Abstract

Recent interest in flavonoids and their possible role as contributors in the reduction of risk of several chronic diseases has lead to the development of a database on the flavonoid content of selected foods. The objective of this project was to collect, evaluate and compile a table of published flavonoid values, representing the range of analyte gaps in data and to set priorities for new research, including the development of new analytical methods. Literature searches were done using key words for flavonoids and by taxonomic names, genus, species for tea and citrus fruits using the Food Science and Technology Abstracts (FSTA) database for articles. The relevant articles were reviewed and articles containing analytical data were retrieved. These articles were further examined to separate articles containing data on the selected compounds in five of the subclasses of the dietary flavonoids. The flavonoids included in the database (a particular focus in the food supply) are as follows:

- **FLAVONES:** Quercetin, Kaempferol, Myricetin, Isorhamnetin
- **FLAVONES:** Ansergen, Luteolin
- **FLAVANOLS:** Hesperidin, Naringin, Erycitrold
- **FLAVONOLS:** Catechin, Epicatechin, Theaflavins, Thearubigins
- **QUERCETIN:** Cyanidin, Delphinidin, Malvidin, Pelargonidin, Paeonolin, Petunolin

The following steps were then applied to compile the final database:
- Only values obtained by high performance liquid chromatography (HPLC) were used. Thin layer and paper chromatography have been used primarily as qualitative techniques, therefore data were not included. Data generated by spectrophotometric or pH differential methods for total flavonoids or total subclasses were not included because of the lack of specificity of such procedures.
- However, data for total anthocyanidins generated by HPLC techniques were included in the database.
- The values for glucosides were converted into aglycone forms.
- Values for beverages were adjusted for specific sugars.
- Trace values were qualified as < 0.17 X LOG (Limit of Quantitation) (Mangels, et al. 1993) if LOG value was available.
- A zero value reported in the database is a true zero (below the limit of detection). Therefore, the lack of a value for a particular flavonoid in a food (e.g., a missing value) does not imply a zero value, but an unavailable value.

Methods

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Data Evaluation and Compilation

The NDL has developed new software for evaluating data quality (Hodler, et al. 2002) based on the criteria described earlier (Mangels, et al. 1993). Each value for each compound is evaluated for the following criteria:

- **Sampling plan**
- **Sample handling**
- **Matrix effects**
- **Analytical method**
- **Analytical quality control**

Critical analytical steps to aid in the evaluation for each of the five categories have been developed. Data values were assigned a score of 0 to 5 of each of the five criteria. Ratings are combined over all sources for a single compound to yield a Confidence Code (CC). A high number indicates ratings from the five categories at the data aggregation have been reviewed to avoid the possibility that the aggregation is biased. Several high data points would meet, the higher CC rating which is the indicator of data quality.

The data were aggregated according to the Nutrient Data Bank number (NDB) for each food and the mean value (mg/100g) determined. The standard error of the mean (SEM), minimum (Min.) and maximum (Max.) values for each flavonoid compound for each food along with data quality rating are also included in the database. Values are reported on the fresh weight basis.

Summary

This literature review has shown there are a number of gaps in the knowledge of the flavonoids Composition of Foods.

- There is only limited analytical data for U.S. foods.
- For many foods there are only single values.

There is a lack of analytical methods to separate and quantify all the major flavonoids from all the classes simultaneously. As a result many researchers only analyze one class of flavonoids in a particular food and therefore comprehensive data on all the classes is often missing.

A new database for flavonoids in foods will be released on NDL's Web site in late 2002.

References