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Sensory Physiology: Taste & Smell

Printable Flashcards — Pre-Med Biology

Taste buds and papillae, five basic tastes, taste transduction, olfactory epithelium and receptors, cranial nerves VII/IX/X/I, smell pathways, flavor perception, and chemosensory disorders.

175 cards — Print double-sided, flip on long edge, then cut along dashed lines.

175 cards — Printable Flashcards

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1

Taste vs smell: what's the core difference?

2

The 'flavor' you think you taste is mostly...

3

Why does food feel 'bland' when your nose is blocked?

4

Trap: when you have a cold you lose taste buds. True or false?

5

Spicy 'hot' (chili) is a taste?

6

Mint 'cooling' is a taste?

7

Taste is like the body's quick safety check for food: what 2 tastes are most 'warning' coded?

8

Smell is strongly linked to memory/emotion because it connects closely with...

2

Smell + taste + trigeminal sensations (spice/cool).

1

Taste detects chemicals in the mouth.
Smell detects chemicals in the air (nose).

4

False (usually).

3

Because smell is doing most of the flavor work, and congestion blocks odor molecules reaching receptors.

6

No - it's trigeminal sensation too.

5

No - it's pain/temperature signaling (trigeminal nerve).

8

Limbic system areas (like amygdala).

7

Bitter and sour (often signals toxins/unripe/acid).

9

Flavor = {{c1::taste}} + {{c2::smell}} + {{c3::trigeminal}} sensations (spice/cool).

10

Nerve system that carries 'spicy heat' and irritation from mouth/nose:

11

Taste buds are...

12

Papillae are...

13

Trap: papilla = taste bud. True or false?

14

Which papilla type has NO taste buds?

15

Which papillae DO have taste buds? (big three)

16

Fungiform papillae are mostly located...

10

Trigeminal nerve (CN V)

9

Flavor = taste + smell + trigeminal sensations (spice/cool).

12

Bumps on the tongue surface; some contain taste buds.

11

Clusters of taste receptor cells (plus support cells) that detect tastants.

14

Filiform papillae.

13

False.

16

On the anterior tongue (front), scattered.

15

Fungiform, foliate, and circumvallate.

17

Circumvallate papillae are mostly located...

18

Foliate papillae are mostly located...

19

Taste buds are ONLY on the tongue. True or false?

20

A taste pore is...

21

Taste receptor cells detect tastants mainly using...

22

Why is saliva important for taste?

23

Taste receptor cells are
replaced pretty often (roughly):

24

Trap: taste receptor cells are permanent
neurons that never regenerate. True or false?

18

On the sides of the tongue (posterior-lateral).

17

At the back of the tongue in a V-shaped row.

20

The tiny opening where dissolved chemicals reach the taste receptor microvilli.

19

False.

22

Tastants have to dissolve to interact with receptors/ion channels.

21

Microvilli exposed to saliva in the taste pore.

24

False.

23

Every ~1-2 weeks.

25

Are taste receptor cells 'neurons'?

26

Papillae are tongue {{c1::bumps}}; taste buds are sensory {{c2::clusters}} inside some papillae.

27

Papilla type that does NOT contain taste buds:

28

Five basic tastes you should know for pre-med exams:

29

Umami basically means...

30

Which taste is most associated with detecting 'toxins'? (evolution idea)

31

Which taste is most directly tied to acid (H^+)?

32

Which taste is most directly tied to sodium ions (Na^+)?

26

Papillae are tongue bumps; taste buds are sensory clusters inside some papillae.

25

Not classic neurons - they're specialized epithelial sensory cells that synapse onto sensory nerves.

28

Sweet, salty, sour, bitter, umami.

27

Filiform

30

Bitter.

29

Savory taste (often from amino acids like glutamate).

32

Salty.

31

Sour.

33

Trap: there's a strict tongue map (sweet only at tip, bitter only at back). True or false?

34

If an exam shows the 'tongue map', what should you answer?

35

Do taste buds detect only one taste each?

36

Why do different people experience bitter foods differently? (basic)

37

Why does food taste different when it's very cold?

38

Basic tastes: {{c1::sweet}}, {{c2::salty}}, {{c3::sour}}, {{c4::bitter}}, {{c5::umami}}.

39

Savory taste category (often glutamate):

40

Fast rule: which tastes are mostly ion channel based?

34

Be skeptical: taste receptors are distributed; the map is oversimplified.

33

False.

36

Genetic differences in bitter receptors can change sensitivity.

35

No, taste buds contain multiple receptor cell types.

38

Basic tastes: sweet, salty, sour, bitter, umami.

37

Taste receptor activity can be reduced, and smell from the food is lower (less volatile).

40

Salty and sour.

39

Umami

41

Fast rule: which tastes are mostly GPCR (G-protein) based?

42

Salty taste: the core mechanism is basically...

43

Sour taste: the core mechanism is basically...

44

Sweet taste: the core mechanism is basically...

45

Bitter taste: the core mechanism is basically...

46

Umami taste: the core mechanism is basically...

47

Common trap: 'sweet taste is just Na^+ entering the cell'. True or false?

48

No matter the taste type, the taste cell usually ends up doing what?

42

Na^+ enters taste cells -> depolarization -> neurotransmitter release.

41

Sweet, bitter, and umami.

44

Sugar binds a GPCR -> second messenger cascade -> depolarization -> neurotransmitter release.

43

H^+ (acid) changes ion channels -> depolarization -> neurotransmitter release.

46

Amino acids (like glutamate) bind GPCRs -> cascade -> depolarization.

45

Bitter compounds bind GPCRs -> cascade -> depolarization; very sensitive warning system.

48

Depolarizing and releasing neurotransmitter to a sensory nerve fiber.

47

False.

49

Why is bitter detection a good survival feature?

50

Why do kids often hate bitter veggies more than adults? (basic)

51

If you lose saliva (very dry mouth), which sense often drops?

52

Ion-channel tastes: {{c1::salty}} + {{c2::sour}}. GPCR tastes: {{c3::sweet}} + {{c4::bitter}} + {{c5::umami}}.

53

Taste most directly linked to H^+ (acid):

54

Taste from the anterior 2/3 of the tongue travels mainly via...

55

Taste from the posterior 1/3 of the tongue travels mainly via...

56

Taste from epiglottis/low throat travels via...

50

Bitter sensitivity can be higher, and learning changes acceptance.

49

It helps you avoid potentially toxic substances.

52

Ion-channel tastes: salty + sour. GPCR tastes: sweet + bitter + umami.

51

Taste, because chemicals don't dissolve and reach receptors well.

54

Facial nerve (CN VII).

53

Sour

56

Vagus nerve (CN X).

55

Glossopharyngeal nerve (CN IX).

57

Fast mnemonic for taste nerves:

58

Trap: taste is carried by trigeminal nerve (CN V). True or false?

59

The trigeminal nerve in the mouth is mainly for...

60

Extra trap: anterior 2/3 of tongue 'feeling' (touch) is CN V, but taste is...

61

Posterior 1/3 of tongue: both taste and general sensation are mainly carried by...

62

Taste pathway (super simplified): taste nerves -> brainstem -> thalamus -> cortex.

63

If you DO want the brainstem nucleus name for taste (optional but nice):

64

Taste cortex is often associated with... (high-level)

58

False.

57

7 front, 9 back, 10 throat.

60

CN VII.

59

Touch, pain, and temperature (like spicy heat).

62

Yes. (Brainstem nucleus -> thalamus -> gustatory cortex).

61

CN IX.

64

Insula/frontal operculum.

63

Nucleus of the solitary tract (NTS).

65

Why can 'taste nerve' damage change what food tastes like?

66

Taste nerves: anterior 2/3 = CN {{c1::VII}}, posterior 1/3 = CN {{c2::IX}}, epiglottis = CN {{c3::X}}.

67

Cranial nerve for taste from posterior 1/3 of tongue:

68

Smell receptors are located in the...

69

Why does sniffing help you smell better?

70

Odorants usually need to be... to smell them well.

71

Olfactory receptor cells are...

72

The 'smell hairs' that detect odor molecules are...

66

Taste nerves: anterior 2/3 = CN VII, posterior 1/3 = CN IX, epiglottis = CN X.

65

Because the brain is getting a distorted pattern of taste inputs.

68

Olfactory epithelium, high up in the nasal cavity (roof/superior area).

67

Glossopharyngeal nerve (CN IX)

70

Volatile (able to get into the air) and able to dissolve in mucus.

69

It moves more odorant molecules up to the olfactory epithelium.

72

Cilia on olfactory receptor neurons.

71

Neurons (olfactory receptor neurons).

73

Olfactory receptor neuron axons pass through the...

74

First brain structure that receives smell input is the...

75

Glomeruli in the olfactory bulb are basically...

76

Mitral cells are basically...

77

Trap: smell signals must go through the thalamus before reaching cortex. True or false?

78

Why is smell so linked to emotion/memory (concept)?

79

Do olfactory receptor neurons regenerate?

80

Trap: if you lose smell once, it's always permanent. True or false?

74

Olfactory bulb.

73

Cribriform plate (ethmoid bone) to reach the olfactory bulb.

76

The main output neurons of the olfactory bulb.

75

Synapse hubs where receptor neuron axons meet mitral/tufted cells.

78

Because olfactory pathways connect strongly with limbic areas.

77

False (at least initially).

80

False.

79

Yes - they can be replaced throughout life.

81

Why can head trauma cause anosmia (loss of smell)?

82

Smell is carried by which cranial nerve?

83

Trap: smell is CN II because it's 'sensory'. True or false?

84

Smell receptors are in the {{c1::olfactory epithelium}} high in the nasal cavity; their axons pass through the {{c2::cribriform plate}} to the {{c3::olfactory bulb}}.

85

Cranial nerve for smell:

86

Olfactory receptors are usually... (receptor type)

87

Smell transduction in one line: odorant binds -> G protein -> ... -> cAMP goes up -> channels open -> depolarize.

88

Odorant binding increases which second messenger (classic)?

82

Olfactory nerve (CN I).

81

Olfactory nerve fibers can be damaged as they pass through the cribriform plate.

84

Smell receptors are in the olfactory epithelium high in the nasal cavity; their axons pass through the cribriform plate to the olfactory bulb.

83

False.

86

GPCRs (G-protein coupled receptors).

85

Olfactory nerve (CN I)

88

cAMP.

87

Yes: cAMP rises and opens cation channels.

89

What happens electrically when an odorant binds its receptor?

90

Trap: odorants hyperpolarize olfactory neurons like light does in rods. True or false?

91

If you're mixing topics: vision vs smell quick sign check

92

In the olfactory epithelium, the receptor proteins sit on the...

93

Why does smell adapt quickly (you stop noticing a smell)?

94

Scenario: you walk into a room and it smells strong, then 10 minutes later you barely notice. That's...

95

Why is smell useful for safety?

96

Trap: smell receptors are in the mouth/throat. True or false?

90

False.

89

The olfactory neuron depolarizes and can fire action potentials.

92

Cilia membranes.

91

Light makes photoreceptors hyperpolarize; odorants make olfactory neurons depolarize.

94

Olfactory adaptation.

93

Receptors/circuits desensitize quickly with constant stimulation.

96

False.

95

It can detect smoke, gas, spoiled food, toxins before you ingest them.

97

Why does chewing make flavors stronger?

98

If someone 'can't smell but can still feel ammonia burning', that burning is mainly...

99

Trigeminal nerve in the nose is most about...

100

If the olfactory epithelium is inflamed/swollen (cold/allergy), smell drops because...

101

Odorant -> GPCR -> G protein -> adenylyl cyclase -> {{c1::cAMP}} up -> ion channels {{c2::open}} -> neuron {{c3::depolarizes}}.

102

Second messenger that rises in olfactory transduction (classic):

103

Smell pathway super short: olfactory epithelium -> olfactory bulb -> olfactory tract -> ...

104

Unique fact: smell is the only major sense that reaches cortex...

98

Trigeminal irritation (CN V), not olfaction.

97

It releases more odor molecules that reach the nose from the back of the throat (retronasal smell).

100

Odor molecules can't reach the receptors well.

99

Irritation, burning, cooling, pain (like ammonia, menthol).

102

cAMP

101

Odorant -> GPCR -> G protein -> adenylyl cyclase -> cAMP up -> ion channels open -> neuron depolarizes.

104

Without the classic 'thalamus first' relay (initially).

103

Primary olfactory cortex (and limbic areas).

105

Smell info from one nostril goes mainly to the... side olfactory bulb.

106

Why can smell triggers nausea so fast?

107

Anosmia means...

108

Ageusia means...

109

Trap: anosmia = loss of taste. True or false?

110

If someone says 'I lost taste but sweet/salty still work a bit', what is likely actually lost?

111

Two common causes of temporary smell loss are...

112

Permanent smell loss is more likely with...

106

Strong limbic/brainstem connections (protective reflex).

105

Same side (ipsilateral).

108

Loss of taste.

107

Loss of smell.

110

Smell.

109

False.

112

Severe head trauma or damage to olfactory bulb/tract.

111

Nasal congestion/inflammation and viral infections.

113

Anosmia = loss of {{c1::smell}}.
Ageusia = loss of {{c2::taste}}.

114

Medical term for loss of smell:

115

Taste receptor cells vs olfactory receptor cells: which are neurons?

116

Taste uses how many main modalities vs smell?

117

If a question asks 'which sense has the widest range of discrimination' between smells/tastes?

118

Cranial nerve check: taste is VII/IX/X; smell is...

119

Trap: both taste and smell use the same cranial nerve. True or false?

120

If an exam asks 'which sense adapts fastest?', taste or smell?

114

Anosmia

113

Anosmia = loss of smell. Ageusia = loss of taste.

116

Taste: 5 basic categories. Smell: huge variety (many receptors, pattern coding).

115

Olfactory receptor cells are neurons. Taste receptor cells are specialized epithelial-like cells that synapse onto nerves.

118

CN I.

117

Smell.

120

Smell (usually adapts very fast).

119

False.

121

Taste adaptation example: after eating something very sweet, plain water can taste...

122

Exam trap: 'taste is mostly smell'. True or false?

123

If you clamp the nose and someone can still tell sugar vs salt, that's because...

124

If you clamp the nose and someone can't tell apple juice vs pear juice, that's because...

125

Taste uses CN {{c1::VII/IX/X}}.
Smell uses CN {{c2::I}}.

126

Five basic taste categories:

127

Circumvallate papillae are 'few but powerful' because...

128

Why do filiform papillae exist if they don't taste?

122

False (but flavor is heavily smell).

121

Less sweet / different because your receptors adapt.

124

Those differences rely a lot on smell (flavor).

123

Those are basic taste modalities
that don't need smell.

126

Sweet, salty, sour, bitter, umami

125

Taste uses CN VII/IX/X. Smell uses CN I.

128

They give texture/friction
and help move food around.

127

Each one contains lots of taste buds.

129

Taste buds face the mouth via...

130

If a question says 'taste buds are on filiform papillae because there are many of them', that's...

131

Taste can be reduced by smoking mainly because...

132

Taste isn't only about receptors - what's the physical step before receptors can even work?

133

If someone has extremely dry mouth (xerostomia), what sense drops more: taste or smell?

134

Taste receptor cells send info to nerves by releasing...

135

Trap: taste receptor cells themselves have long axons that run to the brain. True or false?

136

Which taste often triggers a strong gag/avoidance reflex at very low concentrations?

130

Wrong. Filiform are many, but they don't contain taste buds.

129

A taste pore.

132

Molecules must dissolve in saliva.

131

It irritates/damages oral tissues and can reduce receptor function/saliva quality.

134

Neurotransmitters onto sensory afferent fibers.

133

Taste (more directly), because tastants need saliva to dissolve.

136

Bitter.

135

False.

137

MSG is mostly linked to which taste?

138

Trap: umami is just 'salty' because MSG has sodium. True or false?

139

Sweet taste generally signals...

140

Salt taste generally signals...

141

Filiform papillae = {{c1::no}} taste buds (mechanical/texture).

142

Cranial nerve for taste from anterior 2/3 tongue:

143

Olfactory nerve (CN I) is actually...

144

Olfactory receptor neurons have their cell bodies...

138

False.

137

Umami.

140

Electrolytes (especially sodium).

139

Energy-rich carbohydrates (calories).

142

Facial nerve (CN VII)

141

Filiform papillae = no taste buds (mechanical/texture).

144

In the olfactory epithelium (not deep in a ganglion).

143

Many small nerve fibers (fila) passing through the cribriform plate.

145

Why is the olfactory system considered 'high exposure'?

146

How does the brain code a specific smell (simplified)?

147

Trap: one odor = one receptor type. True or false?

148

Why do you have so many olfactory receptor genes?

149

If nasal mucus dries out, smell can drop because...

150

Why does smell loss often reduce appetite?

151

If someone can't smell smoke/gas, that's dangerous because...

152

Parosmia means...

146

As a pattern of activation across many receptor types/glomeruli.

145

The receptor neurons are directly exposed to air/mucus and can be damaged by toxins/infections.

148

To detect a huge variety of odor molecules using combinations.

147

False (usually).

150

Because food flavor becomes bland and less rewarding.

149

Odorants need mucus to dissolve and reach receptors on cilia.

152

Distorted smell perception (things smell 'wrong').

151

Smell is an early warning system for hazards you can't see.

153

Phantosmia means...

154

Trap: trigeminal nerve detects smell. True or false?

155

If someone has complete anosmia, can they still 'sense' menthol or ammonia?

156

Smell identity is usually coded as a {{c1::pattern}} across many receptors/glomeruli (not one receptor per odor).

157

Bone plate with tiny holes that olfactory fibers pass through:

158

If you pinch your nose and eat chili, you'll still feel 'heat' because...

159

If you pinch your nose and eat onion, what drops the most?

160

Tongue map myth: if it's not real, why did it exist?

154

False.

153

Smelling odors that aren't there (olfactory hallucination).

156

Smell identity is usually coded as a pattern across many receptors/glomeruli (not one receptor per odor).

155

Yes - via trigeminal irritation.

158

Spice is trigeminal pain/temperature, not smell or taste buds.

157

Cribriform plate

160

Different areas have slightly different sensitivity, but not exclusive zones.

159

The 'onion-ness' (smell), not the basic salty/sweet/etc.

161

Taste buds are most densely packed in which area for sharp taste?

162

If a question asks 'which taste is detected by Na^+ ion entry', it's...

163

If a question asks 'which taste is detected by GPCR signaling', you can answer with:

164

Smell receptors are GPCRs. Taste receptors are mixed. So if asked 'which is GPCR only', the best pick is usually...

165

Sneezing from pepper/irritants is mainly...

166

Why does bitter medicine taste so bad even in tiny amounts?

167

Why can some diseases/infections cause smell loss without a blocked nose?

168

If a question says 'taste buds detect airborne molecules', that's...

162

Salty.

161

Fungiform (front) and circumvallate (back) have lots of buds, but taste isn't restricted to one region.

164

Smell.

163

Sweet, bitter, or umami.

166

Bitter receptors are very sensitive (protective).

165

Trigeminal irritation reflex, not 'taste' or true smell.

168

Wrong. Taste buds detect dissolved molecules in saliva.

167

They can affect the olfactory epithelium/neurons directly.

169

If a question says 'olfactory receptors detect dissolved chemicals in saliva', that's...

170

Taste buds respond to... and olfactory receptors respond to...

171

If the olfactory epithelium is only at the top of the nose, how do mouth flavors reach it?

172

Why do we say 'taste is limited'?

173

If you lose smell (anosmia), can you still detect salty food?

174

Taste detects chemicals dissolved in {{c1::saliva}}; smell detects odorants dissolved in nasal {{c2::mucus}}.

175

Myth that says sweet is only at tongue tip and bitter only at back:

170

Tastants in saliva; odorants in nasal mucus.

169

Wrong. Olfaction detects odorants in mucus in the nose.

172

Because taste gives broad categories; smell gives the detailed identity.

171

Airflow from the back of the throat carries odorants upward (retronasal smell).

174

Taste detects chemicals dissolved in saliva; smell detects odorants dissolved in nasal mucus.

173

Yes, salty taste still works (though food feels bland overall).

175

Tongue map