

# Ice Cream and Creaminess

S.A. Rankin, Ph.D.

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Frozen Dessert Center Conference

Creaminess  
meter



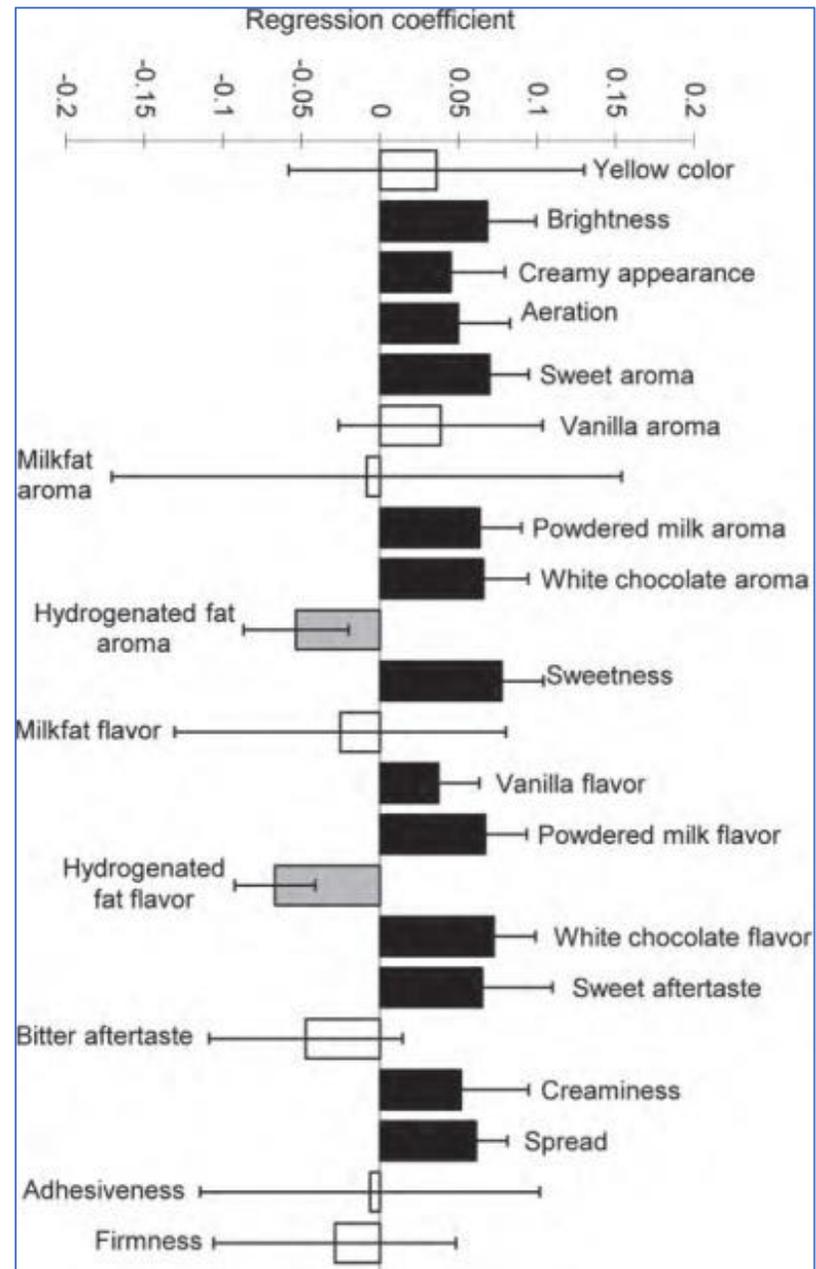
# What's in a name:

- We use the term often
- We know when it's not there:
  - Sandy, icy/coarse, weak
- What do we mean when it *is* there and how can we manipulate these factors?

Creaminess



Multimodal attribute: use multimodal approach



# The Challenge of Creaminess

*“I hate that term [creaminess] ...since it is multimodal and has NO concrete meaning.”*

*“It’s a positive attribute that consumers use to describe certain foods when they like them.”*

An example of trying to unravel Creaminess (sour cream)

*Subsequently, in separate sessions, the effect of each sensory modality was evaluated: visual only, stirring, blindfolded stirring, blindfolded tasting, blindfolded tasting with nose clips and tasting with nose clips*

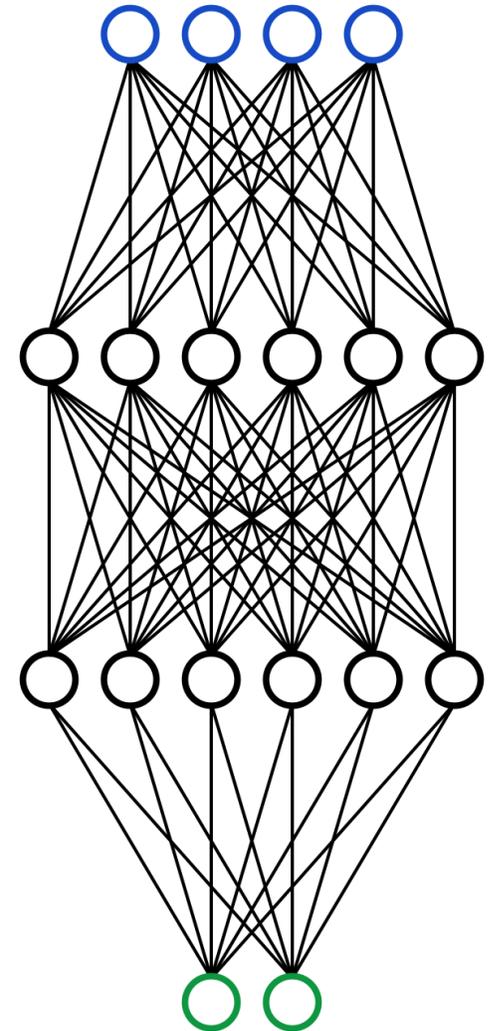


# It's complicated: Multimodal/Integrative sensory

Creaminess is a multimodal term

*Multimodal (or [multisensory](#)) integration refers to the neural integration or combination of information from different sensory modalities (the classic five senses of vision, hearing, touch, taste, and smell, and, perhaps less obviously, proprioception, kinesthesia, pain, and the vestibular senses), which gives rise to changes in behavior associated with the perception of and reaction to those stimuli.*

Encyclopedia of Neuroscience, 2009



# Multimodal: It's like a car crash

- 
- Sound+
  - Motion+
  - Visual element+
  - Aroma+
  - Anxiety/fright

- Integrated



# By Comparison: salty

- Sensation associated with sodium chloride
- Salty sensation is induced with confidence
- Clear mechanistic pathways
- Monomodal term





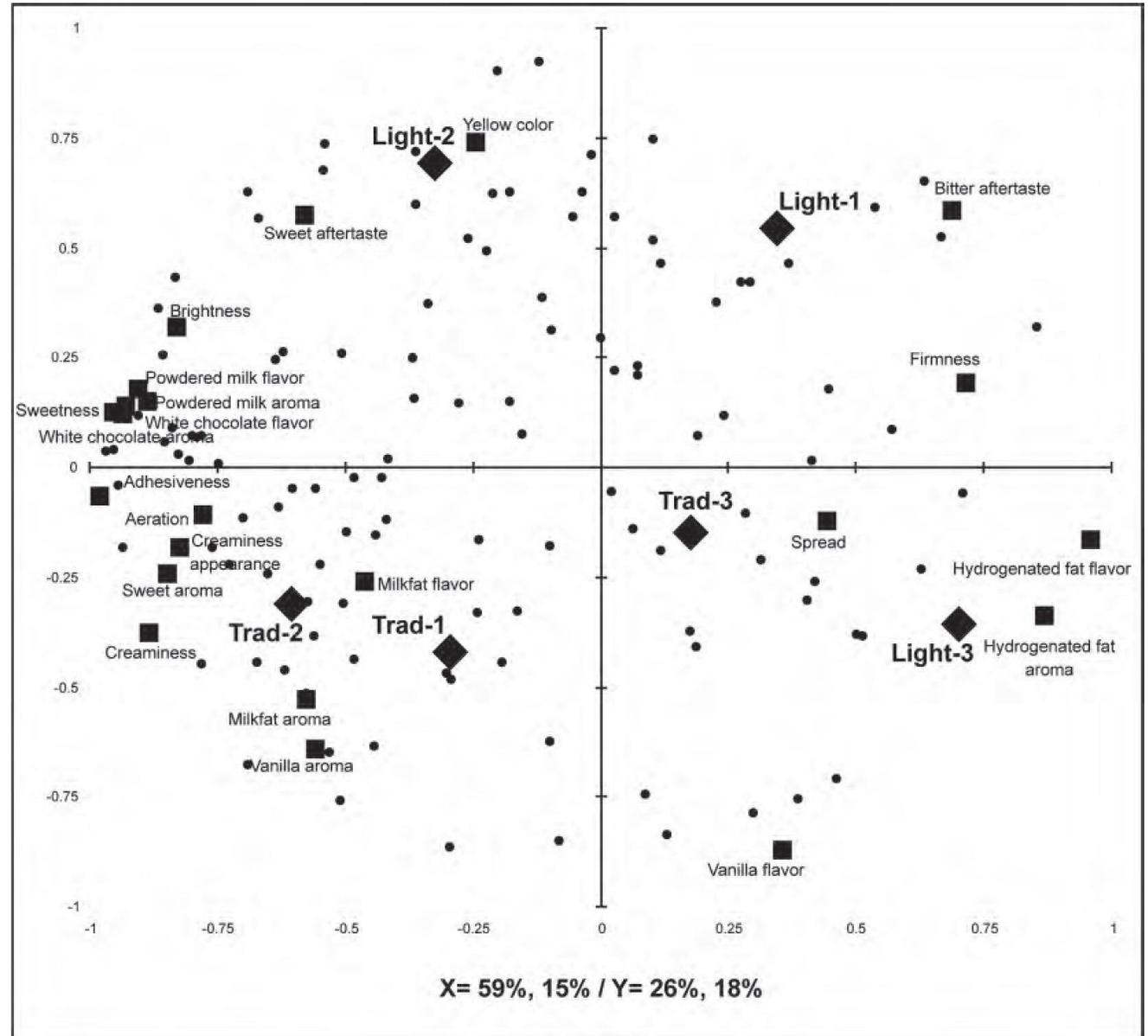
Most foods are multimodal experiences

# Creaminess in sensory analysis

- Creaminess: The force required to compress the sample between the tongue and the palate
  - Weak: Parmalat custard dessert
  - Strong: Parmalat white chocolate dessert
- Creamy appearance: Resistance to using a small plastic spoon
  - Weak: Parmalat dairy dessert
  - Strong: Parmalat dairy dessert with white chocolate flavor

# Preference map of vanilla ice creams

- diamond = samples
- square = attributes of descriptive analysis.
- circle = consumers.
- Trad = traditional ice creams
- Light = vanilla ice creams, reduced fat and sugar



# What we know about **creaminess**, in general

- Results from a multimodal integration of multimodal sensory terms, e.g., looks, smells, tastes, feels **creamy**; looks, smells, tastes, feels **smooth**; looks, smells, tastes, feels **rich**; looks, smells, tastes, feels **thick**, etc.
- Early work attempted to correlate instrumentally measured parameters with sensory assessments of creaminess with little success.
- Subsequent work created models for creaminess with thickness, softness and slipperiness
- Tactile creaminess parameters are influenced by product rheology, viscosity, particle concentration/size/shape/distribution/nature but these parameters are also complicated
- Also categorized as **meta-descriptor** because it changes or its rating is affected by consumer experience (Mattes, 1993 report: dietary habits influenced hedonic ratings)

# Creaminess

No clear model:  
some parts of  
the puzzle;



# Creaminess: evidence for flavor

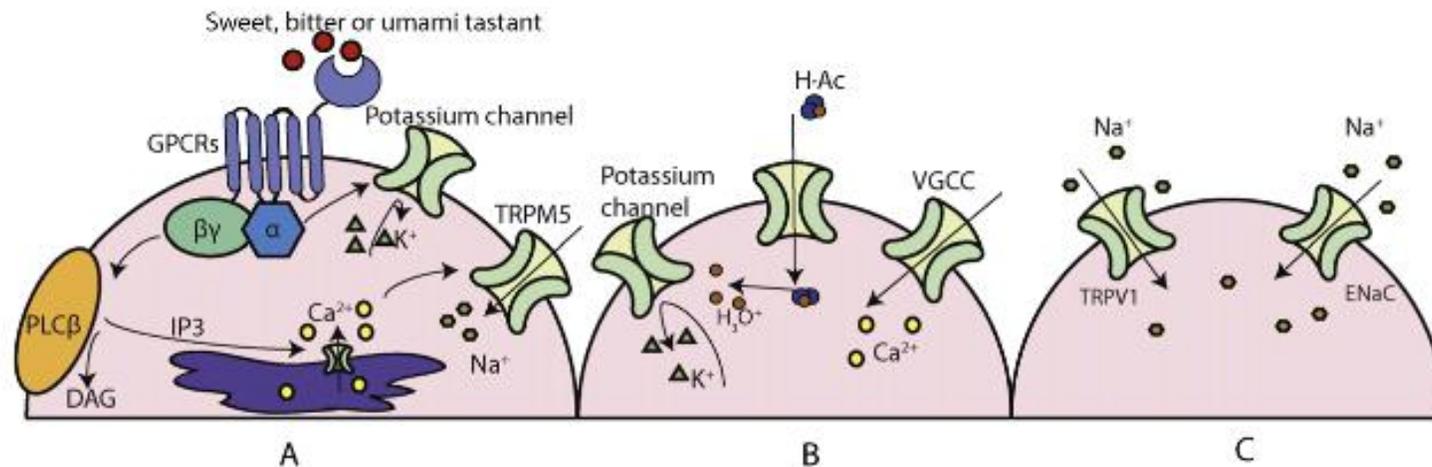
*The perception of creaminess in sour cream is primarily due to milk fat perception specifically from the **flavor** from milk fat. These results suggest that in-mouth perception of creaminess of full-fat sour cream is primarily assessed through olfaction of milk fat-associated flavors.*

# Creaminess flavor chemistry

*The key odour compounds of sour cream butter are diacetyl (buttery-like), butanoic acid (cheesy) and  $\delta$ -decalactone (peach). The aroma of butter oil is characterised by aldehydes, such as (E)- and (Z)-2-nonenal and (E,E)-2,4-decadienal, conferring green and oily notes. Olfactometric studies of heated butter showed the formation of new aroma compounds during heating, such as 3-methylbutanoic acid (cheesy), methional (potato-like) and 2,5-dimethyl-4-hydroxy-3-(2H)-furanone (caramel-like).*

# Creaminess: Evidence for “fat” as a taste

- Evidence points to a chemosensory component for fat taste
- Possible receptors: CD36, G-protein-coupled receptors

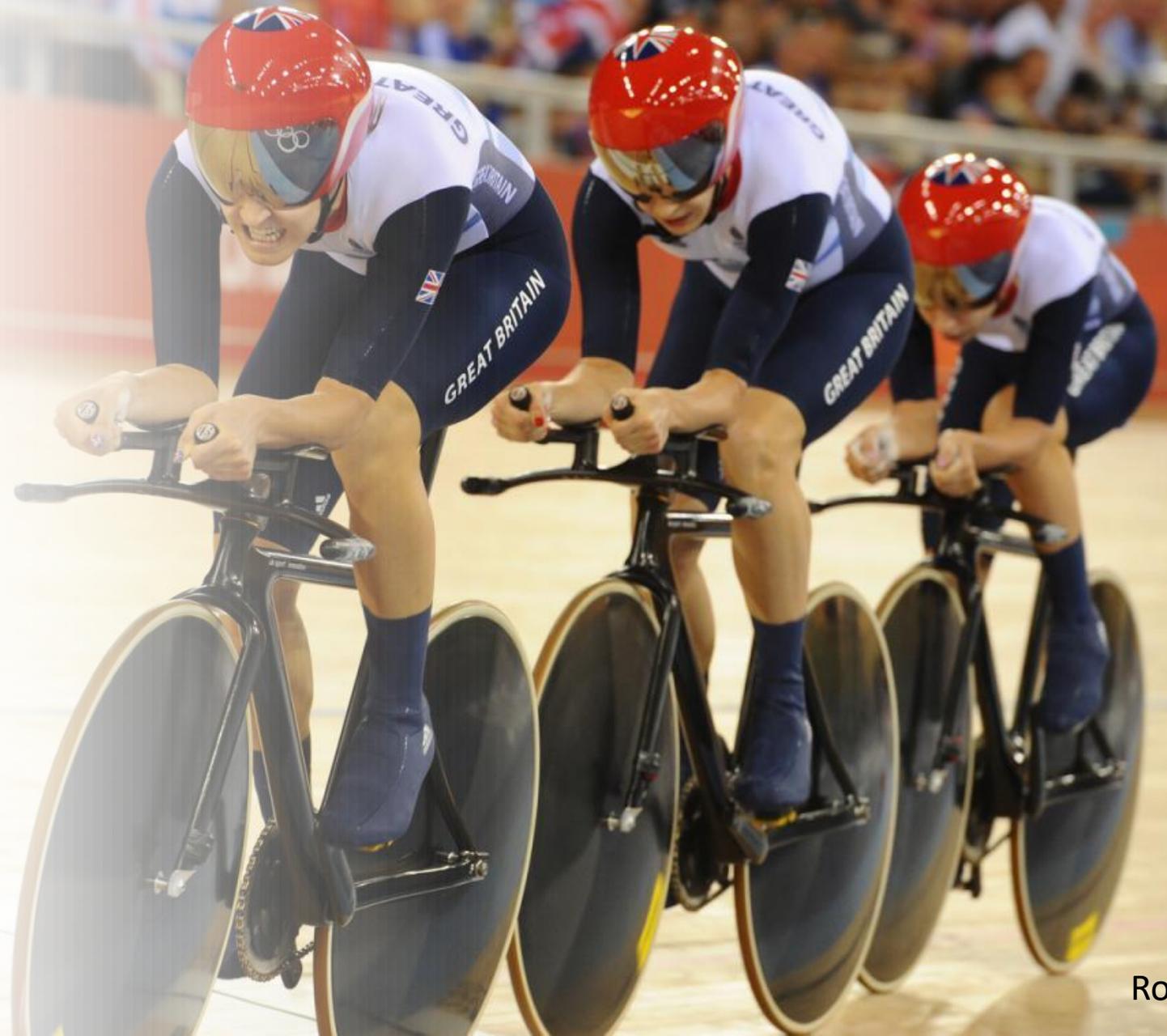


# Creaminess: a role for particles?

*“In contrast to chocolate particles, which are irregular in shape but do not possess sharp edges, particles of alumina (used in toothpastes for their abrasive effect) are hard and possess sharp edges. Such particles produce a gritty sensation in the mouth even when the particle sizes are as low as 10um.”*

-D. Kilcast, S. Clegg, Food Quality and Preference 13 (2002) 609–623611

Path forward?  
British cycling and  
marginal gains



# A possible path forward for Creaminess: Appearance

- Opacity
- Sheen
- Surface character
- Softness
- Aircell size, homogeneity
- Color



# A possible path forward for Creaminess: Touch

At scoop/spoon

- Malleability
- Cut/resistance

Mouthfeel

- Particulate size and shape and character
- Viscosity
- Rheology



# A possible path forward for Creaminess: Aroma

Aroma of milkfat

- High quality cream
- High thermal treatments
- Fermentation?



Path forward? British  
cycling and marginal  
gains

Choose a few, e.g., flavor,  
particles, sheen

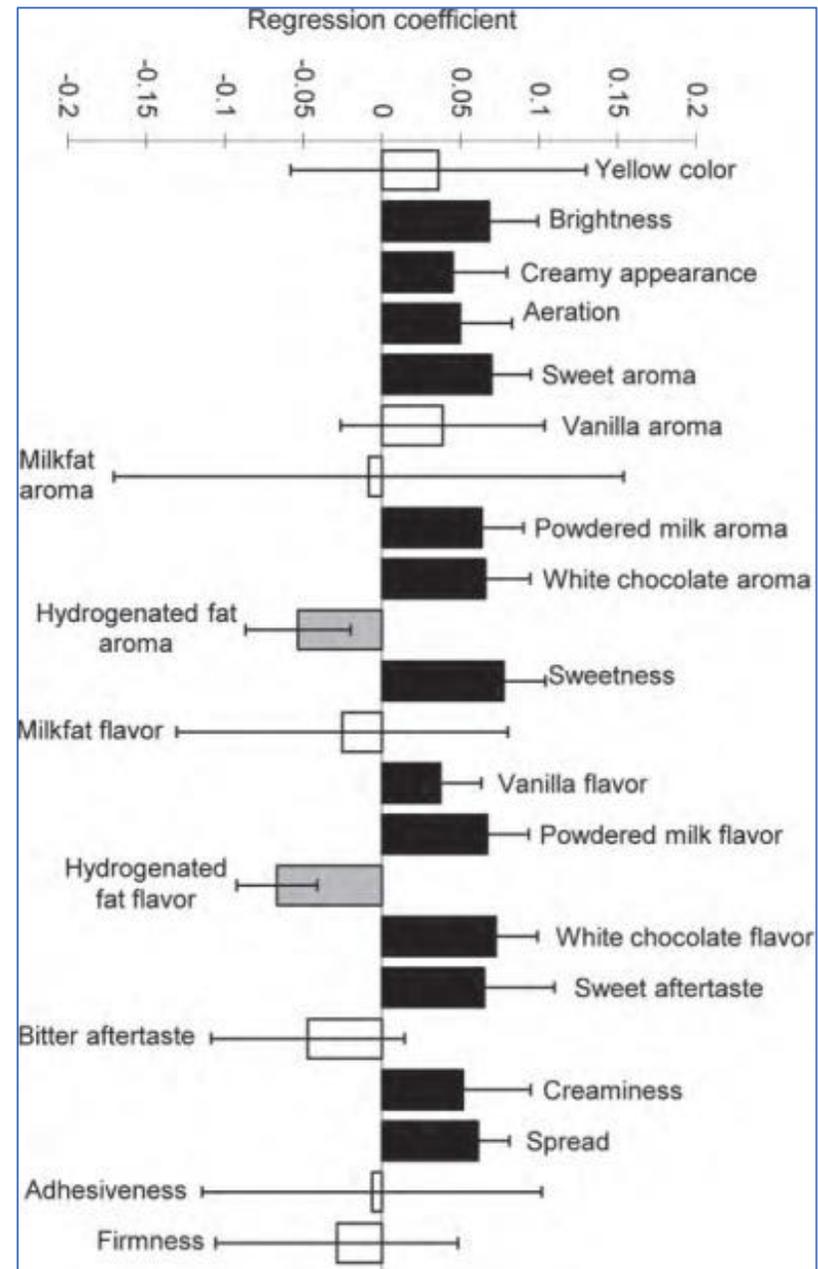
*However, increase number of  
“creaminess cues” = increased  
creaminess perception*

Progress in Lipid Research 63: 41-49, 2016



Road.cc

# Multimodal attribute: use multimodal approach



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