

Ingredients and Emotions

Emotions have much in common with basic food profiles. Thinking of emotions in this way can open a whole new world of opportunity for improving the way food is designed, made and sold.

by Paul Conner and Aaron Reid

In recent years, neuroscience has enhanced our understanding of what emotions are by discovering and delineating the biological processes of emotion. Today emotions are specifically recognized as arising from neuro-chemical activity in certain brain areas that direct our attention, motivate our behavior, and determine the significance of what is going on around us. This neuro-chemical activity is key to how we define emotions and how we conclude that emotions can be considered an important food profile discovery.

Specifically Defined

For the purposes of this article, our working definition of emotions is as follows: “Emotions are automatically occurring states of being which arise from specifically defined networks of neuro-chemical

reactions in the brain and other parts of the body that ultimately inform and drive decisions and behavior.”

By saying that emotions arise from “specifically defined” networks of neuro-chemical reactions, we are arguing that emotions have chemical and location specificity. For example, two emotional reaction chemicals are serotonin and oxytocin. Also, emotional reactions occur largely (but not exclusively) in limbic areas of the brain, which include the amygdala, hippocampus, hypothalamus, and cingulate gyrus among others. Finally, the function of emotional neuro-chemical reactions is to provide value to decisions and behavior we are considering. Without this value, our decisions and behavior would be quite dysfunctional.

It’s also important that we distinguish emotions from

feelings. Emotions arise from the initial, automatically occurring neuro-chemical reactions to emotionally-competent stimuli. Feelings result from the cognitive appraisals of these initial emotional reactions in the context of particular situations.

There are fewer emotions, but many more feelings. For example, the psychologist Paul Ekman recognizes seven primary universal emotions – happiness, surprise, sadness, fear, anger, disgust, and contempt. Yet, he further argues that when such emotional body states are cognitively appraised in various contexts, feelings such as excitement, pride, love, disappointment, guilt, and embarrassment emerge.

This distinction becomes important when we provide examples of emotions and feelings that arise through food consumption.

Food Profile Elements

“Ingredient” can be defined as something that enters into a compound or is a component part of any combination or mixture. Ingredients function in part to form the flavor profile of a food. As we build the link between the flavor profiles and emotional profiles of foods that arise from the ingredients, we will focus on the chemical components of both. The ingredients can be reduced to chemical, molecular structures.

In *Molecules of Emotion* (1997), Candace Pert makes the point that emotions result from, and therefore can be fundamentally represented by, the action of peptide neurotransmitters. Neurotransmitters are chemicals that carry messages between neurons in the brain. Different neurons and their specific neurotransmitters are assigned to different processes, including

Table 1: How Food Ingredients Lead to Emotional Effects

In complex indirect ways, various food ingredients act as neurotransmitter precursors. They help produce various brain neurotransmitter chemicals which, in turn, have various emotional effects. Listed below are several common neurotransmitter precursors along with some of their associated neurotransmitters, emotional effects and foods.

Neurotransmitter Precursors	Help Produce These Neurotransmitters	That Have These Emotional Effects	Some Foods That Contain the Precursors
Phenylalanine Tyrosine	Dopamine Norepinephrine Epinephrine	Alertness, energy, pleasure	Proteins – fish, poultry, meat, eggs, legumes, cheese, fish
Tryptophan B6 Folic Acid	Serotonin	Calm, optimism	Carbohydrates – whole grains by themselves without proteins. Proteins – eggs, poultry, cottage cheese etc.
Cholecystokinin (CCK)	Oxytocin	Love, comfort	Fatty foods (e.g., ice cream) and foods high in fiber (e.g., whole grains and beans)

Keep in mind that food digestion and processing to the brain can be affected by complex mixtures and processes, so these relationships are general in nature.



emotional reactions.

For instance, common emotional neurotransmitters are serotonin, oxytocin, dopamine, norepinephrine, epinephrine, and various endorphins. These neurotransmitters have the following molecular structures:

- Serotonin: $C_{10}H_{12}N_2O$
- Oxytocin: $C_{43}H_{66}N_{12}O_{12}S_2$
- Dopamine: $C_6H_3(OH)_2-CH_2-CH_2-NH_2$
- Norepinephrine: $NC_{18}O_3H_{11}$
- Epinephrine: $C_9H_{13}NO_3$
- Various endorphins like met-enkephalin: $C_{27}H_{35}N_5O_7S \cdot xCH_4O_2 \cdot yH_2O$

Given that “molecules of emotion” have specific molecular structures, aren’t they like food ingredients? For instance, here are the molecular structures of some common food ingredients:

- Fructose: $C_6H_{12}O_6$
- Cholesterol: $C_{27}H_{45}OH$
- Caffeine: $C_8H_{10}N_4O_2$

Activating Emotions

The above food ingredients are listed to show that both traditional food ingredients and emotional neurotransmitters reduce to chemical compositions. From this, one might wonder whether the neurotransmitters can be directly included into food to immediately activate emotions.

We wish it could be that simple, but unfortunately the answer is no. When ingested directly as food ingredients, emotional neurotransmitters don’t cross the “blood-brain” barrier to directly reach the brain and do their work.

However, all is not lost. Certain food ingredients (primarily amino acids) called “neurotransmitter precursors” do activate the production of various emotional neurotransmitters. For instance, tryptophan, a standard amino acid, is a precursor to the production of serotonin in the brain. Tyrosine does the same for the regulation of dopamine. And cholecystokinin (CCK), a hormone, does the same for the production of oxytocin.

Chemical Similarity

To make the “chemical similarity” point for neurotransmitter precursors, here are the molecular structures of those listed in table 1:

- Phenylalanine: $C_9H_{11}NO_2$
- Tyrosine: $C_9H_{11}NO_3$
- Tryptophan: $C_{11}H_{12}N_2O_2$
- B6: $C_8H_{11}NO_3-HC_1$
- Folic acid: $C_{19}H_{19}N_7O_6$
- Cholecystokinin (CCK): $C_{49}H_{62}N_{10}O_{16}S_3$

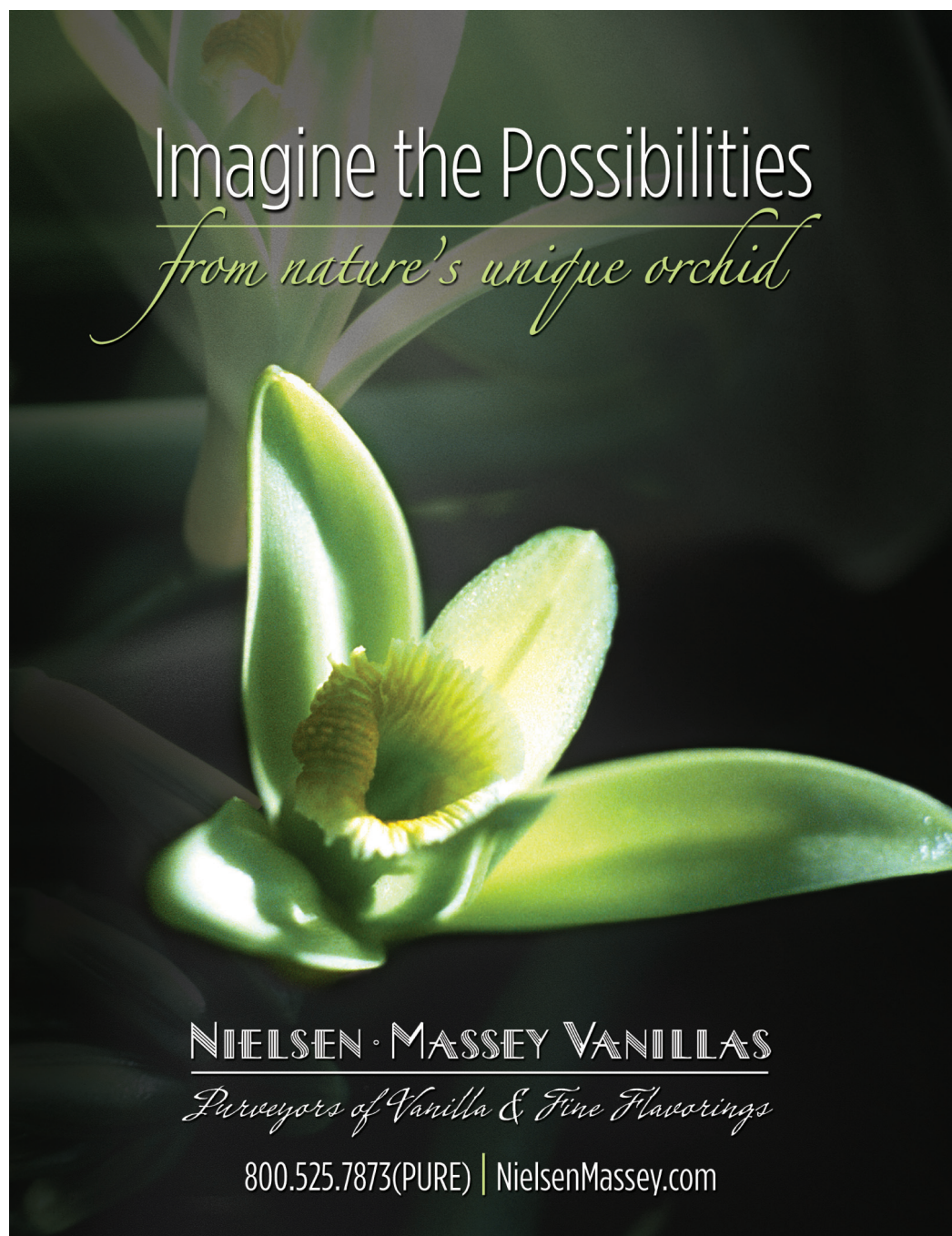
We hope you can see that molecules of emotion are fundamentally constructed no dif-

ferently than food ingredients. In essence, the biological underpinnings of emotions and food ingredients are chemical cousins. They contain combinations of elements that produce certain body reactions (and ultimately consumer behavior).

Driving Behavior

Let’s revisit emotions’ ultimate purpose – to inform and drive decisions and behavior. Stated another way, emotions are our bodies’ first indications that something in our environment

(external or internal) is either good or bad for us and serve as instructions to do something about it. Yes, advanced human abilities to think and reason (i.e., cognitively appraise) can and do intercede impulsive emotional processing to help direct our behavior. But even our reasoning consults emotions to see whether or not considered decisions and behavior will be good for us in some way. In fact, it is commonly agreed upon today that emotions, either with or without reasoning, provide the



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ultimate go-or-no-go value to our decisions and behavior, including our consumer decisions and behavior. We like to say that “emotions tell us what to do, including what to buy.”

Think about it. What ultimately tells you to buy one frozen dinner brand vs. another? One car vs. another? One anything vs. another anything? Yes, reasoning often takes place, but at some point a final evaluation of the “rightness” or “wrongness” of any reasoned options takes place. A spark of “yes, that’s the right decision” occurs. That spark is emotion. And again, it is fundamentally a neuro-chemical reaction that’s making you “feel” your way toward the chosen behavior.

Activating Emotions

Seeing that emotions drive consumer behavior, and knowing that increasing profits requires increasing buying of a particular brand, an important task is knowing how to activate the emotions that will tell a consumer target to buy your brand. How to activate emotions means

creating the right stimuli including the right brand name, the right advertising, the right price, the right social networking, and, of course, the right food ingredients and sensory experiences.

As we’ve seen, different food ingredients help to activate molecules of emotion in our brains. In addition, different sensory aspects of food activate different emotions. A particular smell of cookies can remind someone of grandma’s house, triggering feeling loved and cared for. A hot-and-spicy seasoning can activate feeling excited and playful. A particular wine texture – perhaps full-bodied – can activate feeling romantic on a date. And particular negative sensory experiences – an extremely sour taste or pungent odor – can activate feeling disgusted, if not fear of dying. Finally, even less tangible food experiences can do the same thing. For instance, popcorn might activate emotional memories of snacking with the family while watching a favorite television show on a Saturday night. From this, one might feel excited, playful, or loved,

depending on what emotional molecules were activated and encoded into memory with the event. Whatever the stimulus, neuro-chemical reactions are activated to produce the emotional experience.

Emotional Research

Researching what activates particular emotions is extremely important for food makers and marketers. Yet, effectively conducting emotional research is not an easy task for two important reasons. Firstly, emotions operate in large part below people’s level of awareness. In other words, people are not always consciously aware of how their emotions are driving their behavior. (If we had to stop and think about how we were feeling every time we had to make a decision, we wouldn’t get very far!). Secondly, sharing our emotions, including in research interviews or on research surveys, is often not socially acceptable. People don’t always want to admit that they are feeling certain feelings, if feeling anything at all. Emotional decisions are commonly thought of as inferior, so admitting we make them puts one in a bad light.

To address these natural, yet hidden, aspects of emotions, effective research must often combine more traditional “explicit” research (i.e. techniques that ask for consumers’ conscious awareness of their feelings) with less traditional “implicit” research (i.e. techniques that unobtrusively derive what consumers can’t or won’t convey about their feelings).

Having conducted many explicit and implicit research studies, we have found some very interesting things about how emotions drive the purchase and consumption of various food products. Some examples are listed in the box.

Expanding Food Profiles

Circling back to our main point, we suggest the possibility that emotions and feelings can

be “added to” (i.e. activated by) food products in at least three ways: (1) via ingredients that function as emotional neurotransmitter precursors; (2) via sensory experiences that activate associated emotional reactions; or (3) via contextual associations that activate memorized emotional reactions.

This will require closer consultation between sensory scientists and marketers. These two important product developers should collaborate to design and conduct integrated research that reveals ingredient, sensory, and “life event” food stimuli that activate purchase-driving emotional experiences. Leading CPG brand teams are already activating emotional profiles of foods within the marketplace. For instance, the deodorant Old Spice Matterhorn Deodorant features the words “smells like ice, wind, & freedom.” Why couldn’t food products do the same? For instance, the current ingredient profile of a Larabar Apple Pie includes dates, almonds, unsweetened apples, walnuts, raisins, and cinnamon. Shouldn’t this product also market its emotional profile: produces feelings of security, health, intelligence, and cared for?

Targeting Consumers

Food makers can’t directly add emotional neurotransmitters to their products to produce the intended emotional reaction. However, sensory scientists and marketers on product development teams can certainly research what emotions drive their targeted consumers to purchase their brands. And knowing these emotions, they can also determine what neurotransmitter precursors, sensations, and life events activate them. Doing these tasks and effectively marketing this information will create an emotional food profile that can increase pleasure and profits. ♦

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How Emotions Drive the Purchase and Consumption of Various Food Products

- Implicitly feeling loved by a frozen food brand significantly impacted purchase more than any other tested explicit feeling.
- Lighter wines (in color) made people feel more carefree and are therefore purchased for “lighter” occasions.
- Consumers of a particular snack food felt immediately less depressed when eating the snack.
- Indulgent tasting foods are often sought after as a way for consumers to behave in a naughty or rebellious manner and as a result feel more free and uninhibited.
- Shoppers reduce feelings of guilt about purchasing highly indulgent foods by focusing on the good feelings they get from saving money with a promotion.
- A major CPG brand which reinforced a core brand attribute of being “wild” with bold new flavor profiles saw double-digit growth in sales.