Development of a Food Database of potential carcinogens: A tool for epidemiological studies

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Through diets, humans are exposed to complex mixtures of substances that play important roles in causing, modulating and preventing many types of cancer.

**Background**

**Dietary Carcinogens**
- Tobacco
- Saturated fats
- Obesity
- Alcohol intake

**Risk Factors**

**Prevention Factors**
- Fiber
- Vegetables
- Fruits
- Physical activity
- Healthy Habits
Dietary carcinogens

- Relationship with preservation process (Nitrosamines)
- Relationship with cooking process (HA and PAH)
- Bacterial contamination (aflatoxin B1)
- Chemical Contamination (PCBs, POPs)

Health problem in tropical countries
The data are relevant at local level
Nitrosamines

- They are formed during the preservation process.
- Nitrates and Nitrites are precursors of endogenous nitrosamines.
- Often found in salted, pickled and fermented foods.
- Food that have high content may be associated with colorectal, gastric and esophageal cancers.
Heterocyclic amines (HA)

- They are formed when creatinine, creatine, sugars and aminoacids (meat and fish) react at high cooking temperatures.

- Food content have direct relationship with temperature, time and degree of doneness.

- There is evidence that high intake may increase the risk of colorectal, gastric and bladder cancers.
Polycyclic aromatic hydrocarbons (PAH)

- They are formed by cooking foods at high temperatures
- The most important PAH are benzo(a) pirene and Dibenzo(a) anthracene
- They are mainly present in cereals, meat and oils
There are evidence that these compounds are carcinogens in experimental conditions and animal models, but their effects in humans have not be clearly established

Not present naturally in foods but may be developed during preservation or cooking process

Present in tobacco smoke and environment, but the main source of exposure is diet
Problems with the dietary assessment of potential carcinogens:

- Lack of information about levels of these compounds, mainly because they are not included in Food Composition Databases.

- Heterogenous disperse information.

- Their concentration depends on the cooking or preservation method, information is frequently not included in FFQ (Food Frequency Questionnaire).
JUSTIFICATION

Controversial Evidence

Heterogenous Information

Problems in Assessment intake
OBJECTIVE

Development of a database of food content on potential carcinogens:

- NITROSAMINES AND PRECURSORS (Nitrates and Nitrites)
- HETEROCYCLIC AMINES (HA)
- POLYCYCLIC AROMATIC HYDROCARBONS (PAH)
METHODS

Objective

1. Bibliographical search
2. Database structure
3. Variables
4. Review Process

Food Database
1. Bibliographical search
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Objective

Food Database

METHODS
Bibliographical search

Identify papers with information of food content dating back 1980

(MEDLINE AND EMBASE DATABASE)

Publications with determinations in contaminated zones

Paper for review
Objective

1. Bibliographical search
2. Database structure
3. Variables to extract
4. Review process

Food Database
Which are the relevant variables?

What kind of information will be useful to do a food matching in a specific country?

- General variables (according to the food databases normative)
- Specific variables (cooking methods, T°, etc)
- Information about publication
## Database structure

### Heterocyclic amines

<table>
<thead>
<tr>
<th>FOOD</th>
<th>ALIMENTO</th>
<th>COOKING METHOD</th>
<th>DEGREE OF DONENESS</th>
<th>TEMP</th>
<th>TIME</th>
<th>Phip</th>
<th>Meiqx</th>
<th>Dimeiqx</th>
<th>Meiq</th>
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<table>
<thead>
<tr>
<th>VALUE</th>
<th>ANALYTICAL METHOD</th>
<th>SAMPLE METHOD</th>
<th>YEAR</th>
<th>AUTHOR</th>
<th>COUNTRY</th>
<th>SOURCE</th>
<th>REF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valor</td>
<td>Método Analítico</td>
<td>Método Muestreo</td>
<td>Año</td>
<td>Autor</td>
<td>País</td>
<td>Fuente</td>
<td>Ref</td>
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</table>
METHODS

Objective

1. Bibliographic searching
2. Database structure
3. Variables
4. Review Process

Food Database
FOOD CHARACTERISTICS

- **NAME**: English/ Spanish
- **COOKING METHOD**: fried, boiled, microwaved, baked, raw, cooked, etc.
- **DEGREE OF DONENESS**: rare, medium, well done, extra well-done
- **PRESERVATION METHOD**: canned, cured, dried, fresh, frozen, etc.
- **TEMPERATURE**: (°C)
- **TIME**: minutes
MEASUREMENT INFORMATION

- AMOUNT: mg/100g; μ/100g; ng/g; μ/kg

- VALUE TYPE: median, mean, range, weighted

- ANALYTICAL METHOD: HPLC, GC, MS, not available.

- SAMPLING METHOD: according to the number and origin of the collected samples: complete, incompletely, not specified, not available
METHODS

Variables

PUBLICATION INFORMATION

- AUTHOR: name
- YEAR: year of publication
- COUNTRY: country where the determinations have been done
- TYPE OF PUBLICATION: original and review
METHODS

Objective

1. Bibliographic searching
2. Database structure
3. Variables
4. Review Process

Food Database
METHODS

Review Process

First version
Internal reviewers
External reviewers
Inclusion of Comments
Final revision
FOOD DATABASE
printing
External reviewers

R. Shina - National Cancer Institute - USA

E. Riboli - IARC - FRANCE

A. Farran - Cesnid. Barcelona - SPAIN

L. Puignou - Dep. Analytic Chemistry. UB - Barcelona - SPAIN

G. Keating / M. Knize - Lawrence Livermore National Laboratory - USA

K. Skog - Lund University - SWEDEN

S. Rohrman - Division Clinical Epidemiology. Heidelberg - GERMANY

M. S. García Falcón, A. Lage Yusty - Sgo. Compostela - SPAIN
RESULTS

The complete database:

- Is divided into nitrosamines, heterocyclic amines and polycyclic aromatic hydrocarbons sectors.

- Was gathered from a total of 139 publication from 23 different countries

- The food items are grouped according to the standard classification

- The amount of each compounds is expressed in the units usually reported in the literature
<table>
<thead>
<tr>
<th>Groups of compounds</th>
<th>Compounds</th>
<th>Publications</th>
<th>Country of Publication</th>
<th>Food groups included</th>
<th>Food Items</th>
<th>Information extracted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrates, Nitrites, Nitrosamines</td>
<td>Nitrates, Nitrites, NDMA, NPIP, NPYR, NPRO, and combinations</td>
<td>n 54</td>
<td>CA, CN, DE, FR, GR, HK, IN, IS, JP, NL, SC, UK, US</td>
<td>Potatoes, Vegetables, Fruits, Dairy products, Cereals, Meat, Fish, Eggs, Fats, Alcoholic beverages, Non-alcoholic beverages</td>
<td>n 207</td>
<td>Name, cooking method, preservation method, value, type of value, analytic method, sampling method, year of publication, author, country, source (review or original data)</td>
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<tr>
<td>Heterocyclic Amines (HA)</td>
<td>PhIP, MeIQx, DiMeIQx, AC, IQ, MeIQ</td>
<td>59</td>
<td>AT, CA, CH, CN, ES, FI, DE, JP, NO, NZ, SE, UK, US</td>
<td>Meat (fresh, preserved meat, meat products) and Fish (fresh, seafood, canned fish)</td>
<td>297</td>
<td>Name, degree of doneness, cooking method, temperature, cooking time, preservation method, value, type of value, analytic method, sampling method, year of publication, author, country, source (review or original data)</td>
</tr>
<tr>
<td>Polycyclic Aromatic Hydrocarbons (PAH)</td>
<td>B(a)P, DiB(a)A, PAH total</td>
<td>26</td>
<td>AT, BR, CA, CN, DE, ES, FI, IS, IT, KW, NL, UK, US</td>
<td>Potatoes, Vegetables, Fruits, Dairy products, Cereals, Meat, Fish, Fats, Sweets and desserts, Alcoholic beverages, Non-alcoholic beverages</td>
<td>313</td>
<td>Name, cooking method, preservation method, value, type of value, analytic method, sampling method, year of publication, author, country, source (review or original data)</td>
</tr>
</tbody>
</table>
Distribution of publications

Countries where the data were gathered
LIMITATIONS

- **Quality**
  
  We did not perform any directly measure of the compounds, but papers that were published in peer review journal gave some reassurance about their quality.

- **Completeness**
  
  Not all information is available (access, language, etc.)
Assessment of intake in epidemiological or nutritional studies

Relationships with dietary biomarkers (DNA adducts)

This will provide basis for investigating potential relationships between such compounds and the risk of cancer (particularly in the digestive tract)
EXTERNAL REVIEWERS


INTERNAL REVIEWERS:

Thanks!!

Sagrada Familia (Gaudí) - BARCELONA