Water-borne Contamination and Food Safety Risks

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Key messages

• What it means to have an unsafe food and water supply
• Waterborne contamination and role in food safety
• Example of food value chains where role of water is critical
• Moving forward – what have we learnt
Introduction - Impact of unsafe food and water

To public health

- > 1.5 million children < 5 years of age die annually of diarrhoeal disease

- Among persons > 5 years of age there are more than 5 Billion episodes of diarrhoea each year
Episodes of diarrhoea in over fives per year around the world
Impact

- US: 2010 study estimates foodborne illness costs $152 billion (healthcare, workplace and other economic losses)
- New Zealand: 2008 study $86 million (healthcare and lost productivity)
- England and Wales: 2005 study GBP319 million (765000 cases and 470 deaths)
- No such data for developing countries
Impact of unsafe food

• To trade
  – Product recalls
  – Market closures/bans
  – Disposal of unmarketable product
  – Loss of confidence in products – difficult to regain market access and/or consumer confidence
  – Preventing recurrence of the problem (improving food safety, traceability)
  – Affect all producers even if not implicated
Current waterborne contamination events

• Problems effects economies of all scales
  – Cholera in Haiti
    • > 100,000 illnesses to date
    • Poor or non-existent sanitary infrastructure
    • Food potentially contaminated during production and preparation
Cholera

- Induce panic
- Tighter food regulations

- **1999:** Trade restrictions on fish exports from Kenya, Tanzania and Uganda to EU due to cholera outbreaks in East Africa

- **1991:** The cholera outbreak in Peru cost the country US$ 770 million due to food trade embargoes and adverse effects on tourism

- **2005:** Iran – ban on production of green vegetables. Losses to farmers of at least US$ 55.5 million
Current waterborne contamination events

• Problems effects economies of all scales
  – Cholera in Haiti
    • > 100,000 illnesses to date
    • Poor or non-existent sanitary infrastructure
    • Food potentially contaminated during production and preparation

  – Cryptosporidium in Sweden
    • > 11,000 illnesses
    • Contamination of municipal water supply
    • Potential for food contamination during preparation
Water and Food Production
Water and Food Processing
Water and Food Production
Increasing consumption

- 21 April, 2010 - Global seafood consumption reached 143 million metric tons in 2008, and global seafood consumption topped 17 kilograms per capita in 2007 and 2008, according to a report the United Nations’ Food and Agriculture Organization released on Tuesday.

Consumption of fruits and vegetables from 1993 – 2003 (kg/capita/year)

Increasing production & trade

Global production of fruit and vegetables from 1979-2004

- Growing importance of aquaculture….over one third of fish and seafood come from aquaculture
- Global seafood exports jumped 8.6 percent in 2007 to USD 94 billion and 8.7 percent in 2008 to USD 102 billion.
- The EU is the world’s largest seafood market, followed by the United States and Japan.

Role of developing countries

- Largest producers of fresh fruit and vegetables are developing economies – China, Latin America and Caribbean, India

- About 80 percent of the world’s seafood production occurs in developing countries.
Fresh produce

When it all goes wrong

Cyclospora contamination of raspberries from Guatemala (1996)

Outbreaks in US and Canada in 1996 and 1997

Export stopped mid-season 1997 – US$ 10 million lost income

Water considered to be source of contamination

Control measures: strict food safety measures, water filtration, better worker hygiene & sanitation facilities

Knock on effect on other products e.g. blackberries

- Buyers found new suppliers
- Some growers moved to Mexico
- No recovery
Fresh produce
Sources of waterborne contamination

Primary production:

• Surface run-off – can carry contamination from other sites (animal production units)
• Ground water – issue for heavy metals and other chemical contaminants
• Irrigation water – source, method of application,
• Wastewater – as irrigation water or due to uncontrolled release
• Water source for pesticide, fertilizer application

Processing and marketing

• Water used for washing, cleaning (source and quality)
• An important vehicle for transport of pathogens from human and animal sources
• Transport of chemical contaminants to growing areas.....heavy metals, persistent organic pollutants
• Transport of natural contaminants from the ground
Arsenic in BGD
Clean water – water that does not compromise food safety in the circumstances of its use

Reality – use of cheapest and most abundant source – often contaminated or waste water – potential at primary production but how to address water shortages further down the chain

Studies in countries e.g. Morocco, India, Pakistan on impact of such water use
Solutions

Accept growing reality and address the safety issues
e.g. Risk benefit analysis of waste water use in Pakistan (26% of veg grown with wastewater)

• Selection of crops for which wastewater is used
• Irrigation methods
• Education
• Post harvest handling and marketing practices
• Treatment of water – often cost dependent (low to high tech options)
Fish and seafood

- Wastewater contamination of growing areas – most significant cause of shellfish illness
Aquaculture

• Susceptibility to contamination of aquacultured product from growing waters
  – Accidental contamination after heavy rainfall, flooding (HAV – Italy approx 60% water related outbreaks related to shellfish)
  – Wastewater fed aquaculture

• A source of waterborne contamination
  – Other food production systems
Challenges

• Integrated approaches to addressing problems – Those responsible for wastewater, sewage management and producers

• Differences in systems means no single solutions
In looking for Solutions.....

- Accept growing reality and address the safety issues e.g. Risk benefit analysis of waste water use in Pakistan (26% of veg grown with wastewater)
- Selection of crops for which wastewater is used (how clean does the water need to be)
- Irrigation methods
- Worker hygiene and sanitation
- Education
- Post-harvest handling and marketing practices
- Treatment of water – often cost dependent (low to high tech options)
- Consideration of new approaches – decentralised or local solutions
Moving forward

• Problem is not new but it is expanding
• New hazards being introduced to food production systems where previously not found
• Ideal situation from food safety perspective is use of clean or potable water…but that does not guarantee safety
• Need to address changing reality – water re-use and potential for recycling of both biological and chemical contaminants
Moving forward

- Multi-sectorial approaches – no one sector working in isolation can resolve these problems
- New and emerging technical solutions – need to be willing to consider and embrace where feasible