Risk-Benefit Assessment of Foods

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IS ALL FOOD IS DANGEROUS?
Benefits of Fruits

- Pineapples help digest food and build strong bones
- Watermelons help the body get rid of excess ammonia and helps you heal wounds
- Cherries contain antioxidants that protect the body from cancer cells
- Drinking lemon water can help cure bad breath

10 Benefits of Milk

1. Amazing Complexion
2. Strong Teeth
3. Healthy Bones
4. Muscle Growth
5. Weight Loss
6. Reduce Stress
7. Alleviate PMS Symptoms
8. Energy Booster
9. Heartburn Eliminator
10. Disease Fighter

6 REASONS TO EAT MEAT FOR OPTIMAL HEALTH
Risk-Benefit Assessment

- Usually our research focus is on only risks or benefits
  - one hazard or benefit
  - one food
  - one health effect

- Food is associated with benefits and risks
  - This requires an integrated approach
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  - Food product
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• Risk-Benefit Assessment at different levels:
  - Food compound
  - Food product
  - Diet
Risk-Benefit Assessment

- Assessing food risks and benefits requires a multidisciplinary approach
  - Toxicological risks
  - Microbiological risks
  - Nutrition
    - risks
    - benefits

- Important differences in terms, concepts and approaches
  - Definitions
  - Nature of health effects and dose-response models
  - Available data
  - Common questions and approaches
Food safety risk assessment vs. Nutritional risk and benefit assessment
Risk-Benefit Assessment so far

• First studies 10-20 years ago
  – Qualitative comparisons
  – Nutrition and chemicals

• Some EU projects
  – BRAFO
  – BENERIS
  – BEPRARIBEAN

• EFSA opinion 2010
General framework

RISK ASSESSMENT

1. Hazard identification
2. Hazard characterisation
3. Risk characterisation
4. Common health metrics

BENEFIT ASSESSMENT

1. Positive health effect identification
2. Positive health effect characterisation
3. Benefit Characterisation
Risk-Benefit studies performed

Risk-Benefit Assessment in Denmark

- Risk-Benefit research group established 2015

- Expertises available at the National Food Institute
  - Toxicology
  - Nutrition
  - Microbiology
  - Risk assessment
  - Epidemiology (*Burden of foodborne diseases*)

**MetriX project**

- Develop and apply models for quantitative health assessment in
  - Risk-benefit assessment
  - Risk and benefit ranking
  - Burden of disease studies
Current International Activities

- Projects in different countries
- Workshop Nordic countries 2016
- Special sessions and symposia in international conferences
- EFSA sponsored workshop in Copenhagen 2017
  - Informal network established
  - Challenges identified and way forward discussed
Selected challenges

- Metrics and quantification
- Comparing risks and benefits
- The scope of Risk-Benefit Assessment
How to compare the health impacts of foods?
Disability Adjusted Life Years - DALY

Conceptually simple:
- Translate the number of years of life lost due to the diseases, in terms of loss of quality of life and by premature death

\[ \text{DALY} = \text{YLD} + \text{YLL} \]
How good are DALYs?

😊 Widely used
  • WHO Global burden of foodborne disease studies

😊 Well developed

😊 One metric
  • combines incidence, severity, mortality
  • quite easily interpreted (average healthy life years lost)

😊 One metric

😊 Contains “hidden” and/or subjective values
  • severity weight of disease
  • impact of age at death / onset of disease
    • discount rate over time?
  • no “adaptation” to chronic state of disease
  • choice for life expectancy
  • no impact on family included

😊 One metric
  • different dimensions of health burden are hidden
The case of processed meat: how bad is it?

Processed meats rank alongside smoking as cancer causes - WHO

UN health body says bacon, sausages and ham among most carcinogenic substances along with cigarettes, alcohol, asbestos and arsenic

Sarah Boseley Health editor
Monday 26 October 2015 12.30 GMT

Bacon, ham and sausages rank alongside cigarettes as a major cause of cancer, the World Health Organisation has said, placing cured and processed meats in the same category as asbestos, alcohol, arsenic and tobacco.

The New York Times

Sunday Review & News Analysis

So Will Processed Meat Give You Cancer?

By ANAHAD O’CONNOR  OCT. 31, 2015

Agency for Research on Cancer said there was a group 1 carcinogens because of a causal link

\( \text{cancerogenic to humans} \). Eating red meat is a risk, the IARC says.

-gram (1.8-ounce) portion of processed meat cancer by 18%.
How bad is processed meat?

• IARC experts say the evidence is convincing:

*the risk of colorectal cancer when eating processed meat is significantly larger than when you do not eat it.*

• But **how** bad is it?
  – Relative risk 1.18
  – A 18% increase in risk of colorectal cancer per 50 g per day

– What does this mean?
  • Incidence increase?
  • Death?
  • DALY?
  • Lifetime risk?
Incidence colorectal cancer in Denmark

Incidence is not very high and increases with age
Simplified model for Denmark

- Two consumer group:
  - low and high consumers,
  - high consumers eat 50 g processed meat per day more

For one year, 18% increase in risk means:

- Increased probability of acquiring colorectal cancer up to 0.1% at high age
- Increased probability of fatal colorectal cancer up to 0.001% at high age

- DALY approach:
  - Expected loss in healthy life days up to half a day

- Increased probability of ever getting colorectal cancer during your life increases to up to 2% around age 85

The same risk but the risk perception of different metrics may be different!
Selected challenges

- Metrics and quantification
- Comparing risks and benefits
- The scope of Risk-Benefit Assessment
Comparing Risks and Benefits

• Risk assessment and benefit assessment are different by nature

• Risk should be prevented
  – Conservative estimates
  – Worst case scenarios
  – Precautionary principle

• Benefits should be proven
  – Health claims

• Using statistical evidence
  we need to be 95% sure there is NO risk to exclude it
  we need to be 95% sure there is a benefit to include it

• For fair Risk-Benefit Assessment, risks and benefits should get the same treatment
The risk of Risk-Benefit Assessment

- Benefits should not be an excuse to introduce risks

- Risk-Benefit Assessment should be used to inform on overall health effects
  - One metric may not be enough

- Quantitative approach is ESSENTIAL
Selected challenges

- Metrics and quantification
- Comparing risks and benefits
- The scope of Risk-Benefit Assessment
Broaden the scope outside the health arena

There is more in food than health

- Economy
- Sustainability
- Consumer risk perception and acceptance
- Social sensitivity

Potential tool:
MCDA (Multi Criteria Decision Analysis)
e.g. Ruzante et al. 2010

Source: IOM, 2015
Example: RIVM study

![Image of a table and chart showing scenarios for 2040 with indicators for safe foods, healthy diets, and sustainable diets. The table includes categories such as safety indicators, health indicators, ecological indicators, consumer indicators, and economic indicators.](image-url)
Conclusions

• Risk-Benefit Assessment is a necessary and relevant method to integrate different risk assessment methods with benefit assessment

• Useful methods and frameworks have been developed but
  – More case studies need to be done
  – (Quantitative) method development should continue
  – Think “out of the box”

• New initiatives are taken
  – Take up challenges
  – Collaborative action needed
Thanks!

- My DTU colleagues from the Risk-Benefit Research group
- Participants workshop Copenhagen May 2017
- You