Brazil Micronutrient Project

Food history and micronutrient profile and their relation to DNA damage in children in Brazil

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BACKGROUND

Dietary pattern of children and adolescents:

↑ High energy density food  ↓ Fruits and vegetables
→ Insufficient intake of vitamins and minerals

Micronutrients → cellular protection as antioxidants
Acting in repair reactions of damaged DNA

Unrepaired DNA damage can lead to the development of carcinogenic or mutagenic changes in cells

Aim: To investigate the association between DNA damage and nutritional status in 9 to 13 years old children and adolescents
This is an observational cross-sectional clinical sub study of the project: "Brazil Micronutrient Project".

Data were collected in April 2013.
DESIGN OF EXPERIMENT

- **Anthropometry and body composition**
- **Food history through FFQ & 24hr**
- **Blood sample for micronutrient dosage**
- **DNA damage: electrophoresis in single cell gel (comet assay)**

**Data collection**

- 9 to 13 years old healthy children
- Total of 141 subjects

- After exclusion of under and over diet reports: 120 subjects

- Software SPSS 20.0 for Statistical Analysis
Separation into 2 groups according DNA damage

- **Comet assay**: fragments of damaged DNA are separated in electrophoresis, forming a tail.

- Tail intensity values:
  - Measures % of DNA in tail (damaged DNA)

- Classification proposed by Wollowski et al (1999)

- **Group 1**: 0 to 17% of damage (n=108)

- **Group 2**: 17.1% to 100% of damage (n=12)
RESULTS

Separation into 2 groups according DNA damage

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Group 1 (n=108)</th>
<th>Group 2 (n=12)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retinol</td>
<td>0.35 ±0.08</td>
<td>0.27 ±0.09</td>
<td>0.017</td>
</tr>
<tr>
<td>Beta-carotene</td>
<td>0.22 ±0.13</td>
<td>0.15 ±0.10</td>
<td>0.010</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>3.10 (0.43; 15.05)</td>
<td>1.57 (0.74; 5.85)</td>
<td>0.046</td>
</tr>
</tbody>
</table>

ANCOVA adjusted for BMI

Lower values in the group with higher DNA damage
Separation into 2 groups according to nutrient intake patterns

Robust K-means clustering

Intake of amino acids and some micronutrients
Valine, phenylalanine, leucine, tryptophan, isoleucine, niacin, aromatic amino acids and branched amino acids, phosphorus, pantothenic acid, cyanocobalamin, purines, chrome, manganese, zinc, copper, magnesium, inositol and choline

Cluster 1 (n = 27) higher intake
Cluster 2 (n = 58) lower intake
Heatmap showing separation of the accurate FFQ reporters into 2 dietary patterns.
Separation into 2 groups according to nutrient intake patterns

<table>
<thead>
<tr>
<th></th>
<th>Cluster 1 (n=27)</th>
<th>Cluster 2 (n=58)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tail intensity</td>
<td>9.41 ±4.17</td>
<td>11.54 ±4.9</td>
<td>0.056</td>
</tr>
<tr>
<td>Energy intake</td>
<td>1854.51 ±322.3</td>
<td>2234.05 ±535.8</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Lower DNA damage and energy intake in the cluster with higher intake of amino acids and micronutrients.
DISCUSSION

These findings corroborates literature

• Konopacka et al (2000) concluded that after gamma radiation, lymphocytes treated with betacarotene presented lower DNA damage compared to the untreated ones.

• Morin et al (2007) found a protective role of retinol on oxidative DNA damage in rats.

• Manthey et al (2006) found that riboflavin deficiency was associated with an increase in DNA strand breaks.

• Minnet et al (2011) demonstrated an inverse relation between B12 status and DNA damage in children.
DISCUSSION

Several studies have demonstrated the protective role of vitamins and micronutrients against DNA damage.

However, there is a lack of studies considering healthy children and DNA damage, and most of the studies do not analyze the role of food intake pattern.
CONCLUSION

This study confirms the protective effect of micronutrients against DNA damage.

These findings deserves attention!
Children are increasing energy density food intake lacking in micronutrients.
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