

Biomedical Gastronomy in the Management of Smell and Taste Disorders

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Introduction

Whether one lives to eat or just eats to live, the consumption, ingestion and digestion of foods and beverages comprise a complex system of intertwined signals and rituals. These signals arise from visceral and sensory sources, modulated by psychological, psychosocial and cultural influences, and by external or extrinsic influences. They create the phenomenon of appetite which dictates food choice, pleasure and quality of life.

Food choice and food intake are guided by both sensory and metabolic processes with taste and smell playing key roles in influencing choice, intake and appetite [1]. Food intake is under the joint control of internal signals and external cues [2], with psychological and psychosocial aspects influencing both intrinsic and extrinsic cues.

With some diseases and treatments, the balance of this system becomes perturbed with appetite becoming diminished. In mild cases homeostatic mechanisms prevail, but when severely perturbed malnutrition prevails.

Taste and smell alterations (TSAs) commonly occur both in the pathosis and in the management of diseases. Many are side effects of a variety of therapeutic agents [3] and of particular note are those employed in cancer chemotherapy. As well as TSAs, appetite loss along with nausea and vomiting are common side effects of chemotherapy.

The complexity and regulation of the eating process [4], with the motivation to eat depends on numerous factors of which intrinsic, psychological and extrinsic factors are significant.

Intrinsic cues comprise both the mechanisms relating to hunger and the satiety cascade and to the intrinsic properties of the food conferring taste, smell and somatosenses [5]. The flavour of food is perceived through the senses of taste, smell

and somatosensory (texture and chemesthesis), along with oral function, as a composite neural 'image' which is perceived in the mouth [6].

Psychosocial factors, influence the perception, represent cues independent of food and comprise social interactions, accessibility and atmospherics of the manner in which food is presented or provided [7]; neuromodulation is induced by extrinsic factors [8].

Extrinsic factors and cues are considered to be those involving food behaviour with a focus on the context and process in which food and beverages are consumed. They include the ambience, place, sound, company, presentation and related factors. A significant body of information, recognised as gastronomy, is available from hospitality, restaurateurs and related industries. but its application to the 'healing environment' is wanting. An extrinsic approach conjoins the senses of the ambience, purpose of meals, and is a tool to evoke multisensory embodied experiences [9]. It combines culture, and identity and beliefs in eating, and the role of the 'meal and the table'. Gastronomy potentially has a valuable place in health care establishments [10].

A recent literature review considering the role of interventions of patients with TSAs resulting from cancer chemotherapy [11], found a confusing picture with a lack of consistent data.

Intrinsic approaches based on flavour enhancements, often in conjunction with nutrient enhancement and textural changes, use of therapeutics and other avenues were generally unsuccessful in encouraging eating and preventing the patient from developing malnutrition; few clinical trials were reported.

Psychosocial approaches comprised reports with diverse interventions ranging from direct counselling and education to personal involvement in coping strategies. Some encouraging

reports indicated improvement when the patient was counselled prior to treatment, became involved in their own care, and were involved with others such as family and carers.

Extrinsic approaches represent those involving food behaviour and focusing on the context of the food and the eating process represent a largely unexplored field in respect to the biomedical environment.

A lack of consistency was noted in the lexicon used in publications in which the terms taste and flavor are confused - taste ought represent gustation and flavor represent the composite of smell, taste and somatosenses.

In summary, interventions based on intrinsic cues and factors are poorly accepted, and are confused by inconsistent research, diversity of treatments and staging, and primary lesions. Interpretations can be confounded by therapies for other comorbidities such as antihypertensive pharmaceuticals, leading to unreliable estimates of incidences and outcomes. Psychosocial and psychological techniques have provided some success with psychoeducation having significant value. Extrinsic approaches based on gastronomy are lacking. Several publications concluded that further research of taste and smell alterations and interventions are necessary.

Discussion

Significant advances have been made in the early diagnosis and the treatment of malignant diseases, but at the same time the side effects of cancer chemotherapy remain significant especially in relationship to taste and smell alterations. Loss of flavor perception, distressing to the cancer patient for the loss of appetite and the enjoyment of food, presents a serious problem leading to the development of malnutrition, wasting and malignant cachexia. It contributes to morbidity, is associated with diminished treatment outcomes [12,13] and compounds with psychological and psychosociological problems [14,15].

The literature lacks consistent or significant intervention strategies available for the patients who suffer taste and smell alterations arising from cancer chemotherapy. Currently studies are based on data from patients, ranging from self-reporting and surveys, and diverse assays, with studies from differing primary pathologies, different chemotherapeutic regimes along, with various patient ages, comorbidities and divergent disease staging.

Food selection and the motivation to eat is complex and represents physiological (intrinsic), psychosociological and environment (extrinsic) influences and cues. Numerous papers refer to factors influencing the motivation to eat but limit their scope to suggestions, not applications. Many of the currently used interventions directed towards enhancing intrinsic factors of food were considered to be ineffective in

many studies.

Flavor, comprising the senses of taste smell and somatosenses, has an important physiological role in eliciting the cephalic phase response (CPRs) [16]. A link between extrinsic cues of consumption influencing appetite with the cephalic phase responses is rarely considered in patients undertaking chemotherapy. Currently, few associations with the cephalic phase responses (CPRs) are made or proffered. Much of the research available has centered around obesity studies. There is a lack of appreciation of the vital physiological role of taste and smell on the CPRs in the feeding process in promoting appetite, and preparing the gastrointestinal tract and brain related systems for the consumption and digestion of food, and a lesser extent beverages. It enhances the process of digestion and prepares the body for the perturbation of homeostatic control resulting from the feeding process [17,18]. Anticipatory cues from extrinsic sources have a bearing on Pavlov's classic research [19].

Cognitive factors play an important role in food anticipation in humans. The mere discussion about food triggers insulin release – a component of anticipation [20] and expected food palatability influences cephalic response [21]. An understanding of cognitive capacities in food anticipatory responses is lacking [22], and are likely influenced by rituals, ambience, presentation, and other aspects to enhance pleasure and flavor. Indeed, hospitality is based in this; ambience markedly influences food choice [23] and impact flavor [24].

The value of cues based on extrinsic factors is considered rarely in the management of patients with TSAs despite their use by restaurateurs and many in hospitality. The extensive studies by Charles Spence [25] and associates at Oxford afford significant applications in the emerging interdisciplinary field of gastrophysics – a melding of gastronomy and psychophysics. It pertains to the physical and physicochemical description of the empirical world of gastronomy, with a focus on sensory perception in the oral cavity [26].

The close association between CPRs and the control of eating and digestive behaviours is multifaceted and when the influences of taste and smell are diminished other contributing factors guiding CPRs, currently under researched, may compensate this deficit. The complexity of eating behaviour necessitates a greater focus on multidisciplinary research [27] between physiology, environment, psychology, culture, socioeconomics, and genetics.

Extrinsic cues are within the remit of the scope of gastronomy, especially those elements of the eating process, including the venue, the setting, the ambience, which provide an opportunity by implementing aspects based on the principles and practices of multisensory technology for flavor augmentation [28]. These are coupled with social and

sociological aspects of culture, education and involvement and an understanding of the feeding process.

The role of the eating environment has received only cursory considerations in the management of TSA and their outcomes. Myriad factors comprise the 'eating environment' [29], and how and what is consumed. A recent trend has seen the exploration of healing spaces and healing environments [30]; these environments do not cause healing but facilitate engagement in behaviours and emotions that support healing and represent extrinsic influences. The environment can induce physical and emotional responses such as happiness and joy (reduced distress) and promote relaxation, and the build environment can enhance individual control and functionality – all of which are antecedent to healing [31,32].

There is a wealth of information concerning extrinsic multimodal and cross sensory influences in food but seldom finds application in health sciences, taking a place secondary to active disease management. By introducing a gastronomic extrinsic approach in conjunction with psychological and sociologic management as an intervention for TSAs may enable intrinsic approaches to ameliorate the 'ravages' of malnutrition, and may assist in countering some heterogeneities of treatment regimes. There is a potential role for gastronomy to encourage patients with TSAs to obtain pride, purpose and potential pleasure in the consumption of food and beverages in an enhanced gastronomic environment. This could be achieved through the recognition of multidisciplinary biomedical gastronomy. It is not just when, what and how much you eat, but the way, where and how you eat.

Various directions of research need to be undertaken:

- extrinsic approaches based on knowledge gained from gastronomy conjoined with psychoeducation need to be explored by a dedicated team liaising with clinical support.
- studies of the potential influence as an extrinsic approach for interventions having a focus on CPRs,
- psychosocial investigation of the value of extrinsic factors on healing and prevention of malnutrition and potential economic values in cost of treatment with respect to aspects of patient stay time and food wastage.
- value to the mental health of the patients and to those caring as health professional, and families of patients.

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