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Function & dysfunction of olfaction

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Olfaction represents an ancient and evolutionarily critical physiologic system. Accordingly, smell is one of the several special sensations (visual, auditory, and olfactory) used to monitor the human environment. Also it helps by warning us to escape or avoid from dangerous situations (spoiled foods, fire, and leaking natural gas) and is closely related with taste sensation by allowing us to enjoy the pleasure of flavor when eating. Furthermore, smell plays an essential role in memory and emotion. The general role of olfaction is to alert and drive our attention away from hazards (e.g., microbial threats and poisonous fumes) and focus on items with positive connotations (e.g., nutritious food). This guidance is predominantly driven by the balance (pleasantness/unpleasantness) of the odorous item (e.g., food). Factors that affect human olfaction includes structural aspects of the nasal cavity that can modulate airflow and therefore odorant access to the olfactory cleft, and inflammatory disease, which can affect both airflow as well as olfactory nerve function. After signals are generated, olfactory information is processed and coded in the olfactory bulb and disseminated to several areas in the brain. The discovery of olfactory receptors by Axel and Buck sparked greater understanding of the molecular basis of olfaction. However, the precise mechanisms used by this system are still under great scrutiny due to the complexity of understanding how an enormous number of chemically diverse odorant molecules are coded into signals understood by the brain. Additionally, it has been challenging to understand olfactory sensation due to the multiple areas of the brain that receive and modulate this information. Consequently, our knowledge of olfactory dysfunction in humans remains primitive. Olfactory dysfunction is a relatively common disorder that is often under-recognized by both patients and clinicians. It occurs more frequently in older ages and the male population, decreases patients' quality of life, as olfactory dysfunction may affect the emotion and memory functions. Three main causes of olfactory dysfunction are sinonasal diseases, upper respiratory viral infection, and head trauma. Aging process is also a cause of loss of smell and other potential causes include neurodegenerative diseases (including Parkinson disease and cognitive impairments), medications and toxin exposure. Olfactory dysfunction is classified quantitatively (hyposmia and anosmia) and qualitatively (parosmia and phantosmia). From a pathophysiological perspective according to anatomical location of lesion, olfactory dysfunction is also classified by conductive, sensorineural types and central dysfunction. Conductive olfactory loss is any process that causes sufficient obstruction in the nose preventing odorant molecules from reaching the olfactory epithelium. Sensorineural olfactory loss is any process that directly affects and impairs either the olfactory epithelium or nerve. Central dysfunction results from damage/loss of the olfactory processing pathways of the central nervous system. We will discuss the anatomy and physiology of olfaction, pathophysiology and clinical features of olfactory dysfunction focusing on the major smell disorders.

Key Words: Smell, Olfaction, Function, Dysfunction, Olfaction disorders

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