Food Innovation: The Lifeblood of a Food Technologist

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Demand for food

Growing population

Rising income

Changing lifestyles

Social concerns

Environmental concerns
Food improvement

- Food Innovation
- Food renovation
- New product formulation
- Product reformulation
Food reformulation/ renovation

- Product already exists, has a market and most importantly it has consumers with opinion.
- Reformulation strategy: driven by consumer demand: desired for healthier product (lower in sugar, salt, or fat or removal of a particular ingredient that received negative media coverage eg trans fat, artificial colour, HFCS or GMO, allergens and high protein)
- Expectation of the consumer: minimal detrimental impact of product quality
Fig. 3 Relationship between various sensory quality attributes
Value engineering

- Important exercise in reformulation and fill the time of many product developers.
- Considered as a devaluation by the consumer
Food innovation

• Product and process development is a vital part—the **lifeblood**—of smart business strategy.

• **Product Development** is a systematic, commercially oriented research to develop products and processes satisfying a known or suspected consumer need.

• There are five stages in every product development process:
  • product strategy development
  • product design and development
  • product commercialization
  • product launch
  • post-launch

Five key phases in reformulation venture

- Justification
- Mitigation
- Characterization
- Realization
- Qualification
1) Justification

- Change ingredient and/or process will change the product and have an impact on consumers.
- Impact need to be quantified and mitigated
- Why you are undertaking the process and what are the countable benefits.
- Need good background information derived from credible source and supported by good science
Reducing sugar in carbonated drink

- Low sugar; mouthfeel change therefore need to add other ingredient that add ‘body’ or add texture and increase viscosity; eg guar gum, gum arabic
- Add sweetener: changes taste profile (bitterness and aftertaste); not accepted by the consumer
- Each formulation should be carefully tested to ensure product profile meets sensory appeal and is not affected during reformulation
<table>
<thead>
<tr>
<th>Sweetener</th>
<th>Brands or Trade Names</th>
<th>E-number</th>
<th>No. of times as sweet as table sugar</th>
<th>Natural or artificial, caloric</th>
<th>Aftertaste</th>
<th>Stability</th>
<th>Absorption, metabolism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acesulfame K</td>
<td>Sunett, Sweet &amp; Safe, Sweet One, Natrona</td>
<td>E950</td>
<td>200</td>
<td>Artificial - no calorie</td>
<td>Bitter</td>
<td>Stable under heat; stable under moderately acidic or basic conditions.</td>
<td>Not metabolized.</td>
</tr>
<tr>
<td>Sucralose</td>
<td>Splenda, Tagatesse</td>
<td>E955</td>
<td>600</td>
<td>Artificial - no calorie</td>
<td>None</td>
<td>Stable under heat and a broad range of pH conditions.</td>
<td>A small amount is absorbed, but not metabolized.</td>
</tr>
<tr>
<td>Neotame</td>
<td>NutraSweet</td>
<td>E961</td>
<td>8,000</td>
<td>Artificial - no calorie</td>
<td>Slightly bitter/metallic</td>
<td>Moderate heat-stable.</td>
<td>Rapidly absorbed and metabolized.</td>
</tr>
<tr>
<td>Rebauudioside A/Steviol Glycosides</td>
<td>Enliten, PureVia, Stevia, Sun Crystals, SweetLeaf, PureVia, Truvia</td>
<td>E960</td>
<td>40-300</td>
<td>Natural plant extract (Stevia), also manufactured artificially - no calorie</td>
<td>Bitter or licorice-like</td>
<td>Stable under heat up to 140°C and a broad range of pH conditions.</td>
<td>Metabolized into steviol, which is then broken down into glucose and steviol.</td>
</tr>
</tbody>
</table>
Fats and Salts

• Key component in creating appeal increasing mouthfeel and enhancing taste perception.
• By removing fats and salts, product maybe negatively infected and may lose consumer appeal.
• Therefore, need to select ingredients that build back taste and mouthfeel in food product.
Natural Colour

- 78% of global consumers are prepared to pay more for natural colours.
- 88% believed that using natural colours in food and beverages will add value.
- 92% of global consumers are concerned about usage of synthetic colours in food and beverages.
- Female consumers appears to be more receptive to colour claim on product level.
2) Mitigation

- Implication of each potential change and identify the strategy to reduce the risk to an acceptable level.
- Detail understanding of sensory profile and consumer preference of the product.
- Sensory profiling: need trained panel to quantify sensory attributes that the product possesses.
- Preferences: consumer or affective test (potential target consumers)
**Definition of Sensory Evaluation**

Sensory evaluation has been defined as a scientific method used to **evoke**, **measure**, **analyze**, and **interpret** those responses to products as perceived through the senses of sight, smell, touch, taste, and hearing………………(Stone & Sidel 1993)
The quality development cycle and the language of management
Why eat fruits? (PBHF 2005)
Why eat fruits and vegetables: Sensory

- Aroma
- Flavour (Sweetness)
- Color
- Texture
- Taste
Segmenting consumers by mindset

MIND GENOMICS

Targeting part-time vegetarians
eye-catching color developments
ingredients for better breakfasts
processing with microbes
Sensory Evaluation technique
Two Basics types of Sensory tests

- **Affective/subjective**
  - Acceptance; preference; ranking and Focus groups

- **Analytical/objectives**
  - Discriminative: Do 2 or more products differ from each other eg. Paired comparison; Duo-trio, and Triangle tests
  - Descriptive analysis: What are the product characteristics eg Flavour Profiling, Texture Profiling; Quantitative descriptive Analysis (QDA), Profile Attribute Analysis (PAA)
Types of Panelists

- Expert panelists
- Trained panelists
- Experienced panelists
- Lab-trained panelists
- Consumer panelists
Interacting departments within a food or consumer products company

- Sensory evaluation
- Marketing
- Product research
- Manufacturing
- Product safety & Toxicology
- Packaging & Design
- Engineering & Process Dev.
- Quality Control
- Legal services
- Sales
- Purchasing
- Purchasing
3) Characterization

- Physical and chemical changes
- Sugar and fat: provide structural element and have an impact on flavour and mouthfeel.
- May have an impact on product stability and shelf-life
4) Realization

- Not easy to achieve success.
- A replacement ingredient is rarely a like-for-like swap, and required optimization
- It needed a lot of well executed ground work to minimize lab work
5) Qualification

- Any reformulated products must fulfill the legal requirement of a particular country of interest.
- Cost very important; you have the best colour, the best taste but if it is expensive you will not meet the target sale.
- Acceptable by the target consumers.
- Make the quality of your product known; promotion and advertisement.
- True to the original: Need consumer input in reformulation activities.
Trends in food innovation

- **Cutting food waste**
  - top trend in 2014.
  - “Waste not want not” reflected manufacturers’ efforts to reduce food loss and waste during the production process.

- **Food safety and traceability**
  - China (expired meat scandal)
  - Taiwan (“gutter-oil” incident)
  - EU (horse-meat adulteration)

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Trends in food innovation

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Food safety should not start with the end consumer, it should start right at the beginning – during the innovation process.
Trends in food innovation

• **3D-printing**
  - Printing foods by mixing together a series of dry ingredients to use as a sort of edible ink
  - Video on food printing: [http://all-that-is-interesting.com/3d-food-printer-technology](http://all-that-is-interesting.com/3d-food-printer-technology)

• **Complex integrated IT system cookbook**
  - food recipes and food processing instructions are managed and developed in complex, integrated IT system cookbook
Trends in food innovation

• **In-Vitro Meat (lab-grown meat)**

  - Earlier this year, Dutch scientists grew hamburger from the muscle tissue of a cow and invited journalists into the lab for a taste test.
  - If perfected, it could end the suffering of farm animals and help fight world hunger.
  - In vitro meat could become the most efficient and humane method for satisfying the world’s meat cravings.

  - In theory, one cell could produce enough meat to feed the global population for a year. Once multiplied, the cells are infused with nutrients and manipulated to increase protein or decrease fat content. The result is boneless sausage, hamburger, or chicken nuggets.

Source: (http://gastrokitty.blogspot.com/2013/02/observe-remarkable-verdure.html)
Trends in food innovation

Liquid supplement

- Liquid supplement that can be customized for preferences, allergies and disease management.
- E.g. Soylent is 33-ingredient, grayish-colored liquid supplement designed to provide all the essential nutrients.

Source: http://insider.foxnews.com/2013/08/05/could-soylent-powder-replace-solid-food
Trends in food innovation

- **Tomato, Potato**
  - What would you call a plant that grows tomatoes up top and potatoes down below? A pomato? A tompato?
  - The breeder of just such a plant, British seed catalog Thompson & Morgan, has settled on the name **TomTato**.
  - The multi-tasking plant is not genetically engineered in the modern sense of the word. Instead it's a hybrid made by grafting the two plants together, the cataloger explained in a statement.

Source: http://ulcommunityroofgarden.com/2013/09/30/the-tomtato/)
Trends in food innovation

- **Molecular Gastronomy**

  - Molecular Gastronomy is another culinary trend that borrows techniques from the science lab.
  
  - By cooking with a pinch of physics and a dash of chemistry, chefs can transform the tastes and textures of food. For example, you can whip up some apple caviar using a method called basic *spherification*. This involves submerging apple juice that's been mixed with the chemical sodium alginate into a bath of calcium to form a sphere. The juice transforms into tiny balls with thin, barely detectable membranes that burst in your mouth like fish eggs when you bite into it.

Source: [http://www.molecularrecipes.com/spherification/]
Thank you