

### Two Types of Loss

- **Loss of function**
  - You cannot taste or smell as well as you could before your loss. Many patients feel they cannot taste but they mean they cannot get flavor out of food which relates more to smell loss than taste loss.
- **Distortion of function**
  - Distortion of function means that foods or odors that normally are pleasant may taste or smell odd or distorted, perhaps with an unpleasant chemical or a rotten taste or smell. You may experience a taste in your mouth without the presence of any food or drink or an odor in your nose without any vapor in the environment; this can be quite confusing and you may wonder if this is real or just your imagination.



### Hazards of Loss

- A reduced, distorted, or lost sense of taste or smell signifies much more than a weakened zest for food.
- These deficits represent serious risk factors for heart disease, diabetes, stroke, and other illnesses that require adherence to specific dietary regimens.
- Changes in these senses can also lower immunity to disease, contribute to digestive disorders, cause food poisoning, or produce toxic effects of environmentally hazardous chemicals that are otherwise detectable.



### How Common is it?

- In the United States, approximately 2 million adults have disorders of taste and smell.
- Although it is not known how many elderly people have these dysfunctions compared to those in other vulnerable groups, a large proportion is believed to have one or both deficits.
- While around 380 million people worldwide are 60-years-old and over, the number is expected to triple globally to more than 1 billion in the year 2025--a fact that may have ramifications for a high incidence of taste and smell disorders in the elderly, and for the rate of severer forms of age-related diseases that untreated sensory deficiencies may aggravate.



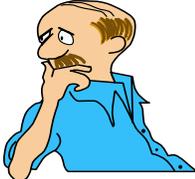
### CHEMOSENSORY DECLINE OF TASTE AND SMELL IN THE ELDERLY

- **Normal aging process.**
- **Disease and other disorders.**
- **Pharmacological effects.**
- **Nutrition and health.**



### THOUGHT

Increased plasma insulin  
Decrease in plasma FFA



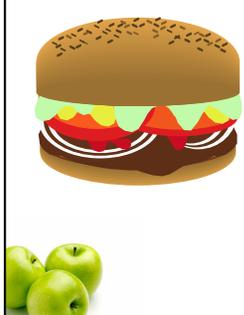
# A Matter of Taste

## SIGHT



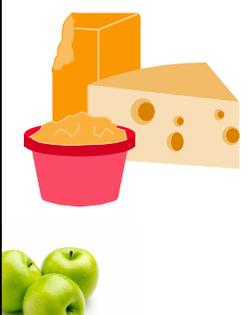
**Gastric secretion**  
**Increased plasma insulin**  
**Intestinal motility**  
**Exocrine pancreatic secretion**  
**Decrease in plasma FFA**  
**Increased metabolic rate (Thermogenesis)**  
**Salivary secretion**

## SMELL



**Gastric secretion**  
**Increased plasma insulin**  
**Gastrin release**  
**Exocrine pancreatic secretion**  
**Decrease in plasma FFA**  
**Increased metabolic rate (Thermogenesis)**  
**Salivary secretion**

## TASTE



**Gastric secretion**  
**Increased plasma insulin**  
**Increased plasma glucagon**  
**Gastrin release**  
**Exocrine pancreatic secretion**  
**Increased pancreatic polypeptide secretion**  
**Decrease in plasma FFA**  
**Increased metabolic rate (Thermogenesis)**  
**Increase in SNS activity**

## Aging Effects

- Olfactory (smell) receptor cells (ten million receptors) are not like other neurons. They are regularly replaced by the division of basal stem cells in the olfactory epithelium. Nevertheless, the numbers produced do decline with age, causing the remaining receptors to become less sensitive. As a result, detecting odors declines with age.
- Gustatory (taste) sensitivity declines as a result of the thinning of the numbers of mucous membranes, as well as a reduction in the numbers and sensitivity of taste buds. At the beginning of life, there are roughly 10,000 taste buds. That number is drastically reduced by the age of 50.
- Vision diminishes by age 70, primarily because of a decrease in the amount of light that reaches the retina and impaired focusing of the light on the retina. The muscles of the iris become less efficient so the pupils remain somewhat constricted most of the time.

Source: <http://www.invista.com/health/anatomy/nervoge.htm>

## NERVOUS SYSTEM DISORDERS

	Taste	Smell
Alzheimer's disease	✓	✓
Bell's palsy	✓	
Damage to chorda tympani	✓	
Down's syndrome		✓
Epilepsy	✓	✓
Familial dysautonomia	✓	
Head trauma	✓	✓

## NERVOUS SYSTEM DISORDERS

	Taste	Smell
Korsakoff's syndrome		✓
Migraine		✓
Multiple sclerosis	✓	✓
Parkinson's disease		✓
Raeder's paratrigeminal syndrome	✓	
Tumors and lesions	✓	✓

NUTRITIONAL DISORDERS		
	Taste	Smell
Cancer	✓	✓
Liver Disease / cirrhosis	✓	✓
Niacin (vitamin B3) deficiency	✓	✓
Thermal Burn	✓	✓
Vitamin B12 deficiency	✓	✓
Zinc Deficiency	✓	✓
Chronic renal failure	✓	✓

OTHER DISORDERS		
	Taste	Smell
Acute viral hepatitis	✓	✓
Amyloidosis	✓	✓
Cystic fibrosis	✓	✓
Hypertension	✓	✓
Influenza-like infections	✓	✓
Olfactory sarcoidosis	✓	✓
Psychiatric disorders	✓	✓

LOCAL DISORDERS		
	Taste	Smell
Adenoid hypertrophy	✓	✓
Facial Hypoplasia	✓	✓
Glossitis & other oral disorders	✓	✓
Oral Crohn's disease	✓	✓
Ozena	✓	✓
Radiation Therapy	✓	✓
Sinusitis & polyposis	✓	✓

ENDOCRINE SYSTEM DISORDERS		
	Taste	Smell
Adrenal cortical insufficiency	✓	✓
Congenital adrenal hyperplasia	✓	✓
Cretinism	✓	✓
Cushing's syndrome	✓	✓
Diabetes mellitus	✓	✓
Gonadal dysgenesis (Turner's syndrome)	✓	✓

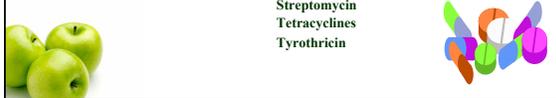
ENDOCRINE SYSTEM DISORDERS		
	Taste	Smell
Kallman's syndrome	✓	✓
Hypothyroidism	✓	✓
Panhypopituitarism	✓	✓
Primary amenorrhea	✓	✓
Pseudohypoparathyroidism	✓	✓
X-linked ichthyosis due to steroid sulfatase deficiency	✓	✓

PHARMACOLOGICAL EFFECTS ON TASTE AND SMELL		
Classification	Drug	
Amebicides and Anthelmintics	Metronidazole	
	Niridazole	
Anesthetics	Benzocaine	
	Cocaine hydrochloride	
	Novocain	
	Tetracaine hydrochloride	
Anticholesteremic Anticoagulants	Clofibrate	
	Phenindione	

# A Matter of Taste

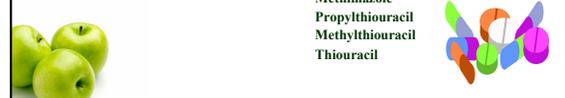
**PHARMACOLOGICAL EFFECTS ON TASTE AND SMELL**

Classification	Drug
<b>Antimicrobial agents</b>	Allicin Amphotericin B Ampicillin Bleomycin Cefamandole Ethambutol hydrochloride Griseofulvin Lincomycin Sulfasalazine Streptomycin Tetracyclines Tyrothricin



**PHARMACOLOGICAL EFFECTS ON TASTE AND SMELL**

Classification	Drug
<b>Antirheumatic, analgesic-antipyretic, anti-inflammatory agents</b>	Allopurinol Colchicine Gold Levamisole D-penicillamine Phenylbutazone 5-Thiopyridoxine
<b>Antithyroid agents</b>	Carbimazole Methimazole Propylthiouracil Methylthiouracil Thiouracil



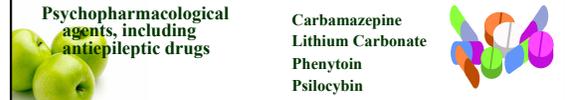
**PHARMACOLOGICAL EFFECTS ON TASTE AND SMELL**

Classification	Drug
<b>Dental Hygiene</b>	Sodium lauryl sulfate
<b>Diuretics, anti-hypertensive agents and drugs for angina</b>	Acetazolamide Captopril Diazoxide Enalapril Ethacrynic acid Nifedipine Nitroglycerine patch
<b>Hypoglycemic drugs</b>	Glipizide Phenformin



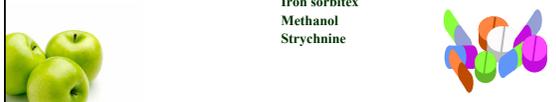
**PHARMACOLOGICAL EFFECTS ON TASTE AND SMELL**

Classification	Drug
<b>Muscle relaxants and drugs for treatment of Parkinson's disease</b>	Baclofen Chlormezanone Levodopa
<b>Opiates</b>	Codeine Hydromorphone hydrochloride Morphine
<b>Psychopharmacological agents, including antiepileptic drugs</b>	Carbamazepine Lithium Carbonate Phenytoin Psilocybin



**PHARMACOLOGICAL EFFECTS ON TASTE AND SMELL**

Classification	Drug
<b>Vasodilators</b>	Oxyfedrine Bamifylline hydrochloride
<b>Others</b>	Acetylcholine-like substances Etidronate Germin monoacetate Idoxuridine Industrial chemicals including insecticides Iron sorbitex Methanol Strychnine



**Outcomes**

- Gradual reduction, or loss, of taste and smell appears to be an unfortunate but normal part of aging
- Thresholds for taste and smell senses are higher for elderly
- Increase the risk of developing depression and unwanted weight loss
- Can impact overall nutritional uptake



## Treatment

- While these sensory dysfunctions reduce the enjoyment and quality of life for affected individuals -- the positive news is that in many cases they are **temporary or minor**.
- These disorders are often reversed when underlying medical conditions are effectively treated or offending chemicals or medications are eliminated.
- Flavor enhancers can also help elderly enjoy food again
- Proper nutrition can help strengthen the auto-immune system, and help avoid catastrophic health failures.



## FLAVOR THRESHOLDS

### By Age Group

Food Item	Young Adult	Senior
Bouillon	4.8	8.4
Tomato Juice	5.8	8.8
Orange Juice	8.1	8.5

■ Young Adult ■ Senior

Increase in pleasantness with increasing intensity for elderly subjects.



### PERCENTAGE PREFERENCE FOR FLAVOR-ENHANCED FOODS IN THE ELDERLY

Food Type	Unenhanced	Enhanced	Flavor used
<b>Vegetables</b>			
Carrots	25%	75%	Carrot
Green Beans	17%	83%	Bacon
Green Peas	6%	94%	Pea, Bacon
Potatoes	39%	81%	Potato, Bacon
<b>Meats</b>			
Beef (ground)	6%	94%	Bacon, Beef
Beef (casserole)	37%	83%	Bacon, Tomato
Chicken	40%	80%	Bacon, Chicken
<b>Soups</b>			
Chicken	22%	78%	Chicken, Bacon
Tomato	16%	84%	Bacon, Tomato
Vegetable	17%	83%	Bacon, Tomato, Pea



## HEALTH AND NUTRITION

### Before and After Flavor Enhancement

Condition	White Blood Cells
Baseline	~1800
Before	~1500
After	~2200

■ Baseline ■ Before ■ After

Source: Shiffmann, S, Warwick, Z; Physiology & Behavior, Vol. 53



## EFFECTS OF FLAVOR ENHANCED FOODS ON NUTRITION

- Increased food intake.
- Improved immune status - Total lymphocytes, B-cell and T-cell counts increase.
- Improved well being - Opioid activity (endorphins) as food flavor increases.
- Improvement in grip strength.
- Reduced interest in dietary fat.
- Reduced interest in sodium.



## What is Anorexia & Malnutrition ?

- **Anorexia** is an overall decline in appetite leading to decreased food intake, and consumption of inadequate calories. It is the major cause of weight loss and poor nutritional status in elderly persons.
- **Malnutrition** and **dehydration** are associated with susceptibility to infections, cognitive impairment, poor skin and bone integrity, pressure sores and hip fractures. These serious consequences along with co-morbidities from chronic illness, often lead to mortality.

Source: Thomas, D.R., MD, Morley, J.E. Regulation of appetite in older adults. Clinical Strategies in LTC, a Supplement to Annals Long-Term Care. July, 2002. Pg. 4.



## Nutritional Screening

- Malnutrition, or undernourishment resulting from insufficient food intake is reported in up to 85% of nursing home patients.
- Dehydration had been documented in as many as 60% of residents.
- A protocol to screen and assess elderly residents for nutritional risk is essential in establishing early interventions to diminish serious health effects of malnutrition



Source: Zimmerman, S., Reed, Peter. Characteristics Associated with Low Food and Fluid Intake in Long-Term Care Resident with Dementia. The Gerontologist, October 2005, Vol. 45, Pg 74.

## Consequences of Malnutrition

- Weight Loss
- Infection
- Impaired wound healing
- Immune deficiency
- Development of pressure sores
- Mortality



Source: Zimmerman, S., Reed, Peter. Characteristics Associated with Low Food and Fluid Intake in Long-Term Care Resident with Dementia. The Gerontologist, October 2005, Vol. 45, Pg 74.

## Consequences of Dehydration

- Constipation
- Urinary tract infections
- Renal disease
- Pneumonia
- Hypotension
- Delirium
- Mortality



Source: Zimmerman, S., Reed, Peter. Characteristics Associated with Low Food and Fluid Intake in Long-Term Care Resident with Dementia. The Gerontologist, October 2005, Vol. 45, Pg 74.

## What are the signs?

- Pronounced indentations at the temporal lobes commonly referred to as temporal wasting
- Loss of muscle mass
- Loose elastic skin
- Decreased functional ability to perform activities of daily living (ADL's)



## Causes of Weight Loss

- Poor dentition
- Swallowing difficulties
- Mouth pain
- Psychological disorders
- Depression
- Impaired mobility
- Loss of appetite
- Multiple medications
- Dementia and disease
- Sensory deficits (deafness, blindness)



## Drugs Contributing to Anorexia

- Antidepressants
- Uricosurics
- CNS Stimulants
- Dopamine Agonists
- Antiarrhythmics
- Diuretics
- Xanthines
- Antiepileptics
- Steroids
- Opiates
- Acetylcholinesterase Inhibitors
- Antibiotics
- Antidiabetics
- Anticoagulants



## Nutritional Interventions

- Ensure that patients are equipped with all necessary sensory aids (glasses, dentures, hearing aids).
- Ensure that the patient is seated upright at 90°, preferably out of bed and in a chair.
- Ensure that patients residing in a long-term care facility eat in the dining room.
- Ensure that food and utensils are removed from wrapped or closed containers and are positioned within the patient's reach.
- Remove or minimize unpleasant sights, sounds, and smells.
- Allow for a slower pace of eating; do not remove the patient's tray too soon.
- Consider ethnic food preferences and permit families to bring specific foods.
- If the patient must be fed, allow adequate time for chewing, swallowing, and clearing throat before offering another bite. Rapport between patient and feeder is critical.
- Demented patients may need to be reminded to chew and swallow and may benefit from availability of "finger foods."
- Encourage the family to be present at mealtime and to assist in the feeding.



Source: Evans C, Castle P. Nutritional problems in the elderly patient. [Stanford (CA): Stanford University Hospital, 1991].

## Nutritional Deficiencies

- Remove or substantially modify dietary restrictions (ie, liberalize the patient's diet);
- Encourage use of flavor enhancers;
- Encourage frequent small meals;
- Offer liquid nutritional supplements for use between (not with) meals;
- Improve protein intake by adding meat, peanut butter, or protein powder;
- Treat depression with antidepressants that do not aggravate nutritional problems;
- Remove or replace medications that have anorexia-producing side effects;
- Evaluate swallowing as well as functional ability to manage eating;
- Obtain a social services assessment of living situation of community-dwelling adults.



Source: Huffman GB. Evaluating and treating unintentional weight loss in the elderly. Am Fam Physician 2002 Feb 15;65(4):640-50.



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