Background on sugars: Nutrition

Dietary recommendations

The World Health Organization (WHO)\(^1\) recommends an intake of free sugars less than 10% of total energy intake throughout the lifespan for both dental caries and obesity prevention.

\(^1\)WHO gives same recommendation than WHO for added sugars. SACN recommends less than 5% of free sugars

\(^2\)Seems to be linked with an increased energy intake

\(^3\)only with sugars-sweetened beverages

\(^4\)DGAC gives same recommendation than WHO for added sugars. SACN recommends less than 5% of free sugars
Carbohydrate classification (FAO/WHO, 1998)

<table>
<thead>
<tr>
<th>Class</th>
<th>Sub-groups</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>-Monosaccharides</td>
<td>-Glucose, galactose, fructose, tagatose</td>
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<tr>
<td></td>
<td>-Disaccharides</td>
<td>-Sucrose, lactose, maltose, isomaltose</td>
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<tr>
<td></td>
<td>-Sugars alcohols (polyols)</td>
<td>-Sorbitol, mannitol, xylitol, erythritol</td>
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<tr>
<td></td>
<td></td>
<td>-Maltitol, isomalt, lactitol</td>
</tr>
<tr>
<td>Complex</td>
<td>-Oligosaccharides (DP 3-9)</td>
<td>-Malt-oligosaccharides</td>
</tr>
<tr>
<td></td>
<td>-Non-digestible oligosaccharides</td>
<td>-Maltodextrins</td>
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<tr>
<td></td>
<td></td>
<td>-Raffinose, stachyose, fructo- and galacto-</td>
</tr>
<tr>
<td></td>
<td>-Oligosaccharides (DP &gt;9)</td>
<td>-oligosaccharides, polydextrose, imulins</td>
</tr>
<tr>
<td></td>
<td>-Starch</td>
<td>-Amylose, amylopectin, modified starches</td>
</tr>
<tr>
<td></td>
<td>-Non-starch polysaccharides</td>
<td>-Cellulose, hemicellulose, pectins, starches,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-hydrocolloids (gums, x-gum)</td>
</tr>
</tbody>
</table>

The classification of dietary carbohydrates, used by regulatory authorities for labeling purposes, is based on chemical features, not on physiological impact.

The basics (1): biochemistry

Monosaccharides
- Glucose
- Fructose
- Galactose

Disaccharides
- Sucrose
- Lactose
- Maltose

Polysaccharides
- Starch
- Maltodextrins
- Amylopectin
- Modified starches

The basics (2): digestion & absorption

Intestinal lumen
- Glucose
- Fructose
- Sucrose
- Lactose
- Maltose
- Isomaltose
- Dextrins

Blood circulation
- Glucose
- Fructose
- Galactose

The basics (3): fibres and non-digestible oligosaccharides

Non-digestible oligosaccharides
- Sucrase
- Lactase
- Maltase
- Isomaltase
- Glucoamylase

Fibres
- Not digested
- Not absorbed
- Colonic fermentation

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13.11.2015
Not all sugars are “bad” not all complex carbohydrates are “good”

Sugars

Complex
CHO

Background on sugars: food science

Sugar is a multifunctional ingredient

Agenda

1. Background on sugars
2. Sugar reduction strategies
3. Sugar reduction building blocks & current solutions
4. Conclusion
Strategies to reduce sugars

- **Education**: Adapt serving size
  - Better adjust serving size to consumer habits

- **Gradual reduction**
  - Flavored waters
  - Salt level in UK

- **Partial replacement**
  - Reformulation of the whole recipe
  - Same with less: sugar combinations, flavorings, sweeteners, taste enhancement

- **Total replacement**
  - Use of sweeteners & non-digestible carbohydrates (Fibers, polydextrose…)

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**Agenda**

1. Background on sugars
2. Sugar reduction strategies
3. Sugar reduction building blocks & current solutions
4. Future trends
5. Conclusion

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**Provide sweetness**

**From**: Artificial sweeteners

- Sweeteners
  - Taste enhancers
  - Bulk sweeteners
    - Stevia, LHG
    - Aspartame
    - Sucralose
    - Acesulfame K
    - Polyols
    - Low cal sugars

- Trend: Limit sweeteners
- Go natural when possible
- Sweeteners and health?

**To**: Adapted sweetness

- Natural taste enhancers
  - Flavor boosters
  - Sweet enhancers
- Clean taste & clean label
  - Synergies of aroma and taste
  - Seek for minimal sweetness
  - Be guided by nutrition

**Issues with sugar replacers**

- Different intensity profile (HIS)
  - Sugar profile
  - Slow onset
  - Lingering

- Time

**Trend**

- Regulations as additives
- Research on adapted sweetness
- No harm with sweeteners
- Adapted to recommendations
Texture from ingredients: Bulking agents

From: Sugar  To: Natural & functional bulking agents

Available fibers
- Inulin
- Polydextrose
- Resistant starch
- Resistant dextrins

Low calorie rare sugars
- Polyols
- Sucromalt
- Allulose
- Allose

Natural sources of fibers
- Whole grain
- Cereals
- Fruits

Benefit beyond less sugars
Be guided by nutrition

Low calorie rare sugars

Ingredient availability

Ingredient Benefits:
- Sensory performance
- Natural ingredient
- Health Benefits: not raising blood glucose level, no calories

Challenges:
- Safety
- Communication to consumers/cost
- Regulatory
- Long term health impact needed
- Declaration: Added sugars?

Structure and sweetness perception

Molecular organization
- Crystalline
- Amorphous

Physical attributes
- Slow dissolution
- Fast dissolution
- Fast dissolution, faster interaction with taste receptors

Amorphous sugar dissolves faster in milk

Sugar reduction strategies

1. Background on sugars
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Future trends
A lot of choices but

What is the right sweetness level?
What will make a real impact on public health?
Make the best taste out of known ingredients: cost, communication?
Regulatory constrains: low calorie sugars
Need to reach sufficient level of scientific understanding to make the right choices to replace sugar
Sugar vs sweeteners
Artificial vs natural
Adverse effects of solutions (polyols, fibers, no/low calorie sweeteners)

Conclusion

Global trend to reduce sugars
Solutions are existing to replace sugars: reformulation, sweeteners and fibers, portion control
New classification for sugars is needed: low calorie sugars are added sugars
The future will be based on
Known raw materials to deliver new matrices and new concepts with less sugars.
Beyond innovation, we need new low sugar products with value for our consumers