

食品的品質與風味

1. 食品品質、水產食品的鮮度品質
2. 食物特性與知覺
3. 嗜好性與接受性

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食物所具備的要素

- ◎ 安全性
- ◎ 營養性
- ◎ 美味性（嗜好性）
- ◎ 保存性
- ◎ 便利性
- ◎ 經濟性

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食品機能(functionality of foods)

- ◎ 一次(primary) 機能：營養特性
- ◎ 二次(secondary) 機能：嗜好特性
- ◎ 三次(tertiary) 機能：生理特性
- 四次(quaternary) 機能：人際媒介特性

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飲食消費習慣

- ◎ 多樣化
- ◎ 美味
- ◎ 高品質、高級化
- ◎ 簡便化
- ◎ 健康營養訴求
- ◎ 個性化
- ◎ 外食

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表3 21世紀食品工業發展趨勢

	變 革	潮 流	產品訴求	飲 食 意 識 之 變 化	健 康 之 表 現 與 飲 食 之 配 合
21世紀 消費趨勢	資訊化 技術創新 人性化	國際化 多樣化 文化創造化 高齡化 地方色彩化 休閒化 自由時間	美味取向 健康取向 文化取向 天然原品取向 多樣化取向 高科技取向		

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TABLE 1.
THE CRITERIA USED BY 200 WOMEN IN DEFINING FOOD QUALITY IN DESCENDING
ORDER (GOOD HOUSEKEEPING INSTITUTE, 1984)

Criteria	% of women
Freshness/as fresh as possible	52.5%
A good appearance/good color	29.5
It tastes good	23.5
Contains no preservatives	14.0
It is nutritious	14.0
No additives/few additives	13.5
Has a good texture	13.0
Natural	11.5
Has less fat	10.0
Has no chemicals in it	5.5
Contains good ingredients	5.5
The brand name	5.5
Has a good smell	5.0
Is not bruised/damaged in any way	5.0
Well packaged	4.5
It is within the date for expiration	3.5
Pure/no contaminants	3.5
Has no fillers	3.0
Has no sugar/less sugar	3.0
It is not processed	2.5
Meat is a good tender cut	2.5
The vitamins aren't lost	2.5
The price is reasonable	2.5
Contains no coloring	2.5
Not overly spiced or seasoned	2.0
It doesn't look like canned	2.0
The best you can buy	1.5
The label and what it contains	1.5
Other (one or two mentions each)	15.0

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FOOD QUALITY: CONSUMER ACCEPTANCE AND SENSORY ATTRIBUTES

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ABSTRACT

The quality of foods is intricately related to the sensory properties of food products. Several dimensions of quality are functions of sensory characteristics. The proposed system for measuring food quality includes determining key product attributes and measuring conformance to those attributes. Both descriptive analysis, to document products, and consumer input, to measure affective responses, contribute substantially to defining sensory product specifications.

Descriptive data are related to overall consumer acceptance, to consumer acceptance for appearance, flavor and texture, and to key consumer attributes. These relationships allow management to set realistic and effective specifications for quality control.

INTRODUCTION

Understanding food quality requires a clear definition of quality and how it relates specifically to foods. In general, quality is seen as consistent conformance to consumer expectations. These expectations require the presence of product dimensions that define its character and its usability. Once a product possesses the necessary attributes to insure this product integrity, it must then conform to those required product attributes in a consistent manner.

The dimensions of quality, as outlined by Plsek (1987) are described in Table 1. Quality dimensions define the product requirements or attributes that are necessary to meet consumer expectations for product integrity. These dimensions are broadly drawn and can be applied to products, as well as services. Two broad applications of the quality dimensions to both a product and a service are shown in Table 2, which lists the examples of quality dimensions for a product, a stereo amplifier, and a service, a bank checking account (Plsek 1987).

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FOOD QUALITY:

CONSUMER ACCEPTANCE AND SENSORY ATTRIBUTES

ABSTRACT

- 食品品質很複雜地牽連於產品的感官性質(sensory properties)。
- 構成品質的(數個)層面等同於感官特性的函數。量測食品品質所提出的系統，包括決定主要產品屬性與量測如何一致的表達那些屬性。
- Both descriptive analysis, to document products, and consumer input, to measure affective responses, contribute substantially to defining sensory product specifications.
- Descriptive data are related to overall consumer acceptance, to consumer acceptance for appearance, flavor and texture, and to key consumer attributes. These relationships allow management to set realistic and effective specifications for quality control.

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INTRODUCTION

- 欲瞭解食品的品質，品質就必須要有清晰的定義，及該定義如何特定地關連至食品。
- 通常認為品質是：能一致的合乎消費者的預期(consumer expectations)。而這些預期需要 the presence of product dimensions that define its character and its usability。
- 一旦，產品已具有必要的屬性來證明產品的完整性(product integrity)，其次是採用一致的方法來訂定該產品的品質。

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Food Storage Stability

From "Food Storage Stability" ed. By I.A. Taub and R.P. Singh, CRC Press, 1998

Introduction

Definition of food quality

It is clear from other chapters in this volume that the term "food quality" has a variety of meanings to professionals in the food industry. To nutritionists it is synonymous with the nutritional value of the food, to microbiologists it refers to the food's safety, while to chemists it may equate to the item's stability. Although each of these interpretations of "food quality" has merit, consumers, through their purchase and/or nonpurchase of the product, must certainly be considered the ultimate arbiters of food quality. With this fact in mind, the meaning of food quality to the consumer becomes of critical importance to the discussion of the quality preservation of food.

The notion that food quality must ultimately be defined by consumer perception is embodied in the frequently cited definition of food quality as "the combination of attributes or characteristics of a product that have significance in determining the degree of acceptability of the product to a user," because it serves as the basis for determining both the relative importance of factors that contribute to food quality and the appropriate methods for measuring it. Another definition of food quality that places even greater emphasis on the perceptual aspects of food quality derives from a definition of *sensory quality*.¹ It defines food quality as "the acceptance of the perceived characteristics of a product by consumers who are the regular users of the product category or those who comprise the market segment."¹ In this definition, the phrase "perceived characteristics" refers to the perception of all characteristics of the food, not simply its sensory attributes. Thus, it also includes the perception of the food's safety, convenience, cost, value, etc.

By defining food quality in terms of the consumer's perception of it, this chapter will necessarily focus on the factors and mechanisms that can influence consumer perceptions of foods and beverages and on the available methods by which consumer perceptions of food can be measured. In addition, the relationship between perceived food quality and the common notion of "consumer acceptance" will be explored.

Intrinsic vs. extrinsic factors affecting food quality

The factors that affect consumer perception of food and food quality are numerous. Many of these factors are intrinsic to the food, i.e., related to its physicochemical characteristics. These include such factors as ingredient, processing, and storage variables. These variables, by their nature, control the sensory characteristics of the product, which, in turn, are the most salient and important variables determining both the acceptability and perceived quality of the item to the user. In fact, it is usually through sensory characteristics and the changes that occur in them over time that consumers develop their opinions about other aspects of food quality, e.g., safety, stability, and even the nutritional value of the

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Food Storage Stability

Definition of food quality

- 從文獻可得知，在食品工業之中，food quality 會有不同涵義。對營養學家而言，其意義等同於食物的營養價值；對微生物學家則意謂食品的安全性，對於化學家又如同等於食品的安定性。
- 雖然每一種解釋都有其優點，消費者透過 their purchase and/or nonpurchase of the product, must certainly be considered the ultimate arbiters of food quality.
- With this fact in mind, the meaning of food quality to the consumer becomes of critical importance to the discussion of the quality preservation of food.

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- 食品品質終須以消費者的認(感)知 (consumer perception) 定義概念，也是具體表現自常被引用的食品品質的定義：the combination of attributes or characteristics of a product that have significance in determining the degree of acceptability of the product to a user。
- A critical phrase in this definition is "**acceptability of the product to a user**," because it serves as the basis for determining both the relative importance of factors that contribute to food quality and the appropriate methods for measuring it.

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- 另一項食品品質的定義引用來自**感官品質**(sensory quality) 的定義，更加重視食品品質的**感知層面**(the perceptual aspects of food quality)，定義：the acceptance of the perceived characteristics of a product by consumers who are the regular users of the product category or those who comprise the market segment。
- 此定義中的"**perceived characteristics**" 意謂 the perception of *all* characteristics of the food, not simply its sensory attributes。因此，也包括食品的安全性、便利性、成本、價格等等的感覺。

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TABLE 1.
DIMENSIONS OF QUALITY

<i>Dimension</i>	<i>Meaning</i>
Performance	Primary product or service characteristics
Features	Added touches, "bells and whistles,"
Conformance	Match with specifications, documentation
Reliability	Consistency of performance over time
Durability	Useful life
Serviceability	Resolution of problems and complaints
Response	Human-to-human interface
Aesthetics	Sensory characteristics—sound, feel, etc.
Reputation	Past performance and other intangibles

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品質的層面

層面要因	涵義
性能 Performance	產品或服務之首要特性
特色 Feature	新增的特點
一致 Conformance	符合規格及廣告文件的內容
信賴性 Reliability	使用後性能的與時改變或一致性
耐用性 Durability	可使用期間
服務性 Serviceability	問題與抱怨之解決
回應 Response	人性化介面
美學 Aesthetics	官能的特性—聲音、感覺等
信譽 Reputation	以往的性能與其它無形的

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TABLE 2.
EXAMPLES OF QUALITY DIMENSIONS

Product Example: <i>Stereo Amplifier</i>	Service Example: <i>Bank Checking Account</i>
Power	Process time
Remote control	Automatic bill paying
Workmanship	Accuracy
Mean-time-to-failure	Process time variability
Useful life	Pace with trends
Ease of repair	Resolution of errors
Courtesy of dealer	Courtesy of teller
Oak finished cabinet	Lobby appearance
Consumer Reports rating	Word of mouth, years in business

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層面 要因	產品： 立體聲擴大機	服務： 銀行活期存款
性能	◎ 功率	◎ 作業時間
特色	◎ 遙控	◎ 自動現金給付
一致	◎ 製品做工	◎ 正確性
信賴性	◎ 性能衰減平均時間	◎ 作業時間變動性
耐用性	◎ 可使用壽命	◎ 與趨勢同步
服務性	◎ 維修容易	◎ 錯誤的解決
回應	◎ 店家的親切度	◎ 出納員的親切度
美學	◎ 原木外殼	◎ 門廳的外觀
信譽	◎ 消費者報告的評價	◎ 口說、各年度營業額

TABLE 3.
QUALITY DIMENSIONS FOR FOODS

Dimension	Food Product Example
Performance	Sensory attributes, nutrition, wholesomeness
Features	Convenience
Conformance	Concept match
Reliability	Consistency of sensory attributes
Durability	Shelf-life, preparation tolerance
Serviceability	Ease of preparation
Response	Consumer Hot-Line
Aesthetics	Sensory attributes, package
Reputation	Brand name

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QUALITY DIMENSIONS FOR FOODS

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Reputation	Brand name

層面要因	食品產品
性能	◎官能屬性、營養、合乎衛生
特色	◎便利
一致	◎符合概念
信賴性	◎官能屬性的一致性
耐用性	◎貯藏壽命(食用期限)、處理耐受性
方便性	◎處理容易度
回應	◎消費者熱線
美學	◎官能屬性、包裝
信譽	◎品牌

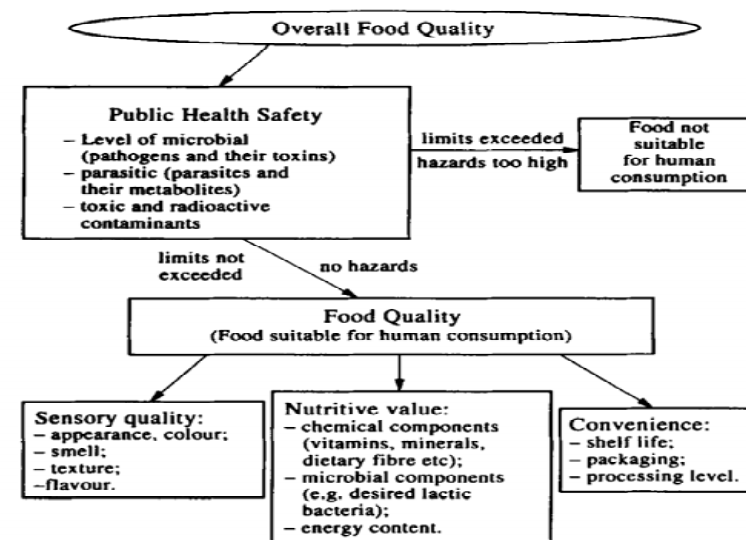


FIG. 1. Definition and description of food quality.

From: P. J. Molnar, 1995. a model for overall description of food quality, Food Quality and Preference 6:185-190.

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Concepts for modelling the quality of perishable products

M. Stooft, L.M.M. Tjiskens and E.C. Wilsson

Trends in Food Science & Technology May 1996 (Vol. 7)

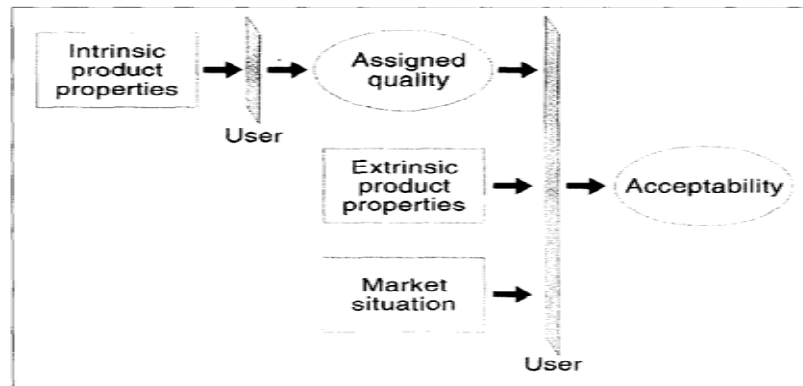
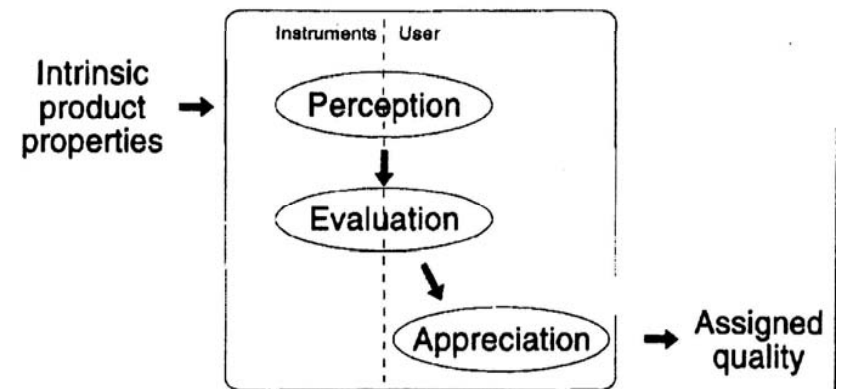


Fig. 1

A user evaluates intrinsic product properties to assign quality to a product. By also taking into account extrinsic product properties and the market situation, the user determines the acceptability of the product.

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Steps in quality assignment to a product by a user. For the perception and evaluation steps, instruments and/or human senses may be used, whereas appreciation is assessed entirely in the mind of the user.

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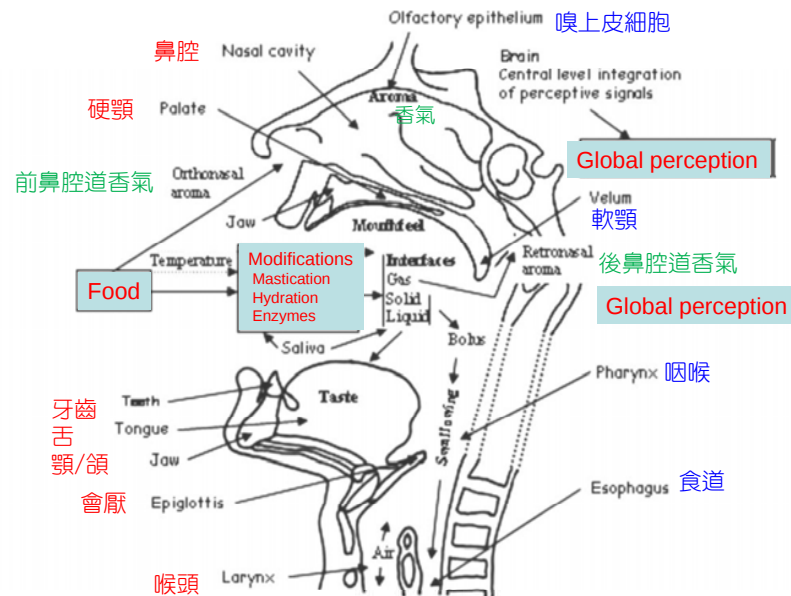


Fig 1. Oral organ cross section diagram: main events occurring in mouth.

Steps in quality assignment

Perception

步驟一：使用儀器或人類知覺來認知內部的產品性質。

- 有些性質如維生素C含量，僅能儀器測定；這些即是所謂的隱藏屬性(hidden attributes)。其餘性質現今都能以人類知覺（例如：風味）做最好的評定。
- 透過認知，將產品的內部性質轉變為品質屬性(quality attributes)。
- 單一項的品質屬性可能是基於幾項的產品品質而構成。
- 官能的認(感)知是複雜的，即使蘋果的粉性(mealiness)，無疑地是項品質屬性，但不表示和cell juice量是一對一的關係。粉性也和咬碎時蘋果組織如何的破碎有關，粉性感覺因順著細胞壁破碎而增強，故阻擾認(感)知果汁及存在原細胞處的糖份。食用者因而經驗一個粉性蘋果是乾(欠缺多汁性感覺)的，雖然它含有和脆蘋果幾乎一樣的汁液量。

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Evaluation

- 步驟二：評估所認知的品質屬性，決定其強度或表示數值。
- Evaluation can also be conducted both by instruments and by human senses.
- 由於認知與評估的工作都是接連一起，產品屬性的認知與評估常用相同的“設備”來執行，亦即採用儀器或者人類知覺。
- 一刺激（物）強度和人類感官所經驗之對應的知覺之間的相關性並非是一單純的線性模式。經常在高強度時由於人類知覺已飽和，而變得平緩；反之，低於某一閾值強度(threshold intensity)之刺激強度，使用者將全然無法感知。
- Another characteristic of using human senses instead of instruments to evaluate quality attribute is a possible shift in perceived intensity following the evaluation of several products.

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Appreciation

- Once the quality aspects have been perceived and evaluated, they can be converted into appreciations.
- 在諸多的例，從一品質層面的評估與評斷之間的相關，顯示都會出現明顯的最適值：喜好度隨強度的增加而上升，達no preference區域時變平緩，之後強度的再增加，喜好度急速下降。非常稀鹽溶液不被認同，很濃的鹽液也是。
- 最後，個別品質屬性的評斷綜合至 a uni-dimensional quality measure，在此步驟，個別的品質屬性以及品質屬性的組合都指定其相對權重(relative weights)。
- 這些的權重(weights)反映社會-心理因素，包括個人喜好、趨勢、傳統及身分信條等，對於一產品指定其品質之影響。社會-心理因素決定要採用的屬性，以及那些屬性的重要性順序。

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- 通常咸認為：易腐壞產品的品質取決於以下三因素，即產品本身、使用者及市場狀況，因為如此，要定義品質是什麼與如何管控是有所困難。
- 若分解這些影響品質的因素，可瞭解 the assigned quality and the acceptability of a product 的差別。Assigned quality 指一消費者對於一種產品的品質概念，這來自消費者就特定的標準評估該產品。接受性(acceptability)則在特定的情況下，定義消費者是否有意願去購買一產品，這來自比較其 assigned quality和其他產品之間以及和外在因素例如價格之結果。
- 產品與消費者研究的重點在於 assigned quality，市場研究則聚焦於產品接受性(product acceptability)。
- Assigned quality的變化可透過品質變化模式來模擬，此模式包含 separate models for the quality assignment, for the product behaviour and for the product environment.

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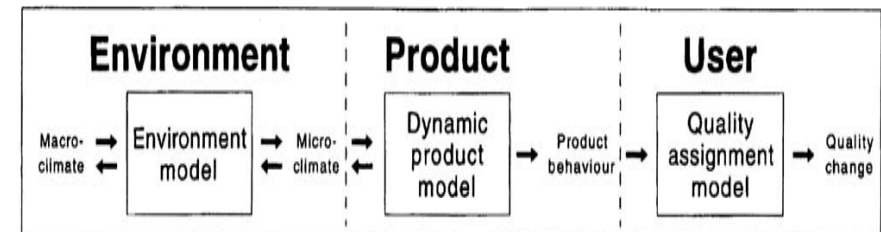


Fig. 2

A quality change model is a composition of three separate submodels for the entities affecting the changes in assigned quality: the quality assignment by the user, the physiological behaviour of the product in a particular environment and the changes in this environment.

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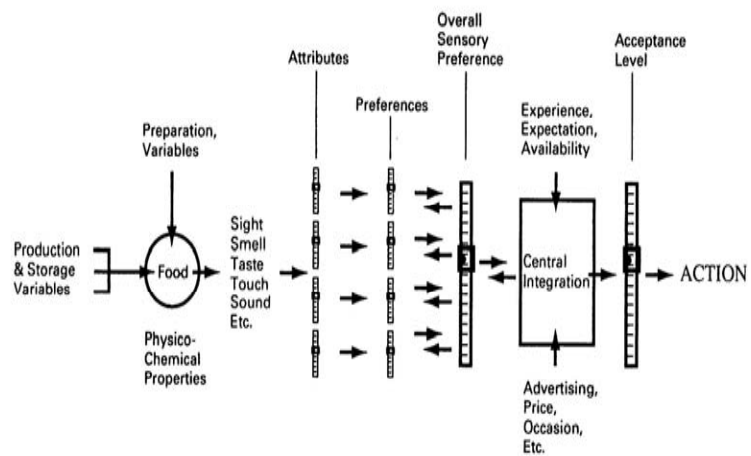


Figure 1 Land's model of the sensory and cognitive factors that contribute to food acceptance action. (From Land, D. G. In *Sensory Quality in Foods and Beverages*. Ellis Horwood: Chichester, U.K., 1983. With permission.)

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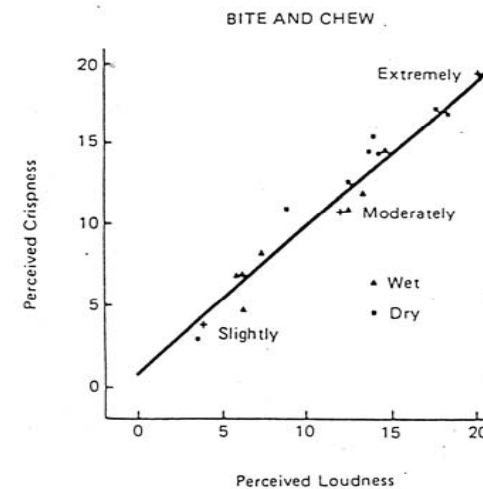
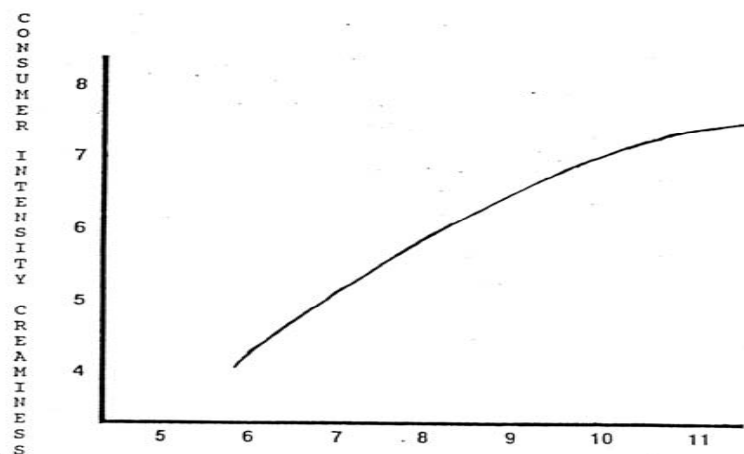


FIG. 4. RELATIONSHIP BETWEEN LOUDNESS AND CRISPNESS AFTER BITING AND CHEWING WET AND DRY FOOD SAMPLES
The solid line is the function derived from the appropriate linear regression equation.
[Reprinted from *Journal of Food Science* 1981, 46 (2), 574-578. Copyright © by Institute of Food Technologists.]

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QT DESCRIPTIVE ATTRIBUTE INTENSITY
ATTRIBUTE: SMOOTHNESS/LACK OF PARTICLES
FIG. 3. CONSUMER INTENSITY CREAMINESS AND DESCRIPTIVE INTENSITY CREAMINESS

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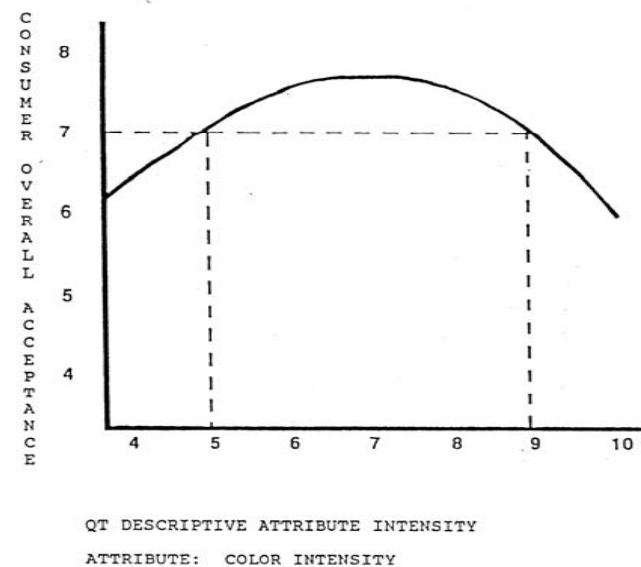
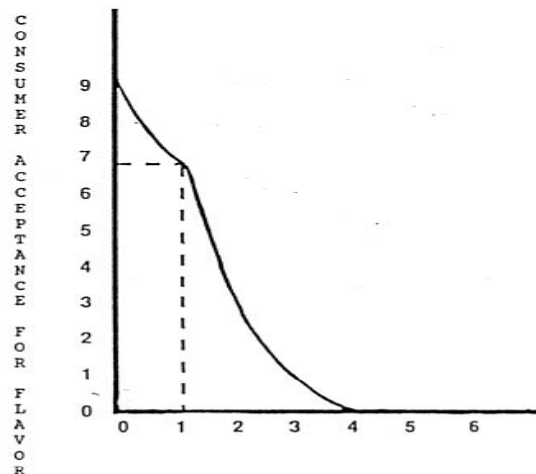


FIG. 1. CONSUMER ACCEPTANCE RELATED TO DESCRIPTIVE COLOR INTENSITY

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QT DESCRIPTIVE ATTRIBUTE INTENSITY
ATTRIBUTE: OFF NOTE: FLAVOR OR AROMA

FIG. 2. CONSUMER ACCEPTANCE OF FLAVOR AND DESCRIPTIVE INTENSITY OF OFF NOTE

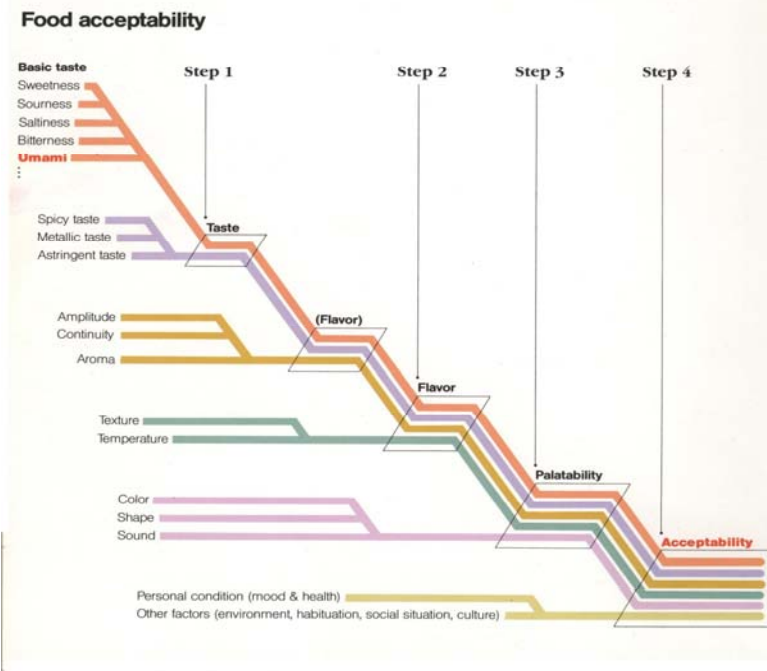
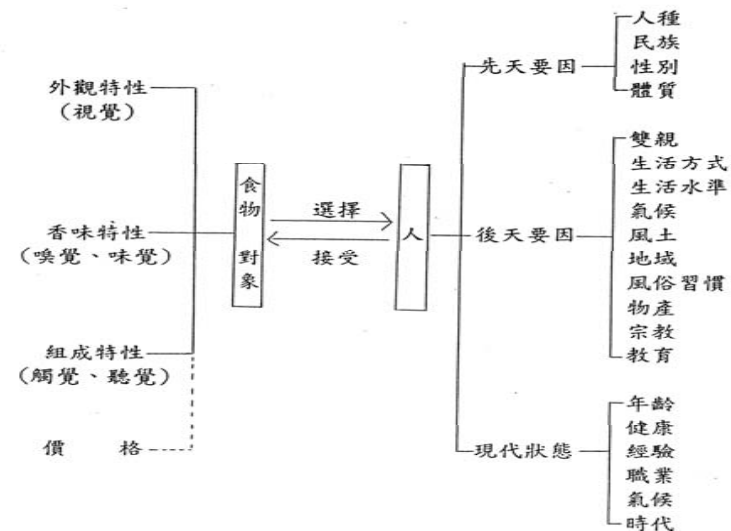


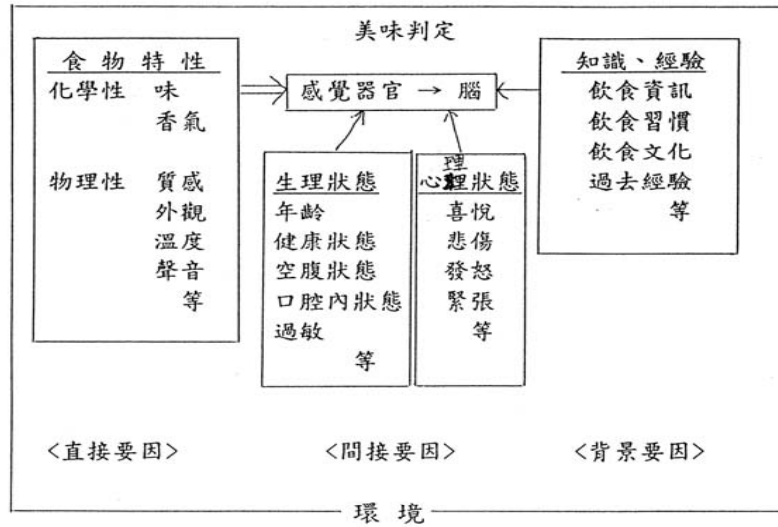
表 2 食品的二要素與嗜好

A. 生物學或生理學上要素	1. 日常生活活動所需能量的補給源：糖類、脂肪、蛋白質 2. 維持肉體的正常狀態，肉體再生產所需營養的補給源：蛋白質、維他命類、礦物質、其他微量成分
B. 心理學上要素	形狀、色、香、味、物理性質(Texture)、化學及物理的成分組織構造完整，促進食慾(其前提是易消化吸收、化學上及微生物上安全)
嗜好	1. 就各國或地域的氣候、風土、宗教、教育而自然形成的嗜好：民族嗜好、地域嗜好 2. 由年齡、生活環境所形成的嗜好：個人嗜好(教育、所得、職業、mass communication)

嗜好的要因



食物美味之構成



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食物特性和知覺的關係

Sense	Sensory property
視覺 (Vision)	形狀、顏色、組織 ...
觸覺 (Touch)	硬度、柔軟度、光滑、粗糙、脆度、彈性 ...
皮膚感覺 (Skin Sensation)	冷、熱、刺激性、收斂性 ...
嗅覺 (Smell)	香味
味覺 (Taste)	味

廣義味覺的分類

項目 (Item)	內容 (Content)
心理的味覺 (Psychological Taste)	形狀、顏色、光澤 ...
物理的味覺 (Physical Taste)	軟硬度、黏度、冷熱、齒感、口腔觸感 ...
化學的味覺 (Chemical Taste)	基本味 (basic taste)

「風味」之定義

Sensory organ	Stimuli	Sense
視覺 (Vision)	物理的 (Physical)	色、形狀... 外觀組成 (Color, Shape... Appearance composition)
嗅覺 (Smell)	化學的 (Chemical)	香氣 (Aroma)
味覺 (Taste)	化學的 (Chemical)	味 (Taste)
觸覺 (Touch)	物理化學的 (Physicochemical)	觸感 (Touch sensation)
聽覺 (Hearing)	物理的 (Physical)	聲音 (Sound)

風味 (Flavor) is defined as the combination of these senses. It is categorized into:

- 狹義 (Narrow):** 風味 (Flavor)
- 廣義 (Broad):** 風味 ⇒ 好吃 (Flavor ⇒ Delicious) or 難吃 (Unpleasant)

Factors influencing flavor include: 習慣、嗜好 (Habits, Preferences), 生理、環境 (Physiology, Environment), 健康、文化 (Health, Culture), 民族性 (Ethnicity), etc.

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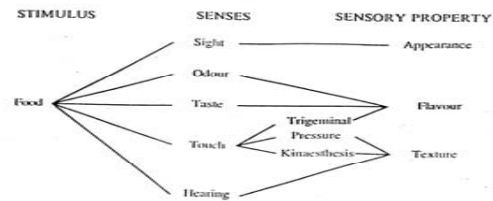


Figure 1.1 Relationship of the five senses with sensory properties.

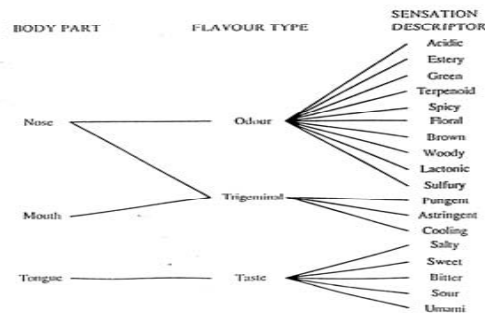


Figure 1.2 Correlation of flavor types with sensation descriptors.

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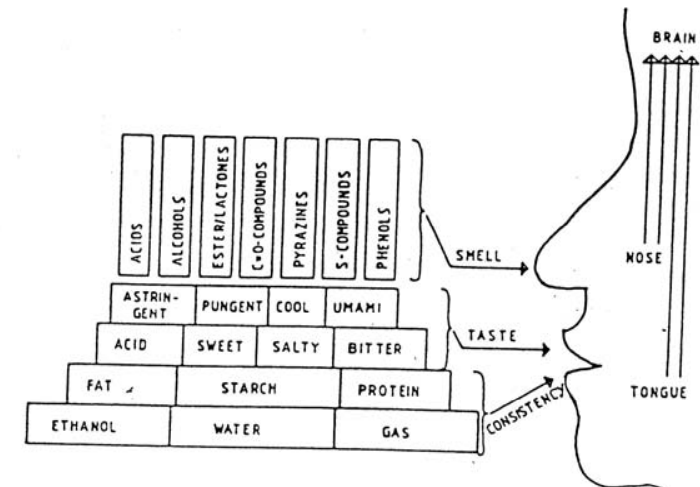


FIG. 10.1 A schematic diagram categorizing the key components of flavor in what is described as an aromagram. Each food consists of various combinations of the boxes from the three levels of smell, taste, and consistency. In addition, there will be a variety of personal, social, and cultural factors. (From Ney, 1990.)

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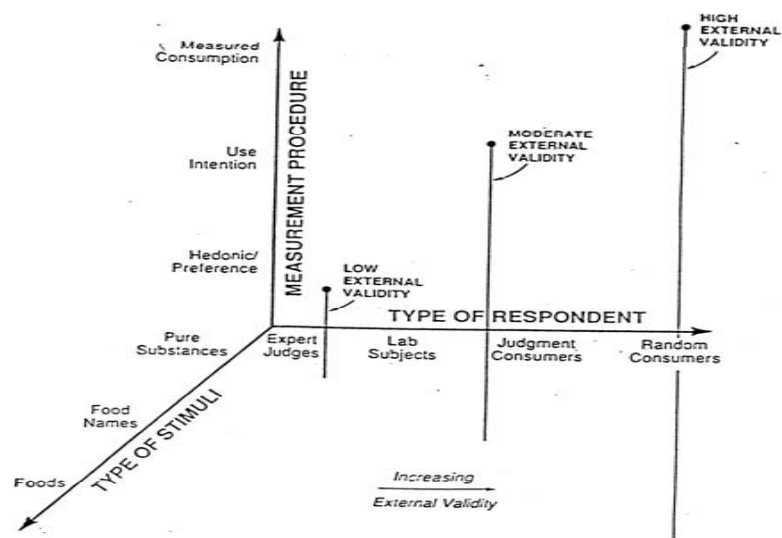


FIG. 5.1 Food acceptance validity factors.

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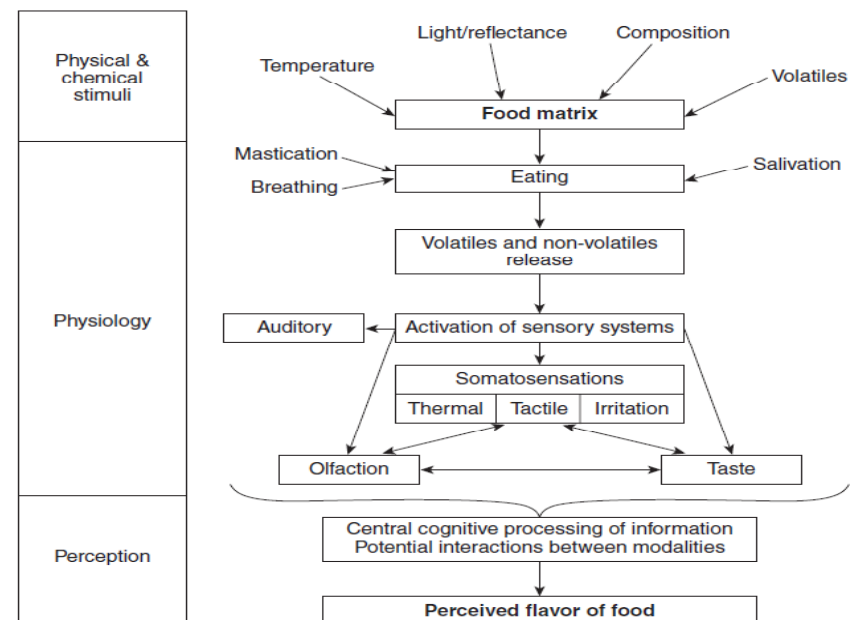
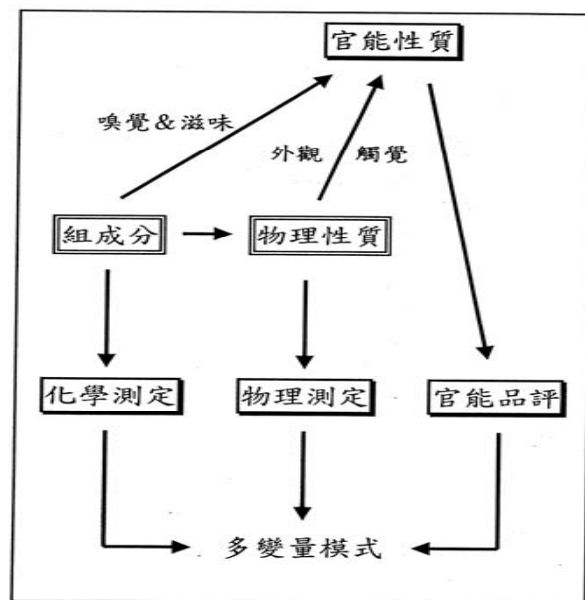


Fig. 3.1 Flow diagram outlining stages and factors involved in flavor perception (adapted from Keast *et al.*, 2004 by Charve, 2010).



產品組成與性質之間相關性的模式化

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TABLE 3.
EXAMPLE OF A COMPLEX SYSTEM—OXIDIZED LIPID FLAVORS

Associative terms from oxidized milk fat, considering individual compounds:¹

Oxidized	Grassy
Cardboard	Beany
Tallowy	Metallic
Oily	Mushroom
Painty	Cucumber
Fishy	Nutmeg
	Creamy
	Fruity

Associative terms from "Warmed-over-flavor" in beef:²

Cardboard
Oxidized
Rancid
Painty
Fishy

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TABLE 4.
AN ACCEPTANCE MODEL

Acceptance = $k_1(S_1) + k_2(S_2) + \dots k_n(S_n)$ (simple linear model)

+ $k_{12}(S_1 * S_2) \dots$ (with interaction terms)

+ $k_{1m}(S_1)^m \dots$ (higher order polynomial)

where S_n = perceived intensity of
attribute n

Intensity can also be predicted by equations such as

$$S_n = K_n (I)^b$$

Where b is the characteristic of the
power function exponent

and I is the stimulus intensity in
physical units (e.g. molarity)

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食品香味之生成要因

生成要因	食品例
(1) 原存在酵素之反應生成	水果, 蔬菜, 香辛料, 熟成肉類
(2) 微生物的酵素反應為主	乳酪, 啤酒, 酒, 醃漬物
(3) (1)+(2)	紅茶, 煙草, 乾式香腸
(4) 加熱等化學反應為主	調理加熱肉類
(5) (1)+(2)+(4)	麵包, 可可亞, 咖啡, 含酒精飲料

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食品成分之間的反應變化和品質

分類	主要的反應	主要品質之生成與變化
1. 酵素反應	脫水縮合、水解 氧化、還原	萎凋、發芽、熟成、呈色 變色、風味
2. 酵素-非酵素反應	氧化、重合、裂解、縮合	褐變、風味
3. 非酵索性反應 一般化學反應	水解、脫水縮合 Amino-carbonyl反應	呈色、變色 褐變、風味、變性
自由基反應(氧、活性 氧、光、輻射線)	氧化、過氧化、分解、重 合	劣化、變性、風味、保存 性
其他反應(熱化學、光 增感)	分解、重合	劣化
4. 分子間相互作用 (離子結合、氫鍵、疏 水性作用、電荷移動 結合)	水合化、脫水、變性、 熟成、老化、 錯化合物形成	物性、 色、香、味
5. 複合生理作用 (複數成分引起之複合生 理作用)		色、味、風味、營養生理 性、生理機能性

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