Taste Alterations Among Patients With Cancer

Victoria Wenhold Sherry, MSN, CRNP

Taste alteration is a frequent and significant problem for patients with cancer. Taste alterations are defined as changes in the usual patterns of taste perception that are unique to the person experiencing the changes (Bender, 1999). Taste alterations may occur as a result of the cancer itself, treatment of the cancer, or other social and emotional factors.

Alterations in taste are not a life-threatening side effect of cancer treatment and, therefore, may be overlooked by healthcare providers. Taste alteration also has received little attention in the recent literature; however, many patients with cancer commonly experience this symptom. In a study of 59 hospitalized patients with cancer, 66% reported distressing changes in taste (Foltz, Gaines, & Gullatte, 1996). During cancer treatment, patients report that food tastes like cardboard or metal; tastes too salty, sweet, sour, or bitter; or has no taste at all (DeConno, Ripamonti, Sbanotto, & Ventafridda, 1989). This article discusses the role of clinicians in the symptom management of cancer-induced taste alterations.

Pathophysiology

The sense of taste includes four primary sensations: sweet, sour, bitter, and salty. Taste buds, the receptors and conductors of taste sensation, respond to all four taste sensations to varying degrees. A taste bud receptor for bitter also can perceive salty, sweet, and sour sensations, but less acutely (Wickham et al., 1999). Taste buds are located on the tongue, soft palate, glossopalatine arch, and posterior portions of the pharynx. The sensation of taste involves stimulation of specific chemoreceptors (taste buds), adequate saliva, neural pathways, and smell (Schiffman, 1994). The impulses from the taste cells are transmitted through cranial nerves V, VII, IX, and X to the cerebral cortex (Bender, 1999). Intact olfactory receptors, adjacent to the nasal septum, are important because smell is the other chemosensory component associated with taste (Wickham et al.).

The lifespan of a taste cell is about 10 days. These cells rapidly proliferate and, therefore, are predisposed to cellular destruction that occurs as a result of cancer and its treatment (Strohl, 1984).

The exact etiology of aberrations in taste among patients with cancer is unknown. Many theories are recognized, including the effect of tumors, cancer cell mitosis, vitamin deficiencies, and cytokine involvement. Cancer treatment and the presence of malignant cells may reduce the number of taste buds. The higher taste threshold that patients experience is a result of a decrease in the number of taste buds cells (Strohl, 1989). A large tumor burden (e.g., large primary tumor, regional or metastatic invasion) can increase the degree and duration of taste alterations. When the tumor load decreases, taste sensations commonly return to their usual patterns. Taste alteration may be an early diagnostic sign of cancer, an indication that cancer has returned, or a sign that tumor load is increasing (Goodman, Ladd, & Purl, 1993).

Cancer cells actively divide and secrete an amino acid-like substance. This process enhances the bitter taste sensation and is the basis for aversions to foods that contain high levels of amino acids (Strohl, 1984). Proteins, composed of amino acids and urea, are the substances that give meat its taste. Other foods high in amino acids include chocolate and tomatoes (Bender, 1999). Stroth (1989) found that many patients experiencing taste alterations find protein-rich foods, tea, and coffee unpalatable.

Another etiology of taste alteration is cancer-induced deficiencies in zinc, copper, nickel, and vitamin A. Heavy metals, such as zinc, copper, and nickel, are involved in the physiology of taste function (Henkin & Bradley, 1970). The specific role of these metals is unknown, but low plasma concentrations of zinc, copper, and nickel have been linked to a distortion of normal taste (dysgeusia) and a reduction in taste sensitivity (hypogeusia) (Davidson, Pattison, & Richardson, 1998). Bernard and Halpern (1968) identified a role for vitamin A in taste alterations. Low levels of vitamin A in plasma have an impact on the physiologic function of cells with a high turnover rate, such as taste receptor cells (Davidson et al.). Low vitamin A levels cause patients to complain of a loss of discrimination or reduction in taste threshold.


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Cytokines are produced by the host’s cells in response to a growing tumor and regulate many nutritional and metabolic changes that occur in a patient with cancer (Soubra, 1997). Davidson et al. (1998) found that patients with a low threshold for bitter sensations had higher levels of circulating cytokines in their plasma. Neoplastic tumors also have been found to alter taste by directly releasing cytokines, such as interleukin-1, tumor necrosis factor, and interleukin-6 (Lowry & Moldawer, 1990).

Taste alterations often worsen as cancer progresses. The results are poor dietary intake, weight loss, and a profound impact on patients’ quality of life (Wickham et al., 1999).

**Effects of Therapy**

**Radiation Therapy**

Radiation to the head and neck region can cause hypogeusia, an absence of taste sensation (ageusia), or dysgeusia (Ripamonti et al., 1998). Patients undergoing six to eight weeks of curative radiotherapy of 60–70 gray (Gy) have reported measurably impaired taste function as early as the first week of treatment. Taste loss is not observed until radiation doses of 20 Gy have been administered to head and neck regions (Mossman, 1986). Patients report 50% taste loss, involving all four tastes, up to an accumulated 30 Gy (Conger, 1973). A dose of 60 Gy may cause permanent taste loss in 90% of patients (Madeya, 1996).

Taste changes result from the direct pathologic effects of radiation on taste buds. Radiation reduces the number of taste buds and damages the microvilli of the taste cells (Mossman & Henkin, 1978). The earliest and greatest impairment occurs in the bitter and salty taste sensations, and the sweet quality is the least affected (Mossman & Henkin). Destruction begins in 10–14 days and continues for 14–21 days after completion of radiation therapy. Complete recovery usually occurs within four months to one year (Mossman, Shatzman, & Chenciarick, 1982). Some hypogeusia may be permanent (Madeya, 1996).

**Chemotherapy**

Many chemotherapy agents have been associated with taste changes (see Figure 1). As a result of continuous cellular division, the oral cavity is especially sensitive to the effects of chemotherapy (Ackerman & Kasbekar, 1997). About half of all patients receiving chemotherapy experience taste changes (Wickham et al., 1999).

<table>
<thead>
<tr>
<th>Chemotherapy Agent</th>
<th>Taste Alteration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisplatin</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Cyclophosphamide</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Dacarbazine</td>
<td>Decreased sensitivity to all tastes</td>
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<td>Daclomycin</td>
<td>Decreased sensitivity to all tastes</td>
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<td>Doxorubicin</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Fluorouracil</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Levamisole</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Mechlorethamine</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Methotrexate</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Paclitaxel</td>
<td>Decreased sensitivity to all tastes</td>
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<tr>
<td>Vincristine sulfate</td>
<td>Decreased sensitivity to all tastes</td>
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</tbody>
</table>

**Figure 1. Chemotherapy Agents Associated with Taste Alterations**

Note. Based on information from Bender, 1999.

Patients receiving chemotherapy experience a lowered threshold for bitter tastes and an increased threshold for sweet tastes (Madeya, 1996). Patients receiving certain chemotherapeutic agents, such as nitrogen mustard, vincristine, cisplatin, and cyclophosphamide, experience a metallic taste during the IV administration of these drugs (Skipper, Szeluga, & Groenwald, 1993). Wickham et al. (1999) found that the degree of taste change was greater in regimens including doxorubicin and cisplatin and lower in regimens containing carboplatin and 5-fluorouracil.

Ageusia may occur from a conditioned response of food aversions, which may be associated with chemotherapy-induced nausea and vomiting (Bender, 1999). Reported onset and duration of taste alterations are variable but may occur during chemotherapy administration and last for a few hours to several days, weeks, or months after treatment (Foltz et al., 1996).

**Surgery**

Surgical intervention in the oral cavity and tongue can lead to loss of sweet and salty receptors, whereas surgery on the palate area can lead to loss of sour and bitter receptors (Grant & Kravits, 2000). Tracheotomy or laryngectomy surgeries commonly cause hypogeusia or ageusia as a result of the diversion of air from the olfactory component of taste (Peterson, 1990). Surgical procedures involving the salivary glands, nasal airway, and the pathway of the olfactory nerve also may alter taste (Grant & Kravits).

**Biotherapy**

Taste changes have been reported in patients receiving biological therapy with interleukin-2, lymphokine-activated killer cells, tumor necrosis factor, and the interferons (Madeya, 1996). Patients reported a decreased threshold for spicy foods and indicated that foods tasted bland, bitter, or like chemicals or medicine (Bender, 1999). The underlying mechanism for taste changes associated with biological therapy is unclear, as is the question of whether this problem resolves when therapy is completed (Madeya).

**Other Treatments and Factors**

Taste changes in patients with cancer also may be related to other causes. Some antibiotics, analgesics, bisphosphonates, antihypertensive and cardiac medications, bronchodilators, muscle relaxants, antidepressants, and anticonvulsants can alter taste (Ackerman & Kasbekar, 1997). Noxious odors in the environment, poor oral hygiene, dentures that obstruct stimulation of the taste buds, infections of the oral cavity, and antibiotic therapy may alter taste. The effects of aging, including the perceptual loss of taste and anatomic loss resulting from degeneration of the taste buds, can cause taste loss (Cowart, Young, Feldman, & Lowry, 1997). Because cancer mainly is a disease that occurs in older people, the elderly have multiple risk factors for taste changes.

Change in food appreciation can be one of the causes of poor dietary intake and can contribute to the deterioration of a patient’s general condition. When favorite foods no longer taste pleasing, patients may decrease food intake altogether, leading to subsequent weight loss (Strohl, 1984). To patients and family members, progressive weight loss and changes in appearance are daily reminders of the cancer diagnosis. Because food plays a major role in social activities, the loss of taste can lead to lack of interest and loss of pleasure in the dining experience (Stubbs, 1989). Taste changes have the potential to negatively affect physiologic, psychological, social, and functional status and, therefore, have an impact on patients’ overall quality of life (Wickham et al., 1999).

**Role of the Clinician**

Clinicians’ scope of practice involves expanded knowledge and skills and an increased complexity of clinical decision-making (American Nurses Association, 1996). Clinicians have an important role in assessing patients for potential or actual taste alterations, providing patient and family education, and identifying appropriate interventions. Wickham et al. (1999) found that oncology nurses and physicians typically do not offer self-management suggestions to patients who are experiencing taste alterations and recommended that clinicians assess and treat this symptom.

**Assessment**

Taste alteration assessment includes a diet history, physical assessment, and psychosocial history (see Figure 2) (Grant & Kravits, 2000). Assessment for taste alteration should begin with a thorough dietary history, including reports of taste changes,
**Diet history:** Obtain report of taste changes, appetite, desire for food, eating habits.

**Taste changes:** Document type of change, onset, duration, severity, impact on fluid and food intake.

**Patient self-care:** Discuss oral hygiene practices, changes in the way patient is seasoning foods, aggravating food, appealing food, eating patterns.

**Physical exam:** Assess oral mucosa for stomatitis, swollen or bleeding gums, weight loss.

**Psychosocial effects:** Discuss family and social support, quality of life.

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**Figure 2. Assessing Patients for Taste Alterations**

*Note.* Based on information from Berendt, 1998; Grant & Kravits, 2000; Tait, 1996; Wickham et al., 1999.

Appetite and desire for food, eating habits, and previous responses during other illnesses (Berendt, 1998). A complete diet history elicits information about patients' usual dietary habits, current disease symptoms, side effects of treatment, and education needs concerning diet and nutrition (Tait, 1996).

A review of systems is crucial and should include a detailed assessment of oral cavity symptoms, such as the presence of hypogeusia, ageusia, dysgeusia, or xerostomia. Clinicians should obtain information regarding the pattern of taste alterations, including time of onset, frequency (constant or intermittent), degree and duration, and time of the day when taste alterations are more or less severe. Oral hygiene practices, changes in the way the patient is seasoning foods, factors causing or contributing to the alteration in taste, and foods that taste better or worse are important data. Objective data include physical examination of the oral mucosa to assess for stomatitis, glossitis (raw tongue), atrophic lingua (sick tongue), or swollen or bleeding gums. Anorexia and weight loss can accompany taste changes; therefore, a patient’s weight should be measured for comparison to baseline. Significant weight loss (a loss greater than 2% in one week) might prompt referral to a registered dietician (Grant & Kravits, 2000). Referrals also might be indicated for instruction and guidance on food preparation, caloric intake, and food choices.

Because taste alterations can affect patients’ quality of life, a thorough assessment of patients’ social history, mental health, and performance status are important elements of a complete evaluation (Wickham et al., 1999). Family and social support also should be noted.

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**Education**

Patient education is an essential nursing strategy when managing food aversions and taste alterations (see Figure 3) (Grant & Kravits, 2000). Patients and family members should be instructed to report food reactions (positive and negative), patterns of increased appetite, and environmental factors that may influence the desire for food. Teaching patients and their families that taste alteration is a common side effect of cancer treatment that usually improves after completion of therapy can improve their ability to cope with this often distressing symptom.

Management of cancer-induced taste alterations is aimed at maintaining optimal nutrition (Brodie, 1998). Food must be in a solution to be tasted. Increasing fluid intake to two to three liters per day helps to improve salivation (Brodie). Patients should drink water and other nonirritating liquids, such as apple juice, grape juice, and sports drinks, several times each hour throughout the day. Spraying water, saline, or artificial saliva will keep the oral mucosa well hydrated. Sucking on sour candies usually stimulates the production of saliva (Bender, 1999).

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**Taste alteration is a common side effect of cancer treatment that usually is temporary and improves after completion of therapy. Below is a list of suggestions that may help you to better manage this symptom.**

- Increase your fluid intake to two to three liters a day. Drink nonirritating liquids, such as apple juice, grape juice, and sports drinks. Keep your mouth moist by spraying water, artificial saliva, or saline.
- Suck on sour candies to stimulate your saliva production.
- Eat small, frequent meals.
- Use plastic utensils if food tastes metallic.
- Eat in pleasant surroundings with family and friends.
- Eat sugar-free mints, chew sugar-free gum, or chew ice to mask the bitter or metallic taste.
- Substitute poultry, fish, eggs, peanut butter, beans, and dairy products for red meats.
- Marinate meats in sweet fruit juices, wines, salad dressing, barbecue sauce, or sweet-and-sour sauces.
- Flavor foods with herbs, spices, sugar, lemon, and tasty sauces.
- Chilled or frozen food typically is more acceptable to patients than warm food.
- Do not eat one to two hours before chemotherapy or radiation therapy and up to three hours after therapy.
- Brush your teeth before and after each meal.
- Avoid cigarette smoking.
- Control noxious odors in the environment.

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**Figure 3. Patient-Education Sheet**

*Note.* Based on information from Bender, 1999; Brodie, 1998; Grant & Kravits, 2000; Strohl, 1984; Stubbs, 1989.

- Avoid cigarette smoking.
- Control noxious odors in the environment.

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**Table 3. Patient-Education Sheet**

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Medications

Ripamonti et al. (1998) conducted a double-blind, random study evaluating the effects of zinc sulfate administration versus placebo in the management of taste alterations caused by radiotherapy. Eighteen patients who had external radiotherapy to the head and neck region received either zinc sulfate or placebo tablets three times a day from the onset of subjective perception of taste alterations. The researchers found that zinc sulfate administration significantly slowed worsening alterations and improved taste acuity. Administration of 25 mg of zinc four times a day to patients with hypogeusia normalized serum and parotid zinc levels, taste perception, and taste bud anatomy (Ripamonti et al.). However, further research is needed because of the small sample size studied and strict exclusion criteria.

Nurses play a key role in symptom management and should recognize that distressing taste changes are common before, during, and after cancer treatment. Informing the patients of this side effect prior to treatment can help patients to explore methods of coping with taste changes, thus increasing comfort and self-control. Although nurses may not be able to change patients’ risks for taste changes after cancer treatment, continued assessment may lead to interventions that minimize the negative effects of taste alterations.

Nursing Research

Much literature about patient education, symptom management, and quality of life relating to cancer-induced taste alterations is available. In contrast, only two nursing research studies were found in a review of the literature. Foltz et al. (1996) conducted a retrospective study to evaluate the effectiveness of specific self-care actions on the reduction of chemotherapy-related side effects. Fifty-nine adult patients with cancer completed a self-care diary recalling side effects and self-care actions of patients since their last chemotherapy. The study revealed that taste changes occurred frequently and were moderately severe for patients receiving chemotherapy. These changes also had a negative effect on patients’ quality of life. The researchers advised that additional research in this area was indicated.

An apparent void exists in nursing research related to cancer-induced taste alteration; moreover, evidence suggests that nurses are not routinely assessing for this symptom. The development of a measurement tool for evaluating taste alteration would be helpful to clinicians. Research also is needed to address ways to prevent and effectively manage taste alteration caused by cancer and its treatment.

Conclusion

Cancer-induced taste alteration is a complex and multifaceted symptom. Etiologies include the effect of tumors, cancer cell mitosis, vitamin deficiency, and cytokine involvement. Nursing strategies for managing taste alteration include continued physical assessment, patient and family education, and pharmacologic interventions. Unlike other symptoms, such as fatigue or nausea, much of what is known about taste alteration comes from articles and studies that were published more than 10 years ago. Further nursing research is indicated because taste alteration appears to be an under-recognized and under-studied area.

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References

Ackerman, B., & Kasbekar, N. (1997). Disturbances of taste and smell induced by drugs. Pharmacotherapy, 17, 482–496.


Rapid Recap

Taste Alterations Among Patients with Cancer

- About one-half to two-thirds of patients with cancer report distressing changes in taste.
- The exact etiology of taste alteration is unknown, but the effect of tumors, cancer cell mitosis, vitamin deficiency, and cytokine involvement are a few recognized theories.
- Cancer treatment with radiation, chemotherapy, surgery, and biologic response modifiers can result in taste alteration.
- Nursing strategies for managing taste alteration include continuous physical assessment, patient and family education, and pharmacologic interventions.
- Clinical trials report that administering oral zinc sulfate has been effective in preventing and correcting taste alterations.
- Further nursing research is indicated because taste alteration is an under-recognized and under-studied area.