

DEPRESSED TASTE AND SMELL IN GERIATRIC PATIENTS

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ABSTRACT

Background. Geriatric patients have a number of dental care problems that younger patients do not encounter. The oral changes associated with aging can have a significant effect on the efficacy of dental treatment.

Types of Studies Reviewed.

The authors reviewed studies dealing with the causes of depressed sense of taste and smell; the causes included aging, disease, medications and dental problems. Based on their findings, the authors described the location and anatomy of taste buds and receptor cells for smell and explored appetite, saliva, food seasonings, nutrition and dietary recommendations. They also discussed the relationship of smoking and tongue cleaning to taste sensations.

Results. The authors found that considerable differences exist between elderly people and young people in regards to sensory perception and pleasant-

ness of food flavors. Salt and bitter taste acuity declines with age, but sweet and sour perceptivity does not. Olfactory acuity also declines with age. The authors found that most of the studies reviewed suggested that the sense of smell is more impaired by aging compared with the sense of taste. Smoking diminishes the taste of food and makes flavorful foods taste flat, while tongue brushing can increase taste sensation for geriatric patients.

Clinical Implications. Food can become tasteless and unappetizing for geriatric patients as the result of declining taste and smell perception. Geriatric patients should be encouraged to add seasonings to their food instead of relying on excessive consumption of salt and sugar to give their food flavor. Adequate nutrition, tongue cleaning and smoking cessation are recommended for geriatric dental patients.

Aging is a normal life process. And age itself is not necessarily a contraindication for medical or dental treatment. It is unfortunate, however, that geriatric patients generally need most of their dental and medical services at an age when they are least able to endure and, possibly, to afford them. Degenerating physiological and biological changes and associated chronic diseases also place these patients at a greater risk of requiring surgery.

The majority of elderly people live healthy, active lives. Because of dentistry's current emphasis on prevention and improvements in oral hygiene practices and home care, elderly patients today generally have more of their own teeth and

fewer prostheses compared with elderly patients a decade ago.¹

Oral changes associated with aging can have a significant effect on the efficacy of dental treatment. Among these changes are depressed levels of taste and smell perceptions,^{2,3} which can make foods become tasteless and result in a decline in appetite.

Adjusted national estimates of the 1994 Disability Supplement to the National Health Interview Survey⁴ reported that in the total U.S. population, 2.7 million U.S. adults (1.4 percent) had an olfactory problem, and 1.1 million U.S. adults (0.6 percent) had a gustatory problem. Approximately 3.2 million U.S. adults (1.65 percent) indicated

that they had a chronic chemosensory problem when smell and taste problems were combined. The survey was administered in 1994 to approximately 42,000 randomly selected households, which represented about 80,000 adults older than 18 years. The prevalence rates for these problems increased exponentially with increasing age. Almost 40 percent of adults with a chemosensory problem (1.5 million) were 65 years of age and older.

PROSTHODONTIC FAILURE IN ELDERLY PATIENTS

A reason for prosthodontic failure in elderly patients is deficient tissue tolerance resulting from inadequate nutrition.² This stems, in part, from poor appetite, which can be attributed to an irreversible decline in taste and smell associated with aging, disease, medications, radiotherapy⁵ and dental problems.

Diseases. Several specific diseases can affect a person's sense of taste and smell. They include nervous system disorders (particularly Alzheimer's disease and Parkinson's disease), chronic renal problems or chronic liver disease, endocrine disorders (for example, diabetes mellitus, hypothyroidism and Cushing's syndrome), localized ear, nose and throat ailments and viral infections.^{6,7} Nutritional deficiencies—such as reduced levels of zinc and vitamins B₃ and B₁₂—and nutritional problems related to cancer also can be involved.⁶

Medications. Clinical studies have implicated more than 250 drugs in altered taste sensations.⁸ These include lipid-lowering drugs, antihistamines,

antimicrobial medications, anti-neoplastic medications, asthma medications, antihypertensives and other cardiac medications, muscle relaxants, antidepressants, anticonvulsants and vasodilators. Although little is known about how or where medications can reduce a person's sense of taste or smell, it is recognized that these medications act at several levels, including in the peripheral receptors, chemosensory neural pathways and the brain.

Dental problems and treatments. Reduced taste and smell sensations also can be the

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result of dental problems and treatments, including oral trauma, xerostomia, periodontal disease, burning mouth syndrome, denture-related stomatitis and chemosensory problems such as dysosmia and halitosis.⁹ Common dental treatments identified with decreased sensory sensations include removable prostheses—with or without resilient liners—and over-the-counter preparations such as dentifrices, denture adhesives and cleansers, and mouthwashes.¹⁰

TASTE

Taste sensations occur during mastication and deglutition, when chemicals in foods and beverages contact clusters of polarized neuroepithelial cells called taste buds. The sense of smell also contributes strongly to taste perception, as taste and smell are inextricably intertwined in determining the palatability of food and complement one another. In addition to the texture of food as detected by tactual senses in the mouth, the presence of flavoring agents and condiments influences the taste experience.

Taste buds are found primarily around the margin of the tongue, the dorsum of the tongue with the exception of the central area, the base of the tongue near the sublingual gland ducts, the soft palate, the pharynx, the larynx, the epiglottis and the initial one-third of the esophagus.^{5,6,11} Each ovoid taste bud consists of approximately 50 to 100 specialized taste cells that are arranged like orange segments.

The tongue. The mucous membrane of the tongue is divided into anterior and posterior parts by the V-shaped sulcus terminalis. The apex of the sulcus projects backward and is marked by a small pit called the foramen cecum.

Four types of papillae are present on the tongue: filiform, fungiform, circumvallate and foliate.¹² The mucous membrane covering the posterior one-third of the tongue is devoid of papillae.

Filiform papillae (Figure 1), which do not contain taste buds, are numerous and form small conical projections. They are white due to the thickness of their keratinized epithelium.

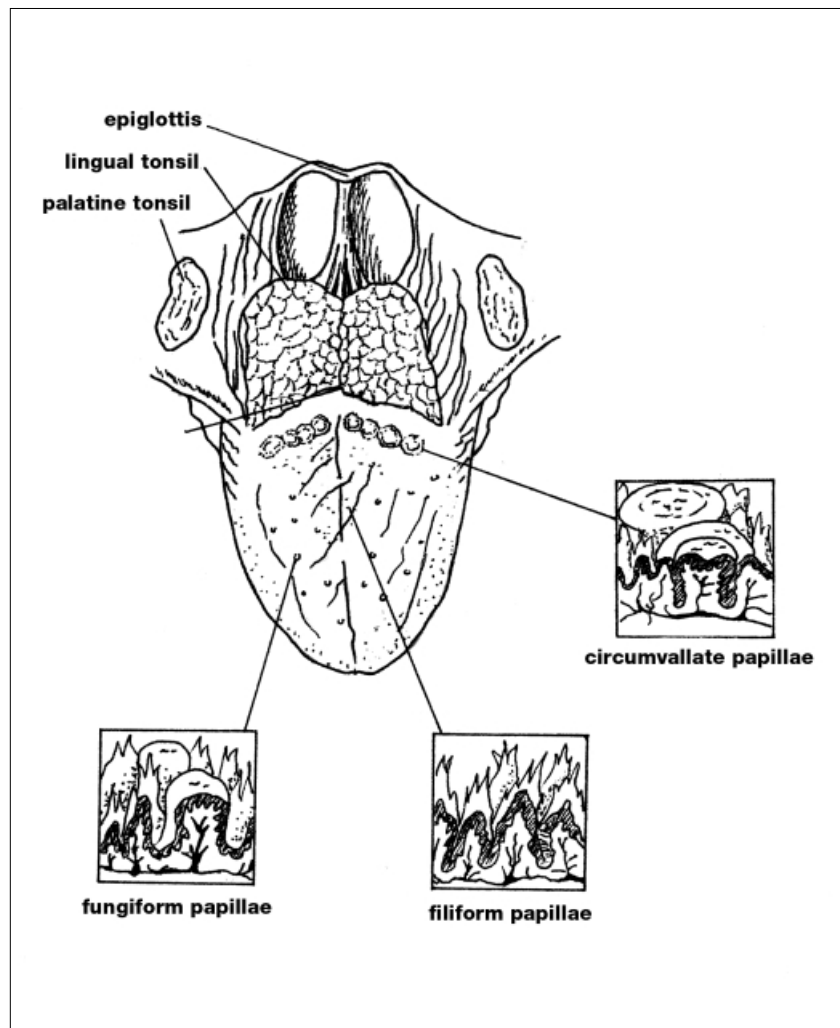


Figure 1. Three types of papillae are present on the upper surface of the anterior two-thirds of the tongue: filiform, fungiform and circumvallate. Modified from Massler and Schour.^{12p42}

There are fewer fungiform papillae (Figure 1) than filiform papillae. They are, however, larger than filiform papillae and are scattered on the sides and apex of the tongue, are rounded and have a vascular connective core, which gives them a reddish color. Approximately 200 taste buds are sparsely and variably scattered on the fungiform papillae.

The eight to 12 turret-shaped circumvallate papillae (Figure 1) are in a row, which extends to the lateral borders of the tongue immediately in front of the

sulcus terminalis. Each papilla is approximately 2 millimeters in diameter and protrudes slightly from the surface of the tongue. Circular furrows, or trenches, in the walls of which lie taste buds surround the papillae. Each circumvallate papilla contains approximately 250 taste buds.

Foliate papillae are vertical folds located on the posterior lateral sides of the tongue. Approximately 1,200 taste buds are found within the foliate papillae.

Each taste bud is linked by

synapses at its base to the cranial nerves. Taste—or nerve—fibers from the anterior two-thirds of the tongue—except for the circumvallate papillae—are in the facial nerve's chorda tympani branch. The circumvallate papillae are served by the glossopharyngeal nerve.

Taste sensations. Taste buds can detect four primary taste sensations—sour, salty, sweet and bitter. Acids produce a sour taste; the more acidic the food, the stronger the sensation. Ionized salts, mainly cations, stimulate a salty taste. Various classes of chemicals—mainly organic—produce sweet and bitter sensations. Other taste sensations such as metallic also have been suggested.⁶

Although it was once thought that particular areas of the tongue specialized in detecting specific tastes, investigators now believe that every taste bud has some degree of sensitivity to all of the primary taste sensations, and that the brain detects the type of taste by the ratio or pattern of stimulation that different taste buds receive.¹³ Some taste buds may respond to all four primary taste sensations, while others respond to only one, two or three.

Degeneration of taste buds. A diminishing of taste results from the degeneration of taste buds and a reduction in their total number.¹⁴ Taste buds in a healthy adult reproduce approximately every 10 days. Renewal is slower in elderly people, especially in postmenopausal women who have an estrogen deficiency. Protein and zinc shortages also can retard taste bud renewal.

Differences in sensory perception. Elderly people and

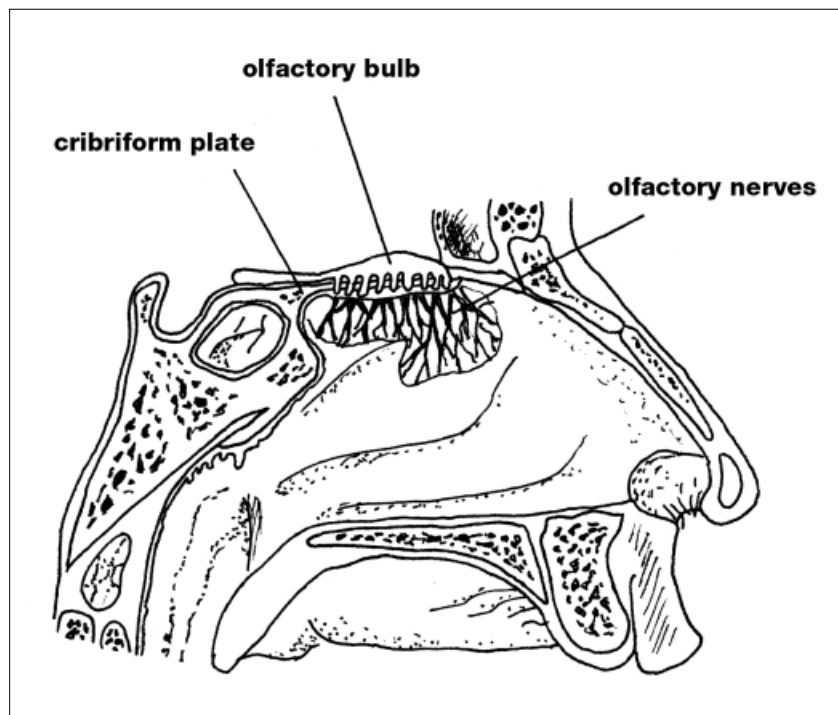


Figure 2. The olfactory nerve emerges through the cribriform plate of the ethmoid process. The mucosal ends of olfactory cells form expanded cylinder-shaped knobs from which six to 12 olfactory hairs or cilia project. The microtubular arrangement of the cilia provides large areas of sensory surfaces that can be exposed to odorant molecules. Modified from Massler and Schour.^{12p56}

young people have considerable differences in their sensory perceptions and their capacity to detect the pleasantness of food flavors.^{15,16} Weiffenbach and colleagues¹⁷ found that while acuity of salty and bitter tastes declines with age, perceptivity of sweet and sour tastes does not.

Age-related changes in functions that relate the concentration of the flavors tested with perceived intensity, concentration with pleasantness, and perceived intensity with pleasantness have been reported to be specific for different flavors.¹⁶ Investigators found that older subjects seemed to prefer higher concentrations than did younger subjects.¹⁶ As these investigators tested a limited number of flavors—bouillon in water, tomato juice in water, orange

juice in water, strawberry in yogurt and sugar in unsweetened yogurt—the investigators suggested that their study be repeated with other flavors.

Genes that probably are responsible for the mammalian sense of taste have been identified recently. Hoon and colleagues¹⁸ described genes that encode two novel proteins expressed in cells specifically geared to the sense of taste. They believe that the isolation of taste receptor genes can provide the foundation for modulating taste perception and stimulating or blocking taste cell function.

SMELL

The olfactory cells are the receptor cells for smell (Figure 2). They are bipolar and are derived from the central nervous

system. About 100 million of these cells are located in the olfactory epithelium in the dorsal area of the nasal cavity, the septum and part of the superior turbinates. The mucosal ends of olfactory cells form expanded cylinder-shaped knobs from which six to 12 olfactory hairs, or cilia, project into the mucus that coats the inner surface of the nasal cavity. The olfactory cells form a dense mat in the mucus. The cilia, which extend into the upper nasal passageway, react to odors in the air and then stimulate the olfactory cells.¹⁹ The olfactory receptors adapt to approximately one-half of their entire capacity within the first seconds after being stimulated by odors. From that time on, adaptation is slow and greatly decreased.

In young people, olfactory cells are renewed approximately every 30 days.¹⁴ This renewal process is slowed by aging. In very old people, it may stop altogether, resulting in the loss of the sense of smell, a condition called anosmia.

Reports have indicated that there may be as many as 50 or more sensations of smell.¹⁹ Much of the mechanism pertaining to how different odors are distinguished is not yet known. Individual receptor cells are attuned to a narrow range of odorants with common chemical features, although the precise number of different odorant types and corresponding cell types is unknown.¹¹

Olfactory acuity. Olfactory acuity declines with age. The number of olfactory nuclei in the brain decline, and the olfactory receptors in the roof of the nasal cavity regress. Older people generally have greater

difficulty differentiating among food odors than do younger people. They can, however, best discriminate fruits from other stimuli and also appear to prefer fruit odors compared with other stimuli.²⁰

Most studies suggest that the sense of smell is more impaired by aging than is the sense of taste.⁶ Elderly patients may not be aware of taste and smell changes until their attention is drawn to their mouths during the fabrication of prostheses. When they realize that foods do not taste the same as they did in the past, they may attribute the problem to their prostheses.

APPETITE

Appetite is controlled by the appetite center in the base of the brain. Overweight people have very active appetite centers, which causes them to overeat during meals and to eat between meals when they are not hungry. The appetite center of thinner people probably is much more inactive than it is in overweight people, which results in their eating little or no food between meals. Emotional stress can result in a loss of appetite. Appetite and hunger, however, usually are complementary and mutually supportive.¹⁴

Appetite is influenced by food palatability. Decreased gustatory ability, olfactory ability or both can have an adverse effect on diet and nutrition. Because taste and smell are amalgamated in the determination of a food's palatability and acceptance, a loss of flavor can make food tasteless and result in a decline in appetite.

Saliva. Solid foods must be dissolved before the taste buds can be stimulated. Slow and

thorough chewing and adequate salivary function are essential to sensing taste.

Salivary function appears to be relatively unimpaired in healthy older people.⁹ As a result of regressive changes in their salivary glands, however, some older people may have decreased salivary flow. This can result from a number of medical problems and their treatments such as medications or head and neck irradiation or other conditions such as menopause, dehydration and vitamin deficiencies.² A temporary decrease in salivation can be caused by a severe emotional

Flavoring agents will preserve the stimuli that taste and smell add to the enjoyment of food and counter the decline in salt and bitter taste acuity.

reaction or sialolithiasis—a salivary duct blockage caused by calculus.²

A decrease in salivary flow can interfere with complete denture retention and an ability to taste foods. It also will make mastication and deglutition difficult, because a bolus of food must be moist when swallowed. If a dry mouth is caused by a decrease of salivary gland secretions, the use of artificial saliva and frequent mouthrinses—particularly during meals—may be helpful.

Sialogogues, which are drugs that stimulate the flow of saliva without affecting its ptyalin content, can be prescribed to the patient if some glandular

function still is present. It has been found that 5-milligram pilocarpine hydrochloride tablets taken four times a day produce significant improvements in dry-mouth symptoms in patients with Sjögren's syndrome.²¹ Other possible adverse reactions of pilocarpine hydrochloride include nausea, rhinitis, chills, flushing, urinary frequency, dizziness, diarrhea, headaches and weakness. Sweating is by far the most common adverse reaction.²

SEASONING OF FOODS

Flavoring agents—such as vanilla, orange, strawberry and cherry—and spices and salt substitutes—such as caraway, chili powder, chives, cinnamon, cloves, curry, garlic (not garlic salt), ginger, lemon juice, mint, dry mustard, peppers, sage, tarragon and vinegar—should be added to foods instead of salt and sugar. These flavoring agents will preserve the stimuli that taste and smell add to the enjoyment of food and counter the decline in salt and bitter taste acuity. An excessive intake of sugar, which may be the result of the retention of elderly people's sweet perceptivity, should be avoided.

A variety of flavors and textures in the diet, along with a healthy natural dentition and adequate prostheses to replace missing teeth, can result in maximum enjoyment of meals.

NUTRITION

Dental practitioners should be aware of the nutritional factors and deficiencies that can adversely affect geriatric patients' oral surgery and their subsequent prosthodontic rehabilitation.²² Many nutrients, vitamins and minerals can be

useful and even necessary for successful dental treatment.

Schmuck and colleagues²³ reported that, with the exception of retinol, dietary vitamin intake was positively correlated to corresponding blood concentrations. Because of this factor, dental practitioners should consider the potential benefits of providing micronutrient-enriched foods to geriatric patients before and after surgical procedures.

Adequate calcium intake is essential for people of all ages. Milk and milk products are the best sources of calcium. Almost all of the approximately 2 to 3 pounds of calcium present in the body is concentrated in the bones and teeth. The calcium needs of elderly people are about 1,000 mg per day.

In elderly people, protein depletion of body stores is seen primarily as a decrease of skeletal muscle mass. Chronically inadequate dietary protein intake may be involved in depressed immune function, decreased muscle strength and poor wound healing in older adults.²⁴

Patients older than 55 years of age should ingest 1.00 to 1.25 g of high-quality protein per kilogram of their weight daily.²⁵ The best sources of protein for elderly people are meat and fish.

Water, the most important nutrient in the diet, is essential for all body functions. Water lost from perspiration, elimination and the lungs must be balanced every day by an adequate intake from drinking water, beverages, soups and other foods, especially vegetables. If this balance is not maintained and water loss exceeds intake, chronic dehydration can result.

Geriatric patients are particularly susceptible to negative water balance, which often is caused by excessive water loss through inefficient or damaged kidneys.

The oral mucosa of dehydrated elderly patients can become dry and easily irritated. Fluid consumption, in general, and water consumption, in particular, can have an effect on salivary gland function and overall health in elderly patients.²⁶

The average sedentary man must consume at least 2,900 milliliters of fluid daily in the form of noncaffeinated, nonalcoholic beverages, soups and foods, and the average sedentary woman must consume at least 2,200 mL of fluid daily. Solid foods contribute approximately 1,000 mL of water, and an additional 250 mL are derived from oxidation.²⁶

SMOKING

Smoking not only diminishes the taste of food, but it also makes flavorful foods taste flat and unappetizing.¹⁴ Investigators also have reported that smoking increases the risk of dental implant failure.²⁷

Patients who smoke often experience delayed healing, dehiscence and infection after surgical procedures, which probably are the result of the actions of the toxins—nicotine, carbon monoxide and cyanide—in cigarette smoke. Dental implants and implant-retained or -supported prostheses are viable treatment options for older patients.¹ Many dental practitioners, however, refuse to provide implant service for smokers.

Elderly patients who smoke should be strongly encouraged

to stop. If a geriatric patient does not wish to discontinue the use of tobacco, a dental practitioner also should stress the possible adverse cardiac and cancerous effects of cigarette, pipe and cigar smoking, as well as dental reasons such as periodontal disease, halitosis, tooth staining, stomatitis nicotina and gingival bleeding.

TONGUE CLEANING

Geriatric patients should add tongue brushing to their home care regimen. A thick white mucoid coat, evident on arising and persisting after breakfast, is common in elderly patients.²⁶ This coating can be removed easily by using a soft toothbrush or a dry gauze pad. The coating also can be removed by eating so-called "detergent" foods such as hard bread, dry cereal, uncooked vegetables and fibrous meats.

Tongue brushing is especially important for increasing the taste acuity in geriatric patients who receive prostheses, because a dirty mouth cannot distinguish the subtle flavors of good, well-prepared food. The tongue should be cleaned twice daily, in the morning when the patient wakes up and in the evening before he or she goes to sleep.

CONCLUSION

Dental care for geriatric patients presents a number of problems not encountered in younger patients. Food can become tasteless and unappetizing for them as a result of their declining taste and smell perceptions. They should be encouraged to add seasonings to their food instead of relying on an excessive intake of salt and sugar. Certain nutrients, vitamins and minerals may be necessary for



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successful dental treatment. Adequate nutrition and tongue cleaning and being a nonsmoker are recommended for geriatric patients. ■

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