

Considerations in Natural Flavoring Use in a Clean Label World

Keith Cadwallader

*Department of Food Science and Human Nutrition
University of Illinois at Urbana-Champaign*

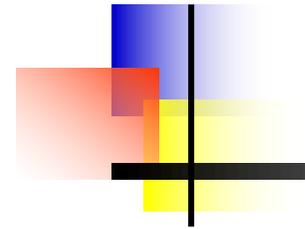
Email: cadwldr@illinois.edu



CLEAN LABEL
CONFERENCE

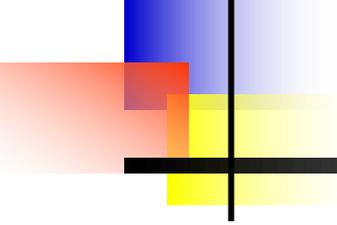
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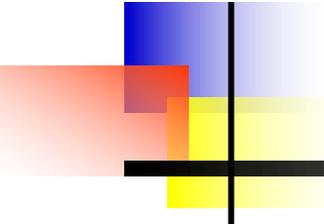
Overview

- **Flavor and Flavor Quality**
- **Defining “clean labeling”**
- **“Clean labeling” and natural flavoring substances**
- **Future flavoring challenges and solutions (examples)**
 - **Flavor/taste enhancers**
 - **Smoke flavor**
 - **Vanillin**



Significance of Flavor to the Food Industry

- **Flavor is THE main determinant or driver of:**
 - **consumer acceptance of a food product**
 - **repeat purchase intent for a food product**



Flavor

- **Flavor is the integrated and nearly simultaneous response to the perception of taste, aroma and somatosensory (nerve) stimuli present in the oral and nasal cavities, generally as a consequence of the consumption of a food or beverage (Reineccius, 2006).**

But many other factors influence our “flavor experience”

Review

The multisensory perception of flavor

Malika Auvray ^{*}, Charles Spence

Department of Experimental Psychology, Oxford University, South Parks Road, Oxford OX1 3UD, UK

The impact of perceptual interactions on perceived flavor

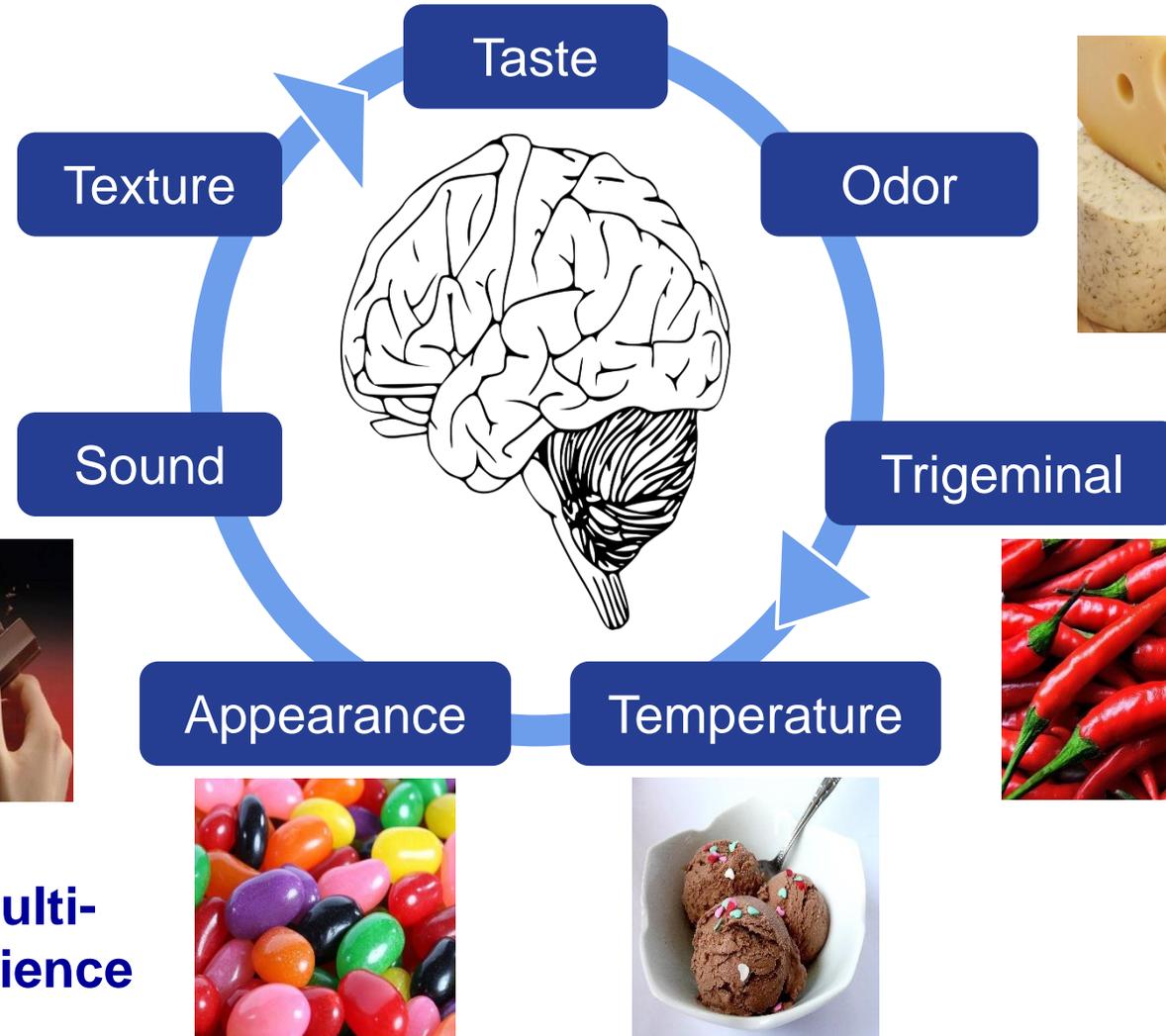
Jeannine Delwiche

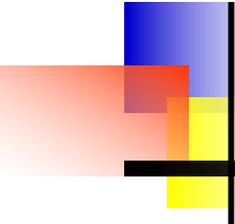
Department of Food Science and Technology, The Ohio State University, 2015 Fyffe Road, Columbus, OH 43210, USA

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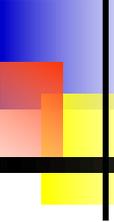
Flavor is a multi-sensory experience





Flavor

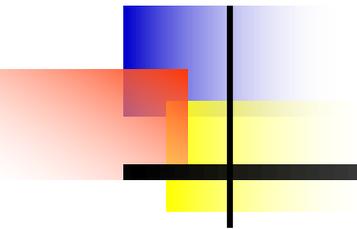
- **Olfaction (aroma or odor) plays the predominant and characterizing role in food flavor quality, including recognition and overall food acceptance (Spence, 2015).**
- **This explains why most commercial flavorings contain mainly aroma compounds (that is, they deliver the aroma components of the target flavor).**



What defines flavor quality ?

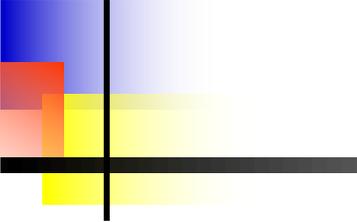
Desirable Sensory Attributes

- **Immediate impact of identifying (expected) flavor (e.g., vanilla / chocolate / lemon)**
- **Rapid development of a balanced, full-bodied flavor**
- **Compatible mouthfeel and texture**
- **Lack of foreign or off-flavors**
- **Minimal (brief) aftertaste, i.e., “clean taste”**



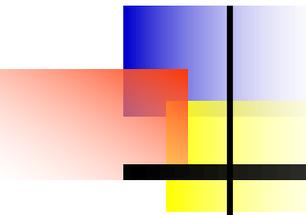
Why add flavor?

- Impart target flavor attributes (aromatics) to formulated products that lack flavor
- Compensate for flavor deficits or defects
e.g. “top note” frozen concentrated orange juice (FCOJ)
- Mask off-flavors
e.g. functional foods
- Compensate for flavor losses caused by processing or storage
e.g. thermal degradation, flavor fade due to flavor interactions/binding



Commercial flavorings

- May contain either natural or artificial (chemically synthesized) aroma compounds or a combination of both (+ essential oils/extracts).
- Most contain mainly aroma substances
 - **taste components/enhancers are generally added separately by manufacturers**
- Savory flavors (e.g., spice extracts, process flavors) may contain both aroma and taste-active compounds
- Available as concentrates, diluted flavors (in carrier), or bound to/in carriers (encapsulated)



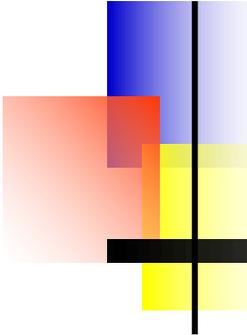
Product Form and Function Matter

Bars/Cereals

- Low moisture/low water activity
 - moisture migration concerns
 - texture concerns
 - possible phase changes
- No or mild thermal process
- Immobile flavor system
- Ambient storage/long shelf-life
- Possibility of using encapsulated flavors
 - will reduce flavor interaction and flavor loss

Beverages

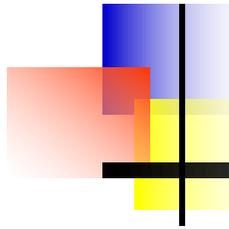
- High moisture
 - spoilage concerns
 - viscosity/consistency concerns
- pH restrictions/limitations
- Severe thermal process (UHT)
- Integrated/mobile flavor system
- Ambient or refrigerated storage
 - variable shelf-life
- Difficult to use encapsulated flavors



Natural Flavors and Clean Labeling

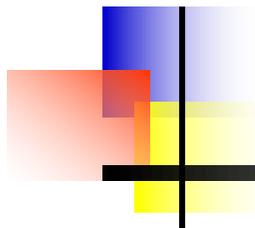
What is a “Clean Label”?

- Clearer, more precise and transparent label (*full disclosure*)
- Shortened ingredient list, simpler claims
- Packaging, labels and declared ingredients convey quality, wholesomeness and healthfulness
- Clean labels can indicate what IS and what IS NOT in the product
Free from GMOs, preservatives, artificial flavors, colors, hydrogenated oil, trans fat, cholesterol and artificial ingredients. Low in sodium and saturated fat. Made with real honey and whole grain brown rice.
- Helps consumers understand what is in the product and how it was made.
 - clean and wholesome ingredients, minimally processed
 - natural flavors



“Clean Label” Flavors and Flavorings

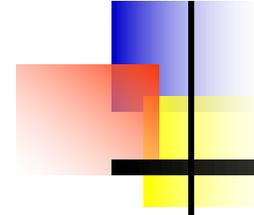
- **Must not contain anything (declarable) on the “clean label list”**
- **Must be “natural”** **“Natural” = “Clean”?**
- **“Verified” (non-GMO) flavors**
- **Allergen-free flavors (e.g., avoid nut-derived flavors)**
- **“Wholesome” flavors – derived from natural, wholesome sources and traditional methods**



What is a natural flavor?

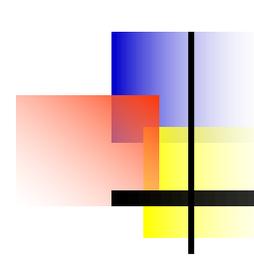
US and EU define “natural” differently

- **US – An essential oil, oleoresin, essence or extractive, protein hydrolysate, distillate, or any product of roasting, heating or enzymolysis . . . (source material must be natural) [21CFR101.22]**
- **EU – Source material must be vegetable, animal, or microbiological. Must be produced by a traditional food preparation process. Natural flavoring substances correspond to substances identified in nature.**
- **But, not all natural flavors are “clean” ingredients.**



Types of Natural Flavor and Flavorings Generally Suitable For a Clean Label

- **Plant sourced: extracts, essences, essential oils**
- **Fermentation-derived (including bioconversions)**
 - **Includes biotech flavors (non-GMO process)**
- **Process flavors (thermal processing)**
 - **Must not contain HVP, AYE or added MSG/I+G**



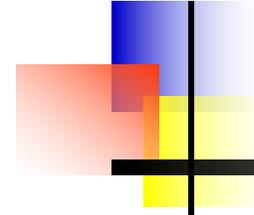
More Flavoring Considerations

- **Natural flavor extracts (source derived extracts), e.g., vanilla extract**

versus

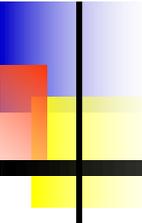
**Natural aroma chemicals (WONF)
Includes biotech flavors (non-GMO process)**

- **Natural flavors (ambiguous) - not necessarily derived from the substances they mimic**
- **Organic flavors (requires source materials are organic)**
- **Often natural flavors are combined with WONF**
 - **e.g., Natural Lemon Flavoring with other natural flavors**



Some examples of effective “clean” ways to deal with challenging flavors

- **Flavor/taste enhancement**
 - **need alternatives to the (intentionally added) HVP, AYE, MSG, I+G**
- **Smoke flavor**
 - **perceived issues regarding process and safety**
- **Vanilla flavor (vanillin)**
 - **tremendous demand, limited supply, high cost for natural flavor**



Flavor/Taste Enhancement

- **Need clean alternatives to the direct addition of HVP, AYE, MSG, I+G**
- **Consider the use of ingredients naturally high in free glutamate: derivatives/extract/powders of ripe tomato, cheese (EMCs, parmesan), soy-sauce, fish-sauce, mushroom, etc.**
- **Alternative declaration statements:**
Label declares contains
"hydrolyzed *wheat* protein" or
"hydrolyzed *milk* protein" instead of HVP

Smoke Flavor

- **Liquid Smoke** - a *natural* aqueous condensate of wood smoke (GRAS status).

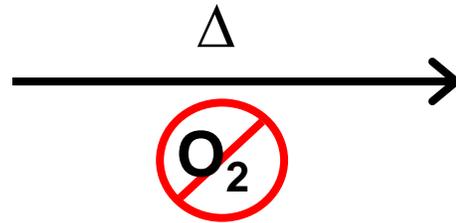
- **Early development**
 - 1880s
- **Commercially viable**
 - early 1970s



Controlled pyrolysis of wood components

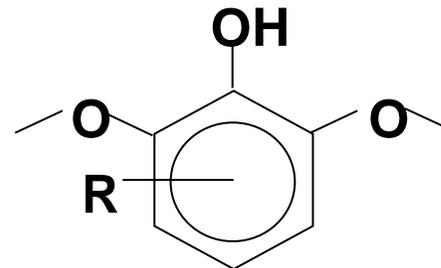
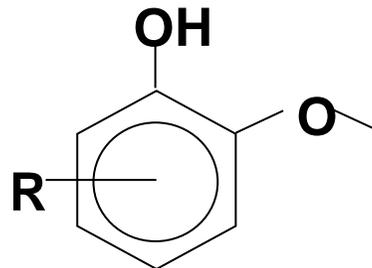
Wood Components

- Cellulose
- Hemicellulose
- **Lignin**
- Miscellaneous



Volatiles

- **Phenols/Guaiacols**
- Acids
- Carbonyls
- Esters
- Alcohols
- Miscellaneous

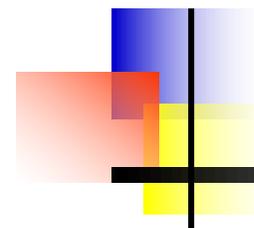


Labeling/Ingredient Considerations

- **Natural smoke flavoring** may not be listed as just "**natural flavor**" or "**flavor**" in the ingredients statement. It may be declared as "**natural smoke flavoring**" or "**smoke flavoring**."
- **Option = use "perceived" wholesome ingredients that impart smoke flavor ***

*Natural Hardwood Smoked - sugar, salt, spices, cheese or other smoked ingredient provides smoke flavor with a clean label, can be labeled as **Natural Hardwood Smoked X.***

* **Note: use of a direct smoked product or ingredient may not be a safer alternative, since liquid smoke extracts undergo stringent purification steps to remove undesirable substances.**



Vanilla Extract, Natural Vanilla Flavor, and Vanillin

- **Vanilla is the world's most popular flavor**
- **Enormous demand for natural vanilla/vanillin**

Vanilla Extract

Natural Vanillin

Artificial Vanillin

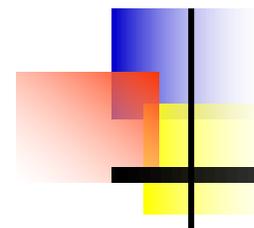
- from pods

- biotech

- from guaiacol

- from lignin

- **Huge cost difference between natural and artificial vanillin**
 - **natural vanillin** \approx \$1500-4000/kg (pods)
 - $>$ \$100/kg (biotech)
 - **artificial vanillin** \approx \$10-15/kg

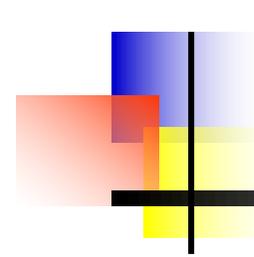


Vanilla Extract, Natural Vanilla Flavor, and Vanillin

- **Supply is main problem concerning natural vanilla, although declaration of contains “natural vanilla” or “pure vanilla extract” is most desirable**
- **Biotech is best solution for sustainable vanilla flavor**
 - **R&D conducted for over 4 decades**
 - **viable technologies demonstrated in past decade***

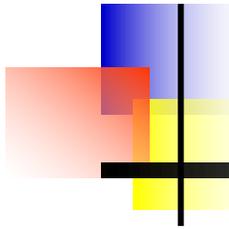
US (FDA) and EU Labeling Regulations Differ

- **Vanillin extracted from vanilla beans and/or purified vanillin from this source**
 - “natural vanilla flavor” in both US and EU
- **Vanillin made by fermentation (e.g. from ferulic acid) or by extraction from other source material than vanilla beans.**
 - “natural flavor” in both US and EU
 - FDA may require further approval of process, EU might not
- **Vanillin made by chemical process from lignin, guaiacol, etc.**
 - “synthetic” or “artificial vanilla flavor” in US, “vanilla flavoring” in EU
- **Ethyl vanillin (not found in nature)**
 - “artificial vanilla flavor” in US
 - “vanilla flavoring” in EU (absence of word “natural” implies artificial flavor in EU)



Summary and Conclusions

- **“Clean label” is a dynamic concept that appeals to consumers**
- **It is as much about what’s in the product and what’s NOT in the product**
 - **use of wholesome, consumer friendly ingredients and flavorings**
 - **avoid certain ingredients and flavorings not considered “clean”**
- **Some traditional flavoring ingredients may not be “clean” ingredients.**
- **Whenever possible manufacturers should explicitly state use of specific flavors/flavorings perceived to be “clean”.**



Summary and Conclusions

- **To help meet the demands of the “clean label” conscious consumer, manufacturers have stepped-up efforts to produce natural biotech flavors using non-GMO approaches to produce natural flavors and ingredients.**
- **Finally, expect change – due to ever evolving consumer attitudes, regulations and industry innovation**

Thank you

