Proposed Total Diet Study in Vietnam

Dr. Le Hong Dung
National Institute of Nutrition
Vietnam

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Risk assessment has recently become a priority in the framework of the National Program for Food Safety from 2012 to 2015. Besides the various training programs to improve the knowledge of scientists in food safety sectors, some pilot studies on the exposure of nutrients and contaminants have been done to evaluate and to develop a model for a total diet study in Vietnam. This presentation reviews the studies on dietary intake of some nutrients, as well as the dietary exposure of food additives, heavy metals, polycyclic aromatic hydrocarbons (PAHs), and pesticide residues among Vietnamese children and adults. These studies were based on either the food consumption data from the National Food Consumption Survey conducted by the NIN in 2009, or individual food frequency data set to estimate the intake of nutrients and toxicants. The presentation will also discuss the proposals and future plans to develop a model for a total diet study in Vietnam.

Proposed Total Diet Study in Vietnam

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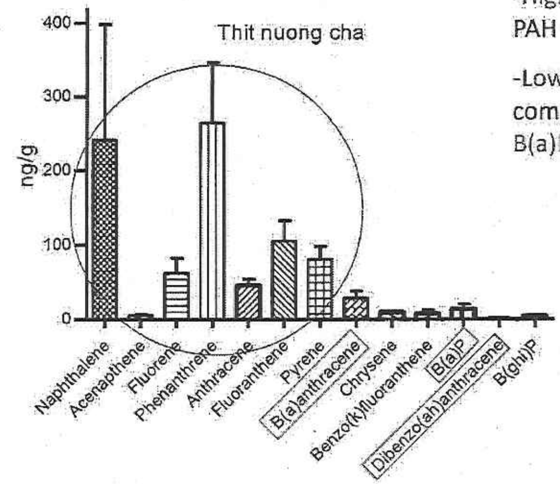
Content

- Overview of dietary exposure study at NIN, challenges and limitation
- Proposed future total diet study
- Technical needs for Viet Nam

Study 1:

- Evaluation of PAHs contamination in processed food and PAH's exposure among adults in Ha Noi and Ho Chi Minh City
- High risk food: grilled and deep fried meats, fishs, cereal products

Concentration of PAH in food (ng/g)



-Higher content: less toxic PAH

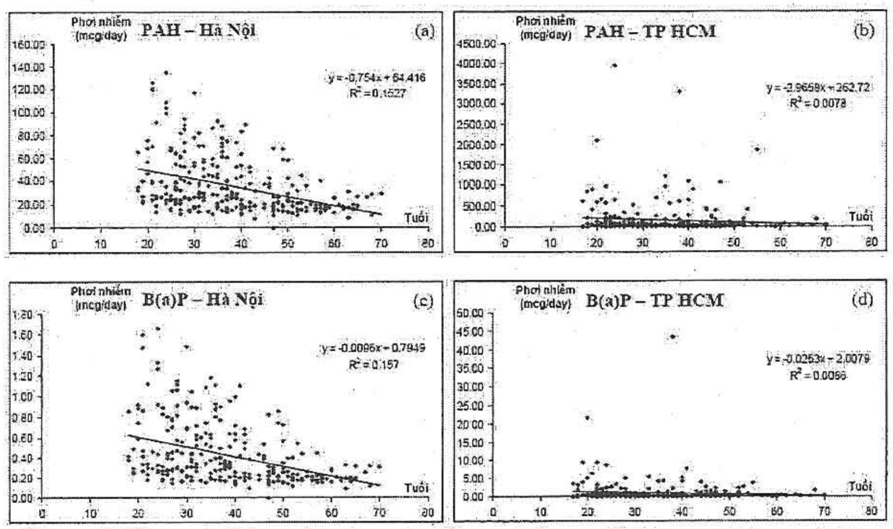
-Lower content: carcinogenic compound group 2A: B(a)A, B(a)P, Dibenzo(a,h)A

Intake of PAH from food

- Formula:

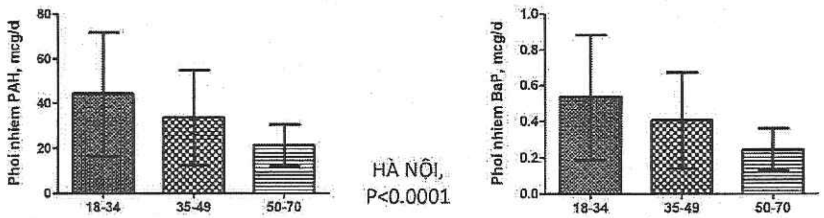
Intake (μg/person/day) for individual PAH in each food = [PAH concentration (μg/g) x amount of food consumed/time x frequency/month] / 30

Trend of PAH exposure by age groups in Hà Nội (a,c) and TP Hồ Chí Minh (b,d)

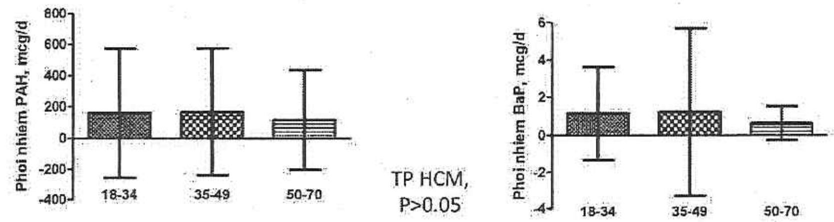


By age groups

youger expose more PAH from HANOI



HÀ NỘI, P<0.0001



TP HCM, P>0.05

By sex group

Group	PAH intake (µg/per/day)		B(a)P intake (µg/per/day)	
	Hà Nội	TP HCM	Hà Nội	TP HCM
Male	**43.5**	**224.9**	**0.52**	**1.57**
Femal	32.3	113.2	0.39	0.80
Ttest	**P = 0.0005**	**P = 0.0250**	**P = 0.0017**	**P = 0.0601**

male expose more PAH

TB (µg/per/day)	HN	TP HCM	Italia 1995	Holland 1986	England 2000	Germany 1985	USA 1996	EU
Naphthalene	7.48	25.52						
Acenapthene	0.12	0.24			0.98			0.98
Fluorene	**1.90**	**1.45**			0.56			0.6
Phenanthrene	**8.11**	**5.89**		4.51	1.54			<0.33-4.51
Anthracene	**1.62**	**1.43**		0.64	0.08			<0.04-0.64
Fluoranthene	**3.71**	**1.98**		1.66	0.35			0.35-1.66
Pyrene	**2.36**	**1.75**			0.35			0.35-1.09
Benzo(a)anthracene	0.72	0.79	**0.41**	**0.36**	**0.06**			**<0.02-0.41**
Chrysene	0.49	0.46	1.46	1.53	0.11			0.11-1.53
Benzo(k)fluoranthene	0.16	0.16		0.14	0.09			0.04-0.14
Benzo(a)pyrene	0.31	0.29	**0.17**	**0.29**	**0.11**	**0.02-0.14**	**0.05**	**0.05-0.29**
Dibenzo(a,h)anthracene	0.03	0.05	**0.08**		**0.04**			**<0.02-0.08**
B(ghi)perylene	0.17	0.22		0.36	0.06			0.06-0.36

higher than other city

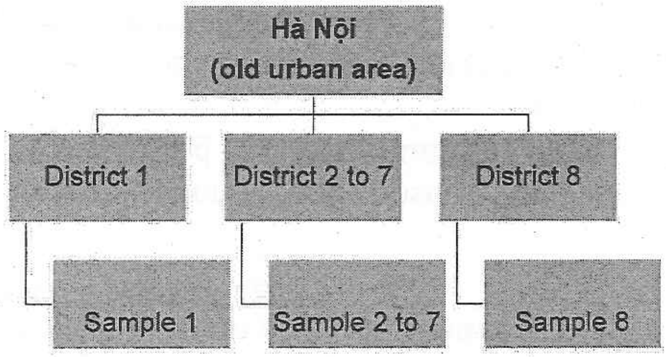
Study 2 (ongoing): Dietary exposure of food additives (benzoic acid, sorbic acid), acrylamide, melamine and some pesticide residue in children from 4 – 5 years of age

- Design:
  - Determination of food consumption in children by using food frequency questionnaires
  - Collect the food sample in the market, analyse for additives, acrylamide, melamine, and pesticide residues ready-to-eat food
  - Estimate the intake of toxicants by multiplying the amount of food consumed by the additive concentration

Study 3 (ongoing): Pilot total diet study of heavy metal and pesticide residue among adults in Ha Noi

- Objective: Determination of dietary exposure of lead, arsenic, mercury, cadmium and some pesticide residue among adults people in Ha Noi
- Design:
  - Generation of the food list from national food consumption survey year 2009
  - Collect the food sample from the market
  - Prepare the composite and ready to eat food sample
  - Analyse for heavy metal and pesticide content
  - Estimate the dietary exposure by multiplying the amount of food consumed by the toxicants' concentration

Sampling sites



Sampling method

National food (milk product, sweet...): 10 food items were collected from 1 super market

- No of collected sample: 1 food item x 3 samples = 30 samples.
- Combine 3 individual samples into one composite sample
- No. of composite sample: 10

Local food: 70 items

- **No. of collected sample:** 70 items x 8 sites = 560 samples
- Combine 8 individual samples from sites to make 1 composite sample
- **No. of composite sample:** 70 samples

Prepare TDS sample

- Prepacked food:
  - Ready to eat: analyse directly
  - Others: cook as instruction in the label
- Fruits and salad vegetables: wash by tap water and prepare the edible parts for analysis
- Other raw food: cooked by common recipe

Methodology

Food analysis

- Content of lead, cadmium, asen and mercury were determination by AOAC 986.15 using AAS
- Organochlorine and organophosphorus pesticide were determined by AOAC 2007.01 by GC/MS/MS

Exposure assessment:

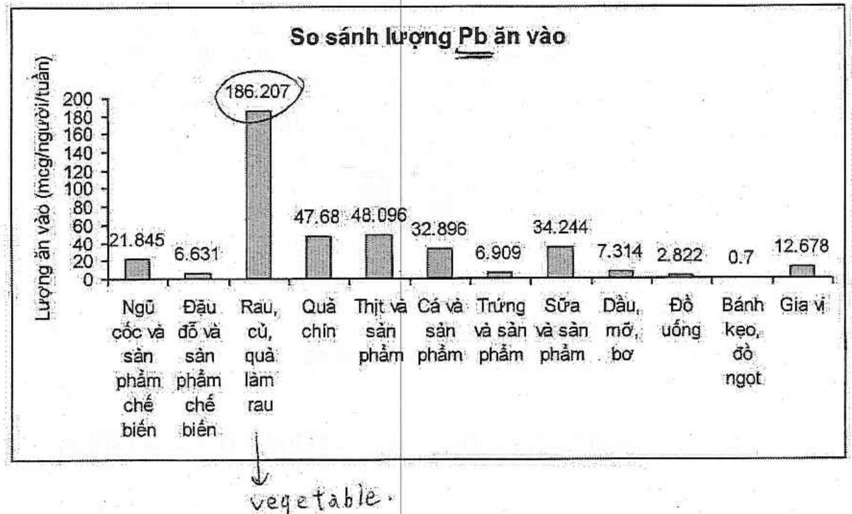
- Dietary Exposure = Σ (Concentration of chemical in food x Food consumption)

Preliminary results: heavy metal intake study

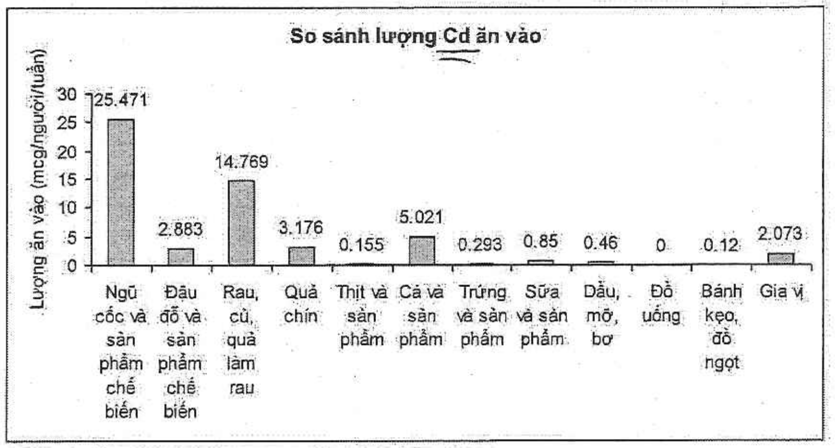
- Heavy metal concentration in composite samples

Compound	No. sample	No. of detected sample	Range (mg/kg)
Pb	80	68	0.003-0.940
Cd	80	41	0.001-0.080
As	80	61	0.004-0.460
Hg	80	3	0.020

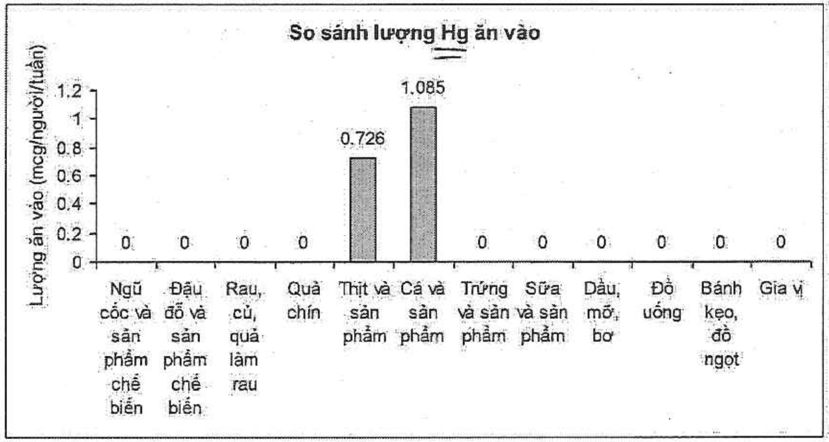
Intake of lead by food groups



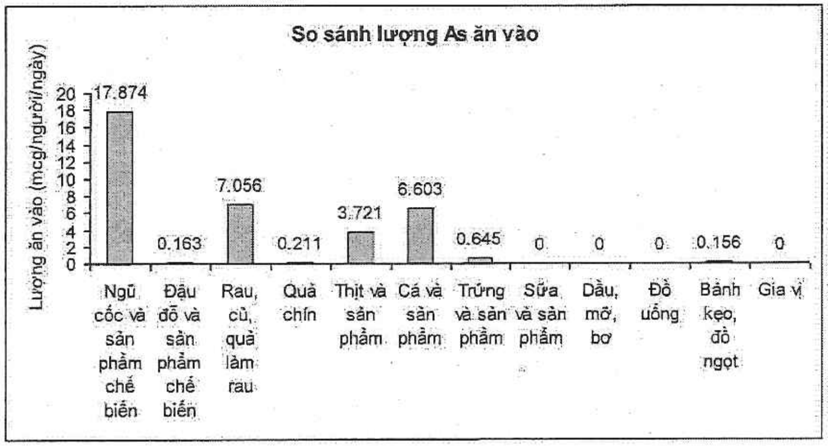
Intake of cadmium by food groups



Intake of mercury by food groups



Intake of arsenic by food groups



Comparison of heavy metal intake among adults and the WHO's guidelines

Heavy metal	WHO's limit		This study	
	PTWI (mg/kg B.W)	Adults (60kg)	Intake (mg/person/wk)	Percentage of the tolerable limit (%)
Pb	0.025	1.5	**0.405**	**27.0**
Cd	0.007	0.42	**0.059**	**14.0**
Hg	0.004	0.24	**0.002**	**0.8**
	PTDI (mg/kg B.W)	Adults (60kg)		
As	0.002	0.12	**0.037**	**31.0**

Disadvatage of current studies

- Food consumption data were based on household food consumption survey → limitations:
  - Food intakes were averaged for every people in family, and do not represent the individual diets
  - Food intake data could not be separated for various age groups
  - Possible errors from 24 hour recall data

Disadvatage of current studies (cont.)

- Limited budget: variation on food products and level of contaminants → composite samples may not provide information for the sources and ranges of contamination
- Standardization of cooking method is not available: diversity of traditional cooking methods
- Difficulties in food mapping

Proposed of future TDS in Viet Nam

- Selection of priority contaminants: based on WHO recommendation, including pesticides, heavy metals, industrial chemicals (PCBs, dioxins...), mycotoxins, byproduct by cooking (acrylamide)
- Design: pilot study at small scale (e.g. one city) then expand to larger scale
  - Apply TDS model of WHO and developed countries (Australia, US...) – market basket study

- Improve food consumption data: conduct individual food consumption survey, which covers all population groups (e.g. from 6 month old children to 70+ year old adults)
- Improvement of analytical capacity to determine contaminants in food

➢ Final goal: Maintain the TDS as a regular program by the integration the TDS into current food safety monitoring scheme

Technical needs

- ➢ Standardization of the methodology
  - Design of Total diet study
  - Formulation of the TDS food list
  - Sampling scheme
  - Selection of representative recipes
  - Food mapping technique
- ➢ Training on total diet stdudy for scientists and technical staff

THANK YOU FOR YOUR ATTENTION

Risk Management of Arsenic in Foods — Japanese Experience

Ms. Tomoko Takahashi
Nestlé Japan Ltd.
Japan

Risk Management of Arsenic in Foods – Japanese Experience

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Arsenic exists in the earth's crust and is released to the environment by natural phenomena such as volcanic activities and forest fires. It occurs in the soil, both in seawater and freshwater, and in almost all plant and animal tissues. As a result, arsenic occurs naturally at very low levels in many foods and it is not possible to avoid it completely.

Arsenic in food is not a major concern of consumers in Japan because they seldom hear about it in the news. News on arsenic in foods almost always comes from overseas, but once reported in the Japanese media, it is shocking for the Japanese.

In 2004, the Food Standards Agency (FSA) in the UK announced that people should not eat a type of seaweed called "*Hijiki*" because FSA found that it contained high amounts of harmful inorganic arsenic. In addition, arsenic standards in rice (polished and husked) have been one of the hottest topics in CODEX because rice contains high amounts of inorganic arsenic compared to other foods. "*Hijiki*" and rice have been consumed by the Japanese for a long time and consumers in Japan are unlikely to stop eating them on account of their arsenic content.

In response to the arsenic issues, the Ministry of Agriculture, Forestry and Fisheries (MAFF) of Japan has been investigating arsenic in various foods and has provided explanations as well as the results of their investigations in their website. In addition, the Ministry of Health, Labor and Welfare of Japan prepared a Q&A in their website soon after FSA discouraged people from consuming "*Hijiki*". The Food Safety Commission, an independent risk analysis organization under the Cabinet in Japan, published a report on arsenic in food in 2013.

This presentation will share the outcome of the investigations and the recommendations of governmental agencies in Japan regarding the consumption of "*Hijiki*" and rice.

Risk Management of Arsenic in Foods – Japanese Experience

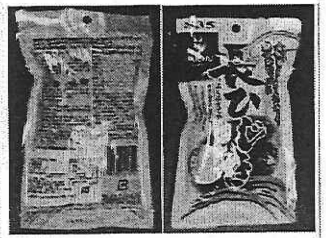
Seminar on
Food Safety and Standards
December 15, 2015
Hilton Hanoi Opera, Hanoi, Vietnam

Tomoko TAKAHASHI
Regulatory and Scientific Affairs Senior Specialist
Regulatory and Scientific Affairs Department
Nestle Japan Ltd.

News about Arsenic in Food:

- Taiwan Ministry of Health and Welfare (衛生福利部)：
  - June 5, 2015 :Announced they found High level of Arsenic in *Hijiki* seaweed imported from Japan.
- Food Standards Agency- UK:
  - In 2004 : Carried out survey finding that *Hijiki* seaweed contains inorganic arsenic.
  - In August 2010 : Reminded people of its advice not to eat a type of seaweed called *Hijiki* because it contains high levels of inorganic arsenic.
  - In 2009 : Published arsenic in rice research, and advised that toddlers and young children (ages 1 - 4.5 years) should not be given rice drinks as a substitute for breast milk, infant formula or cows' milk.

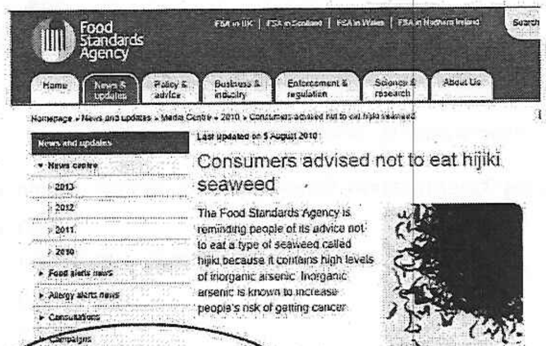
Taiwan Ministry found High level of Arsenic in *Hijiki* seaweed from Japan

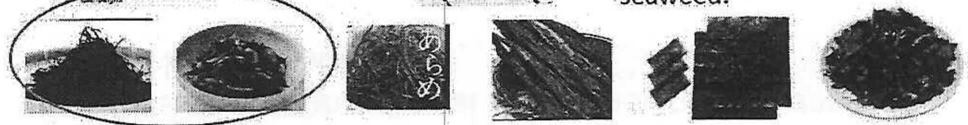


Manufacturer in Mie prefecture.
The manufacturer uses *Hijiki* imported from Korea.

- June 5, 2015 : Taiwan Ministry of Health and Welfare (衛生福利部) announced the detection of excess amounts of "Inorganic Arsenic" in seaweed imported from Japan.
- Analysis done by the Ministry :
  - Period : August 28, 2014-May 30, 2015
  - Subjected food for analysis : Imported seaweeds.
  - Standards of Arsenic level in foods in Taiwan: max 1 ppm. (same as the level of New Zealand and Australia)
- At least 4ppm of Arsenic was detected from imported *Hijiki* seaweed. The highest level detected was 16.08ppm.

Food Standards Agency- UK





The Agency carried out a survey in 2004, which found that *hijiki* contains inorganic arsenic – a form that occurs naturally in some foods. The survey also tested *arame*, *kombu*, *nori* and *wakame* but no inorganic arsenic was found in these types of seaweed.

Food Standards Agency- UK continued

Science behind the story

- Arsenic is widely distributed in the environment. It occurs in soil, water – both sea and fresh – and in almost all plants and animal tissues. As a result, arsenic occurs naturally at very low levels in many foods and it is not possible to avoid it completely.
- How harmful the arsenic is depends on the chemical form in which it is present. The inorganic form can cause cancer by harming our genetic material (DNA). Rice and rice products together with *hijiki* seaweed have higher levels of the inorganic form of arsenic compared with other food. The Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) (an independent scientific committee that provides advice to the Food Standards Agency) has concluded that people should consume as little of this form of arsenic as reasonably practicable. The organic form is less harmful.

Current regulations

- There are no EU-wide regulations for arsenic levels in food. In the UK, there is a general limit of 1 mg/kg (milligram per kilogram) for arsenic in food, though seaweed is not included. Separate limits apply to certain food categories. For instance, ready-to-drink non-alcoholic beverages have a limit of 0.1 mg/kg. The UK regulations were set in 1959 before it was known that inorganic arsenic can cause cancer.
- In September 2009, the European Food Safety Authority (EFSA) published its opinion on the risk to human health associated with arsenic in food. EFSA concluded that it was not appropriate to identify a tolerable daily or weekly intake for arsenic and recommended that dietary exposure to inorganic arsenic should be reduced. Following this, it is possible that EU-wide regulations will be set for arsenic levels in food.

Countries and International bodies having Standards of Arsenic level in foods:

- **CODEX**
- **EU**
- **Australia / New Zealand**
- **China**
- **WHO** : Guidelines for drinking-water quality, fourth edition (2011)
  - 0.01 mg/L
    - provisional guideline value because calculated guideline value is below the achievable quantification level
    - provisional guideline value because calculated guideline value is below the level that can be achieved through practical treatment methods, source protection, etc.
- **Japan**

  etc.

CODEX:

Items	Standards	
	Total Arsenic	Inorganic Arsenic
Fats and oils	0.1 mg/kg	
Fat spread, blend spread		
Animal fats		
Purified olive oil		
Virgin olive oil		
Olive pomace oil		
Crude vegetable oils		
Vegetable oils		
Natural Mineral Water	0.01 mg/L	
Salt	0.5 mg/kg	
Polished rice		0.2 mg/kg *)

*) A country or an importer may also decide to use a general arsenic analysis in the rice as a screening in case of application of the biggest standard value of the inorganic arsenic in the rice.

Codex Committee on Contaminants in Foods (CCCF) & Codex Alimentarius Commission (CAC)

- Since April 2010 at 4th CCCF, discussion on Arsenic level in rice continues.
- July 2014 at 37th CAC
  - Adopted maximum level for inorganic arsenic in polished rice : 0.2 mg/kg
- March 2015 at 9th CCCF
  - proposed draft maximum level (0.35 mg/kg)for inorganic arsenic in husked rice to the CAC 38 for adoption at Step 5
- July 2015 at 38th CAC
  - Adopted the draft maximum level for inorganic arsenic in husked rice : 0.35 mg/kg.

EU: maximum levels of inorganic arsenic in foodstuffs

COMMISSION REGULATION (EU) 2015/1006 of 25 June 2015

- The Scientific Panel on Contaminants in the Food Chain (CONTAM Panel) of the European Food Safety Authority (EFSA) concluded PTWI by JECFA (15 mcg/b.w.)no longer appropriate :

Items	Arsenic (inorganic) *) : mg/kg
Non-parboiled milled rice (polished or white rice)	0.20
Parboiled rice and husked rice	0.25
Rice waffles, rice wafers, rice crackers and rice cakes	0.30
Rice destined for the production of food for infants and young children	0.10

*) Sum of As (III) and As (V)

Rice, Husked rice, Milled rice and Parboiled rice as defined in Codex Standard 198-1995

To be adopted from Jan 1, 2016

Australia/New Zealand:

Items	Standards (mg/kg)	
	Total Arsenic	Inorganic Arsenic
Cereals	1	-
Crustaceans	-	2
Fish	-	2
Mollusks	-	1
Seaweeds	-	1

China:

Items	Standards (as As:mg/kg unless defined)	
	Total Arsenic	Inorganic Arsenic
Cereals excluding husks	0.5	-
Cereals powder excluding husked rice and polished rice	0.5	-
Husks, Husked rice, Polished rice	-	0.2
Seafood and fishery products excluding fish	-	0.5
Fish and fishery products	-	0.1
Fresh vegetables	0.5	-
Mushroom, Mushroom products	0.5	-
Meat, Meat products	0.5	-
Raw milk, Pasteurized milk, Adjusted milk, Fermented milk	0.1	-
Powdered milk	0.5	-
Fats and oils and products thereof	0.1	-
Seasoning (excluding spices and seasoning using fish and seaweed)	0.5	-
Seasoning using marine products excluding ones using fish	-	0.5
Seasoning using fish	-	0.1

Items	Standards (as As:mg/kg unless defined)	
	Total Arsenic	Inorganic Arsenic
Sugar and sweeteners	0.5	-
Packaged drinking water	0.01 mg/L	-
Cocoa, Chocolate, Chocolate products	0.5	-
Cereal products for young children (excluding ones added seaweeds)	-	0.2
Cereal products for young children (ones added seaweeds)	-	0.3
Canned products for young children (excluding fishery products and products with animal lever)	-	0.1
Canned products for young children (fishery products and products with animal lever)	-	0.3

How about in Japan?

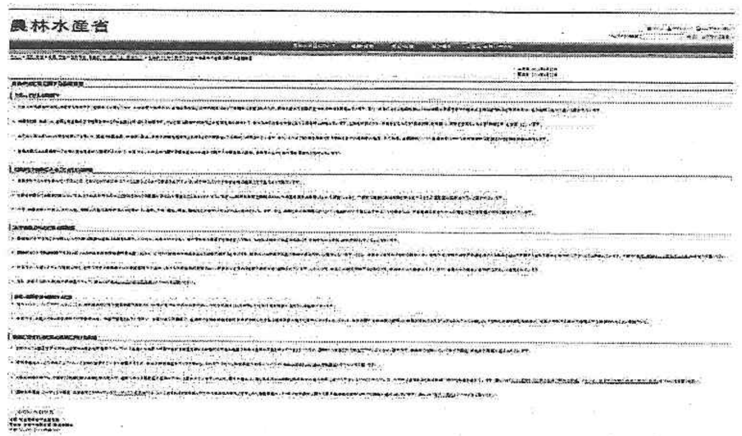
Standards of Arsenic Japan

- For Food
  - Tap water : 0.01mg/L (Arsenic and its compounds)
  - Water used to manufacture soft drink beverages and mineral waters : max.0.05mg/L
  - Soft drinks : must not be present in detectable amounts.(<0.2ppm as arsenious anhydride)
  - Powdered drink beverage : must not be present in detectable amounts. (<0.2ppm as arsenious anhydride)
  - As Agricultural Chemicals residue*: Arsenic Trioxide. *) There is no agricultural chemicals registered in Japan that has arsenic as effective composition.

Food	MRLs(ppm)
Potato	1.0
Tomato	1.0
Cucumber (including Gherkin)	1.0
Spinach	1.0
Citrus NATSUDAIDAI, pulp	1.0

Food	MRLs(ppm)
Citrus NATSUDAIDAI, peels	3.5
Apple	3.5
Japanese pear	3.5
Peach	1.0
Strawberry	1.0
Grape	1.0

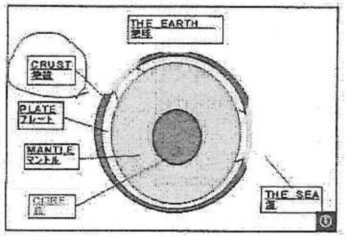
The Ministry of Agriculture, Forestry and Fisheries says...

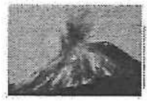


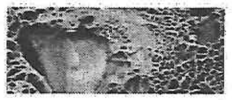
Ministry of Agriculture, Forestry and Fisheries (MAFF) Japan says:

What is "arsenic"? Where and how it exists?

- The element widely exists in natural environment. It is found in the earth crust, and released in the environment by natural phenomena such as volcano activities, forest fires and weathering of minerals.







That is why "arsenic" exists in soils including agricultural fields and water.

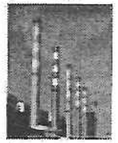
Notably in the soils in Japan contain relatively higher amounts of arsenic and this is because soils in Japan were affected by recent volcano activities.

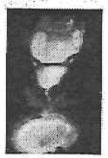
Arsenic exists in the environment in "Organic" form and "Inorganic" form.

MAFF Japan says:

How industrial activities influence "arsenic" in environment?

- Arsenic also released through the industrial activities such as disposal of waste including arsenic, thermal power generation and metal refining.





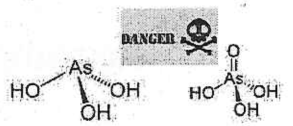
How our government manages it?

- To manage the appropriate release of arsenic in the environment through industrial activities, Japanese government has established the standards of arsenic in water and soils, water quality for drinking water, regulation on discharge of arsenic from the industries, and so on.

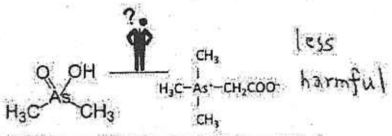
MAFF Japan says:

What the influences of health when Arsenic is taken in body?

- It differs depending on the type of Arsenic compounds and amount consumed.
- Amongst various Arsenic compounds, the effects of organic arsenic are not known well at this moment. EFSA (European Food Safety Authority) and FDA (Food and Drug Administration) evaluate that effect of organic arsenic is smaller than that of inorganic arsenic.



Examples of Inorganic Arsenic Compounds



Examples of Organic Arsenic Compounds

- On the other hand, it is reported that when large amount of inorganic arsenic is consumed at a time or in a short period, fever, diarrhea, vomiting, excitement, hair loss and so on are observed. When large amount of inorganic arsenic is consumed continuously in longer period, adverse effects such as changes in dermal tissues and cancer are reported.

MAFF Japan says:

How do we consume "arsenic" from Food and Water?

- Arsenic incorporated from water and soils by animals and plants are widely found in farm products, marine products and forest products. Therefore, not only drinking water but also various food contain small amount of arsenic and we consume arsenic orally through daily diet.
- JECFA (Joint FAO/WHO Expert Committee on Food Additives) estimates that people consume arsenic mostly from drinking water amongst drinking water and foods . Nevertheless, in some areas where the arsenic concentration in drinking water is relatively low, the arsenic consumption from food become relatively bigger.

- In Japan the concentration of arsenic in drinking water is maintained low by regulating the release of arsenic in the environment through industrial activities and standardizing the quality of drinking water, in addition to the maintenance of the water service system. Therefore, we estimate that the arsenic consumption from drinking water by Japanese citizen is small and the one from food are relatively big.

MAFF Japan says:

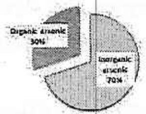
Management for the reduction of Arsenic in Food

- Toxic substances like "arsenic" that are unintentionally contained in various food should be reduced as low as reasonably achievable level by taking appropriate measurements in every step of food chain from production to consumption. This is an internationally agreed idea. Therefore, many scientific studies and researches on "arsenic" in food have been conducted internationally and locally.
- MAFF has also carried out various studies to get the picture of "arsenic" level in food. (see Annex-1)
- It is believed that in general inorganic arsenic is more harmful than organic arsenic. The MAFF has been trying to reduce the arsenic level in *Hijiki* seaweed and Rice, because these contain inorganic arsenic more in ratio of total arsenic than the one of organic arsenic, comparing those in other food. (see Annex-2)
- It has been discussed in CODEX Committee where the international food standards (CODEX standards) are established, how to reduce the arsenic in rice in effective way and to establish the maximum arsenic level in rice.

Summary of findings of MAFF research

1. Japanese citizens intake arsenic mainly from seafood, seaweeds and rice.

2. About 70% of Arsenic in *Hijikji* seaweed is Inorganic arsenic.



3. Arsenic in *Hijiki* seaweed can largely be reduced through processing (soaking in water) and cooking(boiling in water).
4. Arsenic in Rice can largely be reduced through processing (polishing) and cooking(washing).
5. Further investigations are required to develop the technology to reduce Arsenic in Rice during cultivation, such as water management at the sprouting season to balance Cadmium absorption.

Comments from MHLW (Ministry of Health, Labor and Welfare) on Arsenic in *Hijiki*

Soon after FSA in UK announced the advice "not to eat *Hijiki*" in 2004.

- Q) Do we get more risk by eating *Hijiki*?
- A) No, we do not think the health risk would be increased by eating *Hijiki*. This is because :
  - There is no report that inorganic arsenic in seaweeds caused the arsenic poisoning.
  - **National Nutrition Survey** carried out in 2002 showed that Japanese ate seaweed 14.6g/day. This includes other seaweeds such as "*Nori*" and "*Kombu*". Other seaweeds contain Organic arsenic that are less harmful.
  - When we calculate *Hijiki* intake amongst seaweed by Japanese from sum of production volume and import volume it is assumed that *Hijiki* contributes 6.1% of total seaweed intake by Japanese. If so, we can assume that *Hijiki* intake by Japanese in one day would be 0.9g.
  - WHO set in 1988*) PTWI(Provisional Tolerable Weekly Intake) of Inorganic arsenic to be 15 mcg/kg body weight/week, and this means 107 mcg/person/day for person with 50kg body weight. Food Standards Agency in UK reported that they found maximum 22.7mg /kg of Inorganic arsenic in *Hijiki* after dried one were soaked in water. When we eat Hijiki containing this level of Inorganic arsenic everyday, if we do not eat more than 4.7g per day(33g per week) continuously, we would not exceed the PTWI.
  - *Hijiki* contains other nutrients such as minerals and dietary fiber, and if you do not eat extremely high amount of *Hijiki* and try to have well-balanced diet, the health risk would not be increased.

*) In 2010 JECFA withdrew the PTWI set in 1988 as "not appropriate" based on the recent scientific knowledge.

Comments of Food Safety Commission Japan

(independent Risk Analysis organization under the Cabinet in Japan)

Published the report on Arsenic in Food in December 16, 2013.

Carcinogenesis (lung cancer and bladder cancer, etc.) is admitted by inorganic arsenic exposure in human, and the genotoxicity such as the chromosomal aberration is also observed.

However, due to the lack of scientific knowledge in a carcinogenesis mechanism by "arsenic", we are not ready to judge about a presence of a threshold in the carcinogenesis amount of exposure of "arsenic".

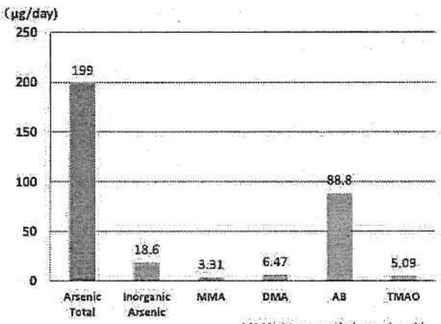
- Marine products contain large amount of Arsenic.
- Amongst Agricultural products, the consumption of Arsenic by Japanese is relatively big from rice.

- The harmful effects of Arsenic through daily diet in Japanese is not recognized.
- It is important not to lean to a specific food and to have a well-balanced diet.

Annexes

Annex-1. Picture of Arsenic in various food in Japan

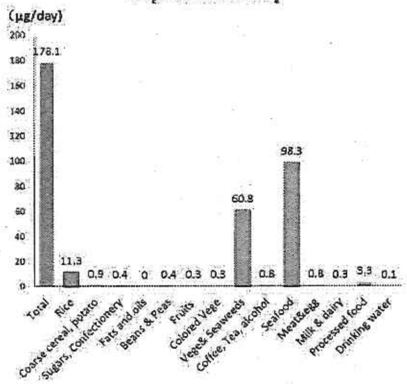
Estimated intake of Arsenic by Japanese a day



MMA :Monomethylarsenic acid
DMA: Dimethylarsinic acid
AB: Arsenobetaine
TMAO: Trimethylarsine oxide

Source : 2012 Cabinet Office Investigation : by duplicated diet method 2006-2010

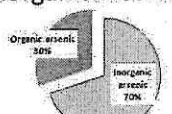
Estimated source of Arsenic intake by Japanese a day



Source : MAFF calculation from studies of Ministry of Health by market basket method 2002-2011

Annex-2.1. MAFF Research and investigations on arsenic in *Hijiki* seaweed

- Arsenic in *Hijiki* is mainly Inorganic arsenic, and Inorganic arsenic in total arsenic in *Hijiki* is about 70% in dry weight.



- Inorganic arsenic is water soluble, and thus can be reduced by washing, soaking in water, boiling with water, etc.
- These are normal processes for cooking of *Hijiki* at home and at food industry.
    - MAFF has prepared the leaflet for Food industry and ask to do the proper preparation of *Hijiki*, and for the ones who sell the dry *Hijiki* for consumers to declare "soak dry *Hijiki* in water before cooking" and "it is not recommendable to use the water used for soaking for cooking".

Annex-2.2. Arsenic elution by soaking dry *Hijiki* in water

MAFF conducted the investigation during 2006-2008 and found that 50-66% of total arsenic in *Hijiki* is eluted in soaking water.

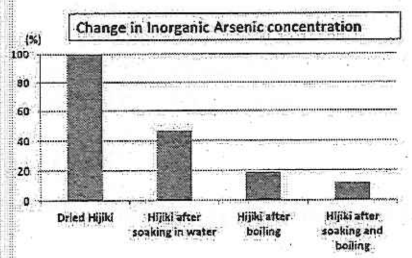
	Total Arsenic (mg/kg)		Ratio of eluted Arsenic (%)
	Dried Hijiki	Soaking water	
Minimum	28	0.19	20
25 percentile	72	0.95	50
Median (50 percentile)	89	1.3	58
Mean	91	1.3	58
75 percentile	110	1.7	66
Maximum	160	2.7	90

Limit of determination : 005mg/kg
Dried *Hijiki* is soaked in water (20 oC) for 30 minutes. Water : Dried *Hijiki* (w/w) = 40:1
Ratio of eluted arsenic (%) = Total arsenic in soaking water x 40 / Total arsenic in dried *Hijiki* x 100

Annex-2.3. Reduction of Arsenic in *Hijiki* by cooking at home

MAFF investigated how to reduce the arsenic by cooking during 2013.

- Cooking methods at home :
    1. Soaking in water : Dried *Hijiki* -> Soak in water (20 oC) for 30 minutes -> discard soaking water and then wash *Hijiki* for 20 seconds by running water. ↓ 50%
    2. Soaking by boiling water: Dried *Hijiki* -> put *Hijiki* in water and bring to boil and keep boiling for 5 minutes -> discard water -> wash *Hijiki* for 20 seconds by running water. ↓ 80%
    3. Soaking and Boiling : After doing 1, then proceed 2. ↓ 90%



Findings :

- Just soaking in water reduces Inorganic arsenic about 50%.
- Boiling reduces inorganic arsenic about 80%.
- Soaking and boiling reduces the most, about 90% of inorganic arsenic is reduced.
- All cooking methods do not reduce other nutrients :

Calcium : remains more or less the same.
Iron : remains more than 70% after soaking & boiling.
Dietary fiber : remains more than 80%.

Annex-2.4. Arsenic in Various Seaweeds

Seaweeds (Investigation year : 2006-2008)

Items	Investigation year	Substances	No.of samples analyzed	Limit of determination (mg/kg)	No. of samples below Limit of determination	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Median (mg/kg)
Hijiki (dried)	2006-2008	Total Arsenic	299	0.05	0%	28	160	93	92
		Inorganic Arsenic	299	0.5	0%	4.5	130	67	68
Hijiki (rehydrated)	2006-2008	Total Arsenic	71	0.05	0%	2.1	20	6.0	5.5
		Inorganic Arsenic	71	0.5	4%	<0.5	17	3.6	3.2
Kombu (dried)	2006-2008	Total Arsenic	200	0.05	0%	25	110	53	51
	2006-2007	Inorganic Arsenic	100	0.5	100%	-	-	0.19	-
Wakame (dried)	2006-2007	Total Arsenic	100	0.05	0%	15	52	33	33
		Inorganic Arsenic	100	0.5	100%	-	-	0.15	-
Nori (dried)	2006-2007	Total Arsenic	100	0.05	0%	13	51	25	23
		Inorganic Arsenic	100	0.5	100%	-	-	0.16	-

Minimum : the lowest value obtained amongst the results. When all samples resulted in "below the limit of determination", we do not declare the value.
Maximum: the highest value obtained amongst the results. When all samples resulted in "below the limit of determination", we do not declare the value.
Mean : average value mathematically calculated. Depending on the percentage of samples "below the limit of determination" we calculated as below.
- In case "below the limit of determination" samples are not more than 60% : concentration of samples of such are calculated as half amount of the limit of determination.
- In case "below the limit of determination" samples are more than 60% : concentration of samples that are below "detection limit" are considered as detection limit, and then the concentration of the samples that are above "detection limit" and below "limit of determination" are considered as limit of determination.

Annex-2.5. MAFF Research and investigations on arsenic in rice:

- Hazard analysis and development of the technology to reduce the risk of arsenic during production, distribution and processing.
  - Basic data accumulated on arsenic in soils and various agricultural products during 2008-2013.
- Dynamic analysis on chemical form of arsenic in the rice during processing, cooking, distribution and storage during 2011-2013.
  - Various major finding obtained.
- To develop the technology to avoid the Cadmium absorption as well as to avoid the arsenic absorption in rice during the cultivation 2013-2017
  - It is reported that once changing the water management to reduce the absorption of arsenic in rice, the increase of absorption of Cadmium in rice observed.
    - Standard of Cadmium in rice (husked and polished) : < 0.4 mg/kg

Annex-2.6. Arsenic in Rice in Japan

Item	Year of Investigation	Substance analyzed	No. of samples	Limit of Determination (mg/kg)	% of samples under Limit	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Median (mg/kg)
Husked Rice	2004-2006	Total arsenic	600	0.01	0%	0.04	0.43	0.17	0.16
		Inorganic arsenic	600	0.01	0%	0.04	0.37	0.15	0.15
Husked Rice	2012	Total arsenic	600	0.02	0%	0.03	0.80	0.23	0.21
		Inorganic arsenic	600	0.02	0%	0.03	0.59	0.21	0.20
Polished Rice	2012	Total arsenic	600	0.02	0%	0.02	0.44	0.14	0.13
		Inorganic arsenic	600	0.02	0%	0.02	0.26	0.12	0.12

Annex-2.7. Inorganic arsenic in rice in various countries:

		No of samples analyzed	% of samples under Detection Limit	% of samples under Limit of Deterimination	Mean (mg/kg)	Median (mg/kg)	Standard Deviation (mg/kg)
Japan	Husked Rice	1200	0%	0%	0.18	0.17	0.08
	Polished Rice	640	0%	0%	0.12	0.12	0.04
Australia	Husked Rice	37	0%	0%	0.10	0.10	0.05
	Polished Rice	37	2.7%	2.7%	0.05	0.05	0.03
Brazil	Husked Rice	2	0%	0%	0.16	0.16	0.003
	Polished Rice	21	0%	0%	0.09	0.09	0.03
China	Husked Rice	443	0%	0%	0.21	0.2	0.08
	Polished Rice	467	0%	0%	0.11	0.11	0.04
Singapore	Polished Rice	2	100%	100%	0-0.28*	-	-
Thailand	Husked Rice	285	3.2%	16%	0.12	0.12	0.04
	Polished Rice	354	2%	45%	0.07	0.05	0.03
USA	Husked Rice	302	0%	0%	0.12	0.12	0.05
	Polished Rice	320	0%	0%	0.09	0.09	0.03

Data submitted to CCCF until 2014.
*) Calculated values for "Under detection limit" as "0" and as "detection limit".

Annex-2.8. Ratio of Inorganic arsenic in total arsenic in Rice

		No of samples analyzed	Minimum	Maximum	Mean	Median
Japan	Husked Rice	1200	0.57	1.00	0.92	0.92
	Polished Rice	640	0.41	1.00	0.88	0.90
Australia	Husked Rice	37	0.23	0.86	0.50	0.44
	Polished Rice	36	0.03	1.00	0.34	0.27
China	Husked Rice	443	0.15	1.00	0.82	0.84
	Polished Rice	466	0.13	1.00	0.76	0.79
Thailand	Husked Rice	235	0.33	1.00	0.67	0.67
	Polished Rice	182	0.33	1.00	0.59	0.56
USA	Husked Rice	299	0.10	1.00	0.66	0.67
	Polished Rice	320	0.12	1.00	0.49	0.49
5 countries total	Husked Rice	2331	0.10	1.00	0.82	0.87
	Polished Rice	1919	0.03	1.00	0.71	0.75

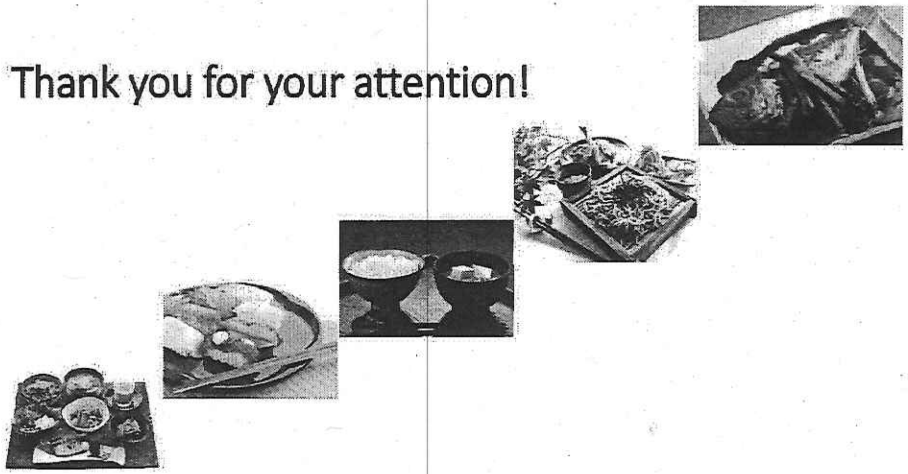
Data calculated from the submitted to CCCF until 2014.
Values vary even among the rice cultivated in the same countries.

Annex-2.9. Do Processing, cooking, distribution and storage influence the arsenic in rice?

MAFF conducted the dynamic analysis on chemical form of arsenic in the rice during processing, cooking, distribution and storage during 2011-2013.

- Major findings :
  - Polishing of rice (90% yield rate) decreases the total arsenic and inorganic arsenic in rice to 64% and 62 % respectively of ones in husked rice in average.
  - Washing of polished rice (90% yield rate) at 3 times decreases the total arsenic and inorganic arsenic to 82% and 72% respectively of ones in the polished rice.
  - Total arsenic and inorganic arsenic in the cooked rice of 3 time washing do not change the ones in rice of 3 times washing before cooking.
  - Total arsenic, inorganic arsenic and DMA(Dimethylarsinic acid) do not change during the storage of rice at 15oC and 25oC for 1 year.

Thank you for your attention!



Risk Communication in Food Safety

Dr. Kai Zhong
China National Center for Food Safety Risk Assessment
China

Risk Communication in Food Safety

Dr. Kai Zhong
China National Center for Food Safety Risk Assessment (CFSA)
China

After the melamine crisis in 2008, the Chinese government and food industries in China were overwhelmed, and consumer confidence inevitably collapsed. The increasing importance and prevalence of social media use has posed challenges to risk communicators, though there are also opportunities to conquer these challenges.

Adaptable and integrated strategies have been practiced in several cases, which eventually shaped the current framework of the CFSA's risk communication. This presentation will include several case studies to show how CFSA involved different stakeholders into risk communication efforts. It will also give examples of China's risk communication innovations, which may provide inspiration for the participants.

Risk Communication
Challenges and Opportunities
Experience from China

Dr. Kai Zhong
Deputy Director of Risk Communication Division, CFSA
ILSI, Vietnam, 2015

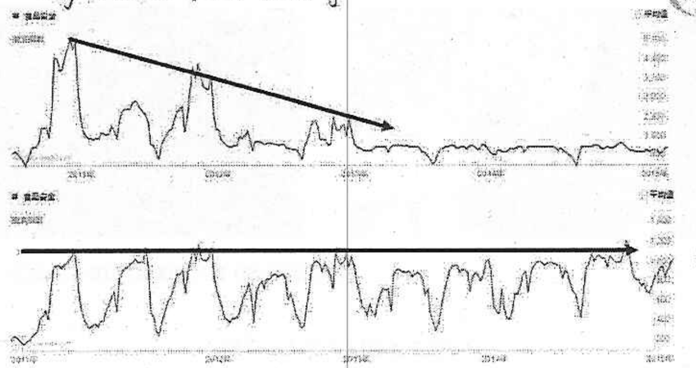
Challenges from social economics

- How many <u>pig farmers</u> in the US and China?
- How many <u>food producers, catering services, farmers and fishermen</u> in China?
- 80% of the producers are small businesses, less than 10 people.

Trends in China

- PC→Mobil Terminal
- Portal Website→Twitter→Wechat, Mobile client, Apps
- Unfamiliar→discontent→angry, panic→rational (indifferent)

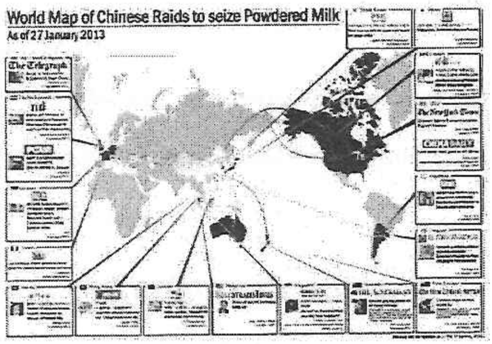
Key word = food safety



personal computer

mobile

Confidence collapse



Opinion leader

- Opinion leaders influence

food and enviromental experts

"Nuclear" strike

Rumors around social media

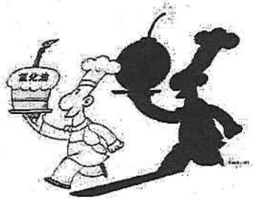
- How many food safety rumors on the internet?
- Over 60% of the fake news was first released on Weibo (Twitter) —Chinese Academy of Social Science
- The science literacy is very low (5%)

Our Practice

- How to fight with social media?
  - Personal channel
- Stakeholder involvement
  - Reporter, opinion leader

Trans Fat, a bomb on the table

- News letter
- Q&A
- Opinion leader
- Expert Interview



- Fast response– edible ice crises
  - Jul 20th 8pm reported, 11pm respond through weibo
  - Jul 21st 12am, popular science article published
  - Lab test to breakdown the rumor
  - Further discussion around foodborne disease and standards.

◈Fast response– Botulinum in Fonterra

新西兰恒天然乳粉检出肉毒杆菌 质检要求召回

2013年08月03日 08:27 新华网 我有话说(110人参与)

新西兰恒天然集团奶粉出现质量问题

2013年08月03日 11:11:11 来源：新华网

奶粉里的肉毒杆菌哪来的？ (2013-08-03 11:46:29)

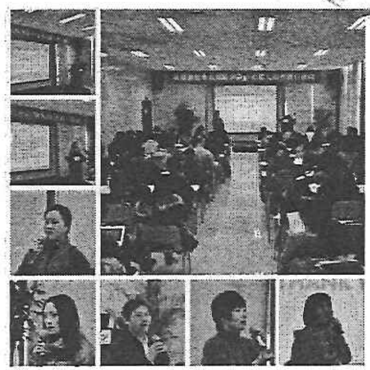
标签：奶粉 肉毒杆菌 新西兰 分类：科普专栏

◈Open day

◈best experts

◈open discussion

◈Over 1000 journalist attended



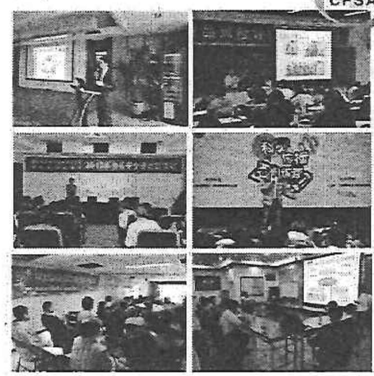
◈Outreach

◈ Societies

medical ◈ Universities What kind to choose?

◈ Media

◈ Food companies



◈ Media relations

Capability building

◈ Drafted food safety risk communication guidelines and trainings

◈ Set up a risk communication advisory group

◈ Set up a NGO, CFIC

◈ Set up dialogue platform for multiple stakeholders, health talks of Southern Weekend

◈ Pilot research on public risk perception

◈ Online-quiz competition

◈ Collect the most common misunderstandings and

CFSA

Thank you

Zhongkai@cfsa.net.cn
+86-10-52165592