Parma Summer School 2019

Risk-Benefit in Food Safety and Nutrition

CONCLUDING REMARKS

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AND

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Risk is a social construct

Risk-benefit assessment is part of life

it is made by facts (= scientific data) but also by values, expectations and perceptions
Values= evidence-based prevention vs. precaution considering emerging risks and uncertainties

The question to be answered (which depends from above)
The availability and quality of evidence (which depends from the interest and resources devoted to a specific problem)

Risk is a social construct

Medicines: risk/benefit trade/off is implicit and has robust criteria (comparing clinical relevance, use surrogate markers...)

Food and nutrition: in our societies perceived as they have to be safe;
food safety is a key social value (EC White Paper 2000)
Risk Assessment is the basis for food safety (not RBA !)

New aspects, new declinations
Health claim: food should "support/improve" health
Food production must be sufficient for a growing population (*trade off with safety??*)
Must be sustainable (resources consumption, greenhouse emissions, biodiversity) (e*ating fish: healthy but not sustainable?)*
(FAO 20102: sustainability is an additional leg together with safety and nutrition, must not be viewed as "alternative to")

RBA

RBA is an important *exception not the rule*

Specific foods, processes, products, dietary choices

Whenever scientific evidence may support
Two or more options that go in opposite directions

Products/processes
Fortify flour with folic acid or not?
Use biocides on animal carcasses in slaughterhouses?

Food/dietary choices
Eat more or less fish during pregnancy?
Replace red meat by eating more fatty fish?

RBA relies on the possibility of qualitative AND quantitative comparison

Need for an interdisciplinary team (e.g., smoked salmon: nutritional advantages vs. microbiological risk)

Need for a common, standardized, robust, comparable and transparent (= *to be trusted*) metrics
Qualitative comparison screens scenarios for possible use of Quantitative metrics Number of cases induced/prevented DALYs (takes into account incidence, onset, severity)

(example of nuts in Sweden: effect identification screens prevention of cardiovascular problems vs. liver cancer/toxicity from Aflatoxin B1 as the key effects for quantitative analys)

Question for the future: finding a metrics that include e.g. sustainability

RBA as a spin-off of RA

RBA is a well-described (see EFSA and open literature), multi-step, process that parallels the steps of risk assessment
but needs to be implemented in more case studies in different scanarios in much more EU (and non-EU) Countries

Problem formulation (the initial question) is even more critical than for RA (folic acid in bread for a given purpose)

a compound,
a product (smoked salmon),
a process, (bread fortication)
a food (nuts),
a dietary habit (red mets consumption)

RBA as a spin-off of RA, but mind

At least two scenarios must be considered
and possibly more (multiple options: levels of addition of folic acid in bread, levels of consumption of large fatty fishes)

It may be translated into the related risk ranking (risk from NOT consuming fish vs. risk from consuming MUCH fish)
And here again the issue of the *common currency* (DALY)

Target populations may be different
(neural tube defcts vs. masking vit b12 deficiency) which then leads to *societal choces*

Indeed, risk managers may want to know the *economic impact* (in terms of diseases burden) of different risks and/or options

Science matters! How Risks are viewed

For instance, in the fieìld of pesticides
- Knowledge of metabolites/by-products may change a useful sustainable low-risk pesticide in a high-concern product
- Assessment of combined effects of multiple pesticide residues may change the view of risks associated with pesticides in foods and/or environment

And the same could be viewed in other fields (e.g., food contact materials, food additives in ultra-processed foods)

- Use of methods for linking toxicity mechamisms to health outcomes may improve the use of epidemiological data for risk assessment of chemicals, by providing a robust and transparent appraisal of biological plausibility

- better knwledge on metabolism and bioavailability of specific forms of nutrients may change the view on the safety of those nutrients

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Science matters! How Benefits are viewed

Evidence to integrate nutrition into helth assessment may not be always so clear
The nutrition-dense food we do NOT eat maybe more impoortant than junk food we eat

How to define a diet/dietary style?
It changes with time and life: cutting pont, e.g., when I become a guy following "Mediterranean diet"?

RR always with absolute risk: risk mangers need to kmow if RR =3 For a 1% or 20% background incidence

Science-based (and transparent) options
How to interpret statistical associationso?
Meta-analysis = strength of number and of stanndardization *but*
- (conservatively) consider only substantial (3-4) Relative Risks?
- accept the "accumulation" of low-level Rrs that are consistent?
or...

Science matters! How Benefits are viewed (II)

or... Focused hypothesis tresting,more stress biological plausibilit

For instance meta-analysises assessing the health impact of diet X on cardiovascular disease consider *only* lipds and get inconsistent results

While they should consider also other main risk factors togrther, based on physiological knowlesge:
Blood pressure (salt), oxidative streess (micronutrients), glucose (sugars)

Produce fresh evidence, we don't knoew 100%, dietary habits evolve
Integrate microbiome knowledge
food components mainly involved in RB (example: colorectal cancer)
fingerprinting interaction pathways of microbiome/food components
More good quality RCTs in different (EU and not) areas
Make cohort studies available for further independent analysis,

Science matters! human data (exposure and epidemiology)

What makes up exposure?
distribution (in population) + frequency (habitual intake?) + concentration (+ background) (+ body store/burden)

Especially for items on which data are NOT routinarily collected
- data mostly from a few Countries
- inadequately comparable methods for sampling and/or analysis
- analytical methods of insufficient sensitivity

-One way forward
- **Total Diet Studies TDS)**

Intake of nutrients and contaminants together
In the foods how they are consumed
Stratified per age groups
Taking into account regional differences (Italy: four main diets)
Standardized methodology, but time- and resource-intensive

Science matters! human data (exposure and epidemiology II)

- human biomonitoring data: insufficient knowlege on the factors influencing variability within and among populations

Uncertanties in risk ranking

- contaminants: significant time lag between exposure and disease (less for adverse developmental outcomes)

- microbiological effects: the surveillance system may reveal only tip of iceberg (combine different sources)

Tips anf food for thought from lectures

Many possible endpoints (e.g., folic acid deficiency vs. excess)
A selection of a few is legitamate as well as of practical value
Critera for selecting endpoints *must be transparent*
Transparent selection of conservative assumptions to account for uncertainty (reduction of sperm in mice as parameter for dioxins)

Basis for metrics (easy to explain to risk managers)
- Changes in comparison with reference exposure/intake
- extra cases vs. prevented cases
Preferably weight of the evidence should be comparable for R and B, (not always possible..)

Anyway remind that
- Full quantitative RBA can be very demanding (so, has to be aimed understandable and usable)
- Wonderful Softwares of top value do exist, but human reasoning (still) needed

Tips anf food for thought from two case studies

- *Raw mil*k: a will to be "natural" rather than a evidence-supported health benefit, indeed *at the border between* RA and RBA
- the benefit could be dscribed as the impact of the additional fraction of vitB2 (prevented from degradation by pasteurization) ?
- Storage conditions and initial contamination identified as critical aspects for risk management (but, is it RA or RBA?)

Substitution of red meat with fish

- Multiple scenarios representing different options, including "business as usual" (reference)
- what does it mean fish? Lean, fatty, tuna.
- Take into account local food culture (a signficant fraction of Danish food consumption made by cold fish of rye bread)
- Age and gender related DALY (depend on agents and effects considered
- updates: New TWI for dioxins change scenarios and RBA outcomes

Suggestion

For the present moment, let's keep conceptually distinct

I) Risk and Benefits for HEALTH which can be measured through a common metrics
Delivered to risk managers

ii) Assessment of the safety of use for a given purpose at a given dose in comparison with usefulness and possible substites
Where health risk assessors contribute to the outcome together with other inputs by risk managhers
Usually done at the ECHA)
(let's invite ECHA next yesr?)

Sustainability:
A parallel RBA assessment?
Introducing a comparative metrics with health effects?

Personal note: *the hidden RBA*

During this course I realized that during my activity (2003-12 and 2015-18) as member of EFSA FEEDAP Panel (substances used in animal feed)

A number of opinions contained significant elements of RBA (RBA spirit), though not formalized as RBA

Nutrients

- iodine (2005, 2012): risk of excess for consumers vs meeting nutritional needs in farm animals

- Zinc (2014), Copper (2016): risk of excessive input in the environment and ecotoxicity vs meeting nutritional needs in farm animals

- vitamin D3 in aquaculture feeds (2017) sufficient or excessive enrichment of vitamin D for consumers?

Efficacy vs. safety* of *risk-reducing feed additives:

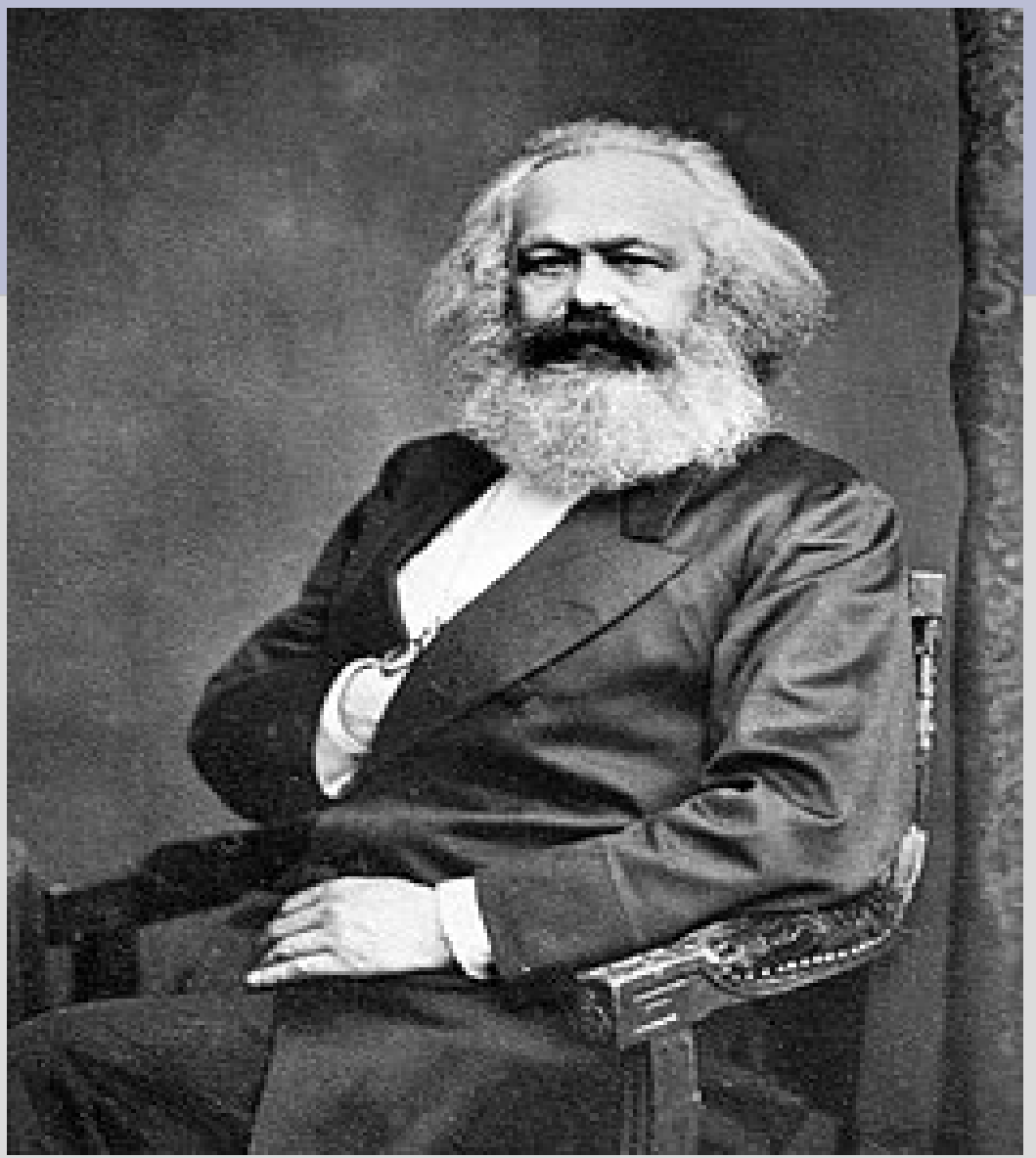
aflatotoxin binder for cow feed (2011)

Formaldehyde to improve feed hygiene (2014)

Benzoic acid to reduce ammonia emission in pigs (2015)


FAMOSO·DOCTOR PARESELSVS.

What sense would it make or what would it benefit a physician if he discovered the origin of the diseases but could not cure or alleviate them?



The philosophers have only interpreted the world, in various ways.

The point, however, is to change it

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Risk-Benefit Assissement

Applied **science**
built-up in a way that it *can be utilized*
for a better living