Using Food Consumption Data To Estimate Dietary Exposure To Chemical Contaminants In Foods

USDA's CSFII consumption data may be used to assess the health impact of chemical residues in foods. These data permit estimates of long- and short-term intakes for the overall US population and for population subgroups. Intake is calculated as the product of the amount of food consumed and the chemical level in the food. Because consumption and contaminant data frequently are collected independently and for different purposes, one must use caution when combining the data.

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Consumption data may be used to assess the potential health impact of chemical contaminants or constituents in foods. Dietary intake, calculated as the product of the amount of food consumed and the chemical level in the food, may be compared against an appropriate toxicological endpoint. Intake levels greater than a "safe level" may be associated with adverse health effects.

Novigen's proprietary software, Dietary Exposure Evaluation Model (DEEM™) utilizes consumption data from the USDA Continuing Survey of Food Intake by Individuals (CSFII). These data permit estimates of both long- and short-term intakes for the overall US population and for various population subgroups based on age, gender, ethnicity, geographical areas, and consumption during different seasons of the year.

In selecting food consumption data, completeness of food descriptions is especially important, because chemicals are usually measured on the raw agricultural commodity (RAC); however, survey data typically are reported on foods as consumed (e.g., slice of apple pie). Therefore, it is necessary to convert the food consumption data into a format that may be used in the dietary intake estimates. The use of recipes enables this conversion. For example, the apple pie reported in the CSFII would be converted to the RAC components such as wheat, field corn (sweetener), soybean (oil), apple, etc. in the appropriate recipe proportions.

Residue data are collected to establish enforcement levels and to calculate anticipated levels for use in dietary intake estimates. Data typically are generated by pesticide registrants or may be from monitoring data collected by government agencies such as FDA Total Diet Studies and Enforcement Monitoring Programs, CAL-EPA Food Safety Programs, and the USDA Pesticide Data Program.

Because consumption and contaminant data frequently are collected independently and for different purposes, one must use caution when combining the data. For example, FDA monitoring data include compliance samples that are taken as follow-up to findings of illegal residues or when there is evidence of a pesticide residue problem. Thus, data collected under the compliance program may overestimate actual exposure, since compliance data tend to include samples with a higher incidence of detectable residues.

Intake estimates may utilize 1) chemical and consumption single point estimates, 2) consumption distribution plus single point chemical value, or 3) distributions of both consumption and chemical levels. Single points of upper percentiles of consumption or of residue levels for more than one food may result in overestimates. In contrast, methods using distributions consider variations in daily consumption and, therefore, provide more realistic estimates than the single point method. Since the actual consumption distribution is used, this method may be utilized for several foods. Methods using residue distributions combined with food consumption distributions result in even more realistic estimates of intake.

Endnote

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