Food Safety Issues in South East Asia

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Outlines

- Food Safety Definition
- SEA Countries
- Issues with Foodborne Diseases Data in SEA
- Food Safety Microbiology Status in:
  - Brunei, Singapore
  - Indonesia, Malaysia, The Philippines, Thailand
  - Cambodia, Lao PDR, Myanmar,Vietnam
- Common Pathogens, Foods and Conditions

Food Safety

A condition and or effort such that foods do not contain biological, chemical or physical hazards at levels that can cause adverse effects on human's health

SEA countries

No	Country	GDP per capita* (USD)	HDI*
1	Singapore	43,117	0.846
2	Brunei	31,239	0,805
3	Malaysia	8,423	0,744
4	Thailand	4,992	0,654
5	Indonesia	3,015	0,600
6	Philippines	2,007	0,638
7	Vietnam	1,174	0,572
8	Laos	984	0.497
9	Cambodia	814	0,494
10	Myanmar	702	0,451

*2010


Southeast Asia Map
LAOS
THAILAND
MYANMAR
VIET NAM
CAMBODIA
PHILIPPINES
MALAYSIA
BRUNEI DARUSSALAM
SINGAPORE
INDONESIA

Foodborne Diseases

World wide (WHO, 2004)

1.8-3.1 billions cases of foodborne diarrhea
52.7-124 million cases of foodborne salmonellosis
2,16 million cases of typhoid fever
216,000 death due to typhoid fever

US

1988-1992 : 90% of outbreaks due to bacterial pathogens (Bean et al., 1997)
2000+ Noroviruses accounted for 50% of outbreaks

Issues with Foodborne Disease Data in SEA

- Lack of a coherent and consistent surveillance programs in countries
  - information scarce and patchy
  - may not always represent to the true picture
  - increase in number due to increased awareness
- Data on microbial illnesses are available, mostly from stool isolates, not equal to those foodborne
- Reports on food intoxications/poisoning due to bacterial toxin is fewer
- Other food safety problems also occur : chemical agents or `biotoxins, abuse of chemicals/adulteration

Brunei

- Cholera was no longer reported since 1982 (WHO report,1999)
- Largest cholera outbreak in 1965 ; 24 cases in 1970, 72 confirmed and 1999 outbreak involving 29 suspect cases happened in school
- Sporadic outbreaks, possibly not related to hygienic condition but improper food handling, e.g. outbreak due to rice-chicken, no pathogen identified (2000)
- High GDP, best health services

Singapore

- Cholera cases have been declining from 17 cases in 1992 to 7 cases a year in 2007
- During 1992-2007 : 210 cholera cases due to *V. cholerae* O1 biotype El Tor and serotype Ogawa (83.8%) (Wong, 2010)
- Food associated with outbreaks :
  - partially cooked green mussel (1993)
  - iced banana flavored drink (contaminated crushed ice (1999)
  - imported seafood items (2004)
- 24% of cholera cases : imported foods.

Singapore

- Salmonellae continues to cause foodborne illnesses
- Serotypes found in 2000 :
  - *S.* Enteritidis
  - *S.* Stanley
  - *S.* Weltervreden
  - *S.* Typhimurium
- *S.* Typhimurium DT104L resistant to multiple antibiotic
- In 2007

  S. Enteritidis : the most important foodborne pathogen responsible for 62.2% of non-typhoid salmonellosis, including a cream cake outbreak (Solhan et al., 2011)

Indonesia

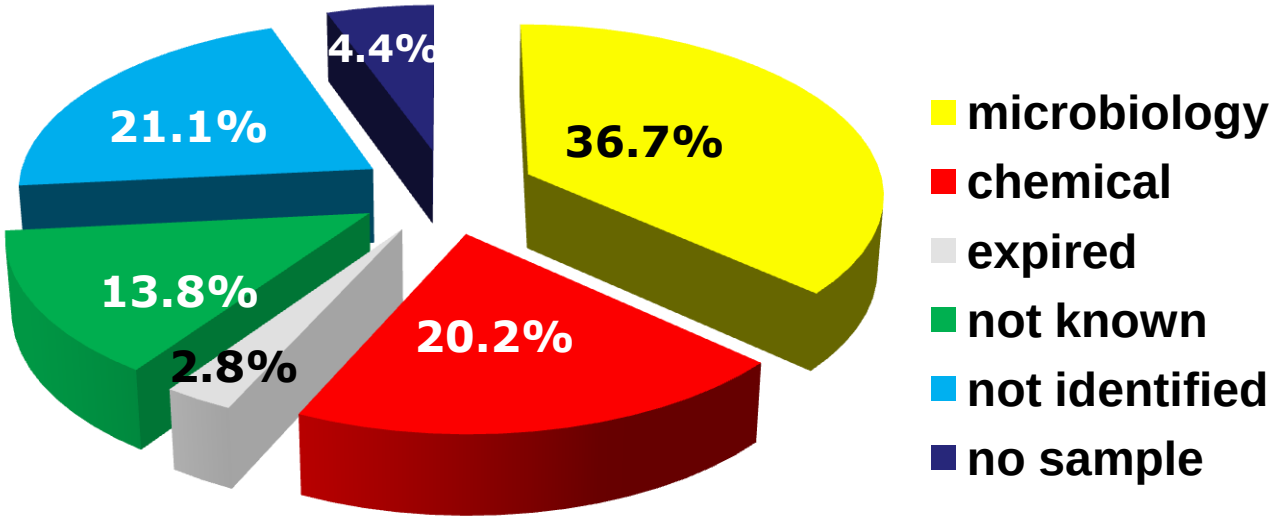
Reported Foodborne Disease in Indonesia 2001-2009*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009 **
Number of outbreaks	26	43	34	164	184	159	179	197	109
Number of cases	1955	3635	1843	7366	8949	8733	7471	8943	3050

*BPOM, 2009
**incomplete

Indonesia

Foodborne Diseases in Indonesia 2009

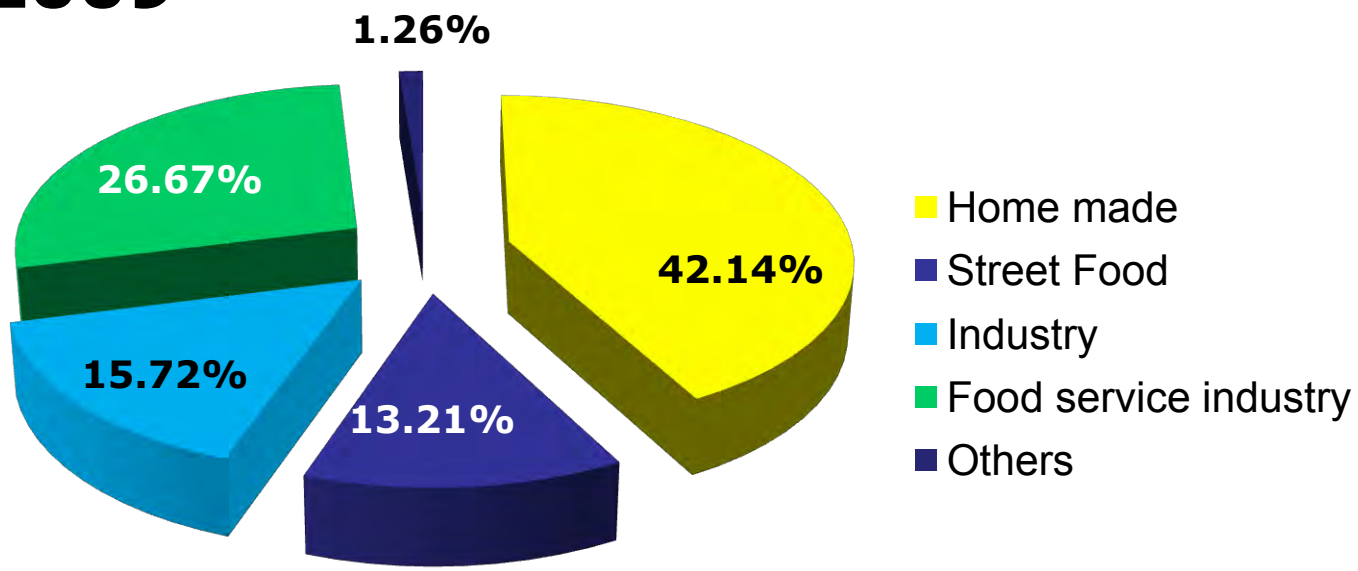


n = 119

*Suratmono, 2010

Indonesia

Foodborne Diseases in Indonesia 2009



n = 119

Indonesia

- Four most frequently isolated pathogens from diarrheal patients (Oyofo et al., 2002;Tjaniadi et al., 2005):
  - *V. cholerae* O1 (37.1%)
  - *Shigella flexneri* (27.3%)
  - *Salmonella* (17.7%)
  - ETEC (18%)
- Others *V. parahaemolyticus* (7.3%),*S*. Typhi (3.9%),*C. jejuni* (3.6%), *V. cholerae* non O1 (2.4%), EHEC 1%, *Clostridium difficile* 1%, *S.* Paratyphi (0.7%)
- Protozoa and parasites: *Blastocystis hominis* 5.7%, *Trichuris trichuria* 2.1%, *Ascaris lumbricoides* 1.5%, *Giardia lamblia* 0.8% and *Endolimax nana*.

Indonesia

- Some of *V. cholerae, S flexneri, Salmonella* : resistant to various antibiotic

  - 75-95% of *Shigella* resistant to ampicillin, trimethoprim-sulfamethoxazole,chloramphenicol, tetracyclin, but sensitive to nalidixic acid, ciprofloxacine and ceftriaxone.

  - *S.* Typhi, *S.* Paratyphi : sensitive to all antibiotic

- *E. coli* resistant to ampicillin, gentamicin, cefotaxine, ciprofloxacine and trimethoprim-sulfamethoxazole was isolated from carriers in hospital and community

Indonesia

- Street food vendor is more likely to cause infection from *S*. Paratyphi based on 2 separate studies conducted in Semarang and Jakarta (Gasem et al., 2001; Vollaard et al., 2004a)
- Street food vendors were characterized by poor hand washing practices/facility, direct contact with hand, male worker and low education (Vollaard et al., 2004b).
- Typhoid fever was less associated with food, and related to : other case in the home, no washing prior to eating and recent consumption of ice cubes

Indonesia

- Consistent with studies in clinical isolates, *Salmonella* is often isolated in food, especially from seafood for export (Dewanti-Hariyadi, 2005, USDA,RASFF)
- *Staphylococcus aureus* are commonly isolated from ready-eat-food, sometimes at low concentration ($<10^5$ CFU/g); improper handling (temperature, time) are likely to support the growth and toxin production
- Prior to 2008, emerging pathogens such as *E. coli* O157:H7 and or EHEC, *Enterobacter sakazakii* (*Cronobacter* spp) have been reported from ground beef, slaughterhouse and dry food, respectively

Malaysia

- Four bacterial pathogen species most commonly isolated frim stool samples examination (Lee, 2002)
  - non typhoid *Salmonella* 57%
  - enteropathogenic *E. coli* 14%
  - *Shigella* 11%
  - *Campylobacter* 5%
  - *Aeromonas* 5%
  - Also Protozoa : *Cryptosporidium* and *Giardia*

Malaysia

- *S.* Typhi was found to be resistant to ampicillin and chloramphenicol
- All *Shigella flexneri* were resistant to ampicillin and cotrimoxazole, while 80% was resistant to chloramphenicol
- 61.2% of *E. coli* strains was resistant to kanamycin, tetracyclin, chloramphenicol, gentamicin,ampicillin, nalidicic acid, sulfametoxazole-trimethoprim, cefetoxin, norfloxacin, and to ciprofloxacin.

Malaysia

Salmonella Serotype Isolates in Malaysia

2003			2004			2005		
Serotype	**No.**	**%**	**Serotype**	**No.**	**%**	**Serotype**	**No.**	**%**
Enteritidis	233	26.7	Enteritidis	206	25.0	Enteritidis	155	28.1
Weltervreden	200	21.9	Weltervreden	165	20.0	Weltervreden	142	25.7
Corvallis	115	12.6	Corvallis	117	14.2	Corvallis	57	10.3
Typhimurium	49	5.4	Typhimurium	43	5.2	Typhimurium	37	6.7
Stanley	32	3.2	Albany	37	4.5	Limete	9	3.3
Tshongwe	29	3.2	Limete	18	2.2	Stanley	8	1.4
Biegdam	19	2.1	Braenderup	15	1.8	Agona	7	1.3
Albany	17	1.9	Tshongwe	15	1.8	Albany	5	0.9
Braenderup	12	1.3	Stanley	11	1.3.	Rissen	5	0.9
Newport	10	1.1	Bovismorbificans	10	1.2	Virchow	5	0.9

*Thong, 2006

Malaysia

- Several studies on foodborne pathogens in specific foods have been reported
  - *E. coli* O157:H7 was isolated from 36% of beef samples (Son et al., 1998)
  - *Listeria monocytogenes* from 74% of imported beef, 43.5% of local beef and 56% of fermented fish (Hassan et al., 2001) *C*
  - *Campylobacter* in 3-18.8% of fresh vegetables (Chai et al., 2009)
  - *V.cholerae* is carried by shellfish which has been implicated in the cholera outbreaks.

Philippines

- Stool samples of diarrheal patients (Adkins et al., 1987) :
  - 58.4% had one or more enteric pathogen
  - rotavirus : the most frequently isolated (30.6%)
  - bacterial pathogens : *Shigella* (11.6%), *Salmonella* (9.2%) and enterotoxigenic *E. coli* (7.8%).
  - 30% had multiple pathogens.
  -*Salmonella*, ETEC, *C.jejuni* isolated from healthy people
- Foodborne nematodes :

73.3% contained parasites; 32% with one parasite, and 41% with more than one parasite (Belizario et al., 2010).

Thailand

- 1,493 cases of diarrhea per 100,000 /year during 1990 -1995 (Pitisuttithum (2003))
- 110 cases of foodborne intoxication, 140 cases of dysentery, 20 cases of enteric fever, 26 cases of hepatitis
- Number of acute diarrhea started to decrease in 2003
- *V. cholerae*, *Shigella flexneri* or *S. dysenteriae* and *Salmonella*
- Reasons for outbreaks: unsafe drinking water, lack of personal hygiene and consumption behavior(e.g. eating raw or underprocessed food product)

Thailand

Foodborne diseases in Thailand 2003

Foodborne diseases	No of cases	Death	Morbidity rate	Mortality rate
Acute diarrhea	956313	146	541.26	0.05
Dysentery	23113	3	12.44	0
Foodborne intoxications	12685	11	67.79	0
Enteric fever	9633	3	3.57	0

Thailand

Salmonella serotype most commonly isolated in Thailand

Source	*Salmonella* serotype
Pig	Rissen, Derby
Pork	Weltervreden, Rissen, Anatum, Emek
Chicken	Emek, Rissen, Enteritidis
Chicken meat	Weltervreden, Emek, Hadar
Human	Weltervreden, Rissen, Stanley, Enteritidis, Anatum

Thailand

- A large foodborne disease outbreaks linked to school meals in 2005 :1,598 cases associated with mixed chicken-rice dish, attack rate 37% *Shigella sonnei* as well as *Salmonella* group C were etiologically linked to the outbreak (Chanachai et al., 2008)
- A very rare outbreak of botulism was reported in Thailand in 2006 : 91 victims, 42 needed mechanical ventilator due to respiratory failure, no fatality. Improperly home-canned bamboo shoots was the source of the intoxication (Witoonpanich et al., 2010).

Cambodia

- Diarrhea :leading cause for morbidity and mortality
- Inadequate water and sanitation program
  - Access to drinking water in rural (29%) and urban community (69.55%)
  - Access to hygienic facilities 8.6% (rural), 49% (urban)
- The number of diarrhea & dysentery cases
  - 0-4 years 17.5%
  - 5-14 years 4%
  - >15 years 8.3 %
- *S.* Typhi 0.9% the samples of diarrheal patients
  - 56% resistant to ampicillin, 56% to chloramphenicol, 81% to trimethoprim-sulfametoxazole
- 2001 school related outbreak and outbreak of toxic fish.

Lao PDR

- Diarrhea :
  very important health problem, 16% of death in children
- Studies in 1996 and 1997
  Shigella 16.8%
  Diarhegenic *E. coli* 17.1%
  Rotavirus 6.1%
  C. jejuni for 4.4%
- Almost all *Shigella* &diarhegenic *E. coli* were resistant to ampicillin, tetracyclin and erythromycin.
- January-August of 2007 : 7 diarrheal cases/100,000

Lao PDR

- During cholera epidemic :
  - 58.6% of stool samples were positive for *V. cholerae* O1 Ogawa (Lenglet, 2010)
  - Water was the vehicle of the outbreak.
- A human trichinellosis outbreak due to *Trichinella* species was reported in 2004
  - pork meals, i.e. uncooked minced pork with mint and fermented pork were the implicated vehicles for of the nematodes (Sayasone et al., 2006)

Myanmar

- 70 percent of diarrheal diseases was due to food contamination
- Most frequent illnesses : diarrheal diseases, foodborne intoxication, typhoid & paratyphoid
- In 2000 typhoid fever outbreak : drinking unboiled river water, contact with other patients before illness and failing to wash hands with soap after defecation (Aye and Siriarayapon, 2004).
- Food survey on *mohinga* :
  - noodle 100% coliform, 80% fecal coliform, 2% EPEC/*S.* Typhi
  - soup : 20% coliform, no fecal coliform or pathogen
  - contamination : mixing noodles with warm soup and addition of fresh ingredients (Aung et al., 2004).

Vietnam

- Study on 587 diarrheal children & 249 age-matched healthy controls : 60% had pathogenic bacteria
  - Children <2 years old :
    group A Rotavirus (46.7%)
    diarrhegenic *E. coli* (22.5%)
  - In children > 2 years old
    enterotoxigenic *Bacteroides fragilis* 7.3%
    Shigella 4.7%, respectively
- *E. coli* and *Shigella* resistant to ampicillin, chloramphenicol and trimethoprim-sulfamethoxazole.
- Children with diarrhea : poor families, lack potable water &latrines, mothers not washing hands, low education and or little information on hygienic habits (Vu Nguyen, 2006).

Vietnam

- Diarrhegenic *E. coli* (Hien et al.,2008)
  - Attaching and effacing *E. coli* (AEEC) (9.2%)
  - Enteroaggregative *E. coli* (EAggEC) 8.8%
  - Enterotoxigenic *E. coli* (4%)
  - Enteropathogenic *E. coli* (2.8%)
  - Enteroinvasive *E. coli* (0.8%).
- Typhoid fever 24.2/100,000 population (Ochiai, 2008).
- Infection due to flukes linked to consumption of raw fresh water fish or crabs, and aquatic plants (Thanh et al., 2009).

Common Foodborne Infections and Intoxications

- Bacterial pathogens most commonly reported to cause food infection : *Shigella flexneri,* typhoid and non typhoid *Salmonella, Vibrio cholerae* O1
- Strains resistant to multiple resistant antibiotic are common for nontyphoid *Salmonella, Shigella, E.coli*
- Rotavirus is the viruses commonly associated with diarrhea
- Helminthic parasites are also reported
- Sporadic foodborne intoxication reported are *Staphylococcus aureus, Clostridium botulinum,* cassava poisoning (cyanide), toad and fish poisoning

Foods and Conditions associated with Foodborne Infections and Intoxications

- Several conditions shared in (mostly) developing countries within SEA are contributors to food safety status
  - Unsafe water
  - Unhygienic practices (e.g. open defecation or use of night soil for fertilization of fish ponds)
- Raw or undercooked food associated with outbreaks
  - freshwater and brackish water fish, snails
  - amphibians, terrestrial snake, aquatic insects/plants
- When hygienic handling is the reason, RTE foods involved are non specific
- Street food vendors and schools are common setting

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