The Arsenic Debate Continues: What are the Facts about Arsenic in Food and Beverages? The Whole Food Discussion

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JIFSAN 2014 Annual Spring Symposium:
“The Case of Avoiding Risk: Truth or Consequences”
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Outline

- What is prompting all the concern about arsenic?
- Arsenic in the environment and food supply
- Focus on arsenic in apple juice and rice
- The science and health effects of arsenic
- JECFA, EFSA & Codex Contaminants discussions
- FDA ongoing investigations
- Perspective on “Benefit-Risk” evaluation
Increasing concerns related to potential chemical hazards in food

✓ More sensitive analytical methods
✓ Increasing media and consumer awareness
✓ The concerns are global
✓ Some irresponsible messaging and non-balanced discussions
✓ Regulatory scrutiny and scientific uncertainty
✓ All lead to confused and concerned consumers!
Arsenic: Recent Media Coverage

"The U.S. Food and Drug Administration and Consumer Reports released studies showing "worrisome" levels of cancer-causing arsenic in many popular rices and rice products."
10/12/12

Are High levels of Arsenic in foods dangerous?
Inorganic Arsenic [iAs]

- Known for centuries as the “most infamous” POISON, but it’s an unavoidable, naturally occurring trace element.
- The Problem: it’s classified as a Human Carcinogen.
  - IARC Monograph Vol. 2 (1973)
  - Bladder, lung and skin cancers
- California Proposition 65: listed as a carcinogen (1987) and as a developmental toxicant (1997)
Arsenic in Foods – General Considerations

- Arsenic is a naturally occurring trace element that has a ubiquitous presence in the earth’s crust, soil, air, water and many plant-derived food products, including juices and rice.

- It occurs in both inorganic and organic forms in foods -
  - Total arsenic (inorganic + organic) measured by some easier methods; inorganic As demands better methods
  - As+3 (trivalent) arsenite and As+5 (pentavalent) arsenate
  - Monomethylarsonic acid [MMA], dimethylarsinic acid [DMA] and others
  - Arsenobetaine – major arsenic species in most seafoods, non-toxic
  - Arsenolipids and arsenosugars

- Arsenic “Speciation” is the critical analytical need.
Toxic, naturally occurring arsenic species

\[
\begin{align*}
\text{OH} \\
\text{HO—As} \\
\text{OH}
\end{align*}
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Arsenic III

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\begin{align*}
\text{OH} \\
\text{HO—As═O} \\
\text{OH}
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Arsenic V

Metabolic byproducts of arsenic V

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\begin{align*}
\text{CH}_3 \\
\text{O═As—O} \\
\text{OH}
\end{align*}
\]
Monomethyl arsenic

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\begin{align*}
\text{CH}_3 \\
\text{O═As═O} \\
\text{CH}_3
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Dimethyl arsine

Nontoxic species of arsenic in food supply

\[
\begin{align*}
\text{CH}_3 \\
\text{CH}_3—\text{As}^{\ominus}—\text{CH}_2\text{CH}_2\text{OH} \\
\text{CH}_3
\end{align*}
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Arsenocholine

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\begin{align*}
\text{CH}_3 \\
\text{CH}_3—\text{As}^{\ominus}—\text{CH}_2\text{C}═\text{O} \\
\text{CH}_3
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\]
Arsenobetaine
Figure 1. Metabolism of inorganic arsenic through a series of reductions and oxidative methylations (from Le et al., 2000), as originally proposed by Challenger (1951). Used with permission.
What’s driving new consumer concerns about arsenic in food?
Arsenic is new in the news, but not new in the world.

- Arsenic (As) naturally occurs in soil, water, rocks, air and food, has been there forever.
- Arsenic (As) is known to be a poison and carcinogen.
- FDA has monitored As for >20 years.
- EPA standard for As in drinking water.
- Chasing “Zero” in Chemical Contaminant Analysis – measuring smaller and smaller amounts.
- Media reports of As in rice and other food products.
  - Media coverage of research studies.
  - Dr. Oz.
  - Consumer Reports coverage of As in apple juice and rice.
  - Additional testing by FDA underway.

TIPPING POINT
Arsenic levels in common foods

Arsenic intake occurs through food and drinking water with recent concerns focused on high levels in rice. Elevated levels of arsenic can cause lung, bladder and skin cancers, cardiovascular disease and hypertension and could cause neurological deficits and diabetes.

**RICE, RICE PRODUCTS**

- 3.5-6.7 µg per cup

**MEAT**

- Beef: 0.1 µg per half pound

**COOKED SPINACH**

- 1.1 µg per cup

**GRAPE JUICE**

- 2.3 µg per cup

**Chicken**

- 0.2 µg per half pound

**Shrimp**

- 0.4 µg per half pound

**FISH**

Fish has high amounts of organic arsenic that are not as risky to human health as inorganic arsenic.

**RECOMMENDED MAXIMUM ARSENIC INTAKE**

- 220-lb. person: 30 µg
- 50-lb. child: 14 µg

Health threat = 50+ µg

**Arsenic in water**

**WELL, SPRING, NATURAL WATER**

- Concentration can reach 100-200 ppb (parts per billion) = 200-400 µg per 2 liters of water.

**PUBLIC WATER**

- Typical concentration: 2-4 ppb = 4-8 µg per 2 liters of water.

**NOTE:** 10 ppb is the maximum concentration allowed, or 20 µg per 2 liters of water.

Sources: "A Market Basket Survey of Inorganic Arsenic in Food," Food and Chemical Toxicology 37 (1999), by R.A. Schoof, et. al.
U.S. Arsenic Map

Arsenic concentrations in at least 25% of samples exceed:
- 50 µg/L
- Insufficient data

Colors indicate:
- Red: 50 µg/L
- Orange: 10 µg/L
- Yellow: 5 µg/L
- Green: 3 µg/L
- Dark Green: 1 µg/L

USGS logo
Arsenic in Foods – Additional Facts

- All plants, including fruits and vegetables, take up arsenic from the soil, regardless of whether the farming method is conventional or organic.

- Trace “parts-per-billion” (ppb) levels of total arsenic, and lesser levels of inorganic and organic arsenic species, have been reported in juices, rice products and many other foods.

- U.S. FDA has been carefully monitoring the arsenic content of foods since 1991 in the TDS.

- FDA has recently expanded its surveillance activities to ensure that consumers are protected.
Arsenic in Foods – Rice

✓ FDA has indicated that the average daily intake of arsenic does not pose a hazard or risk to U.S. consumers

✓ The overall arsenic content of U.S. rice is similar to that found in some regions of the world, but less than that reported to date in China, Japan, Australia, UK and the EU (see Codex “Proposed Draft MLs” 2012)

✓ There have been no documented incidents in which arsenic in U.S. rice has led to human health problems. In fact, many populations that consume up to five times more rice than Americans have lower overall disease rates

✓ The rice industry has been fully engaged with government agencies, food scientists, nutritionists, toxicologists and manufacturers to ensure the continued safety and healthfulness of rice products.
Arsenic - All Food Groups

**Total As Intake** 20 to 300 µg/day
Contribution 10-25% inorganic

- **Vegetables** 24%
- **Fruits and Juices** 18%
- **Rice products** 17%
- **Beer and wine** 12%
- **Other grains** 11%
- **Meat, eggs** 5%
- **Other** 13%

75% organic
Fish / shellfish – major source

Arsenic Exposure and Bioaccessibility from Rice

✓ U.S. EPA researchers did an elegant study of As exposure from U.S. rice using a synthetic GI-based extraction procedure and a probabilistic exposure model for a range of rice types

✓ U.S. population as a whole -
  ✓ 75 %ile exposure was < 0.95 µg of iAs/day
  ✓ 95 %ile exposure was < 5.2 µg of iAs/day

✓ 1-2 year old age group -
  ✓ 75 %ile exposure was < 0.34 µg of iAs/day

✓ Concluded that Total As data may be inappropriate for estimating risk from consumption of U.S. grown rice, because these products contain elevated Total As concentrations and were also shown to contain a disproportionate % of DMA rather than iAs.

Arsenic in Foods – Key Considerations in Toxicology [“ADME”]

“Absorption, Distribution, Metabolism, Excretion” –

✓ In humans, more than 90% of inorganic arsenite and arsenate are absorbed from drinking water, but only 60-70% of dietary arsenic is absorbed (or “bioavailable”)

✓ Ingested organic forms (MMA and DMA) undergo limited metabolism, do not readily enter the cell, and are primarily excreted unchanged in the urine; they are considered much less toxic forms of arsenic

✓ Inorganic arsenic is not formed during the metabolism of organic arsenicals

✓ The majority of ingested arsenic is rapidly excreted in the urine within a few days. It does not accumulate in the body.
Sam Cohen’s 2013 Review of Inorganic Arsenic
REVIEW

Evaluation of the carcinogenicity of inorganic arsenic

Samuel M. Cohen¹,², Lora L. Arnold¹, Barbara D. Beck³, Ari S. Lewis³, and Michal Eldan⁴,⁵

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Cohen Conclusions

- **Mode of action (MOA)** of iAs’s carcinogenicity is based on the U.S. EPA/IPCS framework, focusing primarily on bladder cancer

- MOA involves formation of reactive trivalent metabolites interacting with critical cellular sulfhydryl groups, leading to cytotoxicity and regenerative cell proliferation

- Metabolism, kinetics, cell transport and reaction with specific proteins play a critical role in producing the effects at the cellular level, regardless of whether bladder urothelium, lung epithelium or skin epidermis cells

- The cytotoxicity induced by iAs results in non-cancer toxicities, and regenerative cell proliferation enhances development of epithelial cancers
Cohen Conclusions (cont’d)

- Evidence supporting this MOA comes from *in vitro* studies on animal and human cells, from animal models and from epidemiology studies.

- This MOA implies a *non-linear, threshold dose-response* relationship for both non-cancer and cancer end points.

- No effect levels in animal models (~ 1 ppm of water or diet) and *in vitro* (40.1 mM trivalent arsenicals) are strikingly consistent.

- Cancer effects of iAs in human epi studies generally are *not* observed below exposures of 100–150 ppb in drinking water.

- Environmental exposures to iAs in most of the U.S. *do not* approach this threshold.
Figure 6. Interaction of arsenicals with cells. Pentavalent arsenicals, except arsenate, are poorly transported across cell membranes. Trivalent arsenicals are efficiently transported across cell membranes. Oxygenated arsenicals can be converted to the corresponding thiolated arsenicals, which can readily enter cells. The thiolated arsenicals inside the cell are rapidly converted to the corresponding trivalent oxyarsenical. Trivalent arsenicals can react with free sulfhydryl groups. If sufficient interactions with specific targets are achieved, a biological response occurs.
JECFA and EFSA

Discussions on

Inorganic Arsenic
FAO/WHO Joint Expert Committee on Food Additives (JECFA)
JECFA Evaluation in 2010

- Levels of iAs in foods and beverages usually do not exceed 0.1 mg/kg, with mean values generally < 0.03 mg/kg

- **Adults**: mean dietary exposures < 1 μg/kg bw per day, and upper-percentile estimates < 1.5 μg/kg bw per day

- **Infants and children**: mean dietary exposures < 2 μg/kg bw per day, and upper-percentile estimates < 3 μg/kg bw per day

- JECFA identified a benchmark dose lower confidence limit for a 0.5 % increased incidence of human lung cancer (BMDL_{0.5}) of 3.0 μg/kg bw per day (2-7 μg/kg bw per day based on range of estimated total dietary exposure)

- Committee withdrew the previous PTWI of 15 μg/kg bw per week because it was near the BMDL_{0.5} and no longer appropriate

European Food Safety Authority
2009-2014
Inorganic Arsenic
SCIENTIFIC OPINION

Scientific Opinion on Arsenic in Food

EFSA Panel on Contaminants in the Food Chain (CONTAM)

European Food Safety Authority (EFSA), Parma, Italy

This scientific output, published on 1 February 2010, replaces the earlier version published on 22 October 2009. This scientific output replaces the earlier version published on 1 February 2010.

ABSTRACT

The EFSA Panel on Contaminants in the Food Chain (CONTAM Panel) assessed the risks to human health related to the presence of arsenic in food. More than 100,000 occurrence data on arsenic in food were considered with approximately 98% reported as total arsenic. Making a number of assumptions for the contribution of inorganic arsenic to total arsenic, the inorganic arsenic exposure from food and water across 19 European countries, using lower bound and upper bound concentrations, has been estimated to range from 0.13 to 0.56 μg/kg bodyweight (b.w.) per day for average consumers, and from 0.37 to 1.22 μg/kg b.w. per day for 95th percentile consumers. Dietary exposure to inorganic arsenic for children under three years of age is in general estimated to be from 2 to 3-fold that of adults. The CONTAM Panel concluded that the provisional tolerable weekly intake (PTWI) of 15 μg/kg b.w. established by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) is no longer appropriate as data had shown that inorganic arsenic causes cancer of the lung and urinary bladder in addition to skin, and that a range of adverse effects had been reported at exposures lower than those reviewed by the JECFA. The CONTAM Panel modelled the dose-response data from key
SCIENTIFIC REPORT OF EFSA

Dietary exposure to inorganic arsenic in the European population

European Food Safety Authority

European Food Safety Authority (EFSA), Parma, Italy
EFSA 2014 Exposure Assessment

- Over 100,000 food samples (including drinking water) used to calculate dietary exposure to iAs

- EFSA Comprehensive European Food Consumption Database used to estimate chronic dietary exposure to iAs [17 countries]

- Mean dietary exposure for infants, toddlers and other children: 0.20 to 1.37 μg/kg bw/day, while 95th %ile ranged from 0.36 to 2.09 μg/kg bw/day

- Mean dietary exposure for adult population: 0.09 to 0.38 μg/kg bw/day, and 95th %ile ranged from 0.14 to 0.64 μg/kg bw/day

- For all age groups except infants/toddlers, main contributor to dietary iAs exposure was ‘Grain-based processed products (non rice-based)’, in particular, wheat bread and rolls

- Other key contributors to iAs exposure: rice, milk and dairy products (main contributor in infants and toddlers), and drinking water.
Codex Committee on Contaminants in Food

~ Arsenic in Rice ~
Earlier Codex Considerations on Arsenic in Rice

- **Codex Committee on Contaminants in Food (CCCF)** has been working on As in rice since 2010; “Discussion Paper” was finalized in 2011

- CCCF meeting in 2012 **suspended work for 2 years** on any consideration of drafting **Maximum Levels (MLs)** for arsenic in rice -
  - Committee considered MLs for iAs or total As in raw rice at 0.3 mg/kg (ppm) and for iAs in polished rice at 0.2 mg/kg (ppm)
  - Committee developed a “Discussion Paper” on what should be included in a “Code of Practice for Arsenic in Rice” and how it should eventually be developed

- “Discussion Paper” was evaluated at CCCF meeting in April 2013 -
  - Committee agreed to further develop the “Discussion Paper” and to determine which current **risk management** measures for reducing As levels might provide the basis for the preliminary development of a “Code of Practice.”
Agenda Item 13

CX/CF 14/8/13
February 2014

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

Eighth Session
The Hague, The Netherlands, 31 March – 4 April 2014

DISCUSSION PAPER ON THE DEVELOPMENT OF A CODE OF PRACTICE FOR THE PREVENTION AND REDUCTION OF ARSENIC CONTAMINATION IN RICE

(Prepared by the Electronic Working Group chaired by China and co-chaired by Japan)
Agenda Item 6

CX/CF 14/8/6
February 2014

JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON CONTAMINANTS IN FOODS

Eighth Session

The Hague, The Netherlands, 31 March – 4 April 2014

PROPOSED DRAFT MAXIMUM LEVELS FOR ARSENIC IN RICE (RAW AND POLISHED RICE)

(Prepared by the Electronic Working Group chaired by China and co-chaired by Japan)
CCCF Decisions (April 2014) on Arsenic in Rice

- CCCF agreed to establish an ML and to forward this draft ML to the Commission for adoption at Step 5/8:
  \[ \text{ML} = 0.2 \text{ mg/kg for inorganic As in polished rice} \]

- CCCF could not reach agreement on an ML for iAs in husked rice (i.e., raw or brown) because of a debate over product rejection rates (~ 5% at 0.3 mg/kg):
  \[ \text{ML range discussed was 0.25 to 0.4 mg/kg} \]

- CCCF agreed to re-establish the Electronic Working Group (led by China, co-chaired by Japan) to prepare a proposed draft ML for husked rice at Step 3 for further consideration at next year’s meeting.
FDA Considerations on Arsenic in Apple Juice and Rice
Arbitrage in Apple Juice

Arsenic is present in the environment as a naturally occurring substance or as a result of contamination from human activity. It is found in water, air, soil and foods. In foods, arsenic may be present as inorganic arsenic (the most toxic form of arsenic) or organic arsenic. FDA has been monitoring the levels of arsenic in foods for decades, and in 2011, increased its testing. The latest results confirmed that the amount of arsenic in apple juice is low. The agency has studied consumption levels among children and adults, and completed a scientific assessment. Based on this work, FDA is confident in the overall safety of apple juice for children and adults.

July 12, 2013

- News Release: FDA proposes “action level” for arsenic in apple juice. The action level that FDA is proposing is the same as EPA’s limit for arsenic in drinking water. This action level is intended to help keep out of the food supply even the occasional lot of apple juice with arsenic levels above those permitted in drinking water. FDA may take this level into account when considering an enforcement action.

- Draft Quantitative Assessment of Inorganic Arsenic in Apple Juice (PDF 296KB). This risk assessment provides estimates of arsenic exposure and risk to humans at different hypothetical limits for inorganic arsenic in apple juice. See also Peer Review Report: Risk Assessment of Arsenic in Apple Juice (PDF - 292KB).

- Draft Guidance for Industry on Arsenic in Apple Juice: Action Level. This guidance document identifies the action level, achievable with the use of good manufacturing practices, and describes the FDA’s intended sampling and enforcement approach.

- Supporting Document for Action Level for Arsenic in Apple Juice.

- Why FDA Proposes an ‘Action Level’ for Arsenic in Apple Juice. This is a blog from Michael R. Taylor, Deputy Commissioner for Foods and Veterinary Medicine.

- Questions & Answers: Apple Juice and Arsenic (updated July 15, 2013)
FDA’s Apple Juice “Action Level” for iAs

✓ Using new QRA/chronic exposure (0-50 years) and cancer endpoints, new data on total and iAs levels and manufacturer achievability, FDA proposed an action level for iAs in single-strength apple juice of 10 µg/kg (10 ppb) [same as the EPA drinking water standard]

✓ FDA said it is appropriate to set an action level for iAs because their sampling data show that iAs is the main form of As in apple juice and because iAs is considered more toxic than organic arsenic species

✓ FDA will continue to screen apple juice samples for total arsenic, prior to speciating for iAs in samples with total arsenic levels above 10 ppb

✓ FDA concluded that 10 ppb iAs is achievable under GMPs based on evaluation of recent FDA data in apple juice samples purchased at retail

✓ FDA also concluded that an action level of 10 ppb is adequate to protect the public health based on its risk assessment.
Arsenic is present in the environment as a naturally occurring substance or as a result of contamination from human activity. It is found in water, air, soil and foods. In foods, arsenic may be present as inorganic arsenic (the most toxic form of arsenic) or organic arsenic. FDA has been monitoring the levels of arsenic in foods for decades, and in 2011, increased its testing.

On September 6, 2013, FDA released the analytical results of approximately 1,100 new samples of rice and rice products as part of a major effort to understand and manage possible arsenic-related risks associated with the consumption of these foods in the U.S. marketplace. These 1,100 new samples are in addition to the approximately 200 samples of rice and rice products that the FDA initially tested and released the findings in September 2012.

- **FDA Statement on Testing and Analysis of Arsenic in Rice and Rice Products**
  The levels FDA found in its testing are too low to cause immediate or short-term adverse health effects. FDA's work going forward will center on long-term risk and ways to manage it with a focus on long-term exposure.

- **Consumer Update: FDA Explores Impact of Arsenic in Rice**
  This news feature is intended for consumers interested in knowing about arsenic in rice and rice products.

- **Updated Questions & Answers: Arsenic in Rice and Rice Products**

- **Blog: On Farms and in Labs, FDA and Partners Are Working to Get Answers on Arsenic in Rice**
  FDA Commissioner Margaret A. Hamburg, M.D., recounts her experience touring farms and research facilities in the U.S. and China, and meeting with state and national officials and rice farmers on the arsenic issue.
Inorganic Arsenic in Rice - Data Evaluation

✓ ~ 1,300 data samples (200 samples from Sept. 2012)

  **Rice grain range:** 2.6 - 7.2 µg/serving
  **Rice products range:** 0.1 - 6.6 µg/serving

✓ FDA’s main message – “Amount of detectable iAs is too low in the rice and rice product samples to cause any immediate or short-term adverse health effects.”

✓ Next steps –
  ✓ Exposure and risk assessments for long-term exposure to very low amounts of iAs (cancer endpoints)
  ✓ Release sometime in 2014 (?) for public comments
  ✓ Will eventually decide if further risk management actions are required (i.e., action levels for various products)

✓ Current FDA advice:
  ✓ Eat a well-balanced diet for good nutrition and to minimize potential adverse consequences; follow AAP guidance for infants/toddlers.
What the Rice Industry is Doing

- The rice industry is working collaboratively with FDA, conducting research to determine:
  - Human health risk from arsenic exposure
  - Net risk / benefit analysis of rice consumption and health / nutrition impacts
  - Agronomic / cultural practices
  - Processing / milling practices
  - Varietal differences / development

- University of Arkansas’s Rice Processing Program, Industry Alliance Meeting, Fayetteville, May 21-22, 2014
Rice Consumption Is Associated with Better Nutrient Intake and Diet Quality in Adults: National Health and Nutrition Examination Survey (NHANES) 2005-2010

Theresa A. Nicklas¹, Carol E. O’Neil², Victor L. Fulgoni³

¹Baylor College of Medicine, USDA/ARS Children’s Nutrition Research Center, Houston, USA
²Louisiana State University Agricultural Center, Baton Rouge, USA
³Nutrition Impact, LLC, Battle Creek, USA
Benefit-Risk Evaluation – Looking at the Whole Food
Food and Chemical Safety Issues

✓ We usually test individual food chemicals, not the whole foods or beverages (except with epidemiology)
✓ For whole foods, we must identify biologically active toxic component(s)
✓ Must determine appropriate mechanism of action and mode of action of specific chemicals (carcinogens, reproductive toxicants, other toxicants)
✓ Key importance of dose-response relationships
✓ Interactions with diet / nutrients, environment & drugs
✓ Explore sensitive segments of population (young, aged)

Risk-Benefit Assessment is the crucial need:

⇒ Goal - NO “significant or unreasonable” risk!!
“Benefit-Risk Evaluation” to Assess the Safety of Foods Containing Toxicants and Carcinogens

✓ I believe we’ve been doing it the WRONG WAY for decades, by simply evaluating the risk of individual chemicals one by one

✓ Going forward, I believe the RIGHT WAY is to evaluate the safety of the whole food by comparing its risks vs. benefits using the “Holistic Approach”

✓ “Benefit-Risk Evaluations” and regulatory guidance documents have recently been published:

✓ FDA’s 2009 “Mercury in Fish” draft evaluation; IFT’s 2009 review
✓ Europe: EFSA’s 2010 Guidance; BRAFO; ILSI Europe (Seal et al., 2008, Acrylamide)

✓ I believe this process can be applied to acrylamide & other heat-produced carcinogens, arsenic and lead, rice, coffee, processed meats, etc.
Draft Risk & Benefit Assessment Report, Draft Summary of Published Research, Peer Review Report

January 15, 2009

Report of Quantitative Risk and Benefit Assessment of Consumption of Commercial Fish, Focusing on Fetal Neurodevelopmental Effects (Measured by Verbal Development in Children) and on Coronary Heart Disease and Stroke in the General Population and

Summary of Published Research on the Beneficial Effects of Fish Consumption and Omega-3 Fatty Acids for Certain Neurodevelopmental and Cardiovascular Endpoints

Federal Register Notice of Availability, January 21, 2009
Docket No. FDA-2009-N-0018

The Food and Drug Administration (FDA) is announcing the availability of two draft documents. The first is entitled “Report of Quantitative Risk and Benefit Assessment of Commercial Fish Consumption, Focusing on Fetal Neurodevelopmental Effects (Measured by Verbal Development in Children) and on Coronary Heart Disease and Stroke in the General Population” (draft risk and benefit assessment report). The draft risk and benefit assessment report describes an analysis done by FDA that results in quantitative estimates...
Risk Benefit Analysis of Foods

As the burden of health costs within society increases due to a longer lifespan, overall balanced nutrition can play an important role in disease prevention. There is considerable disparity in the way benefits and risks are compared for compounds found in food, relying almost always on subjective judgement. This prevents adequate comparison of alternatives and renders resource prioritisation difficult. In addition, it is extremely difficult to provide comprehensible advice to consumers. It is therefore vital that an effective strategy be developed to enable a holistic analysis of the net health impact of chemicals in food to be assessed and quantified, in a manner analogous to the current assessment of risk.
Guidance on human health risk-benefit assessment of foods

Question number: EFSA-Q-2007-0043

Adopted: 29 June 2010

Summary

The European Food Safety Authority (EFSA) asked its Scientific Committee to prepare a guidance document for performing risk-benefit assessments of food related to human health risks and human health benefits.

Risk-benefit assessments are performed in different disciplines, under various perspectives and use a wide range of quantitative or semi-quantitative tools. In this opinion, guidance for performing risk-benefit
Making Decisions about the Risks of Chemicals in Foods with Limited Scientific Information

An IFT Expert Report Funded by the IFT Foundation
Use the Holistic “Risk-Benefit” Approach

✓ The beneficial health effects of certain whole foods may outweigh the adverse effects of trace levels of various carcinogens and other toxicants

✓ We must expand on preliminary efforts to develop improved methods for the qualitative and quantitative assessment of the benefits of whole foods

✓ We must press global health and regulatory authorities to:

  ✓ Use improved toxicology & risk assessment methods on individual chemicals tested at high doses in animals, including consideration of possible human thresholds
  ✓ Consider the health benefits of protective compounds both naturally occurring and produced by heating
  ✓ Assess the safety and benefits of the whole food, not just individual food carcinogens & toxicants one by one.
Thank You!

Questions?