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Strategies for Clinical Practice**

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# Diet and prevention of oral cancer

## Strategies for clinical practice

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**M**ore than 400,000 cases of oral and pharyngeal cancer (OPC) occur annually worldwide, and OPC is among the most common cancers.<sup>1</sup> In the United States, it is estimated that approximately 36,500 new cases and 7,800 deaths resulting from OPC will have occurred in 2010.<sup>2</sup> More than 90 percent of oral cancers are squamous cell carcinomas. Prevention of these cancers in dental practice settings has focused mainly on early detection of oral pre-malignant mucosal changes.<sup>3</sup>

According to the American Cancer Society,<sup>4</sup> “[e]vidence suggests that one-third of the more than 500,000 cancer deaths that occur in the United States each year can be attributed to diet and physical activity habits including overweight and obesity.” Investigators in epidemiologic studies consistently have found a high intake of fruits and vegetables to be protective against OPC, as well as cancer occurring at other sites, including the esophagus, breast, prostate, lung, bladder and colon.<sup>5-7</sup> Our report provides an introduction to the relationship between diet and OPC, and we present recommendations for the primary prevention of OPC through the use of dietary guidelines. In

## ABSTRACT

**Background.** Oral health care professionals can play an important role in preventing oral cancer by performing oral mucosal examinations to detect pre-cancerous changes and by educating patients about oral cancer prevention strategies, including dietary approaches.

**Conclusions.** Current evidence supports a diet high in fruits, vegetables and plant-based foods for prevention of oral cancer. Dietary supplements—including vitamins and minerals—have not been shown to be effective as substitutes for a diet high in fruits and vegetables.

**Clinical Implications.** In addition to discussing tobacco and alcohol use with patients (and, if relevant, betel nut and gutka consumption), as well as the risk of sexual transmission of human papillomavirus, clinicians should provide dietary advice for the prevention of oral cancer as part of routine patient education practices.

**Key Words.** Diet; cancer; mouth neoplasms; nutrition; oral cancer.

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addition, we present patient education strategies.

### MECHANISMS BEHIND THE RELATIONSHIP BETWEEN DIET AND CANCER

The mechanisms by which diet may influence cancer risk, including OPC risk, are understood only partially. The process of carcinogenesis may be initiated by damage to cellular DNA. Various exposures, including those to free oxygen radicals and chemicals such as nitrosamines, can damage DNA.<sup>7</sup> Accumulation of mutations, particularly in genes involved in cell division, DNA repair and apoptosis, can result in changes that may lead to carcinogenesis.<sup>7</sup>

Certain compounds in food may be protective against cancer. For example, vitamins C and E have antioxidant properties and may prevent DNA damage by reducing exposure to free radicals of oxygen; terpenes, which are a group of compounds present mainly in certain plants such as citrus fruits, can influence cell cycle progression and induce apoptosis.<sup>8</sup> Fruits and vegetables contain numerous other known and unknown micronutrients, collectively termed “phytonutrients” (organic components present in plant foods thought to have nutrientlike actions), which may act synergistically to prevent cancers including OPC.<sup>5,7</sup> Other food components, such as nitrites in processed meats, which may form carcinogenic nitrosamines, may increase the risk of developing cancer.<sup>7</sup> Adoption of a diet rich in plant foods (such as whole grains, legumes, nuts, fruits and vegetables) has been shown to increase the intake of protective dietary factors, including antioxidant vitamins, carotenoids, lycopene and fiber, while decreasing the intake of pathogenic dietary factors, including total fat, saturated fat and animal protein and nitrates.<sup>7,9</sup>

### DIET AND CANCER

Fruits and vegetables are the food groups evaluated most extensively in relation to oral cancer risk, with researchers conducting more than 40 epidemiologic studies in various parts of the world during the past five decades. Investigators in systematic reviews<sup>5,6</sup> and in a meta-analysis<sup>10</sup> have identified strong evidence of the protective role of vegetables and fruits, particu-

#### BOX 1

### Recommendations for prevention of cancer.\*

- BODY FAT**
  - Be as lean as possible within the normal range of body weight
- PHYSICAL ACTIVITY**
  - Be physically active as part of everyday life
- FOODS AND DRINKS THAT PROMOTE WEIGHT GAIN**
  - Limit consumption of energy-dense foods and sugary drinks
- PLANT FOODS†**
  - Eat mostly foods of plant origin
- ANIMAL FOODS†**
  - Limit intake of red meat and avoid processed meat
- ALCOHOLIC DRINKS†**
  - Limit intake of alcoholic drinks
- PRESERVATION, PROCESSING AND PREPARATION†**
  - Limit consumption of salt; avoid moldy cereals (grains) and pulses (legumes)
- DIETARY SUPPLEMENTS†**
  - Aim to meet nutritional needs through diet alone; dietary supplements are not recommended for cancer prevention
- BREASTFEEDING‡**
  - Mothers should breastfeed and children should be breastfed
- CANCER SURVIVORS**
  - Follow the recommendations for cancer prevention

\* Adapted with permission from the World Cancer Research Fund, American Institute for Cancer Research, Washington.<sup>7</sup>

† Studies have been conducted of these exposures, with oral cancer as the outcome, and findings have been consistent with these recommendations.

‡ Women who have a history of breastfeeding their children are at a lower risk of developing breast cancer and possibly ovarian cancer. In addition, there are numerous short- and long-term health benefits to the breastfed child. Therefore, any recommendations by dentists regarding the prevention of dental caries in breastfed children should focus on initiation and maintenance of good oral hygiene in the child and not discourage continued breastfeeding.

larly citrus fruits, in the prevention of oral cancer. In a cohort study of risk factors for second primary cancers in patients with a history of OPC, Day and colleagues<sup>11</sup> also found a protective effect of fruit and vegetable consumption. In addition, Maserejian and colleagues<sup>12</sup> found fruit consumption to be protective against oral premalignant lesions.

Researchers have found that consumption of salted meat,<sup>13</sup> processed meat<sup>14</sup> and animal fat<sup>15</sup> increases the risk of developing oral cancer. The results of a study conducted by Peters and colleagues<sup>15</sup> showed that high consumption of dairy products is a risk factor for head and neck squamous cell cancers.

These results suggest that a diet high in fruits and vegetables protects against OPC, and they are consistent with research findings regarding diet and the risk of developing other cancers (Box 1). Researchers<sup>5-7</sup> have shown that fruit and vegetable consumption has protective effects against cancers at other sites, including

**ABBREVIATION KEY.** OHCP: Oral health care professional. OPC: Oral and pharyngeal cancer.

## BOX 2

## Strategies for addressing dietary approaches to risk reduction for oral and pharyngeal cancer.

### DETECT

- Oral premalignant mucosal changes or conditions such as leukoplakia, erythroplakia, submucous fibrosis or lichen planus
- Other risk factors, including current tobacco use or history of tobacco use; alcohol, betel nut or gutka consumption; poor diet; and human papillomavirus infection

### INFORM

- With a diet rich in fruits, vegetables and whole grains, you can make positive strides to reduce your risk of developing cancers of the oral cavity
- Dietary supplements consisting of vitamins, minerals and other bioactive compounds in the absence of deficiencies should not be used as a substitute for fruit and vegetable consumption

### EDUCATE

- Diets rich in fruits, vegetables and whole grains can contribute to a reduced risk of developing oral cancers
- Dietary supplements have not been shown to have the same effect on cancer risk reduction as has dietary intake of fruits and vegetables

### PROVIDE

- Referrals to registered dietitians for medical nutritional therapy as appropriate
- Resources to help patients make positive lifestyle changes to reduce their risk of developing cancer
  - American Cancer Society—Stay Healthy: "<http://www.cancer.org/Healthy/EatHealthyGetActive/ACSGuidelinesonNutritionPhysicalActivityforCancerPrevention/acs-guidelines-on-nutrition-and-physical-activity-for-cancer-prevention-diet-cancer-questions>"
  - American Dietetic Association—Nutrition Fact Sheets: "[http://old.eatright.org/cps/rde/xchg/ada/hs.xsl/nutrition\\_350\\_ENU\\_HTML.htm](http://old.eatright.org/cps/rde/xchg/ada/hs.xsl/nutrition_350_ENU_HTML.htm)"
  - American Institute for Cancer Research—Reduce Your Cancer Risk, Diet—What We Eat: "[www.aicr.org/site/PageServer?pagename=reduce\\_diet\\_home](http://www.aicr.org/site/PageServer?pagename=reduce_diet_home)"
  - Centers for Disease Control and Prevention: "[www.fruitsandveggiesmatter.gov/](http://www.fruitsandveggiesmatter.gov/)"
  - Harvard School of Public Health—The Nutrition Source: "[www.hsph.harvard.edu/nutritionsource/index.html](http://www.hsph.harvard.edu/nutritionsource/index.html)"
  - National Cancer Institute: "[www.cancer.gov](http://www.cancer.gov/)"
  - Nutrition.gov—Smart Nutrition Starts Here: "[www.nutrition.gov](http://www.nutrition.gov/)"
  - University of Medicine & Dentistry of New Jersey Institute for Nutrition Interventions—Health and Wellness Site: "<http://shrp.umdj.edu/programs/INI/Health/index.htm>"

the esophagus, breast, prostate, colon, bladder and lung. Increased intake of dietary fiber has been found to be protective against colon cancer,<sup>7</sup> and intake of red and processed meat has been found to be a risk factor for colon cancer, lung cancer, pancreatic cancer, stomach cancer, prostate cancer and death due to cancer.<sup>16-20</sup> High intake of dairy products has been associated with an increased risk of developing prostate cancer<sup>21,22</sup> and ovarian cancer.<sup>23</sup>

### RECOMMENDATIONS FOR ORAL HEALTH CARE PROFESSIONALS

Oral health care professionals (OHCPs) can play an important role in preventing OPC through screening and education. In addition to performing thorough head and neck and oral mucosal examinations to identify precancerous changes, they should educate patients about oral

cancer prevention. This education is particularly important for patients at an increased risk of developing OPC, including those who use tobacco or have a history of tobacco use or who consume alcohol, betel nut or gutka; those with oral premalignant conditions such as leukoplakia, erythroplakia, submucous fibrosis or lichen planus<sup>24</sup>; and those with a history of head and neck or upper aerodigestive tract cancers.

As part of their routine education practices, OHCPs also should provide patients with dietary advice for the prevention of oral cancer. Box 2 provides resources for OHCPs to use with patients.

### CONCLUSION

Evidence supports a recommendation of a diet rich in fresh fruits and vegetables as part of a whole-foods, plant-based diet, with limited consumption of meat, particularly processed meat. However, use of dietary

supplements (including vitamins, minerals and other bioactive compounds) in the absence of deficiencies has not been shown to confer the same benefits as those of fruits and vegetables, and patients should not use them as a substitute for fruit and vegetable consumption.<sup>7,25</sup> ■

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