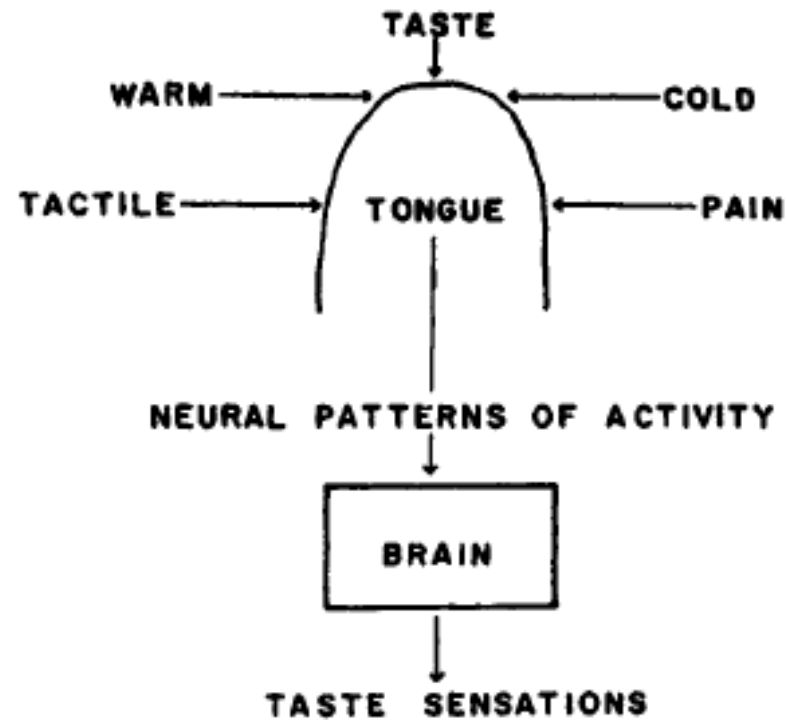


Άρωμα: γεύση και οσμή



Γεύση

- Τέσσερις βασικές γεύσεις
 - Γλυκιά, πικρή, ξυνή, αλμυρή

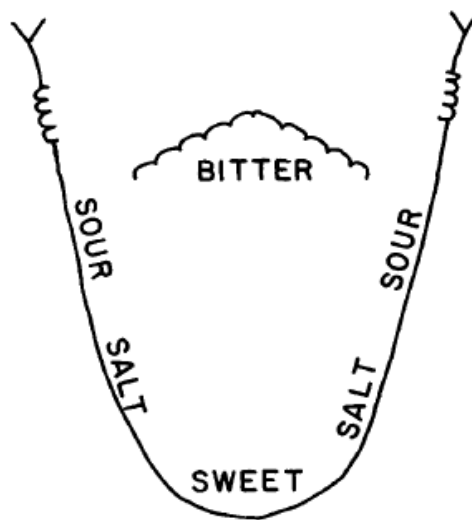
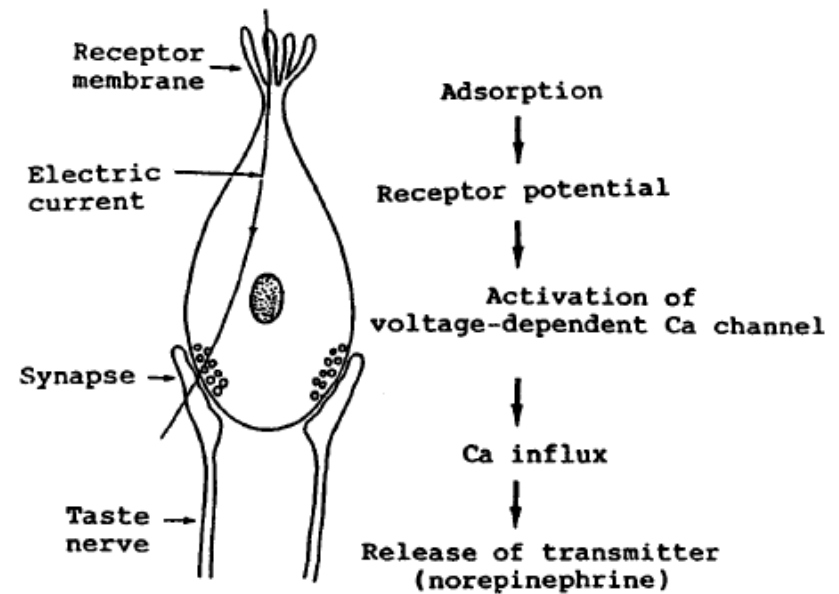
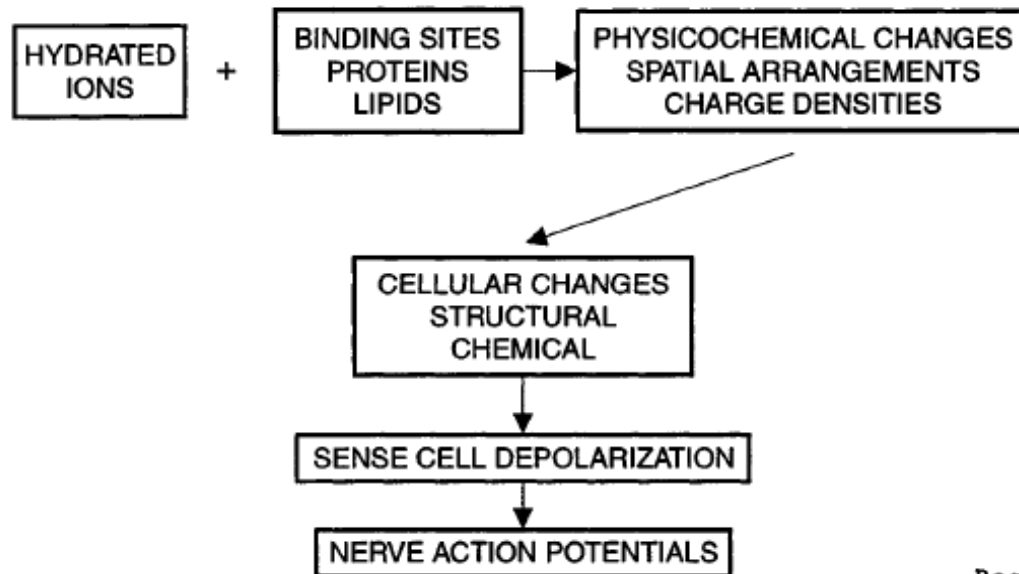


Figure 7-2 Areas of Taste Sensitivity of the Tongue

Γεύση



Γεύση και χημική δομή

- Ξυνή - οξέα
- Γλυκιά - σάκχαρα
- Πικρή - αλκαλοειδή
- Αλμυρή - άλατα

Γλυκιά γεύση

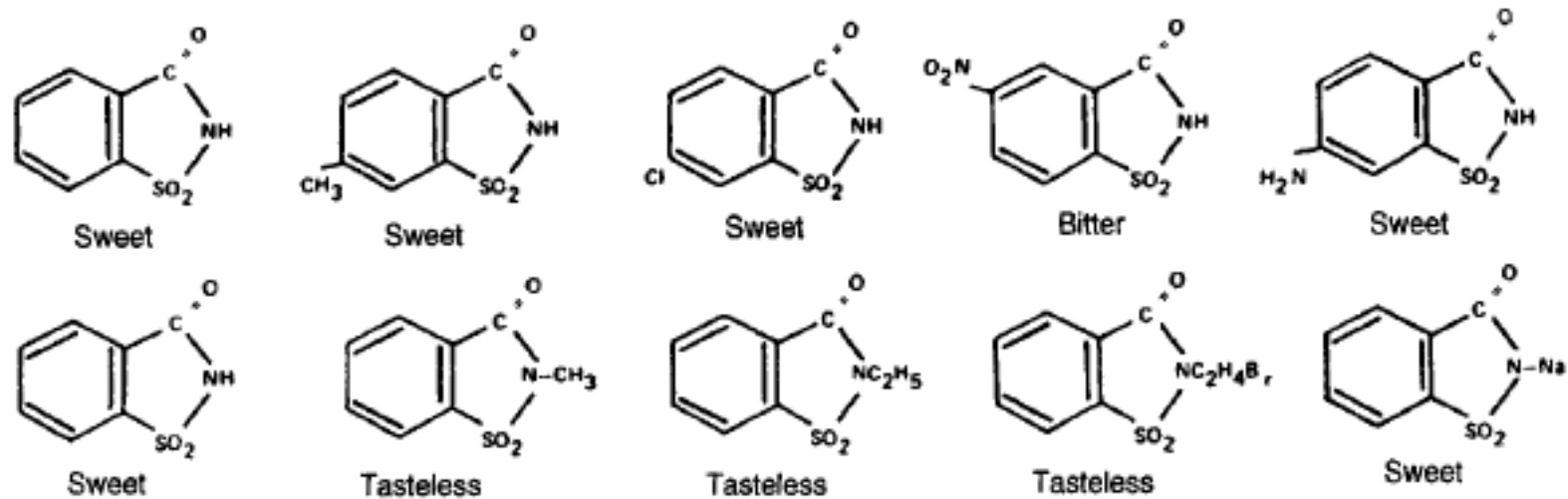


Figure 7-5 The Effect of Substitutions in Saccharin on Sweetness. *Source:* From L.M. Beidler, Chemical Excitation of Taste and Odor Receptors, in *Flavor Chemistry*, I. Hornstein, ed., 1966, American Chemistry Society.

Γλυκιά γεύση

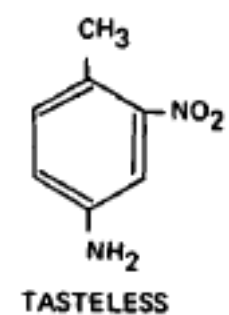
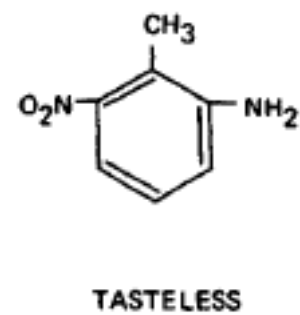
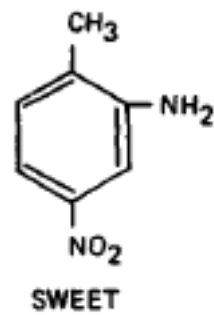


Figure 7-6 Taste of Nitrotoluidine Isomers

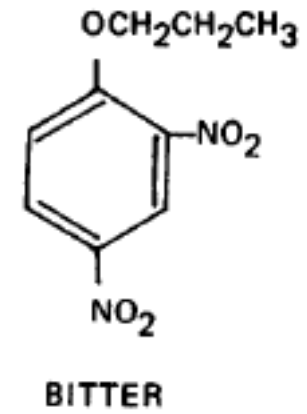
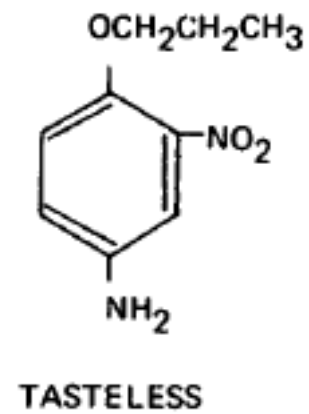
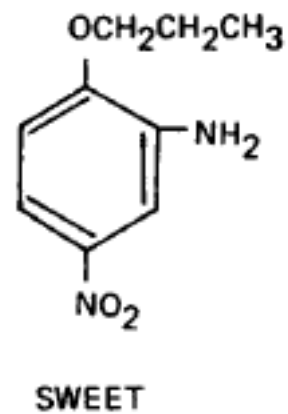


Figure 7-7 Taste of Substituted Propoxybenzenes

Γλυκιά γεύση

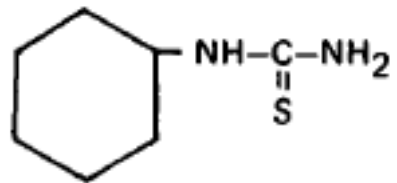
Table 7-1 Difference in Taste Between the L- and D-Forms of Amino Acids

<i>Amino Acid</i>	<i>Taste of L Isomer</i>	<i>Taste of D Isomer</i>
Asparagine	Inspid	Sweet
Glutamic acid	Unique	Almost tasteless
Phenylalanine	Faintly bitter	Sweet, bitter aftertaste
Leucine	Flat, faintly bitter	Strikingly sweet
Valine	Slightly sweet, bitter	Strikingly sweet
Serine	Faintly sweet, stale after-taste	Strikingly sweet
Histidine	Tasteless to bitter	Sweet
Isoleucine	Bitter	Sweet
Methionine	Flat	Sweet
Tryptophane	Bitter	Very sweet

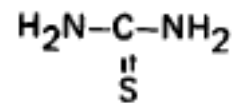
Table 7-2 Relative Sweetness of Sugars and Other Sweeteners

<i>Compound</i>	<i>Relative Sweetness</i>
Sucrose	1
Lactose	0.27
Maltose	0.5
Sorbitol	0.5
Galactose	0.6
Glucose	0.5–0.7
Mannitol	0.7
Glycerol	0.8
Fructose	1.1–1.5
Cyclamate	30–80
Glycyrrhizin	50
Aspartyl-phenylalanine methylester	100–200
Stevioside	300
Naringin dihydrochalcone	300
Saccharin	500–700
Neohesperidin dihydrochalcone	1000–1500

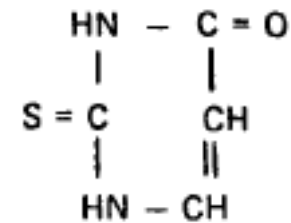
Γενετική προδιάθεση στη γεύση



Phenylthiourea



Thiourea



Thiouracil

Figure 7-9 Compounds Containing the $\begin{array}{c} \text{S} \\ || \\ -\text{C}-\text{N}- \end{array}$ Group by Which Tasters and Nontasters Can Be Differentiated

Όξινη γεύση

- H^+
- pH , τύπος οξέος, παρουσία άλλων ενώσεων

Table 7–3 Properties of Some Acids, Arranged in Order of Decreasing Acid Taste and with Tartaric Acid as Reference

<i>Properties of 0.05N Solutions</i>						
<i>Acid</i>	<i>Taste</i>	<i>Total Acid g/L</i>	<i>pH</i>	<i>Ionization Constant</i>	<i>Taste Sensation</i>	<i>Found In</i>
Hydrochloric	+1.43	1.85	1.70	—	—	—
Tartaric	0	3.75	2.45	1.04×10^{-3}	Hard	Grape
Malic	-0.43	3.35	2.65	3.9×10^{-4}	Green	Apple, pear, prune, grape, cherry, apricot
Phosphoric	-1.14	1.65	2.25	7.52×10^{-3}	Intense	Orange, grapefruit
Acetic	-1.14	3.00	2.95	1.75×10^{-5}	Vinegar	—
Lactic	-1.14	4.50	2.60	1.26×10^{-4}	Sour, tart	—
Citric	-1.28	3.50	2.60	8.4×10^{-4}	Fresh	Berries, citrus, pineapple
Propionic	-1.85	3.70	2.90	1.34×10^{-5}	Sour, cheesy	—

Αλμυρή γεύση

- NaCl
- Τύπος του άλατος

Table 7–4 Taste Sensations of Salts

<i>Taste</i>	<i>Salts</i>
Salty	LiCl, LiBr, LiI, NaNO ₃ , NaCl, NaBr, NaI, KNO ₃ , KCl
Salty and bitter	KBr, NH ₄ I
Bitter	CsCl, CsBr, KI, MgSO ₄
Sweet	Lead acetate, ¹ beryllium acetate ¹

¹Extremely toxic

Πικρή γεύση

- Παράγωγα αλκαλοειδών

40 μmol

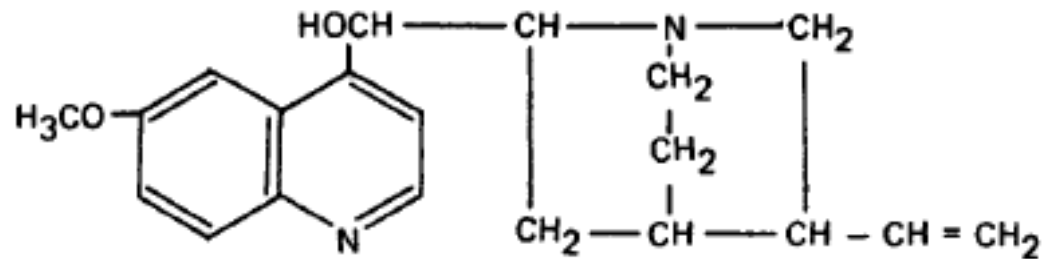


Figure 7-13 Structure of Quinine. This has an intensely bitter taste.

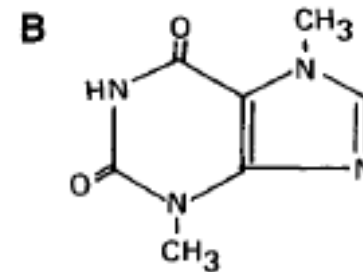
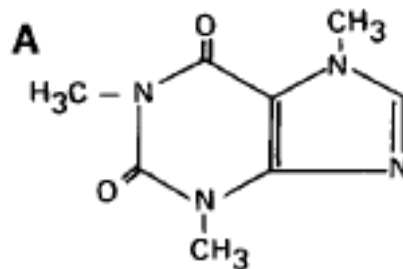
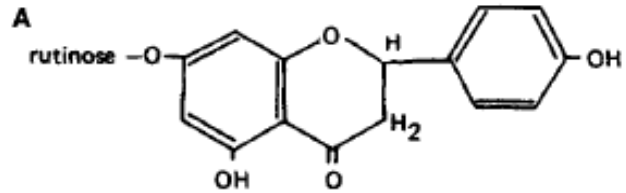
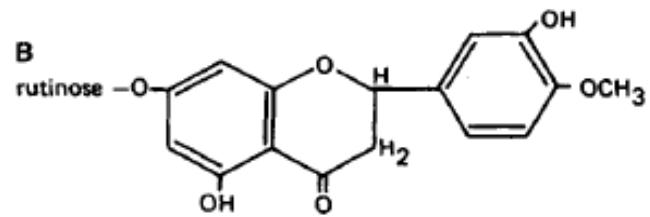


Figure 7-14 (A) Caffeine and (B) Theobromine

Πικρή γεύση



γκρέιπφρούτ



κίτρο, λεμόνι, πορτοκάλι

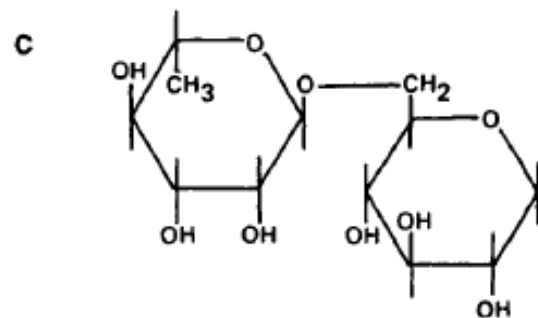


Figure 7-15 (A) Naringin; (B) Hesperidin; (C) Rutinose, 6-O- α -L-Rhamnopyranosyl-D-Glucopyranose

Αλληλεπιδράσεις

- Γλυκιά και ξινή
- Αναλογία σακχάρων/οξέων

Table 7-7 Change in Sugar-Acid Ratio During Ripening of Blueberries*

	<i>Unripe</i>	<i>Ripe</i>	<i>Overripe</i>
Total sugar (%)	5.8	7.9	12.4
pH	2.83	3.91	3.76
Titr acidity (mEq/100 g)	23.9	12.9	7.5
Sugar-acid ratio	3.8	9.5	25.8

*The sugars are mainly glucose and fructose, and the acidity is expressed as citric acid.

Δροισιστικότητα (coolness)

- Μενθόλη

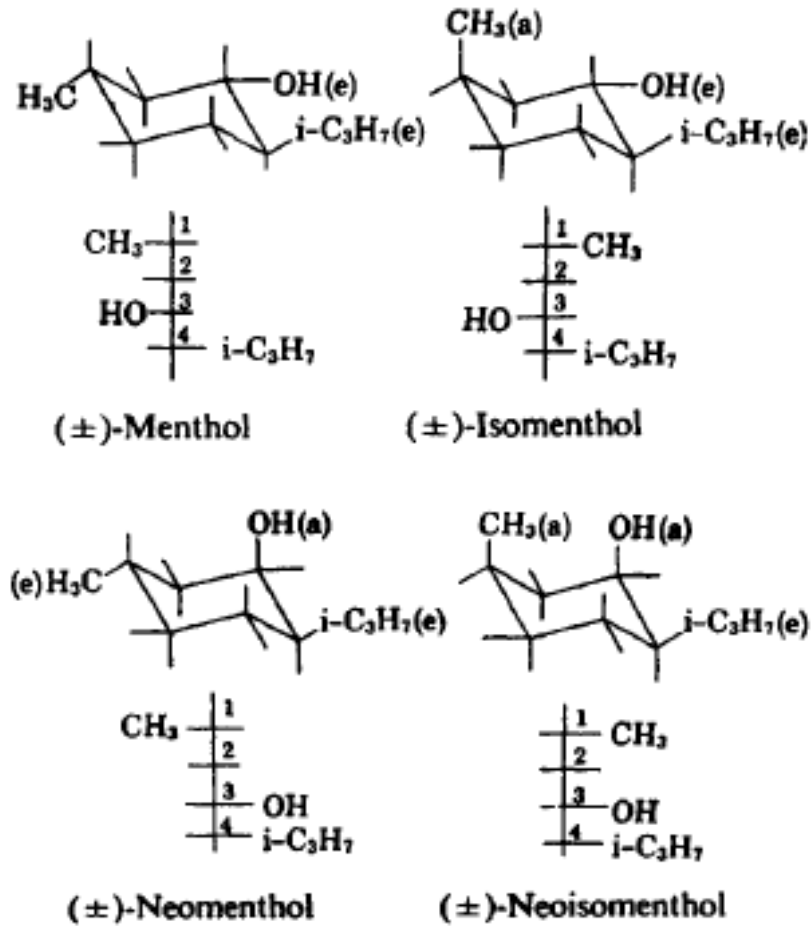


Figure 7-16 Isomeric Forms of Menthol

Αίσθηση καυτού (hotness)

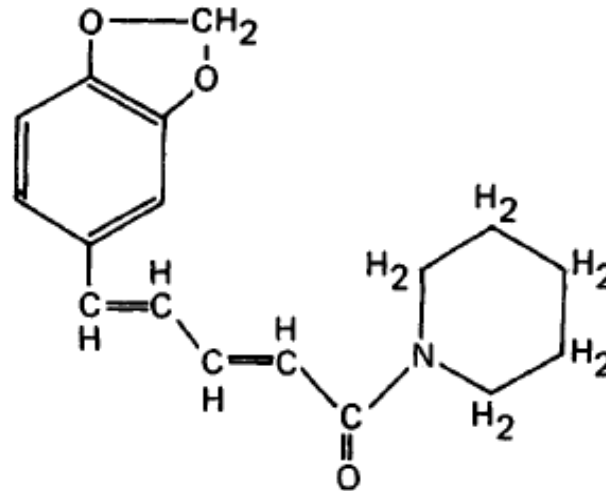


Figure 7-17 Piperine, Responsible for the Hotness of Pepper

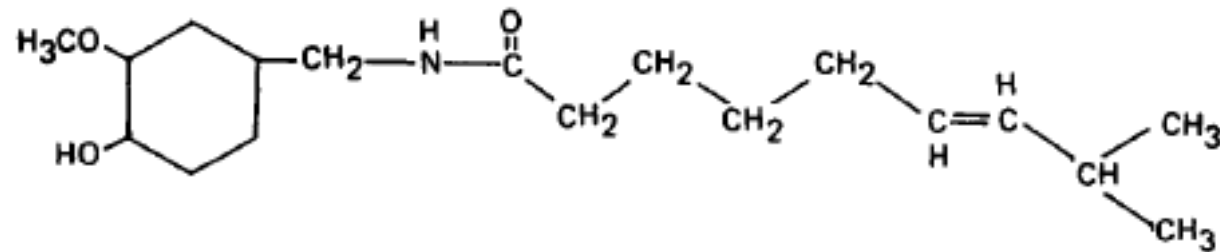
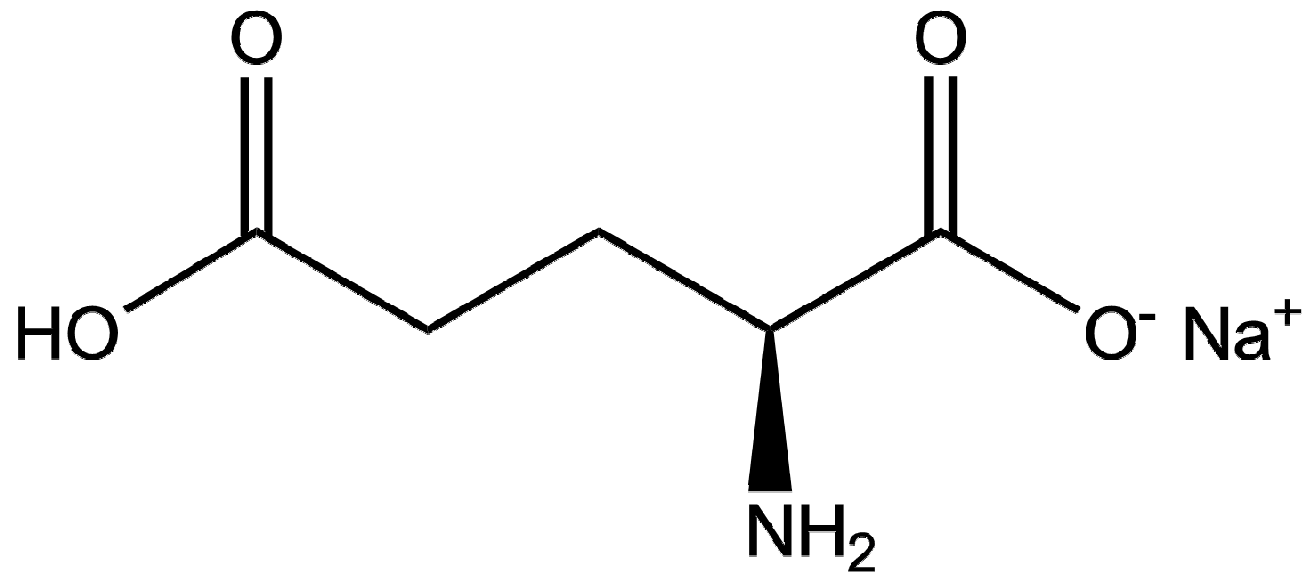


Figure 7-18 Capsaicin, the Pungent Principle of Red Pepper

Ενισχυτικά γεύσης – Γλουταμινικό μονονάτριο

- Γλουταμινικό οξύ (ιαπων. Umami=νοστιμότατο)
- Θεωρείται ξεχωριστή γεύση
- Χρησιμοποιείται σαν ενισχυτικό γεύσης από το 1950



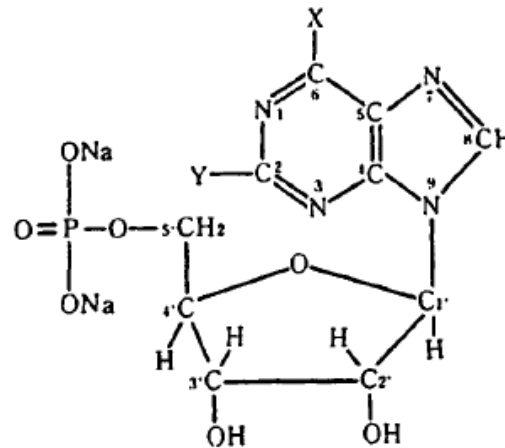
Ενισχυτικά γεύσης - umami

Table 7–8 Glutamic Acid Content of Some Proteins

<i>Protein Source</i>	<i>Glutamic Acid (%)</i>
Wheat gluten	36.0
Corn gluten	24.5
Zein	36.0
Peanut flour	19.5
Cottonseed flour	17.6
Soybean flour	21.0
Casein	22.0
Rice	24.1
Egg albumin	16.0
Yeast	18.5

Source: From L.A. Hall, Protein Hydrolysates as a Source of Glutamate Flavors, in *Monosodium Glutamate—A Symposium*, 1948, Quartermaster Food and Container Institute for the Armed Forces.

Νέα ενισχυτικά γεύσης : 5-γλυκοζίτες



X = OH Y = H IMP
 Y = NH₂ GMP
 Y = OH XMP

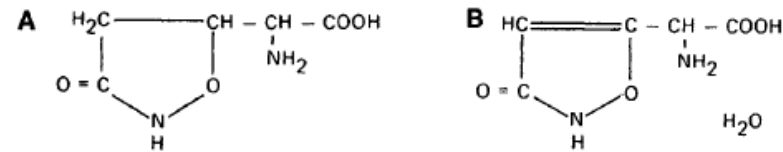


Figure 7-22 (A) Tricholomic and (B) Ibotenic Acid

Table 7-9 Threshold Levels of Flavor Enhancers Alone and in Mixtures in Aqueous Solution

Solvent	Threshold Level (%)		
	Disodium 5'-Inosinate	Disodium 5'-Guanylate	Monosodium L-Glutamate
Water	0.012	0.0035	0.03
0.1% glutamate	0.0001	0.00003	—
0.01% inosinate	—	—	0.002

Όσφρηση

- 10.000 φορές πιο ευαίσθητοι αισθητήρες από τη γεύση
- Πτητικές ενώσεις σε τρόφιμα :
 - βοδινό κρέας (βρασμένο, ψημένο) 486
 - μπύρα 562, βούτυρο 257, καφές 790
 - σταφύλι 466, πορτοκάλι 203, τσάι 541
 - ντομάτα 387, λευκό κρασί 644
- Ο συνδυασμός πολλών διαφορετικών ενώσεων δίνει το οσφρητικό αποτύπωμα κάθε τροφίμου.
- Το αποτύπωμα μπορεί να αποθηκευτεί.

Σχέση δομής - αρώματος

Έλαιο γκρέιπφρουτ

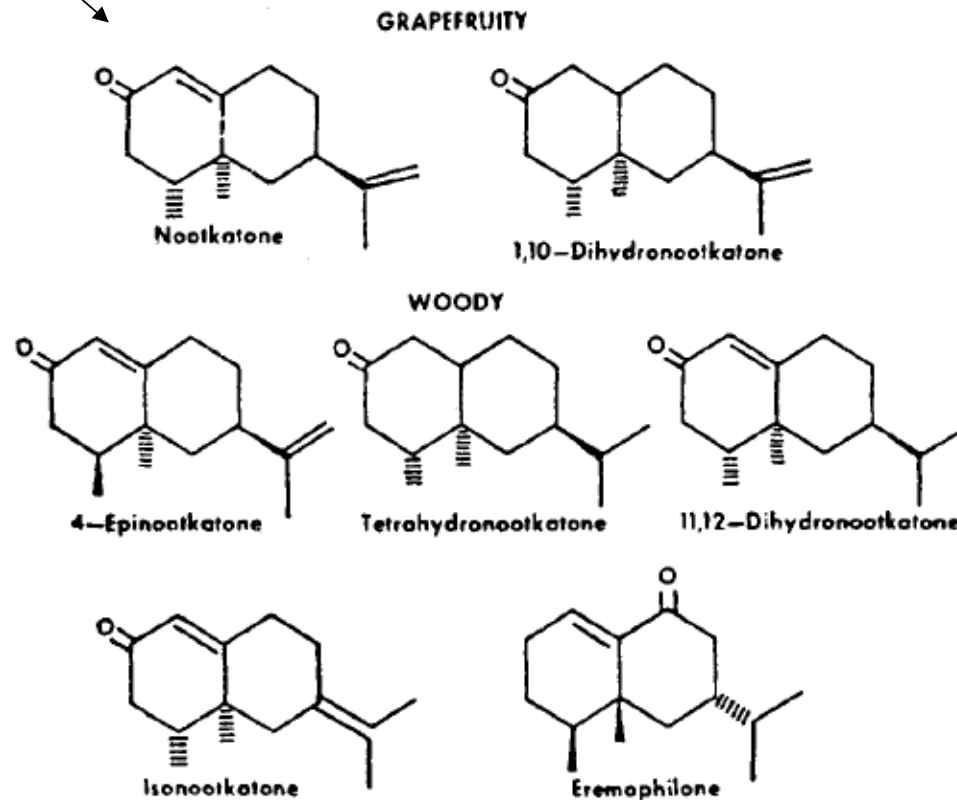
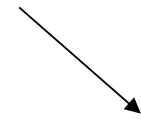
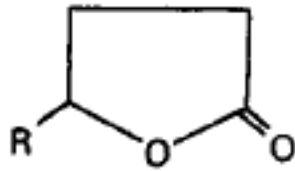


Figure 7-24 Odor Character of Nootkatone and Related Compounds

Άρωμα μερικών γ-λακτονών

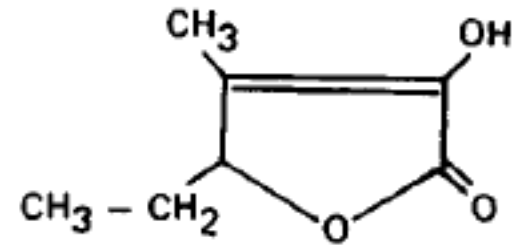


R = C₅H₁₁ (coconut)

R = C₆H₁₃ (peach)

R = C₇H₁₅ (peach)

R = C₈H₁₇ (peach-musk)



Beef bouillon

Λακτόνες φθαλικού οξέος: Σέλινο

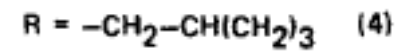
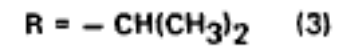
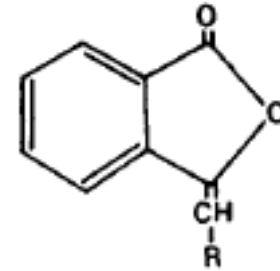
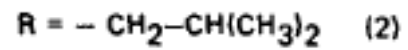
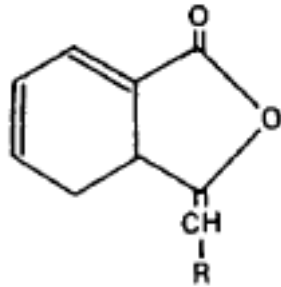
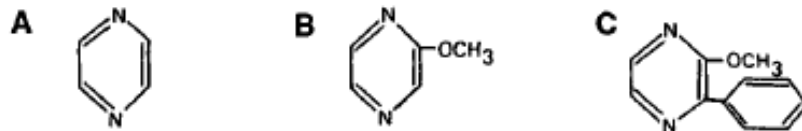


Figure 7-26 Phthalides of Celery Volatiles

Πυραζίνες και παράγωγα



πιπεριές, σοκολάτα, καφές, κακάο

Table 7-13 Odor Threshold of Pyrazine and Derivatives

<i>Compound</i>	<i>Odor Threshold (Parts per 10¹² Parts of Water)</i>
2-methoxy-3-hexylpyrazine	1
2-methoxy-3-isobutylpyrazine	2
2-methoxy-3-propylpyrazine	6
2-methoxy-3-isopropylpyrazine	2
2-methoxy-3-ethylpyrazine	400
2-methoxy-3-methylpyrazine	4000
2-methoxypyrazine	700,000
2-isobutylpyrazine	400,000
2-5-dimethylpyrazine	1,800,000
pyrazine	175,000,000

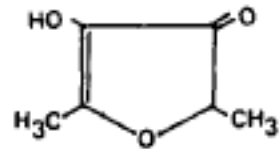
Source: From R.M. Seifert et al., Synthesis of Some 2-Methoxy-3-Alkylpyrazines with Strong Bell Pepper-Like Odors, *J. Agr. Food Chem.*, Vol. 18, pp. 246-249, 1970, American Chemical Society.

Φουρανόνες : άρωμα ψημένου φαγητού

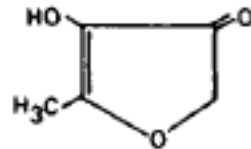
καμμένη καραμέλα

καμμένη ρίζα ραδικιού

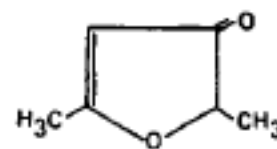
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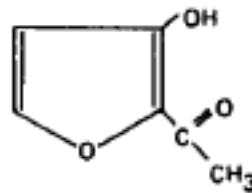
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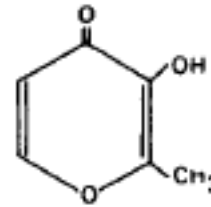
2



3



4



5

προϊόντα καραμελοποίησης
και πυρόλυσης υδατανθράκων

Πρωταρχικά αρώματα

Table 7-14 Primary Odors for Humans and Compounds Eliciting These Odors

	<i>Primary Odor</i>	<i>Odor Compounds</i>
καμφορά ←	Camphoraceous	Borneol, <i>tert</i> -butyl alcohol <i>α</i> -camphor, cineol, pentamethyl ethyl alcohol
οξύ ←	Pungent	Allyl alcohol, cyanogen, formaldehyde, formic acid, methylisothiocyanate
αιθέριο ←	Ethereal	Acetylene, carbon tetrachloride, chloroform, ethylene dichloride, propyl alcohol
άνθος ←	Floral	Benzyl acetate, geraniol, <i>α</i> -ionone, phenylethyl alcohol, terpineol
μέντα ←	Pepperminty	<i>tert</i> -butylcarbinol, cyclohexanone, menthone, piperitol, 1,1,3-trimethyl-cyclo-5-hexanone
μόσχος ←	Musky	Androstan-3 α -ol (strong), cyclohexadecanone, ethylene sebacate, 17-methylandrostan-3 α -ol, pentadecanolactone
σάπιο ←	Putrid	Amylmercaptan, cadaverine, hydrogen sulfide, indole (when concentrated, floral when dilute), skatole

Source: From J.E. Amoore et al., *The Stereochemical Theory of Odor*, *Sci. Am.*, Vol. 210, No. 2, pp. 42-49, 1964.

Στερεοχημικό μοντέλο όσφρησης

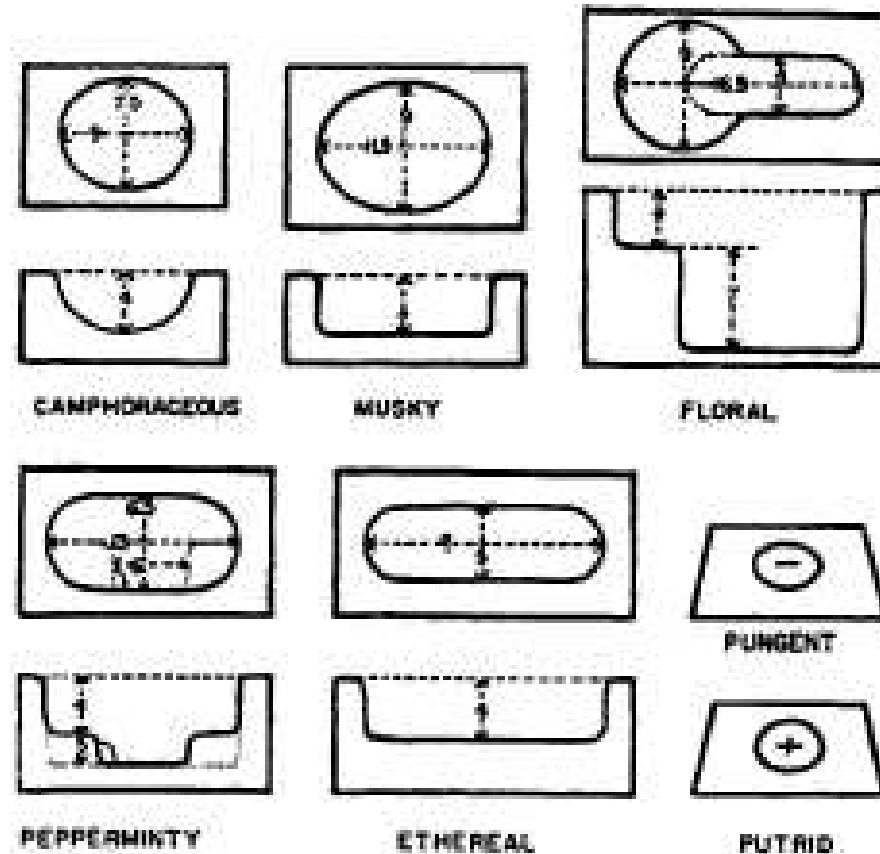
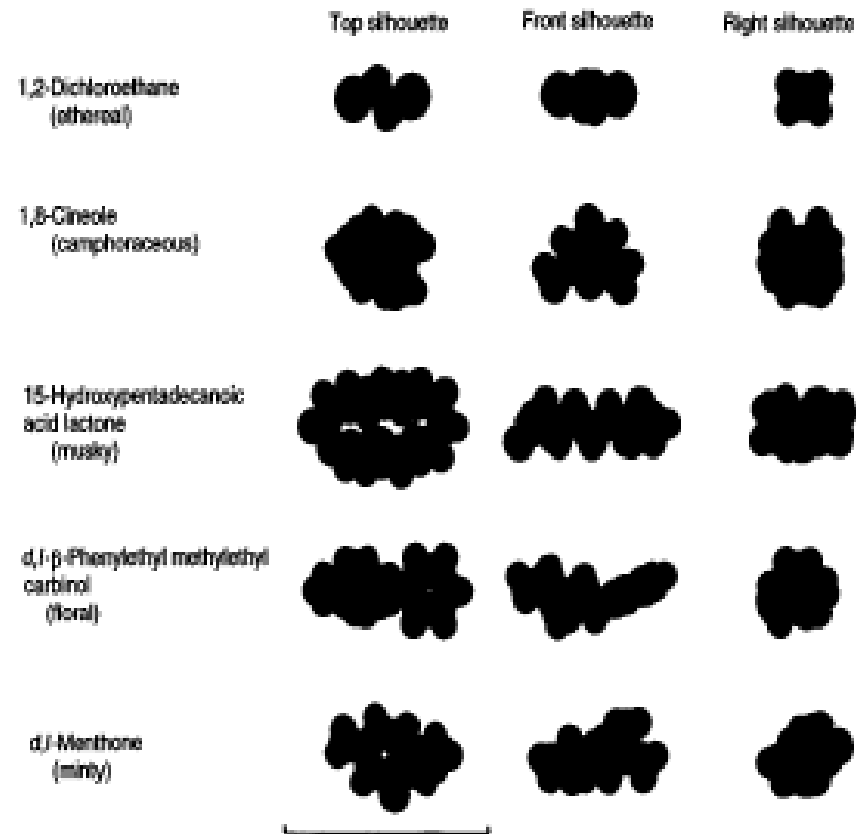


Figure 7-28 Olfactory Receptor Sites According to the Stereochemical Theory of Odor

Στερεοχημικό μοντέλο όσφρησης



Μοντέλο προσρόφησης

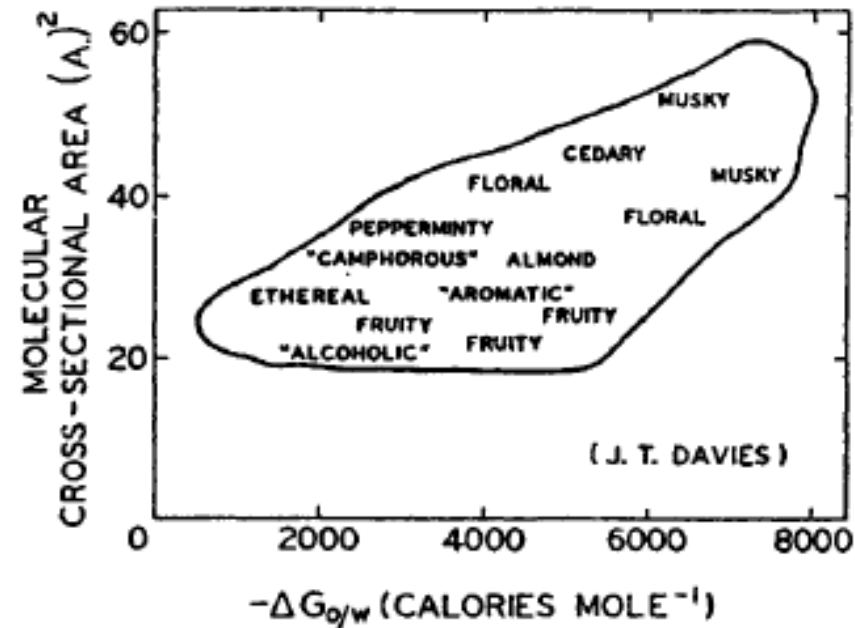


Figure 7-30 Plot of Molecular Cross-Sectional Area Versus Free Energy of Adsorption for Davies' Theory of Olfaction