



Flavour Horizons  
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# Fortifying with Vitamins and Minerals The Product Development Challenges

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Flavour Horizons

[www.flavourhorizons.com](http://www.flavourhorizons.com)

# Why Fortify?

- When legislation demands it
  - Baby food
  - Weight reduction products
  - Wheat flour
  - Margarine
- Market differentiation
  - Breakfast cereals
  - Beverages
  - Dairy products

# Factors influencing the stability of vitamins and their retention in foods

- Temperature
- Water activity
- pH
- Oxygen
- Light (UV)
- Catalysts (Fe, Cu....)
- Enzymes, sulphite, chlorine
- Inhibitors
- Interactions
- Energy
- Time

# Vitamin Stability

| Vitamin | Heat | Oxygen | Light | pH<7 | pH=7 | pH>7 |
|---------|------|--------|-------|------|------|------|
| D       | -    | -      | -     | +    | +    | +    |
| C       | -    | -      | -     | --   | +    | +    |
| B1      | -    | -      | +     | +    | +    | -    |
| B2      | +    | +      | --    | +    | +    | -    |
| B3      | +    | +      | +     | +    | +    | +    |
| B5      | +    | +      | +     | -    | +    | -    |
| B6      | +    | +      | -     | +    | +    | +    |
| B9      | +    | +      | --    | -    | +    | +    |
| B12     | +    | -      | -     | -    | +    | -    |

+ Stable

- Unstable

-- Very unstable

# Mineral addition e.g. Calcium

| Source                                | % Calcium | Solubility            | %w/v for 15% RDA in 200ml | Taste                       |
|---------------------------------------|-----------|-----------------------|---------------------------|-----------------------------|
| Calcium oxide                         | 71        | yes (heat generation) | 0.08                      | Disagreeable alkaline taste |
| Calcium hydroxide                     | 54        | slightly              | 0.11                      | Earthy, sl. bitter          |
| Calcium carbonate                     | 40        | no                    | 0.15                      | None                        |
| Calcium chloride                      | 36        | very                  | 0.16                      | Extremely salty             |
| Calcium sulphate                      | 29        | slightly              | 0.20                      | Bitter, astringent          |
| Calcium citrate                       | 24        | no                    | 0.25                      | Sour, salty                 |
| Calcium glycerophosphate              | 19        | slightly              | 0.31                      | Slightly bitter             |
| Calcium lactate                       | 18        | yes                   | 0.33                      | Sour, slightly bitter       |
| Calcium salts of orthophosphoric acid | 17        | no                    | 0.35                      | None                        |
| Calcium gluconate                     | 9         | yes                   | 0.66                      | Slight                      |

# Vitamin & Mineral Fortification: Summary

- EU Legislation defines what, where & how much
- Vitamin addition - consider stability
  - ❖ product, process & shelf life
- Mineral addition - consider form
  - ❖ solubility & taste
- Get the taste right by considering all product dimensions
- Overlay marketing know-how

**SO THE  
HARDER  
A WIFE  
WORKS,  
THE CUTER  
SHE LOOKS!**

L. GOSH, HONEY, YOU SEEM TO THRIVE  
ON COOKING, CLEANING AND DUSTING—  
AND I'M ALL TUCKERED OUT BY  
CLOSING TIME. WHAT'S  
THE ANSWER?

VITAMINS,  
DARLING!  
I ALWAYS  
GET MY  
VITAMINS

**Kellogg's  
PEP**  
WITH VITAMINS  
100% WHEAT FLAKES

**Vitamins for pep! PEP for vitamins!\***