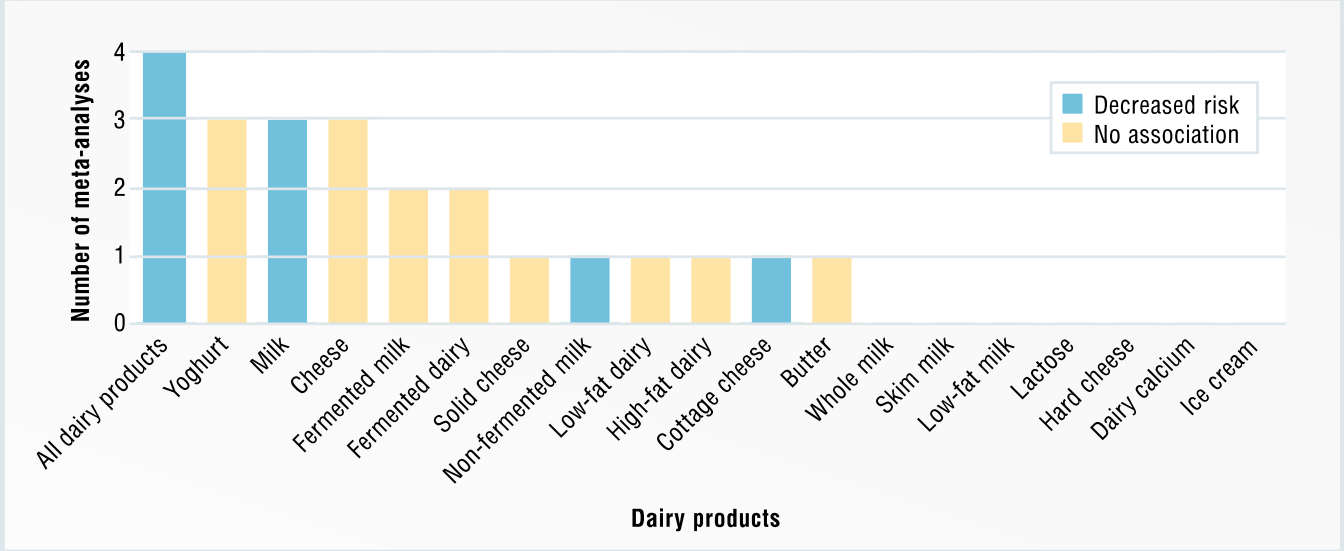


Figure 1: Number of meta-analyses reporting decreased risk and no association between dairy product intake and colorectal cancer

relatively few (i.e. 12) studies had been published, and that the progression from precursor stage to cancer was not known.

A systematic review and meta-analysis by Liang et al.[16] also focused on the intake of fermented dairy products and the risk of colorectal cancer, with the conclusion that products such as cheese and yoghurt may lower the risk. Similarly, an umbrella review by Veettil et al.[17] convincingly highlighted that dietary calcium and yoghurt intakes are associated with a reduced risk of colorectal cancer incidence. The findings with regard to cheese and milk intake were null and weak, respectively.

Barrubés et al.[13] published a systematic review and meta-analysis of 15 cohort studies and 14 case–control studies, comprising more than 22 000 cases in total. They focused on an association between various dairy products and the incidence of cancer in different parts of the colorectal complex. The following subtypes or total dairy products were included: cow, goat or sheep milk; skim, low-fat or full-fat milk; total, low-fat or full-fat yoghurt; cheese; and full-fat dairy, sweetened dairy or other dairy products. The cohort studies revealed a consistent and significant decrease in colorectal cancer risk associated with higher consumption of total dairy products (RR = 0.80; 95% CI: 0.70–0.91) and total milk (RR = 0.82; 95% CI: 0.76–0.88) compared with lower consumption. These cohort studies also showed a significant protective association between low-fat milk consumption and colon cancer specifically (RR = 0.73; 95% CI: 0.61–0.87). An inverse association was found between cheese consumption and the risk of colorectal cancer (RR = 0.85; 95% CI: 0.76–0.96), particularly of the proximal colon (RR = 0.74; 95% CI: 0.60–0.91). No significant associations were found between colorectal cancer and intake of low-fat dairy products, whole milk, fermented dairy products or cultured milk. High intakes of total dairy products and total milk were associated with a lower risk of developing colorectal cancer at any anatomic location (i.e. the proximal colon, distal colon or rectum). Low-fat milk consumption was associated with a lower risk of colon cancer (but not rectal cancer), whereas cheese consumption was associated with a preventative effect for cancer in the proximal colon.

Research on dietary patterns generally does not differentiate between high- and low-fat forms of dairy, sometimes supporting the conclusion that the protective effect of dairy in the initiation of colorectal cancer does not appear to differ substantially between products with different fat contents.[17] In contrast, several studies advise caution,[18-20] stating that inconsistent findings with regard to the association between individual dairy products and overall health, including colorectal cancer, might be explained by confounding factors that could include fat content and geographical location.

HOW DOES DAIRY AFFECT COLORECTAL CANCER INCIDENCE?

The protective role of dairy in colorectal cancer noted in the 2018 WCRF reports has been confirmed in subsequent reviews, such as by Alegria-Lertxundi et al.[21] for example. This opened the door for studies exploring the underlying mechanisms of this effect.

Most cancers, including of the colon or rectum, do not have a single cause. Epidemiological studies point to associations between cancer and a (dietary) risk factor, but cost, the long research process and ethical concerns make it challenging to design studies that prove causality between a specific dietary exposure and cancer as outcome.[17] Lumsden et al.[22] consequently used a genetic variant (rs4988235) near the lactase gene (LCT) locus as a proxy for milk consumption, and comprehensively surveyed potential causal relationships between milk consumption and 12 types of cancer among patients from numerous large databases. They applied Mendelian randomisation – a statistical technique to simulate causation – to investigate the milk–cancer link and confirmed a protective role of milk consumption in colorectal cancer.

A large prospective study by Papier et al.[23] included 542 778 female participants from the UK. They analysed 97 dietary factors in relation to colorectal cancer risk over an average follow-up of 16.6 (±4.8) years. The strongest association was with alcohol (at 20 g/day, RR = 1.15; 95% CI: 1.09–1.20) and calcium intake (at 300 mg/day, RR = 0.83; 95% CI: 0.77–0.89), followed by six dairy-related factors associated with calcium. The authors found a 14% lower risk of colorectal cancer at a consumption of 200 g milk per day. Using Mendelian randomisation, the authors found an intake of 200 g milk per day linked to a 40% reduction in colorectal and colon cancer risk, and a 51% reduction in rectal cancer risk. They noted that by using this approach, they were able to better capture long-term effects of diet and nutrition (which is essential in investigating the nutrition–cancer link), particularly because self-reporting tends to reflect more recent dietary habits. Overall, Papier et al.[23] conclude that dairy products help to protect against colorectal cancer, driven largely or wholly by calcium.

Despite sophisticated statistical analyses, such associations have to be confirmed by biological pathways, molecular epidemiology, biomarker data, genetic studies, omics and animal studies for conclusive claims regarding to causality.[9] It is furthermore possible that factors that contribute to cancer risk vary by geographical region. For example, diets low in calcium have been shown to be the biggest contributor to disability-adjusted life years in sub-Saharan Africa, while alcohol intake and overweight/obesity stand out as the main risk factors for colorectal cancer in higher-income regions.[9]

A brief outline of potential mechanisms by which dairy may reduce the risk of colorectal cancer follows, distinguishing between approaches at nutrient, food-group and pattern levels.

Nutrient-level mechanisms

Several nutrients and components in dairy have been proposed for explaining the protective effect in cancer pathogenesis:

- Dairy is a key source of calcium. Calcium, in turn, may protect against colorectal cancer, through several plausible mechanisms. Emami et al.[24] showed that calcium consumption reduced the risk of colorectal adenoma incidence by 8% (RR = 0.92; 95% CI: 0.89–0.96); intake from food or dairy products

reduced the risk by 21% (RR = 0.79; 95% CI: 0.72–0.86) and 12% (RR = 0.88; 95% CI: 0.78–0.98), respectively. This points to the likelihood that calcium from natural sources such as dairy are preferable to supplemental intake.

- Xiao et al.[25] reviewed the role of whey proteins in colorectal cancer. Their findings highlighted the anti-inflammatory and antioxidant capacities of whey proteins, as well as their potential ability to induce apoptosis and inhibit the proliferation and metastasis of tumour cells.
- Other components that are integral to dairy products and which have tentatively been implicated in cancer prevention include vitamin D, conjugated linoleic acid, selected (sfingo) lipids and lactic acid bacteria (e.g. *Bifidobacterium*). In addition, micronutrients commonly present in dairy products, such as riboflavin, phosphorus, potassium and magnesium, have been mentioned. No systematic reviews or meta-analyses have yet considered these associations.

Mechanisms at the food (matrix) or food-group level

Numerous studies clustered individual food items into groups when investigating diet disease relationships. In doing so, Jabarri et al.[12] concluded in their umbrella review of systematic reviews that 'consumption of whole grains, dairy products, milk, fruits, vegetables, and fibre had a probable inverse association with the incidence risk of gastrointestinal tract cancers as a whole'.

Schwingshackl et al.[26] also followed a food-group approach in their systematic review and meta-analysis to evaluate the relationship between diet and colorectal cancer. An inverse association was observed for whole grains, vegetables, fruit and dairy as food groups. Fifteen studies were included in the analysis of the dairy group. These jointly showed a 7% lower risk (RR = 0.93; 95% CI: 0.91–0.94) at a daily intake of 200 g.

The dairy matrix currently receives considerable attention to explaining different physiological effects seen from specific dairy products and nutrients,[27] and also the effect on morbidity, especially in the case of non-communicable diseases, including colorectal cancer.[28]

Pattern-level mechanisms

As with other non-communicable diseases, the aetiology of colorectal cancer is increasingly understood to be multifactorial and linked to lifestyle considerations that include diet. This approach was also used in the most recent CUP analysis to investigate potential modifiable causes of colorectal cancer.[9] The following definitions were used:

- **Dietary patterns** refer to the quantities, proportions, variety or combinations of different foods, drinks and nutrients, and the frequency with which they are habitually consumed.
- **Dietary and lifestyle pattern** is the combination of a certain dietary pattern with measures of body fatness, other risk factors or behaviour factors such as physical activity, alcohol intake and smoking.

Mertens et al.[29] modelled lifestyle predictors of colorectal cancer risk specifically for the European context. This considers the possibility of geographical variation of modifiable risk within lifestyle thinking.

In addition to the approach that emphasises lifestyle factors during adulthood, life course research suggests that early life and childhood anthropometrics may already be important in the development of colorectal cancer.[30]

Figure 2 shows that the link between dairy and colorectal cancer can be described at many levels, ranging from mechanistic, molecular studies that focus on components or nutrients in individual dairy products to more nuanced and holistic approaches that integrate diet and lifestyle.

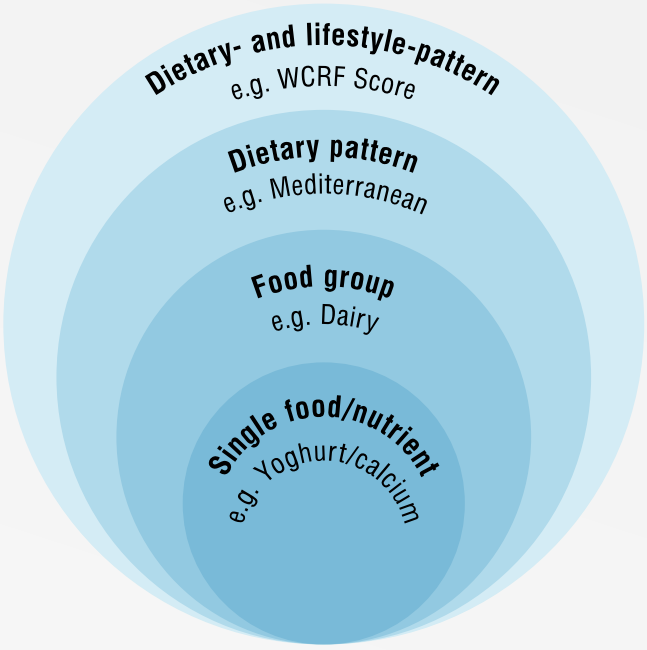


Figure 2: From a nutrient-level to a dietary- and lifestyle-pattern approach to understand the prevention of colorectal cancer *(Concept adapted from WCRF, 2025[9])*

Scoring lifestyle for cancer risk

In the WCRF's third global report on the links between cancer and lifestyle factors,[6] ten recommendations were published for overall cancer prevention. Based on eight of these recommendations, the WCRF/AICR scorecard is a standardised tool to assess dietary and lifestyle patterns (see Table 3). The higher the score, the higher the adherence to the recommendations.

According to the 2025 CUP review, numerous studies consistently showed a reduced risk of colorectal cancer (i.e. 'strong-probable' evidence for a causal link) when seven or eight of the recommendations were met (depending on the inclusion of breastfeeding). Similarly, an umbrella review of systematic reviews and meta-analyses by Yin et al.[31] shows that 'adherence to certain healthy dietary patterns is associated with lower risk of all cancers and of certain individual cancers'.

Table 3: The 2018 WCRF/AICR Score

2018 WCRF/AICR overall cancer prevention recommendations	Criteria and cut-offs	Points
1. Be a healthy weight 	**BMI (kg/m²)**	
	18.5–24.9	0.5
	25–29.9	0.25
	<18.5 or ≥30	0
	Waist circumference (cm)	
	Men: <94 Women: <80	0.5
	Men: 94–<102 Women: 80–<88	0.25
	Men: ≥102 Women: ≥88	0
2. Be physically active 	**Total moderate-to-vigorous physical activity (min/wk)**	
	≥150	1
	75–<150	0.5
	<75	0
3. Eat a diet rich in whole grains, vegetables, fruit and beans 	**Fruit and vegetables (g/day)**	
	≥400	0.5
	200–<400	0.25
	<200	0
	Total fiber (g/day)	
	≥30	0.5
	15–<30	0.25
	<15	0
4. Limit consumption of 'fast foods' and other processed foods high in fat, starches or sugars 	**Percentage of total energy from ultra-processed foods**	
	Tertile 1	1
	Tertile 2	0.5
	Tertile 3	0
5. Limit consumption of red and processed meat	**Total red meat (g/wk) and processed meat (g/wk)**	
	Red meat ≤500 and processed meat <21	1
	Red meat ≤500 and processed meat 21–<100	0.5
	Red meat >500 or processed meat ≥100	0
6. Limit consumption of sugar-sweetened drinks 	**Total sugar-sweetened drinks (g/day)**	
	0	1
	>0–≤250	0.5
	>250	0
7. Limit alcohol consumption 	**Total ethanol (g/day)**	
	0	1
	Men: >0–≤28 (2 drinks) Women: ≤14 (1 drink)	0.5
	Men: >28 (2 drinks) Women: >14 (1 drink)	0
8. (Optional) For mothers: breastfeed your baby, if you can 	**Exclusively breastfed over lifetime for a total of (mo)**	
	6+	1
	>0–<6	0.5
	Never	0
	Total Score Range: 0–7 (or 0–8)	

Source: https://epi.grants.cancer.gov/wcrf-aicr-score/details.html [Accessed on 28 May 2025]

Abbreviations: BMI – body mass index; min – minutes; mo – months; wk – week

The dietary and lifestyle pattern recommendation in relation to the prevention of colorectal cancer prevention is broadly summarised as follows in the joint WCRF/AICR/WKOF report:[9]

- Maintain a healthy weight and habitually take part in physical activity.
- Prioritise consumption of fruit and vegetables, as well as fibre-containing foods.
- Include the intake of coffee and calcium-containing foods, such as dairy products.
- Limit intake of sugar-sweetened beverages and alcohol.
- Avoid processed meat.
- Do not smoke.

Conclusion

The association between dairy intake and colorectal cancer, which is suggested to be a protective role, is becoming more complex as distinctions between subtypes of dairy and colorectal cancer are investigated. Nonetheless, associations between cancer and single foods/nutrients seem unlikely and are not expected to emerge from future research.[32] At present, the consensus from authoritative research is that cancer prevention should be viewed in context of dietary and lifestyle patterns that start early in life, and that dairy is core to the prevention of colorectal cancer.

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