“The meaning of bioactive compounds in Human Health”

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Polyphenols

Main sources are fruits, beverages such as tea, coffee, wine and fruit juices, chocolate and, to a lesser extent, vegetables, cereals and legume seeds.
Polyphenols

- More than 8000 chemical structures
- Aromatic benzenoid (phenyl) ring, hydroxyl (-OH) groups
- Two main classes: **Flavonoids**
  **Non Flavonoids**

*Polyphenols* are abundant micronutrients in our diet, and evidence for their role in the prevention of degenerative diseases such as *cancer* and cardiovascular diseases is emerging. Their health effects depend on the amount consumed and on their bioavailability.
Cherry cultivars

Light cherries

CELESTE

DURONE DELLA MARCA

Dark cherries

LAPINS

MORETTA

BIGARREAU

DURONE NERO I
The objectives

1. **In vitro digestion** of six cherry cultivars.

2. **C18 extraction** of phenolic compounds from both digested and undigested cherries.

3. **Identification and quantification** of cherry phenolic compounds by liquid chromatography-electrospray ionization-ion trap mass spectrometry (LC-ESI-IT-MS/MS).

4. **Evaluation of antioxidant activity** (ABTS⁺), superoxide anion (O₂•⁻) and hydroxyl (OH⁻) radical scavenging activities and ferric reducing power (FRAP assay) and bioaccessibility.

5. **Cytotoxic and anti-proliferative** activity of cherries polyphenols on human colon adenocarcinoma cell lines (Caco-2 and SW 480).

6. **Cytotoxic and anti-proliferative** activity of major colon available phenolics and metabolites on Caco-2 and SW 480.
Tentative identification of 86 individual phenolic compounds in cherry cultivars

40 phenolic compounds identified for the first time in cherries.
Chemical quantification

Hydroxycinnamic and hydroxybenzoic acids, flavan-3-ols, flavonols, anthocyanins and other flavonoids obtained through chemical extraction or after *in vitro* digestion in six different cherry cultivars
Bioavailability

Proportion of a nutrient that is absorbed from the diet and used for normal body functions

- **Bioaccessibility**: Release of the nutrient from the physicochemical dietary matrix
- **Absorption**: Transfer across the gut wall (passing through the cells, in-between them or both) to the blood or lymphatic circulation
- **Bioactivity**:
  - systemic distribution
  - systemic deposition (stores)
  - metabolic and functional use
  - excretion (via urine or faeces)

→ Food matrix
→ Molecular interactions
The capacity of polyphenols to reach unmodified the intestinal tract after digestion, where they can carry out their antiproliferative activity against colon-rectal cancer cell. The bioaccessibility is strictly related to the food matrix and to the cultivars themselves. Also, the phenolic classes display a different bioaccessibility.
Cytotoxic and anti-proliferative activities

Caco-2 cell line
No cytotoxic and anti-proliferative effect.

SW-480 cell line:
digested and methanol polyphenol-rich extracts showed no cytotoxic activity. *In vitro* digested extracts showed higher anti-proliferative activity than the methanolic extracts in SW480 cell line.

<table>
<thead>
<tr>
<th>Cherry cultivars</th>
<th>SW 480 IC$_{50}$ μg/mL</th>
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<tbody>
<tr>
<td></td>
<td>Chemical extracted</td>
</tr>
<tr>
<td>Della Marca</td>
<td>15.43 ± 1.14</td>
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<tr>
<td>Celeste</td>
<td>40.67 ± 1.02</td>
</tr>
<tr>
<td>Bigarreau</td>
<td>7.76 ± 1.08</td>
</tr>
<tr>
<td>Durone Nero I</td>
<td>17.11 ± 1,01</td>
</tr>
<tr>
<td>Lapins</td>
<td>6.63 ± 1.07</td>
</tr>
<tr>
<td>Moretta</td>
<td>11.58 ± 1.08</td>
</tr>
</tbody>
</table>
Cytotoxic and anti-proliferative activities

Main metabolites of digested polyphenol-rich food

- Catechin
- Epicatechin
- Procyanidin B2
- Procyanidin C1
- M6 valerolactones
- M7 valerolactones

The absolute value obtained for each sample (concentration 25 mmol/L) is expressed as relative percent to the absolute value obtained for the untreated Caco-2/SW-480 cells and set at 100%.
Let one cherry leads to another!

Thank you for your kind attention