



Funded by
the European Union

Retrospective analysis of historical food safety incidents

Jan Pieter van der Berg, Wageningen Food Safety Research

Results from a study on historical food safety incidents

Co-authors: Gijs Kleter, Lynn Frewer, Tom Zunder, Ine van der Fels

Food safety incidents, a historical perspective

- ▶ Food safety hazards (chemical, microbiological, physical), are a serious threat to public health
- ▶ Examples have been recorded throughout history
 - ▶ E.g., ergot poisoning incidents, arsenic in beer in 1900
- ▶ Despite food safety practices and standards incidents can still occur
- ▶ Insights into causes and drivers can aid stakeholders to develop measures to improve food safety

Research methodology

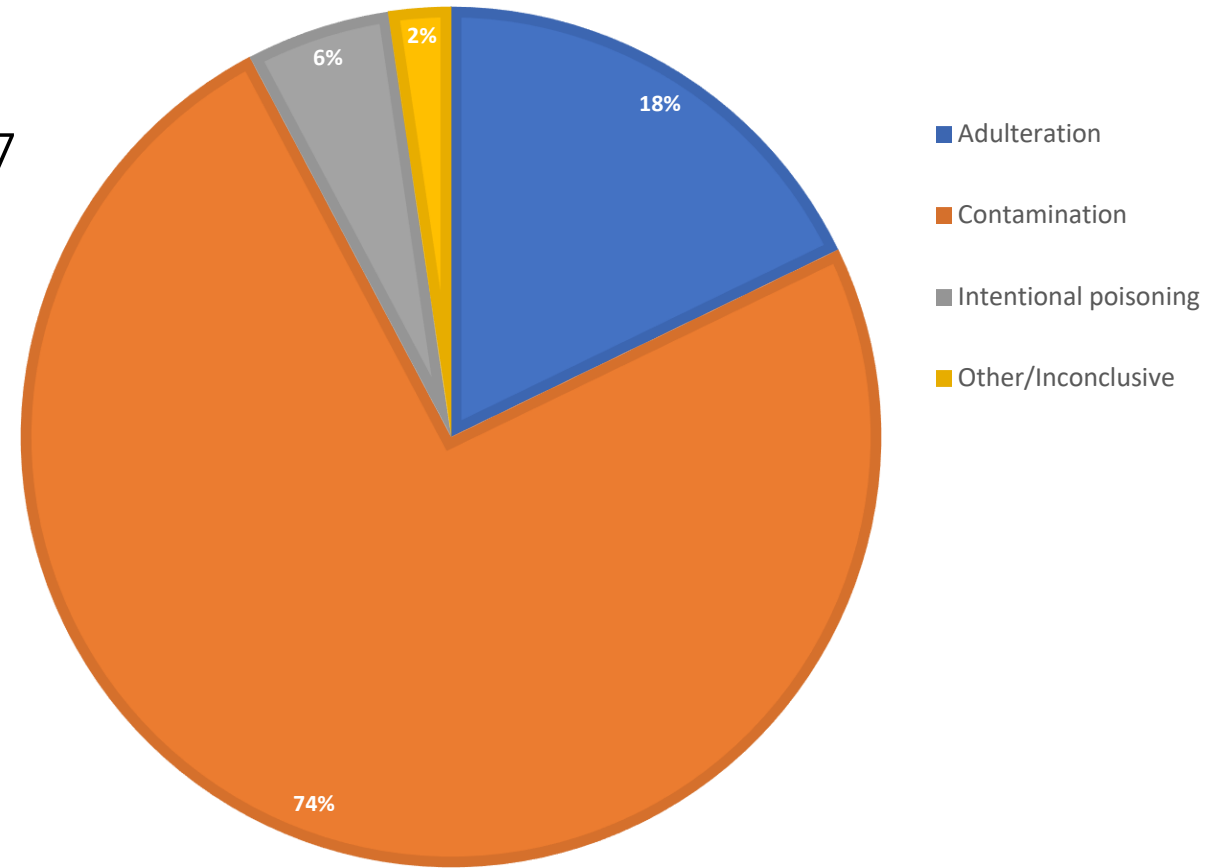
- ▶ Scoping of grey literature via Google advanced search and “snow-balling”
- ▶ Reported food safety incidents were included in the study
 - ▶ From official sources (news briefs, reports, academic literature)
 - ▶ Ranging from large crises to small outbreaks
 - ▶ Incidents involving feed were included, as this may also impact food safety

Research methodology

- Food safety incidents were categorized
- First based on general cause of the incident
 - Accidental / unintentional contamination
 - Intentional adulteration
 - Intentional food poisoning
 - Other / inconclusive
- Next, drivers were assigned – when available/known
 - Economic, environmental, other (e.g. in case of accidental contam.)

Identified incidents

- 129 total cases
- Dating as far back as 1857



Examples of major incidents

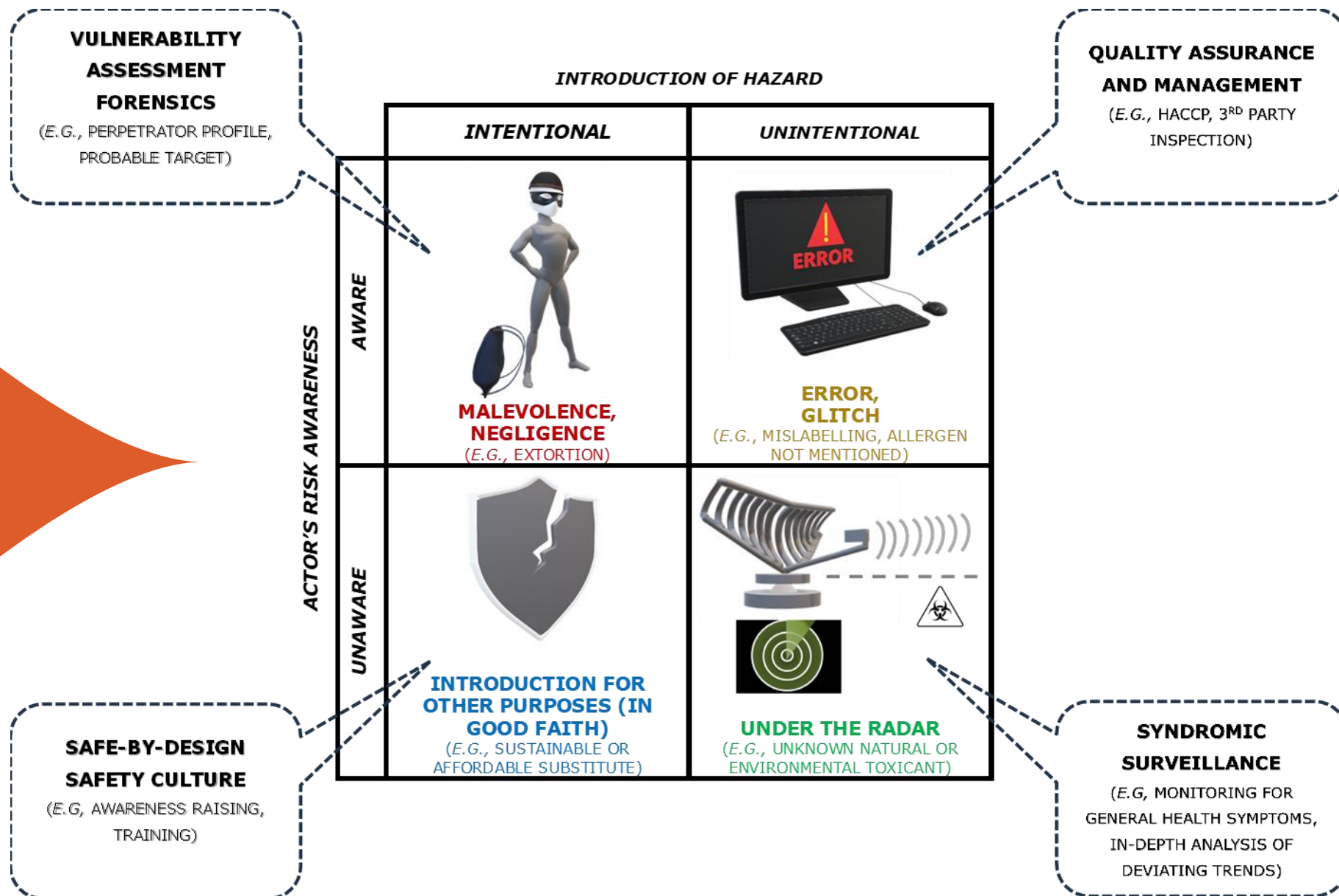
- ▶ 2017-18 Listeriosis outbreak in South Africa
 - ▶ Contaminated RTE meat products
 - ▶ Confirmed cases: 1060, and 216 deaths reported
- ▶ 2011 *E. coli* O104:H4 outbreak, Germany
 - ▶ Contaminated fenugreek seeds, used to grow sprouts and in spices
 - ▶ Confirmed cases: 3,842, and 53 deaths reported
- ▶ 2008 Melamine in infant formula, China
 - ▶ Addition of melamine to diluted raw milk
 - ▶ Approximately 300,000 affected, and six deaths reported

Accidental contamination incidents

Causative agents	No. of incidents
Chemical contaminants	48
Heavy metals (arsenic, cadmium, lead, mercury)	10
Pesticides (e.g., carbamates, organophosphates, QACs)	10
Unintentional persistent organic pollutants (dioxins, PBBs, PCBs, PAHs)	13
Veterinary drugs (chloramphenicol, nitrofurantoin)	6
Other chemical compounds (e.g., iodine, MDA, ethylene glycol)	9
Microbiological contaminants	24
Bacteria (e.g., <i>E. coli</i> , <i>L. monocytogenes</i> , <i>S. aureus</i> , <i>Salmonella</i> spp.)	22
Norovirus	1
BSE/TSE prion	1
Natural toxins	20
Mycotoxins	11
Phytotoxins (e.g., alkaloids)	7
Bongkrekic acid	2
Other contaminants (hormones, plastics, etc.)	4
Total	96

Food adulteration incidents

Causative agents	No. of incidents
Colouring agents (alum, chlorophyllin, lead-based pigments, MSO)	5
Flavouring (Diethylene glycol, methanol, strong acids)	3
Use of cheap contaminated low-quality products (e.g., cooking oils, inferior meat, swill milk)	10
Addition of melamine, e.g. to mask dilution of food products	2
Animal growth promoters (e.g. clenbuterol)	3
Total	23



Identified trends and drivers

Incident Type	Food adulteration/fraud	Accidental contamination			Other
Drivers	Economic		Environmental	Other unintended (e.g., inadequate food handling)	Malevolent activities
Examples	- Value increase (e.g., using hazardous dyes, or dilution of product, e.g., to change organoleptic properties, or increase volume) - Use of prohibited growth stimulants to increase production yield - Mislabelling lower value substitute ingredients (e.g., horse meat) as more expensive ones (e.g., bovine meat) - Use of hazardous compounds as a consequence of fraudulent activities	- Use of contaminated cheaper alternatives during food processing, to produce affordable food in good faith - Presence of antibiotics in animal-derived food products, due to preventive use in livestock - Use of (banned) pesticides in agricultural production - Impure industrial grade food components used in food processing	- Presence of toxic weeds in harvested crops - Fungal growth due to climatological events or improper storage - Transmission of pathogens to foods (e.g., from fertilizer, or during processing) - Contamination of crops with pesticides. - Transmission of toxicants due to illegal practices, or accidents (e.g., burning or dumping of waste) - Contamination of river water used for crop irrigation or fishing	- Improper food handling during production and preparation - Contamination of feed with toxicants (e.g., dioxins) from waste incineration or accidental use of contaminated additives	Deliberate food poisoning / bioterrorism

Discussion / conclusions

- ▶ Many food safety hazards are an intrinsic part of agriculture and food production
 - ▶ Hygiene guidelines and standards, e.g. HACCP, are available to manage food safety
- ▶ Hazards related to food adulteration and fraud can potentially be predicted.
 - ▶ Monitoring of attractive targets for such activities by authorities

Discussion / conclusions

- ▶ Climate change may have a wide range of impacts on future food safety
 - ▶ E.g. geographical spread of mycotoxigenic fungi, increased extreme weather events
 - ▶ Specific measures may be necessary to ensure food safety
- ▶ A combined harmonized food safety approach that is routinely updated with information from past incidents may help prevent future food safety incidents

Thank you for your attention.



Funded by
the European Union