



Emerging Microbiological Risks in the Food Chain

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Sci Com FASFC



Emerging risks



EMRISK UNIT

EFSA EMRISK definition :

“ a risk resulting from a **newly identified hazard** to which a significant exposure may occur, or from an **unexpected new or increased significant exposure and/or susceptibility to a known hazard**”

Early warning systems:

- reactive e.g. RASFF, ProMED, INFOSAN, OIE
- pro-active e.g. GLEWS, GPHIN

based on “intelligence management/data mining”





FASFC SciCom reflections on Emerging Microbiological Risks

Based on information from

- “scientific data”



- “regulatory data”



- “soft data”



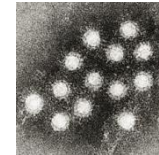
- “expert knowledge”



FASFC SciCom reflections on Emerging Microbiological Risk



- Microbiological biodiversity
- Non zoonotic food borne pathogens



- Water : a critical factor in the food chain



- Good hygienic practices revisited



- Emerging eating habits & the notion of acceptable risk





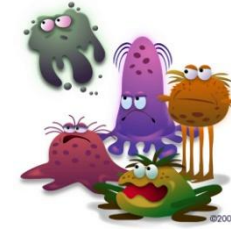
Microbiological biodiversity

German *E. coli* O104:H4 outbreak strain
= unusual multiresistant VTEC EAggEC

- Genes can move between bacteria via mobile genetic elements (plasmids, bacteriophages)
- Complexity to classify and identify pathogenic strains
→ need of a tool box of molecular techniques
- Human disease → biological indicator !

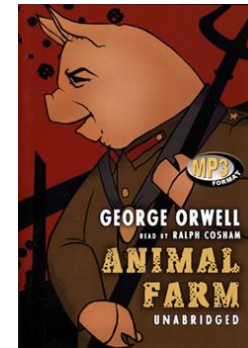


Microbiological biodiversity



pathogenic *E. coli*, *Salmonella* sp., *Yersinia enterocolitica*, *Cronobacter sakazakii*, ...

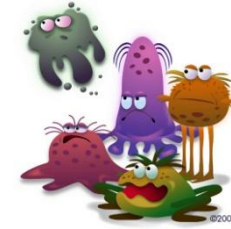
- A large number of bio-/serotypes
- Variation in pathogenic character (?)
- Host specific / regional spread (?)



- Adaptation to ecological niche
- Adaptation to food processing/ food preservation



Microbiological diversity



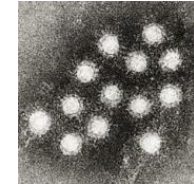
- Need of better hazard identification
 - (molecular) techniques in place
 - Monitoring/base-line programs
 - Epidemiological information
 - Behaviour (growth/survival/competition)



New pathogens emerge or “old” established pathogens may re-emerge and get renewed attention

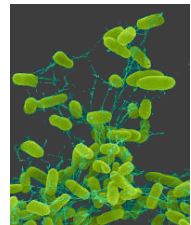


Non zoonotic agents as food borne pathogens

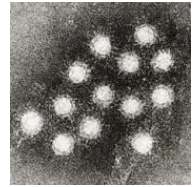


Zoonosis : any disease and/or infection which is naturally transmissible directly or indirectly between animals and humans e.g. Salmonella, VTEC, ... = majority food borne pathogens

Some (recently acknowledged) food borne pathogens have predominantly human reservoir e.g. Norovirus, Hep.A virus, *Shigella* sp., EAggEC (?), *Cyclospora*, etc...



Non zoonotic agents as food borne pathogens



Major mode of transmission : person-to-person
But also indirect - via (fecal contaminated) water
- via food (handler)

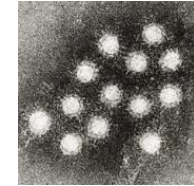
- Low infectious dose
- (variable) ability to persist in environment
- Ready-to-eat foods prone to extensive manipulation (at harvest, processing, catering)
- (some) endemic in third countries



Scare on Hepatitis-sundried tomatoes from Turkey (EU - March 2010)



Non zoonotic agents as food borne pathogens



Contamination through 'unhygienic' handling

- Random localized effect
- Few data on prevalence in food chain (rare events make elaboration of sampling plans challenging + need of appropriate methods)



- Need of adapted Microbiological Risk assessment (MRA) approach for modeling of rare events !
- Need on inclusion of logistic modeling in MRA
- Need collaboration with experts in water/clinical MRA



Water quality: a critical factor in the food chain

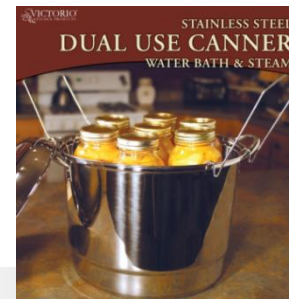


Water is extensively used in the food industry
in primary production

- irrigation water, aquaculture, livestock watering

in processing/preparation

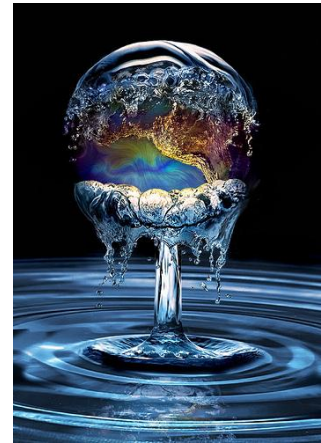
- Ingredient, brines, transport medium
- washing, rinsing, scalding, chilling, etc.
- Blanching, pasteurizing, steam production, cooling, etc.
- Cleaning, sanitation, disinfection



Water quality: a critical factor in the food chain



- Growing demand for water
- impact of industrial activity on the environment
- Limited access to water in some areas
- Increasing costs and strict regulation for waste water discharge



1. Development of unit operations that use less water / optimisation of water circuit
2. Recycling or reuse (following reconditioning)
3. Alternative sources as potable or “clean” water



Water quality: a critical factor in the food chain



- Water/washing may reduce/dilute microbiological contamination
- Water may act as vehicle for transfer and dispersion/spreading of pathogens
- Moist conditions promote persistence of microorganisms (in production environment)
- Need of “clean” water fit for purpose & supported by MRA : - water sources - microbiological criteria
- water treatment systems (sanitation?)



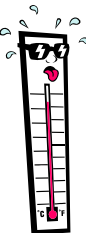
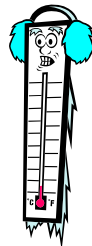
Good hygienic practices revisited



- GAP, GMP, GHP, HACCP, FSMSare shown to be important for assuring food safety

- Often outbreaks
= ruptures in “best practices”

➔ Need continuous attention !



GLOBALG.A.P.

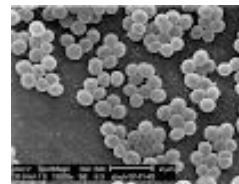
Good hygienic practices revisited



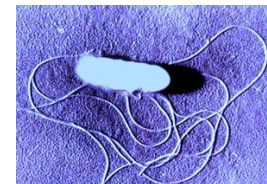
Good hygienic practices (in food chain)

*“Awareness and knowledge of guidelines and procedures, but also persistence of **existing habits and attitudes may influence compliance and actual implementation of procedures in place!** “*

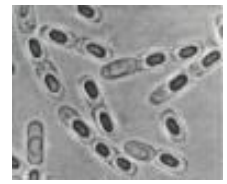
- Cleaning and disinfection
- Infrastructure & maintenance of equipment
- Cold chain
- Personnel hygiene



Staph. aureus



L. monocytogenes



Bac. cereus



Good hygienic practices revisited



- Need of Risk assessments to take into account
- Variability in adherence to “best practices” between food bussiness operators = puts demands on data collection !
- Variability within a batch : rare events of “unacceptable” high contamination = tails of distribution !
- Use of proxy hygiene indicators (*E. coli*, *Listeria* spp.) instead of (low prevalent) pathogens = correlation ?
- “reasonable foreseen” time temperature profiles ?
- Self reported versus actual food handling behaviours (in food preparation)



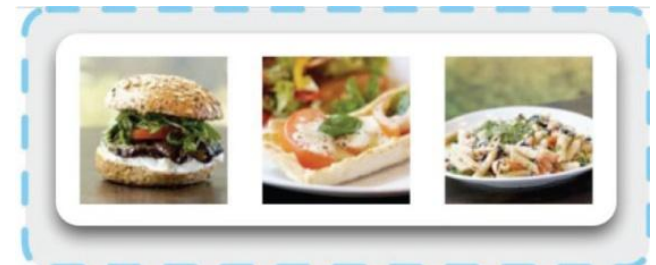
Data-intensive but more accurate risk estimates !



Emerging eating habits & the notion of acceptable risk



- More out-of-home eating
- New culinary trends
 - slow food, sushi, carpaccio's, wok, microwave heating, etc.
- Convenience foods
 - pre-packed, mildly heated
- Healthy foods
 - Healthy fast foods, reduced salt levels, etc.
- Organic produce



Emerging eating habits & the notion of acceptable risk



- Microbiological risk assessment to evaluate safety impact of alternative processes, products
 - Based upon hurdle technology
 - Based upon “integrated” chain approach
(**P**erformance **O**bjectives/ **F**ood **S**afety **O**bjectives)



$$H_0 - \sum R + \sum G + \sum C < PO1$$

$$PO1 - \sum R + \sum G + \sum C < PO2$$

$$PO2 - \sum R + \sum G + \sum C < FSO$$

ICMSF approach (www.icmsf.org)



Emerging eating habits & the notion of acceptable risk



Zero risk does not exist

→ **The notion of “acceptable risk”**

Determined by cultural factors, previous events, location (context), costs (willingness to pay)...

(Refer. Lechevallier & Buckley, Clean Water, AAM report, 2007)

A REPORT FROM THE AMERICAN ACADEMY OF MICROBIOLOGY

THE CONCEPT OF “ACCEPTABLE” RISK

Acceptable risk can be defined as the level of risk that is protective of public health for a population considering cost, feasibility, and other considerations. Acceptable risk figures may be used to derive water quality standards or other goals. Ideally, these standards should be protective of health goals, understandable, tolerated by the public,

Emerging eating habits & the notion of acceptable risk



Nutrition/health aspects versus food safety aspects
e.g. reduced NaCl versus NaCl as preservation factor



Food quality aspects versus food safety aspects
e.g. freshness, taste versus safety guarantees



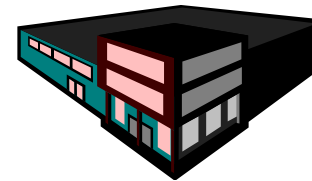
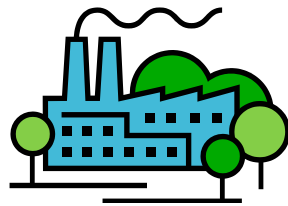
Food safety aspects versus food security aspects
e.g. debate on food waste, expiry date ...





Emerging Microbiological risks....

- Changing consumption patterns & demographics
- Changes in production & distribution (global sourcing)
- Growing awareness of the problem on the part of public & public health officials



BUT

- More research into biology & ecology of pathogens
 - Opportunities to evaluate contamination and growth/behaviour of pathogens in the food chain
 - better knowledge on methods for control & approaches in (predictive) modeling
 - International collaboration & capacity building
- (better) Risk Assessment to support decision making



Thank you for your attention !

