Reformulating for Front of Pack labelling

NZIFST Conference
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Hamilton (NZ)

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What I will cover:

- Background

- Some Front of Pack options in use or suggested (not extensive)

- Fat, sugar and/or salt change options……

- Clever solving of recipe problems

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Background

Why, What, How?

- Guide consumers to "healthier" choices

- Simple or comprehensive, judgmental or interpretive?

- Multitude options

- Will it actually make a difference?

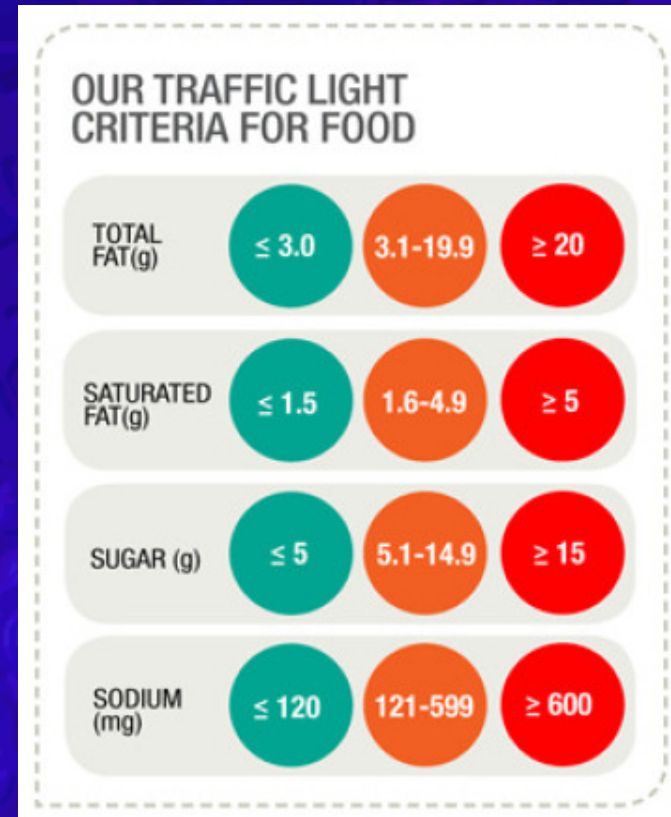Anny Dentener, Technical Director

Traffic lights?

Pros:

1. Simple, easy to understand

Cons:

1. Wide orange criteria

2. Ignores natural foods, protein, fibre.

3. Coloured labels needed

4. No GI consideration

Consumer NZ:

OUR TRAFFIC LIGHT CRITERIA FOR FOOD

	Green	Orange	Red
TOTAL FAT (g)	≤ 3.0	3.1-19.9	≥ 20
SATURATED FAT (g)	≤ 1.5	1.6-4.9	≥ 5
SUGAR (g)	≤ 5	5.1-14.9	≥ 15
SODIUM (mg)	≤ 120	121-599	≥ 600

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NZ Nutrition Foundation e-mark

eMarks

eMark classifies food based on energy density and how quickly the energy is released into the bloodstream. Energy density is shown by the <u>numbers</u> 1 to 5, which rank food according to their kilojoule content per serve.

1
2
3

e Long lasting energy release

e Medium energy release

e Fast energy release

- Combines energy density & relative glycaemic impact
- Pros
  - Food focus, not nutrients

  - Higher number = more energy = smaller serving

  - Not "good" versus "bad" food
- Cons:
  - not simple
  - needs GI testing

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Sanitarium hybrid system
combines thumbnails, traffic lights & nutrient profiling

Figure 3: The Healthy Eating System

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Sanitarium: eating frequency?

Eat Often, Occasionally or Eat Sparingly: clearer wording than FBCS Everyday, Sometimes, Occasional.

Table 6: Classification of dietary advice statements based on FSANZ nutrient profiling scores

	EAT OFTEN	EAT OCCASIONALLY	EAT SPARINGLY
1. Most foods (including milks)	3 or less	4-15	16+
2. Beverages (excluding milks)	0 or less	1-18	19+
3. Cheese and oils/spreads	27 or less	28-42	43+

The dietary advice categories were chosen from the range of possible scores for each food type listed in Table 5, so they are coupled with the proposed FSANZ health claims system. "Eat Often" foods are of high nutrient density and can make health claims under the proposed FSANZ system; "Eat Occasionally" foods should be eaten in conjunction with "Eat Often" foods; "Eat Sparingly" foods should be limited in a healthy diet.

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Develop "healthier" products?

- The "villains": fat =energy density, saturated fat, sugars, sodium/salt.

- Check where you sit against the criteria and/or "colour" boundaries and % change needed. Do-able?

- Remember ~ half the population won't sacrifice taste for health

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Reducing fat / saturated fat

- Fat has different functions in different foods:
  - Flavour (taste = aroma release)
  - Texture/mouthfeel
    - Lubricant
    - Texture interrupter ("shortening", cheese)
    - Fat stuck on tongue = creaminess
  - Opacity: emulsions scatter light
  - Nutrient carrier: essential fatty acids, fat soluble vitamins
- Reducing needs multi-prong approach

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Changing fat formulations (1)

- Just leave some fat out, maybe ok?

- "Saturated" problem?: change fats/oils or fractions (inter-esterified?)

- Use fat replacers:
  - "Creamy profile" starches
  - Thickeners: MCC, CMC, Celluloses, Gellan, Pectin, Guar, Carrageenan, Alginates, Xanthan, LBG, Gelatine
  - Inulin ("creamed")
  - Humectants: e.g. glycerol

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Changing fat formulations (2):

- Add fat mimetic: Simplesse, Slendid, Nektabake, etc.

- Use fibres from citrus, oat, barley, etc. or fruit purees. In liquid foods best if colloid milled or homogenised.

- Reduce oil pick up in frying with cellulose (MCC, MC & HPMC) and/or starch

- Emulsifiers e.g. 0.5% fat ice cream with glycerol mono-oleate.

- Whey Proteins for "open" emulsions

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Changing fat formulations (3)

- Change fatty acid / melting profiles, for instance high oleic and omega-9 oils

- Adjust flavour, use fat flavour enhancers

- Try "Organogelation" = "oil gelling" saturate sparing:
  - Structures liquid edible oils into semi-solid fats using emulsifiers, cellulose fibres, wax esters, phytosterols, proteins, lecithin, etc.
  - Examples: rice bran wax with olive oil, ethyl-cellulose + canola oil

- Remember to adjust for safety if water has increased: pH, a_w, salt, preservative

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Change processing?

- Recipe sequences (e.g. fold in cream last, example cottage cheese dressing)
- Homogenisation & Colloid mill profiles (ΔP or gap setting, number of passes)
- Mixed "two stream" emulsions: e.g. ice cream with saturated fat emulsion with glycerol mono-oleate + protein stabilised unsaturated fat emulsion.
- WOW emulsions: Water in Oil in Water double emulsion: Stability issues still?

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Supplier solution examples

- HawkinsWatts:
  - FMC carrageenan and alginate
  - Novagel/Avicel MCC blends
  - Herbacel apple and citrus fibres
- Invita:
  - Inulin (rafti-creming in liquid products)
  - Rice starch
  - Mouthfeel modulation flavours
- Tate & Lyle: Creamiz modified starch
- National Starch: variety of starches
- Danisco: Grindsted emulsifiers
- Bakels: specialty fats & oils
- Givaudan Taste Solutions Mouthfeel

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Reducing sugar levels

- Sugar has different functions in food:

  - Sweet taste, of course
  - Humectant
  - Preservative (direct e.g. Jam or indirect when used in fermentation)
  - Enhancing flavour, balancing with acids
  - Maillard browning on heating
  - Texture & crystallinity (effect granular size)
  - Body / bulking agent
  - Freezing point depression (ice cream)

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Reducing sugar levels (1)

- Gradually reduce?
- Use different sugars, i.e. 50/50 fructose / sugar blend may allow for ~20% reduction,
- Modify natural sugars e.g. split lactose into sweeter glucose +galactose mix
- Enhance sweetness:
  - pinch of salt in porridge, chocolate & coffee drinks (~0.1% = only 40mg Na)
  - sweetness enhancing flavours
- Sugar flavours and caramel
- In-homogenous distribution (check a_w)

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Reducing sugars levels (2)

- High intensity sweeteners: aspartame, acesulphame-K, sucralose, saccharin, cyclamate, thaumatin, neotame, alitame, steviosides (Stevia), monk fruit (future?)

- Oligofructose (browns, hygroscopic, slightly sweet, synergistic)

- Bulking agents/fibres: polydextrose, inulin, resistant starch, dextrin (e.g. Nutriose), fibres, etc.

- May need off-flavour blockers or change of acid profile (longer lasting lactic?)

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Reducing sugars levels (3)

Sugar alcohols differ in:

- taste
- laxation threshold
- energy (kJ/Cal)
- solubility
- coolness (cal/g)
- degree of hygroscopicity,
- melting point
- freezing point depression
- gelatinisation temperature in baking

Info SPI Polyols	Relative sweetness vs. Sucrose @100	Laxative threshold g/day
Glycerol	55-75	>125
Erythritol	60-70	125
Maltitol	90	90-100
Polydextrose	0	90
Fructose	117	50-70
Sorbitol	60	50
Isomalt	40	30-50
Xylitol	100	25-50
Lactitol	30-40	20-50
Mannitol	50	20

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Supplier solution examples

- Zymus: Zymsweet®: low GI fruit sugars, sugar flavours, Resolvers natural bitter masking flavour, Enhance natural flavour
- Salkat: Flavex
- Hawkins Watts: Symrise Lighten Up, Polydextrose
- Invita: Firmenich flavours, Isomalt, Erythritol, Oligofructose, Inulin
- Danisco: Polydextrose, Lactitol, Xylitol
- IMCD: Sensus Inulin, FOS
- APS & NZ Food Group: maltitol chocolate
- Givaudan Taste Solutions™ Sweetness
- Numerous suppliers for sweeteners, incl. Stevia: different purities, some co-dried with Erythritol

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Reducing Sodium / Salt

■ Salt has different functions in food:
  – Preservative (as is or as additional hurdle)

  – Controls fermentation (e.g. bread, cheese, salami, pickles, olives)

  – Texture (e.g. bread, meats, cheese, cereals)

  – Flavour changer: enhances sweeteness and flavours, masks bitter off flavours, effects aroma release

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Reducing Sodium / Salt (1)

- Reduce slowly in small steps 5-10% steps over time, often up to 30% less ok, but often best not to tell consumers.

- Offer "no or low salt" variants? Not been successful generally: often perceived as tasteless

- Add sugar, spices, herbs, (natural) flavours, bitterness blocker (if needed, esp with use of potassium chloride)

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Reducing sodium/salt (2)

■ Change crystal size or form of salt
  – Salt crystal size effect on taste:
    • Normal table salt - 200-500 microns
    • Micro-fine salt -10-100 microns
    • Nano/low micron salt - 0.005 – 0.01 microns
  – Smallest crystals saltiest perception
  – Shape: flakes vs. crystals, pyramid shape?
■ Add yeast extracts and/or other flavour enhancers: sugar, MSG, nucleotides, peptides & amino acids: umami, kokumi ('deliciousness' or 'yummy' = 6th taste)

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Reducing Sodium / Salt (3)

- Add / replace partly with
  - Potassium chloride (max 30%-50%, bitter)
  - Other chlorides in blends: Mg, NH_4
  - Lactates
  - Co-dried/co-crystallised variants with NaCl
- Part or full switch to other mineral forms of carbonates, phosphates, citrates, etc. (can be significant sodium contributors)
- Try in-homogenous distribution (check a_w), incl. WOW emulsions (salt in outside water)

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Supplier solution examples

- Zymus: Zymsav: low sodium salt with natural rounding flavour
- HawkinsWatts: Symrise Savory Booster, Symlife® Umami, Symlife® Salt: up to 50% salt reduction
- Invita: Magnesal, Smart Salt (co-crystallised $MgCl_2$, KCl, NH_4Cl), Salt Print® 4D flavour solutions.
- Tate & Lyle SODA-LO® hollow low micron salt particles with gum arabic as processing aid, allows 30-50% reduction (NZ agent Ingredient Solutions Australia), also as iodised salt for bakery.
- Givaudan Taste Solutions™ Salt

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So can you have it all?

- **Theoretical example: Sugar & fat & salt reduced Anzac biscuit with Stevia**

- **Edmonds recipe:**
  - 50g flour
  - 75g sugar
  - 2/3 cup coconut
  - 2/3 cup rolled oats
  - 50g butter
  - 1 Tbsp. golden syrup
  - ½ tsp. bicarb soda
  - 2 Tbsp. boiling water

Nutrition Information	Avg Quantity per 100g
Energy	2010kJ
Protein	5.0g
Fat, Total	27.5g
- Saturated	20.4g
Carbohydrate	50.9g
- Sugars	28.4g
Dietary Fibre	4.8g
Sodium	254mg

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Yes you can with clever DOE

- Identify possible test variables:
  1. Sugar and 3 sugar replacers: FOS, erythritol, polydextrose, 0-100% of sugar
  2. Butter and 2 replacers: inulin, a vegetable oil, 0-100% of butter
  3. Sodium and/or potassium bicarbonate
  4. Reduce Coconut level to reduce sat fat
  5. Golden syrup
  6. Oats (less coconut, need more for texture)
  7. Stevia levels
  8. Fix flour and water

- Experimental Design Trick: Can test 13 variables in 31 test bakes only!

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# Using DOE = experimental design

- Some software options for Design of Experiments:
  - Fusion Pro: max 10 variables, user friendly
  - Design Expert: max 50 variables
  - Other stats packages: MiniTab, ECHIP, etc.
- Design:
  - Mixture Design: ingredients need to add up to 100%; includes few duplicates
  - Efficient Screening Linear Model (Scheffe)
- Results may vary from pancakes to rock cakes with good ones in between.
- Software calculates optimal recipe options balancing out best mix for dough handling, a_w, cost, yield, texture, shape, colour, nutrition, sensory, etc.
- End result? Typically superb & faster with less stress.

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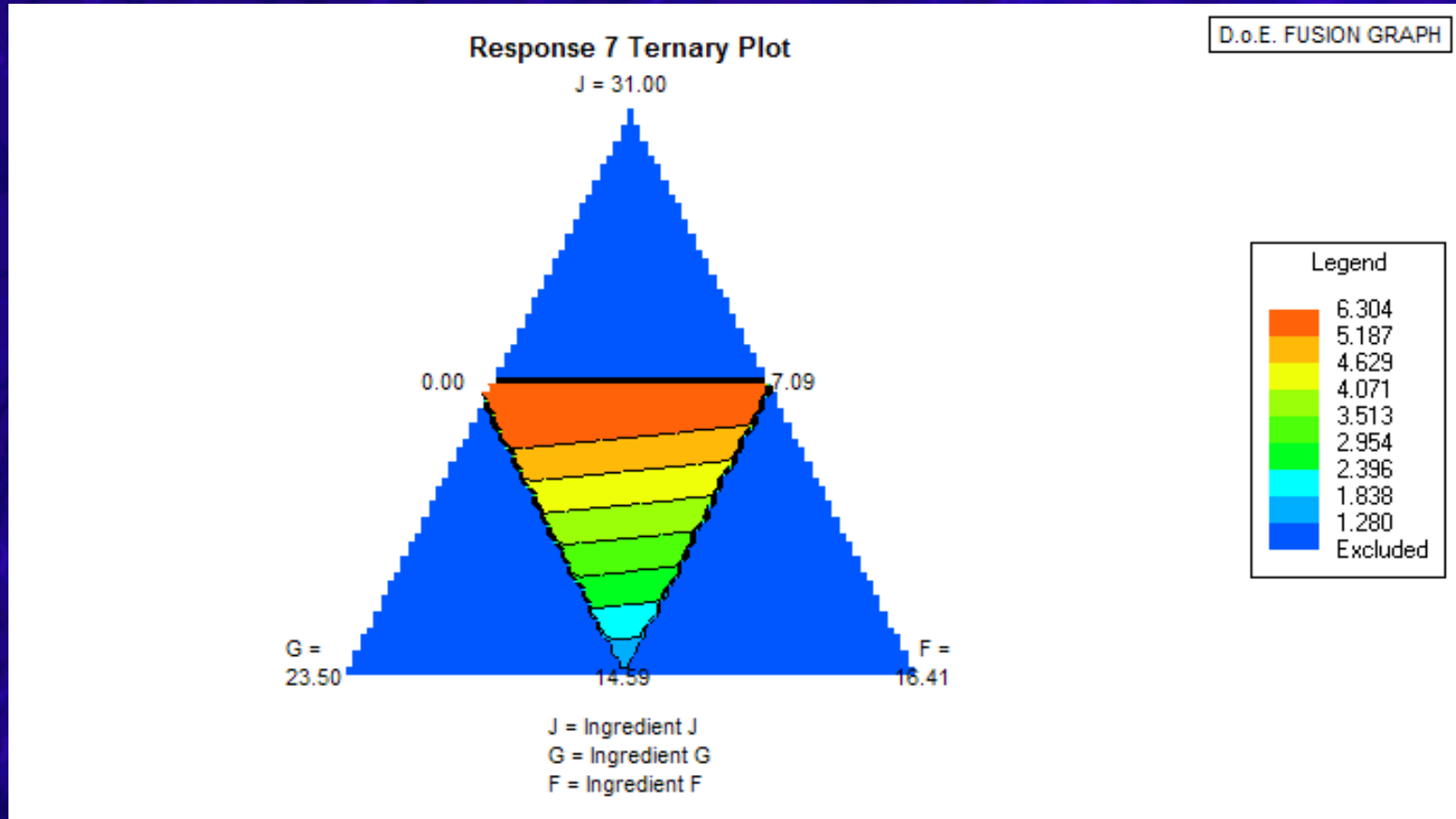# And one I prepared earlier…

■ What was important for response 7?
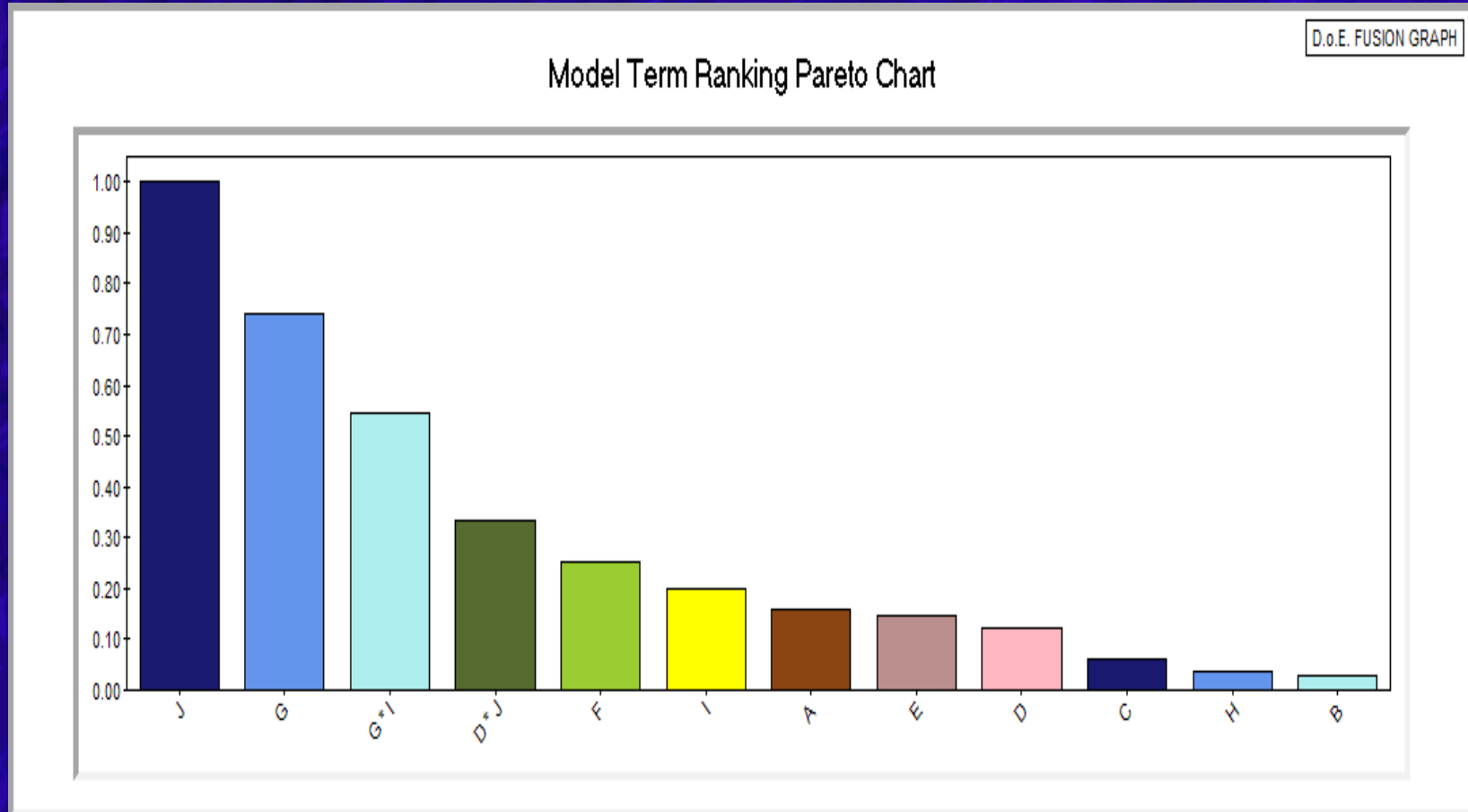
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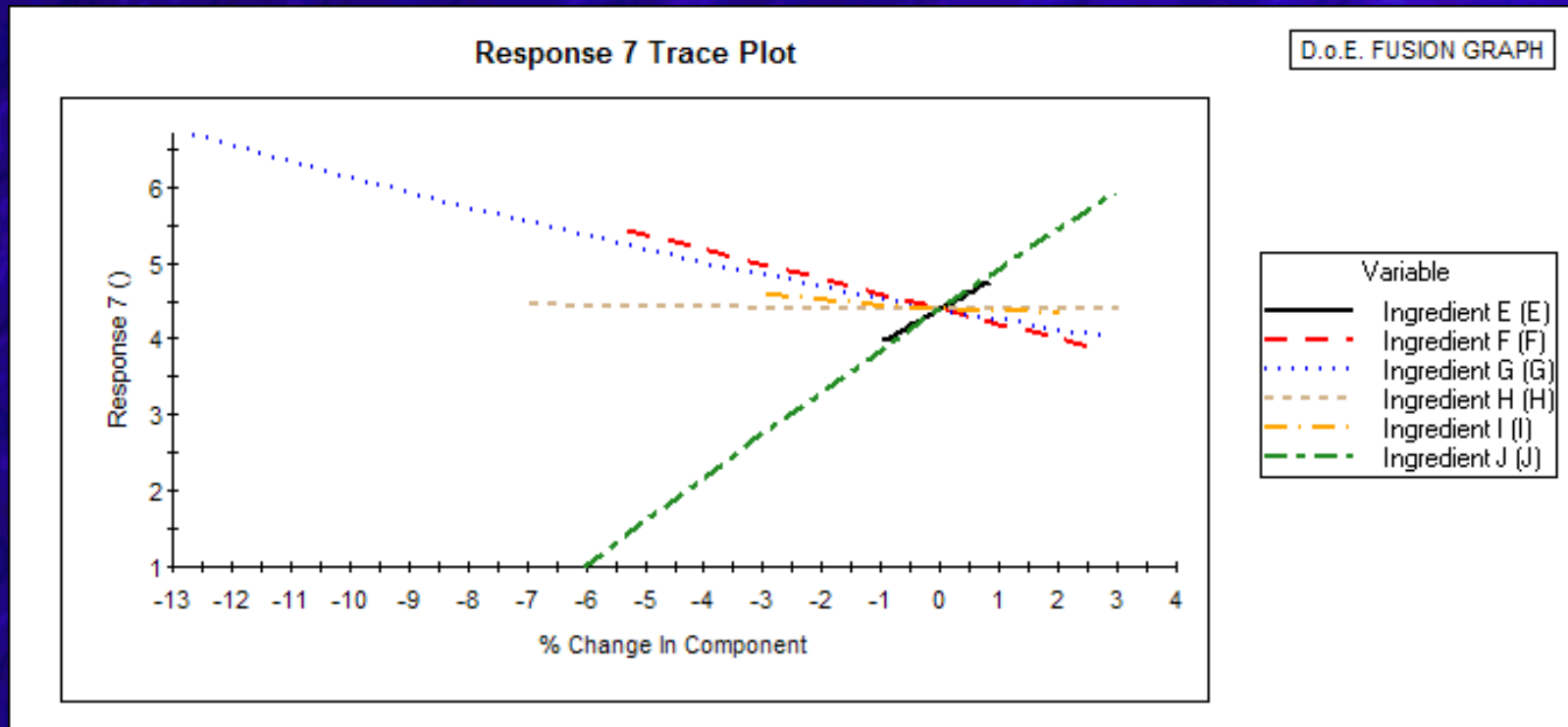■ Response range ingredients J,G and D:

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And one I prepared earlier…..

- What the results can tell you about the sensitivity of your formula:

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Conclusion

Use a systems approach balancing ingredients in formula for best results on nutrition, sensory, a_w for food safety, and cost

but never forget

Flavour Rules !

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Website for download

This presentation will be loaded on

ADECRON Food Tech Consulting website:

www.adecron.co.nz

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