

# **The Challenges of Effective Surveillance in the Event of a Food Incident in China**

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# Outline

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- **International food surveillance systems/programmes;**
- **food surveillance systems/programmes in China;**
- **Case analysis of effective surveillance in the event of a food incident – the melamine crisis.**

# WHO Global Foodborne Infections Network (GFN)

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- ❑ **Mandate** – to enhance the capacity and quality of foodborne pathogen isolation, identification, serotyping, and antimicrobial resistance testing throughout the world and support local interventions that reduce the human health burden of foodborne diseases.
- ❑ **Key focus** – to improve participants' skills in the development of foodborne disease surveillance and outbreak investigation.

# WHO Outbreak investigation and response

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- ❑ Foodborne outbreaks of international public health significance are identified through WHO's Alert and Response Operations Team (INFOSAN) through notification through members of the [Global Foodborne Infections Network \(GFN\)](#) and other networks such as EnterNet.
- ❑ An outbreak investigation manual is being drafted.



# WHO GEMS/FOOD Programme

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- ❑ **Global Environment Monitoring System – Food Contamination Monitoring and Assessment Programme, since 1976.**
- ❑ **Data collection for hazard occurrence, food composition and food consumption.**
- ❑ **Training and capacity building at national/regional level of chemical exposure assessment based on Total Diet Studies.**
- ❑ **Development and dissemination of guidelines and recommendations for exposure assessment methodologies.**



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# Food Safety Law of China

(effective from June 1, 2009)

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**Article 11** A **surveillance system** for food safety shall be established nationwide for surveillance over **food-borne disease, food contamination and other food-related hazards** to human health. The **health administrative departments** of the State Council shall **establish and implement plans** for the surveillance of national food safety in conjunction with other departments of the State Council.

# National food safety surveillance system in China



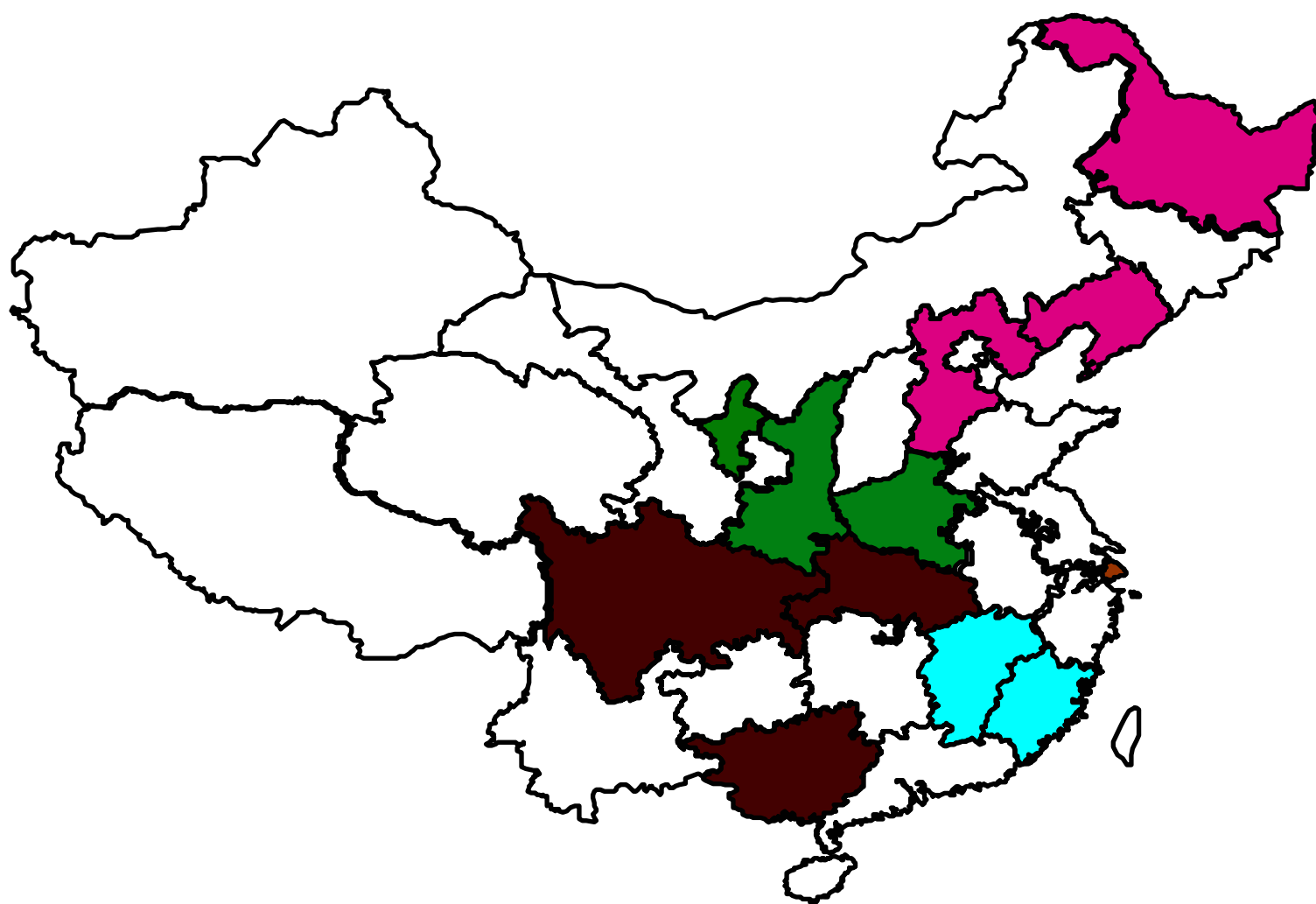
## Before 2009

- 17 provinces included in chemical hazards monitoring (yellowgreen + red)
- 22 provinces involved in microbial hazards monitoring and foodborne illness reporting system (yellowgreen + blue)

## From 2010

all provinces join the national food monitoring program





## Study sites of total diet study in China



# Examples of surveillance findings (1)

## Active surveillance on foodborne illness occurrence

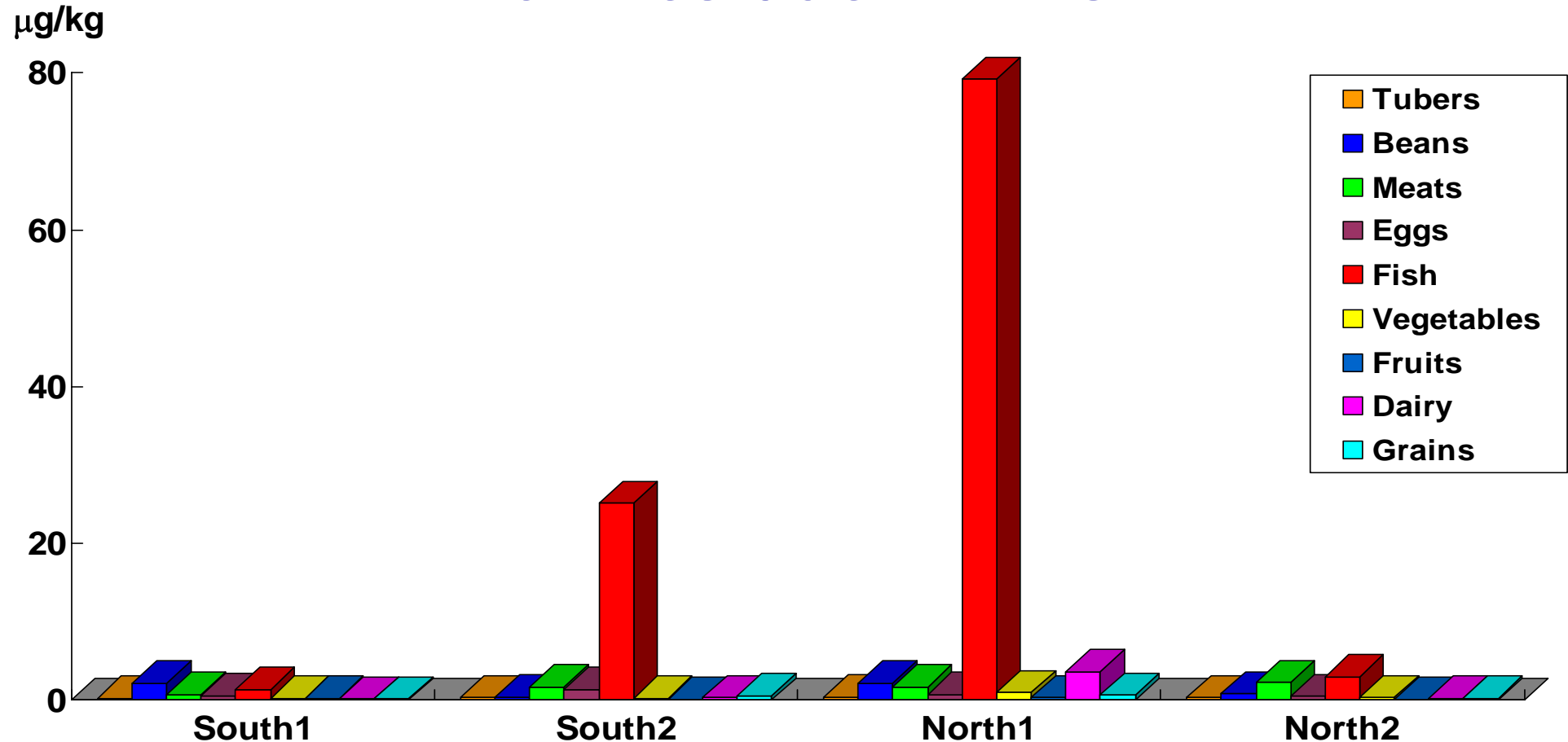
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- ❑ Pilot started in 7 provinces in 2010.
- ❑ 17 sentinel sites – 103 hospitals, cases with laboratory diagnosis of *Salmonella*, *V. parahemolyticus* or *Shigella*.
- ❑ 23 surveillance site (around 0.5 million population) – monthly household visit to identify cases of acute gastro-intestinal disease.

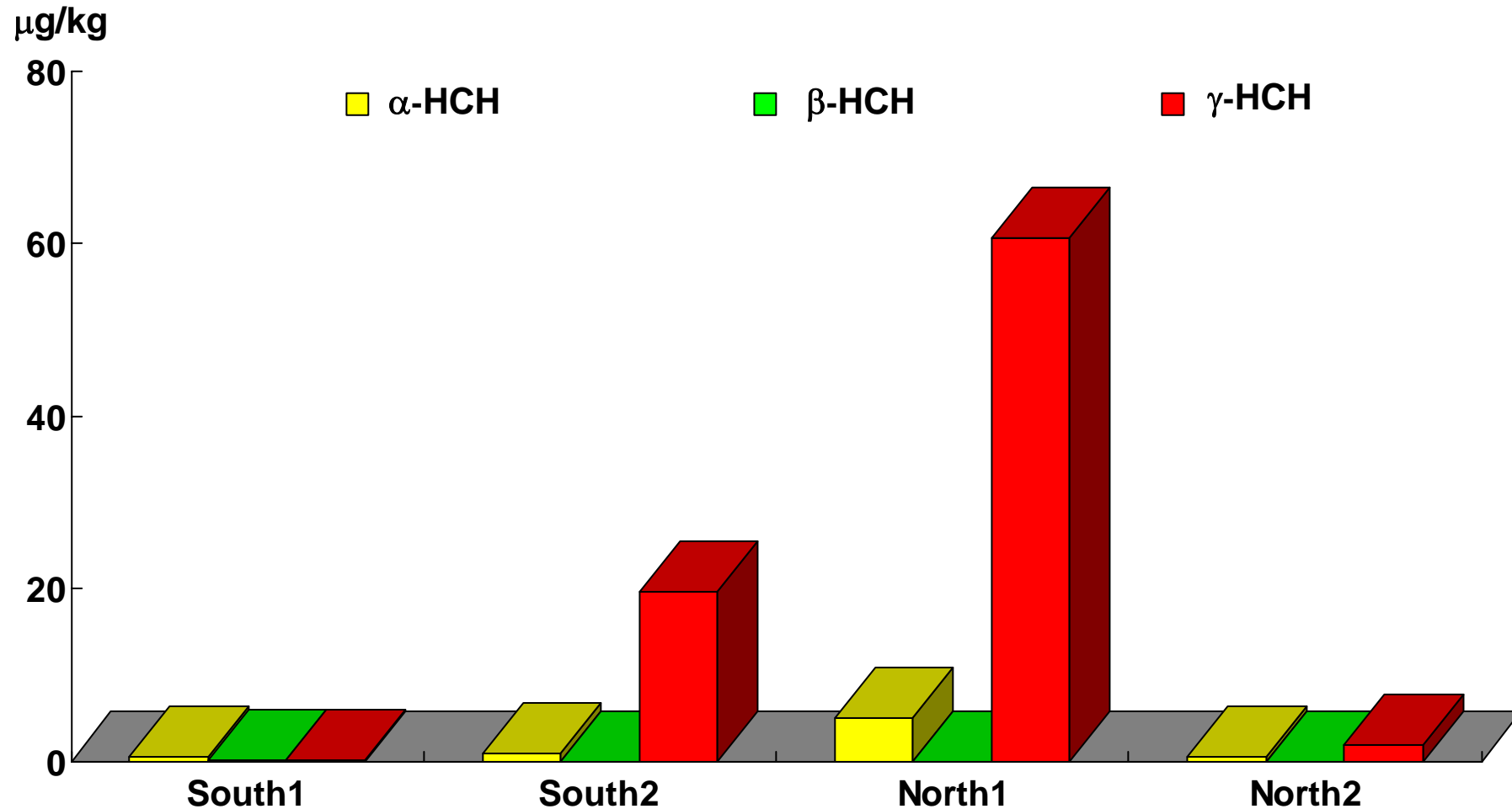
# Examples of surveillance findings (2)

## Hexachlorocyclohexane in aquatic products – tracking the source of contamination

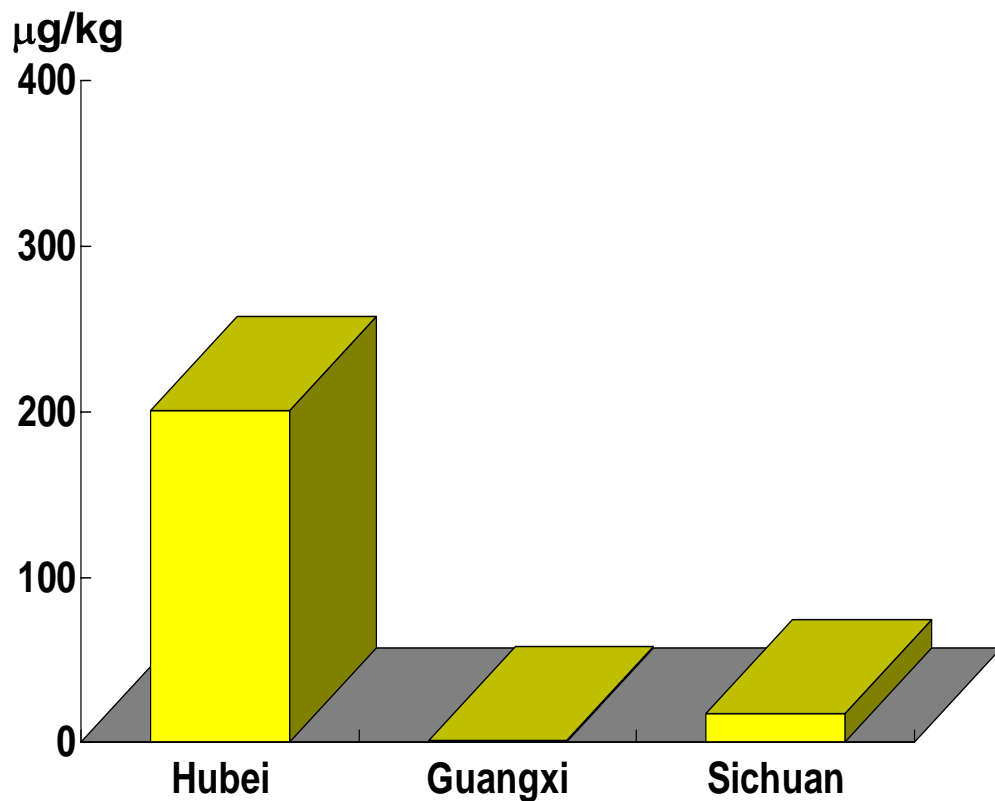
### HCH residue in TDS



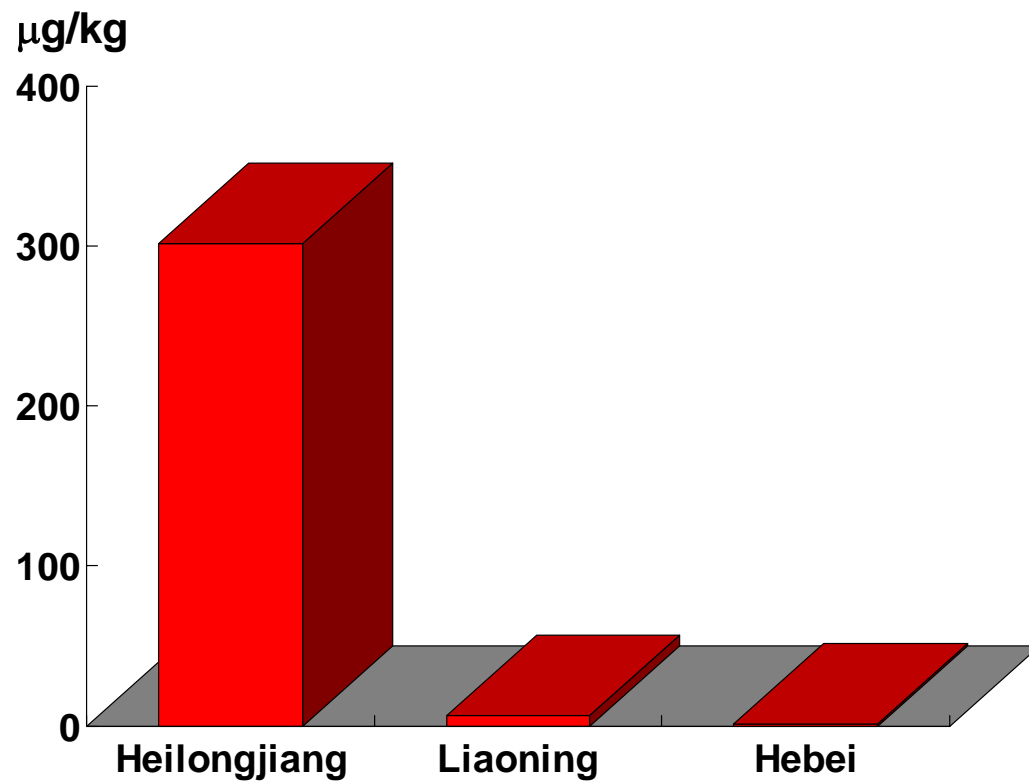
# Various HCH isomers in aquatic foods in the 4 regional baskets



# $\gamma$ -HCH in aquatic food samples from various provinces

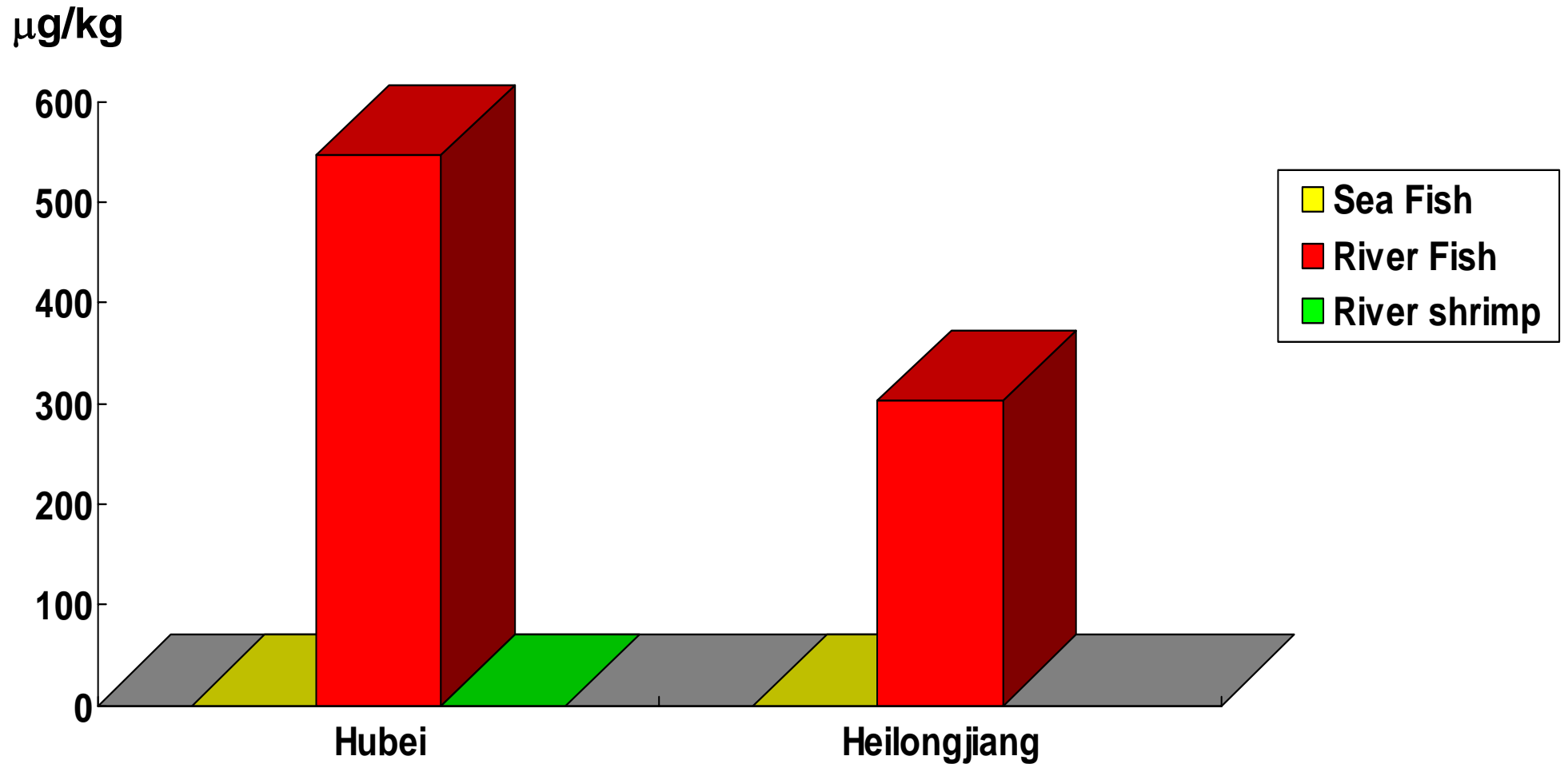


South 2



North 1

# $\gamma$ -HCH concentrations in individual aquatic food samples





# Outline

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- International food surveillance systems/programmes;
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# MOH News Release

(1 December, 2008)

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- ❑ From 21 September to 27 November, 22,380,000 (22 million) children were checked for urinary tract damage and **294,000 cases of abnormal urinary tract** were found.
- ❑ **51,900 cases were hospitalized** and 861 cases are still in the hospital.
- ❑ Retrospective survey found 11 death cases. Among them, **6** were caused by **renal failure** caused by melamine-tainted infant formula and other 5 died of other renal diseases.



# **Melamine contaminated infant formula is the Cause**

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- ❑ **High concentrations of melamine were found in Sanlu infant formula samples collected from the home of the affected cases;**
- ❑ **Very high level of melamine was found in raw materials used for milk adulteration;**
- ❑ **Melamine is the major component of the stone collected from the urine of affected cases.**

# Melamine contents in 111 Sanlu infant formula samples (mg/kg)

Melamine	No. Samples	Mean	Median	P70	P90
<0.05	24	-	-	-	-
0.05-1000	32	506	555	652	900
1000-1900	22	1,439	1,500	1,700	1,840
1900-2600	22	2,212	2,200	2,300	2,560
>2600	11	3,453	3,000	4,000	4,500

Source: China CDC

# Melamine content in Sanlu and non-Sanlu infant formula samples, Gansu Province

Brand	No. Samples	Mean (mg/kg)	Median (mg/kg)	P90 (mg/kg)
Sanlu	52	1,674	1,700	2,880
Non-Sanlu	38	4.06	0.01	8.80

Source: China CDC

## Melamine and its analogs in Sanlu infant formula samples, Gansu province (N=52)

	Mean (mg/kg)	Median (mg/kg)	P90 (mg/kg)
Melamine	1,673.6	1,700.0	2,880.0
Cyanuric acid	1.6	1.1	3.4
Ammeline	1.7	1.3	4.3
Ammelide	2.9	2.1	8.1

Source: China CDC

# Maximum consumption level of infant formula in infants and young children

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Age (mos.)	Mean BW (kg)	Maximum consumption (g/day)
3	5.5	129
6	7.0	150
12	10.0	150
24	14.0	120

Source: China CDC

# Melamine concentrations (mg/kg) in Sanlu infant formula samples

	No. Samples	Mean	Median	P90	Maximum
<b>A</b>	111	1,212	1,000	2,600	4,700
<b>B</b>	52	1,674	1,700	2,880	4,700

Notes: Sample **A**: all samples; Sample **B**: samples collected from affected area in Gansu province. LOQ 0.05 mg/kg.

Source: China CDC

# Intake estimates of melamine from Sanlu infant formula (N=111)

Age (mos.)	Melamine intake (mg/kg bw)			
	Mean	Median	P90	Maximum
3	28.4	23.4	61.0	110.2
6	26.0	21.4	55.7	100.7
12	18.2	15.0	39.0	70.5
24	10.4	8.6	22.3	40.3

Source: China CDC

# Risk characterization and Epidemiology

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- Data from the 2008 Chinese incident illustrate that infant formula contaminated **mainly** with **melamine** can result in **stone formation** if sufficient melamine is present.
- Data indicate that stones are composed of **uric acid and melamine** at a molar ratio ranging from 1.2:1 to 2.1:1, **without** evidence of the presence of **cyanuric acid** or other melamine analogues.
- Most children with stones did not have clinical signs of illness. However, in severe cases of renal failure and/or blockage, clinical signs did occur.



# Risk characterization

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- The dietary **exposure to Sanlu infant formula** in China at the median levels of melamine ranged from 8.6 to 23.4 mg/kg bw/day. This is **about 40 - 120 times the TDI**, which explains the dramatic health outcome in Chinese infants.
- Estimates of potential exposure of adults to melamine from foods containing adulterated milk products were 0.8–3.5 times the TDI.
- Estimates of exposure to **baseline levels** of melamine from all sources (**up to 13 µg/kg bw**) were well below the TDI.



# Risk management

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- ❑ Many countries have introduced control limits for melamine in infant formula and other foods.
- ❑ Limits for melamine in powdered infant formula (1 mg/kg) and in other foods (2.5 mg/kg) would provide a sufficient margin of safety for dietary exposure relative to the TDI.
- ❑ To develop international MRLs for melamine in infant formula and other foods was agreed at the 2009 Codex Committee on Contaminants in Foods (CCCF).

# Conclusions

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- ❑ National food safety surveillance systems are essential for identifying/early warning of potential food incident.
- ❑ Target surveillance programme could provide necessary scientific data to guide food incidence management.
- ❑ However, qualified laboratory facilities, well trained personnel and well established mechanisms of inter-sectorial collaboration are the main challenges for most developing countries to build up effective national surveillance capability.



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Thank you !