

## REVIEW

## Effects of ageing on smell and taste

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Disorders of taste and smell commonly present diagnostic dilemmas to the medical profession. This may be secondary to the lack of knowledge and understanding of these conditions. There seems to be a low level of interest in the disorders, when compared with disruption of the other senses such as sight and hearing. Nevertheless, impairment of these senses are common and may be life threatening, especially when they involve the elderly patient. The aetiology of the conditions is widespread, and extend beyond the content of this article. This article will relate only to how the ageing process may contribute to sensory dysfunction. It will focus on how the ageing process changes the normal anatomy and physiology of the senses, how this effects the person's quality of life, and the current management of these conditions.

Activation of the piriform/amygdalar region and the orbitofrontal cortex has been shown to be reduced in older subjects when exposed to stimulation.<sup>6</sup> In some cases, olfactory loss may be secondary to age related appositional bone growth resulting in the pinching off of the olfactory fila as they traverse the ethmoid bone.<sup>7</sup>

Certain general diseases such as liver disease and non-otolaryngological cancers seem to influence olfactory function.<sup>8</sup> Another contributing factor when considering age related olfactory deterioration is mild cognitive impairment and Alzheimer's disease. Electrophysiological results of patients with Alzheimer's disease and pre-clinical Alzheimer's disease confirm olfactory dysfunction.<sup>9</sup>

**THE EFFECTS OF AGEING ON TASTE**

Gustatory dysfunction may indeed be related to the normal ageing process. However, in many cases, what is perceived as a taste defect is truly a primary defect in olfaction. Other than smell dysfunction, the most frequent causes of taste dysfunction are prior upper respiratory infection, head injury, drug use, and idiopathic causes.<sup>10–12</sup> Chewing problems associated with tooth loss and dentures can also interfere with taste sensations, along with the reduction in saliva production. When presenting to the clinician, older patients with impaired taste should be thoroughly evaluated for oral and pharyngeal disease such as candidiasis. One theory is that normal ageing produces taste loss because of changes in taste cell membranes involving altered function of ion channels and receptors.<sup>13</sup> Taste bud loss is thought to contribute less to this problem with no relation between taste acuity and number of papillae.<sup>14</sup> Rather than whole mouth gustatory dysfunction, regional deficits are much more common. It has been reported that there is a higher prevalence of localised losses on the tongue in elderly subjects than in young subjects.<sup>4</sup> Despite their wide prevalence, most elderly people are unaware of regional taste deficits.

**THE EFFECTS OF AGEING ON SMELL**

The sense of smell is often taken for granted, that is until it deteriorates. As we get older, our olfactory function declines.<sup>1,2</sup> Not only do we lose our sense of smell, we lose our ability to discriminate between smells. It has been reported that more than 75% of people over the age of 80 years have evidence of major olfactory impairment, and that olfaction declines considerably after the seventh decade.<sup>1</sup> A more recent study found that 62.5% of 80 to 97 year olds had an olfactory impairment.<sup>3</sup> However, it is widely accepted that taste disorders are far less prevalent than olfactory losses with age.<sup>4</sup>

There are numerous theories on why the sense of smell deteriorates as we age, I shall attempt to outline a few of these. Various anatomical and physiological theories have been presented. We are aware that both the number of fibres in the olfactory bulb, along with olfactory receptors decrease noticeably with age.<sup>1</sup> The bulb losses may well be secondary to sensory cell loss in the olfactory mucosa, along with a general deterioration in central nervous system cognitive processing functions. Even in the absence of disease, olfactory receptor neurones undergo apoptosis at a baseline rate in each person. Mammals have the ability to replace these cells, however this process degenerates with ageing.<sup>5</sup> This results in a reduction in the surface area of olfactory epithelium, along with reduced numbers of olfactory receptor neurones. In addition, it is thought that age related olfactory dysfunction is related to an increase in receptor cell death.<sup>2</sup>

**SMELL AND TASTE DISORDERS: THE CONSEQUENCES**

The theory behind the deterioration of these senses in the elderly person has been covered, however effects on the person's lifestyle along with the dangers associated with such disorders needs to be considered. The world is a different place without the sense of smell. Pleasant experiences such as the smell of

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## Medical conditions that affect the senses of taste or smell<sup>20</sup>

### Neurological

- Alzheimer's disease
- Bell's palsy
- Damage to the chorda tympani
- Epilepsy
- Head trauma
- Korsakoff's syndrome
- Multiple sclerosis
- Parkinson's disease
- Tumours and lesions

### Nutritional

- Cancer
- Chronic renal failure
- Liver disease
- Niacin deficiency
- Vitamin B12 deficiency

### Endocrine

- Adrenal cortical insufficiency
- Congenital adrenal hyperplasia
- Panhypopituitarism
- Cushing's syndrome
- Diabetes mellitus
- Hypothyroidism
- Kallman's syndrome
- Pseudohypoparathyroidism
- Turner's syndrome

### Local

- Allergic rhinitis, atopy, and bronchial asthma
- Sinusitis and polyposis
- Xerostomic conditions including Sjogren's syndrome

### Viral infections

- Acute viral hepatitis
- Influenza-like infections

flowers in spring, the aroma of fresh coffee, or even a Sunday roast are lost forever. Contrast this with the smell of garlic on an acquaintance's breath cutting a conversation short.

Unfortunately, smell and taste disorders in the elderly person are commonly overlooked, as they are not considered critical to life. However, this may not be the case. Decreased smell function is a contributory factor in the age related increases in accidental gas poisonings and explosions that can endanger public safety. Decreased smell and taste results in appetite suppression resulting in weight loss, malnutrition, impaired immunity, and deterioration in medical conditions.<sup>1-4,15</sup> Nutritional problems are an important sequelae from smell and taste disorders.<sup>17</sup> It has been reported that the elderly person requires a twofold to threefold higher concentration of salt to detect it in tomato soup.<sup>17</sup> The tendency toward higher salt and sugar intake in the elderly diet can aggravate health hazardous conditions.<sup>18</sup> When the sense of smell is decreased or distorted, disability and decreased quality of life are reported.<sup>19</sup> In addition to these problems, such conditions may be responsible for a high

degree of anxiety and depression in the elderly person. Anxiety in the inability to taste and enjoy food, and fears that the symptom is indicative of an underlying disorder. There is also a higher incidence of depression in those who develop anosmia.<sup>11</sup>

## INVESTIGATION OF SMELL AND TASTE DISORDERS

When a patient presents with a problem with their smell and taste, it is important to fully investigate the problem regardless of their age. Investigation is focused on the possible causes of such disorders as outlined in the box. This includes a detailed history and examination that may often lead to the cause of the problem, as is the case with local causes such as nasal polyposis.

More extensive testing with haematological and biochemical investigations are frequently required to discover the various nutritional and endocrine causes of smell and taste disorders.<sup>21</sup> Radiological investigation such as computed tomography is necessary to detect neurological causes for the disorder.

It is only when other causes have been ruled out that the ageing process may be suspected as the important contributor to a smell and taste disorder.

## MANAGEMENT OF SMELL AND TASTE DISORDERS

When a patient presents with such a disorder, they initially need counselling and reassurance that they do not have a malignant disease or infection. Once diminished smell is diagnosed, the goal of management entails preventing injury related to this. Visual stimulating gas detection devices are good for those with a gas stove, as the person may not be able to smell gas leaks. Relatives or neighbours need closer involvement to check for spoiled food that if eaten could lead to food poisoning. People who have taste disorders may benefit from flavour enhancement of their foods. Flavours are mixtures of odorant molecules that can be extracted or blended from natural products, or synthesised based on chromatographic and mass spectrographic analysis of natural products. Flavour enhancers supplement, enhance, or modify the original taste or aroma of a food but do not have a characteristic taste or aroma of their own. Salt is the most widely used additive in flavour enhancement, but others such as monosodium glutamate are also commonly used. Flavour enhancement for the elderly and sick can improve food palatability and acceptance, increase lymphocyte counts, reverse or slow functional decline, and improve overall quality of life. It also has the potential to compensate for anorexia.<sup>22</sup> An additional study found that flavour enhancement for elderly retirement home residents resulted in improved immune status as determined by T and B cell levels and improved grip strength.<sup>22</sup> Taste and odour stimulation has also been shown to increase the rate of salivary IgA in the elderly person.<sup>23</sup>

## SUMMARY

This article has briefly summarised what is known about ageing and smell and taste disorders. More research is required in this field, along with increased awareness to discover new management options to benefit those with these disorders.

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