



Sensory and satiety considerations for protein-rich products

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Overview

- Satiety
- Texture
- Mouth coating / tooth-packing, astringency
- Different proteins



Increased Satiety

- High protein meals & foods accelerate satiety
- Different sources?
 - Whey and fish proteins more satiating than others? (*Gilbert et al. 2010*)
 - Composition of the whole meal / product!!
- Elderly market: reduce portion sizes?
 - Meal size reduction (*Ziylan et al. 2016*)
 - Product size reduction (*Beelen et al. 2017*)



Texture

- High protein products are firmer / more dense / less creamy
 - Firmer products need more oral processing
- Especially problematic for elderly people
 - Satiating effect
 - Denture issues
- Challenge to make high protein products for dysphagia suffers



Texture



- Example
- Enriched with plant based protein
 - Chocolate brownies
 - Apfelstrudels
 - Cakes with fruit filling
 - Different proteins used for cake and for filling
- Softer texture
 - Veal

"Almost broke my dentures"

"Hard as a brick"



"Like wall paper glue"

"Very cohesive filling"



"Extremely bland"

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Mouth coating granules, astringency

- "Astringency is a tactile sensation described as dryness, tightening, and puckering sensations perceived in the oral cavity" (*Fermented Foods in Health and Disease Prevention, 2017*)
- Result of binding with salivary proteins
- Astringency more pronounced in beverages with >3% whey protein and low pH (*Beecher et al. 2008, doi:10.3168/jds.2008-1083*)

"I get this dry feeling in my mouth"



"It feels a little like sandpaper on my teeth"

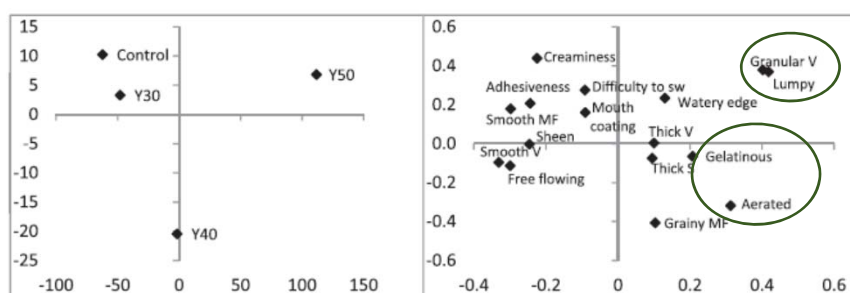
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Different proteins

- Meal replacement bars made with:
 - Whey protein: sweet aromatic and vanilla, adhesive and cohesive texture
 - Soy protein: nutty, tooth-packing and dense
(Childs et al. 2007, doi:10.1111/j.1750-3841.2007.00429.x)
- Meal replacement beverages made with:
 - Whey protein: sweet aromatic and vanilla flavour
 - Soy protein: cereal / grainy flavour
 - Consumer acceptance scores were higher for prototypes containing whey protein or a mixture of whey/soy protein than with soy protein alone
(Childs et al. 2007, doi:10.1111/j.1750-3841.2007.00429.x)
- Yogurt with soy protein: darker, more chalky texture, less sweet
(Drake et al. 2006, doi:10.1111/j.1365-2621.2000.tb10272.x)

Yogurt different casein:whey ratios



Control = 80:20, Y30 = 70:30, Y40 = 60:40, Y50 = 50:50

Sensory descriptive analysis by trained panel

(Laiho et al. 2017, doi:10.1016/j.foodhyd.2017.01.017)



Expectations for a burger

	Blind		
	Meat-based	Plant-based	Insect-based
Aftertaste	21	25	16
Brown colour	32 ^a	22 ^b	16 ^b
Dry	2 ^a	16 ^b	47 ^c
Granular	3 ^a	19 ^{ba}	33 ^c
Homogeneous	12	10	13
Juicy	37 ^a	15 ^b	4 ^c
Meat aroma	22 ^a	10 ^b	7 ^b
Meat flavour	31 ^a	20 ^{ba}	13 ^{ba}
Nutty flavour	1 ^a	10 ^b	19 ^c
Off-flavour	9 ^a	32 ^{ba}	29 ^b
Salty	12	8	13
Soft	28 ^a	19 ^a	5 ^b



(Schouteten et al. 2016, doi: 10.1016/j.foodqual.2016.03.011)

Take home messages

- Firmer, more dense, harder textures
- Different sources of protein alter flavour and texture differently
- pH influences astringency perception
- Different target consumers, different needs

Thank you

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