Risk Perception and Crisis Communication – How to Deal with Uncertainty

Suzan Fiack
Risk Communication
Federal Institute for Risk Assessment
Science and Uncertainty

“More research brings more ignorance to the light of day”
(Douglas/Wildavsky)

Scientific knowledge:
- produces no absolute truths
- is not static
- is based on more or less well-founded assumptions, scenarios and probabilities
- is also a source of uncertainty

Dealing with uncertainty is important in the communication of scientific knowledge.
Dioxin, EHEC, Norovirus

Increased dioxin concentrations in eggs and meat - 2011

1. Industrial fatty acids with high dioxin concentrations
2. Illegal action
3. High media attention, No health risk was expected

EHEC Outbreak - 2011

2. Biggest bacterial outbreak of *Escherichia coli* in Germany since the Second World War with more than 50 deaths
3. Very unusual EHEC strain O104:H4

Norovirus in frozen berries - 2012

3. Around 11,000 children and adolescents suffered from severe vomiting and diarrhoe
4. Laboratory detection of norovirus difficult
Challenges in Risk Communication: Interpretation of Maximum Levels

Dioxin levels exceed the legal standard by 77-fold.
Challenges in Risk Communication: Health Based Guidance Values and Maximum Level

Dioxin 2011: What does this mean for the health of consumers?

„Levels 77 times higher than limit“

Fat
Feed
Animal

Maximum result 4-times higher than maximum level

<table>
<thead>
<tr>
<th>n (measurements)</th>
<th>175</th>
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<tbody>
<tr>
<td>Mean</td>
<td>1,9</td>
</tr>
<tr>
<td>Min</td>
<td>0,1</td>
</tr>
<tr>
<td>Max</td>
<td>12,1</td>
</tr>
<tr>
<td>%&gt;ML</td>
<td>19</td>
</tr>
</tbody>
</table>

TDI: 2 pg/kg KG/Day

High consumption of eggs (mean value): 10 % of the TDI (12,6% children)

Human

Max Level 3,0 pg/g Fett

Egg

Fat
Feed
Animal

TDI: 2 pg/kg KG/Day

High consumption of eggs (mean value): 10 % of the TDI (12,6% children)
For Particularly Concerned Consumers: Worst Case instead of Mean Value

Average dioxin body burden of young adults

Consumption of 2 eggs/d for 1 month

Consumption of 2 eggs/d for 1 year

Body burden today (10 pg/g body fat)

Increase of body burden

Dr. Suzan Fiack, 2013-11-15, Symposium „How to overcome a life-threatening crisis in the food chain“, Berlin
Press conference at the „Green Week“

2011: Consumers do not have to worry

Even if eggs or pork meat with contents in the range of the highest measured values were consumed over a longer period of time during the past months, no health risk is to be expected.

The intake of dioxins through foods must be minimised as far as possible.

The exceeding of the legal maximum level in food and feed is not acceptable.
Challenges in Risk Communication: Understanding uncertainty / lack of knowledge

- **Uncertainty**
  Not much data at the beginning (duration of dioxin analysis)

- **Lack of Knowledge**
  Understanding of maximum levels: Even though foods are not tradable, no adverse health impacts are to be expected

- **Risk Perception**
  Dioxin = “ultra toxin”

5. January 2011

"An acute health risk does not exist," said a spokesman of the Federal Institute for Risk Assessment (BfR).

He relied on the results of a study in which **FOUR EGGS** showed increased dioxin levels.
The fight against “poison”

Risk perception factor: Accident history

Seveso
- Chemical accident in 1976 north of Milan
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (“dioxin”) released into the environment

Agent Orange
- Herbicide, used as a defoliant in the Vietnam War (1962 – 1971)
- Contamination with 2,3,7,8-tetrachlorodibenzo-p-dioxin (“dioxin”)
- Several hundred thousands of inhabitants and US soldiers affected

Yushchenko
- Assassination attempt in late 2004: the former President of Ukraine Yushchenko was confirmed to have ingested hazardous amounts of „dioxin“
### Risk Perception Factors: Dioxin Incident 2011

| Extent | Eggs and meat were affected by the dioxin incident in 2011. With the exception of vegans, many consumers have **regular contact** with these staple foods. |
| Voluntariness | Consumers are **involuntarily** exposed to the risk of “dioxin in food”. |
| Personal Control | Consumers have **hardly any personal control** over the risks – the dioxin concentration of an egg is not visible. |
| Immediacy | The effects of increased dioxin contamination are **long-term** rather than immediate. |
| Severity of consequences | The long-term effects of increased dioxin levels include disturbances of the central nervous system and hormone balance. It is assumed that some dioxins can increase the risk of contracting **cancer**. |
**Challenges in Risk Communication: Intuitive Toxicology**

Laymen regard chemical substances as more dangerous than experts do.

There is no safe level of exposure to a cancer causing agent.

If you are exposed to a carcinogen, then you are likely to get cancer.

If you are exposed to a toxic chemical substance, then you are likely to suffer adverse health effects.

(Quelle: Kraus, Malmfors & Slovic 1992, 217).
Rough Overview
EHEC May to July 2011: a real crisis in consumer protection

EHEC Outbreak

- Biggest bacterial outbreak of *Escherichia coli* in Germany since the Second World War with more than 50 deaths
- Very unusual EHEC strain O104:H4

- May 2011: Increase in the number HUS cases

- Preliminary results of epidemiological studies (Robert Koch-Institute, RKI):

  Recommendation (BfR and RKI) on 25 May 2011, by way of precaution, not to consume raw tomatoes, cucumber and leaf lettuce
Rough Overview
EHEC May to July 2011: a real crisis in consumer protection

- Combined forward/backward trade relations tracking strategy
- Evaluation of company supply channels: carriers of the EHEC bacteria were with high probability sprouts from a farm in Germany,
  New epidemiological data

- Recommendation to consumers on 10 June 2011 not to eat any raw sprouts

- At the end of June 2011, a cluster of EHEC O104:H4 cases in France was also traced back to the consumption of sprouts

- Connection between the German and French cases: a batch of fenugreek seeds produced in Egypt

- High probability that fenugreek seeds used for sprout production were the cause

- European Commission: Recall and destruction of certain fenugreek seed batches from Egypt, import ban on certain seeds and other plant-based foods from Egypt for a limited period
Challenges in Risk Communication: Uncertainty

May 2011: Epidemiological study carried out by the Robert Koch Institute (RKI) together with the Hamburg health authorities

Affected patients had eaten raw tomatoes, cucumber and leaf lettuce significantly more often than healthy study participants.

- All pointed from an early stage to **food contaminated** with EHEC as the source of infection

- Based on the results of this early survey (Robert Koch-Institut), vehicles such as **raw milk, raw meat, sprouts and shoots** did not appear to play a role.

**Can public institutions delay talking about risks until the data situation is “certain”?**

**What risks are involved in waiting longer?**
Challenges in Risk Communication: Uncertainty

Preliminary results of the EHEC/HUS study

RKI and BfR recommend, by way of precaution, not to consume raw tomatoes, cucumbers and leaf lettuce, more particularly in Northern Germany, until further notice.

It cannot be excluded that other foods play a role as an infection source, too.
Detection of EHEC in cucumbers in Hamburg

O104 ?

66 HUS-Cases in Hamburg - Suspicion of O104 confirmed

The detection of EHEC in cucumbers in Hamburg, which were, amongst others, imported from Spain, resulted in several warnings through the European Rapid Alert System.

It has not yet been proven that the EHEC subtype on the analysed cucumbers is the same as in the stool specimen of the patients.
Spanish Cucumbers are the EHEC Carrier
EHEC: Spanish cucumbers are to blame
Challenges in Risk Communication: Variety of Expert Opinions

Until then, the very unlikely but theoretically conceivable worst case that the bacteria were released intentionally cannot be excluded either. (Mikrobiolog in the journal Tagesspiegel, 25th May 2011)

It is perfectly adequate to wash vegetables thoroughly. (Expert in the field of hygiene in the journal The European, 9th June 2011)

Never before have such dangerous intestinal germs been found on fruit and vegetables. If beef were the source of the dangerous germ, it could have something to do with the massive addition of antibiotics to animal feed. (A WHO Expert in the journal La Repubblica, 4th June 2011)

Translation: BfR
Understanding Uncertainty

Authorities are “struggling” in their efforts to find the source
(foodsafetynews, 9.June 2011)

E. Coli source still vague.
(Deutsches Ärzteblatt, 4. June 2011)

No guarantee for clarification

5. June
ZDF – German Television
BfR President Professor Dr. Dr.
Andreas Hensel

In most cases outbreak investigations do not deliver results.

Translation: BfR
As a precaution in addition to the standard hygiene measures, BfR, BVL and RKI recommend that sprouts should not be eaten raw until further notice.

EHEC 2011:
10 Press releases
11 Opinions
~ 50 FAQ
> 300 Media requests
50 TV Interviews
5 Press conferences
> 500 requests from the public

10th of June: 'It's the sprouts.'
Behavioural changes due to EHEC during the outbreak

Did you change your habits during the EHEC outbreak in order to protect yourself from the bacteria? What did you do to protect yourself?

Roughly half of those questioned changed their habits during the outbreak.

- Did not eat certain foods: 72%
- Did not eat raw fruit, vegetables or sprouts: 59%
- Did not eat fruit, vegetables or sprouts in restaurants/snack bars/canteen/cafeteria: 52%
- Washed some foods more thoroughly: 51%
- Washed hands more often: 49%
- Changed shopping habits: 48%
- Peeled fruit and vegetables more often: 39%
- Ensured more kitchen hygiene: 39%
- Washed certain foods at higher water temperatures: 33%
- Cooked my own food: 2%
- Bought organic produce: 1%
- Don’t know/no answer/none of the above: 1%
Comprehension of Consumption Recommendations

Did you understand why the initial recommendation not to eat green salad, tomatoes and cucumber was repealed in the light of new information?

The reversal of the consumption recommendation was understood by 74% of those questioned.

- Yes: 74%
- No: 23%
- Don't know/ no answer: 3%

n = 931; information in percent
Assessment of State Measures

Have the responsible authorities in Germany done enough to protect the general public from the EHEC pathogen in your opinion?

The vast majority of those questioned stated that the responsible bodies have done enough to protect the general public from the EHEC pathogen.

n = 931; information in percent
Comparative Risk Estimation: EHEC vs. Dioxin

How would you estimate your own personal risk of damaging your health when comparing the two incidents, dioxin in foodstuffs and EHEC?

- Dioxin risk is much higher: 14%
- Dioxin risk is slightly higher: 16%
- Both risks are equally high: 40%
- EHEC risk is slightly higher: 14%
- EHEC risk is much higher: 8%
- Don't know/ no answer: 8%

n = 803; interviewees who had heard or read about dioxin; information in percent
Norovirus

Norovirus in frozen berries - 2012

- Around 11,000 children and adolescents suffered from severe vomiting and diarrhoea
- Laboratory detection of norovirus difficult

Experts work at full speed to identify the source of gastrointestinal infections in Eastern Germany. (Nordbayerischer-kurier.de, 8th October)

Authorities are still completely in the dark. (Sueddeutsche.de, 1st October)

Translation: BfR
Norovirus could not be detected initially in samples of suspected strawberries.

Other substances in food can disturb the detection.

In some foods, for example in berries, you can currently only detect noroviruses, when more than 100 virus particles are present.

Noroviruses are highly contagious and as few as 10 viral particles may be sufficient to infect an individual.
Norovirus found…

State Office for Consumer Protection in Saxony-Anhalt: Detection of noroviruses in a sample of the suspect deep-frozen strawberries for the first time with the help of an elaborate laboratory protocol.

BfR: Examintion of the strawberry sample in its virological lab. Confirmation of the finding.

11,000 German schoolchildren probably laid low by strawberries
BERLIN | Fri Oct 5, 2012 6:18pm EDT

(Reuters) - Germany's biggest outbreak of food poisoning, in which more than 11,000 schoolchildren have been laid low by diarrhoea and vomiting, is "very likely" to have been caused by a batch of frozen strawberries, authorities said on Friday.
Challenges in Risk Communication: Understanding uncertainty

Uncertainty can occur in many different ways:
Not enough data, lack of knowledge, different expert opinions, uncertainty regarding the risk level, exposure etc.

Making uncertainty a subject of discussion is often not understood.

It sometimes strengthens trust in the information source, but it is also regarded at times as a sign of incompetence and dishonesty.

The cause of uncertainty is not seen in the nature of the matter itself but mostly in social factors.

A simple appraisal (Is it safe?) is often preferred to the statement of uncertainties.
Challenges in Risk Communication: Dealing with uncertainty

1. Don’t wait to be confronted. Acknowledge uncertainty up-front.

2. Put bounds on uncertainty. What range of possibilities is credible?

3. Clarify that you are more certain about some things than others.

4. Explain what you have done or are doing to reduce the uncertainty.

5. If the remaining uncertainty is very small or very difficult to reduce further, say so. Don’t overpromise.
## Risks at a glance: the BfR risk profile

### BfR risk profile on ...

<table>
<thead>
<tr>
<th>A</th>
<th>Affected group</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Probability of health impairment</td>
</tr>
<tr>
<td></td>
<td>Practically impossible</td>
</tr>
<tr>
<td>C</td>
<td>Severity of health impairment</td>
</tr>
<tr>
<td></td>
<td>No impairment</td>
</tr>
<tr>
<td></td>
<td>[reversible / irreversible]</td>
</tr>
<tr>
<td>D</td>
<td>Validity of available data</td>
</tr>
<tr>
<td></td>
<td>High: the most important data is available and there are no contradictions</td>
</tr>
<tr>
<td>E</td>
<td>Controllability by the consumer</td>
</tr>
<tr>
<td></td>
<td>Control not necessary</td>
</tr>
</tbody>
</table>

*new from 19 April 2013!
### BfR Risk Profile: Further examples:
Perchlorate finds in food

#### BfR Risk Profile:
Health assessment of perchlorate residues in foods
Opinion no. 22/2013

<table>
<thead>
<tr>
<th>Affected group</th>
<th>General population, children, people with thyroid disease or iodine deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of health impairment due to one-time consumption of large portions of products with high concentrations</td>
<td>Practically impossible</td>
</tr>
<tr>
<td>Severity of health impairment due to one-time consumption of large portions of products with high concentrations</td>
<td>No impairment</td>
</tr>
<tr>
<td>Validity of available data</td>
<td>High: the most important data is available and there are no contradictions</td>
</tr>
<tr>
<td>Controllability by the consumer [1]</td>
<td>Control not necessary</td>
</tr>
</tbody>
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Text fields with dark blue background highlighting characterise the properties of the risk assessed in this Opinion.

**Notes**

The Risk Profile is designed to visualise the risk described in the BfR Opinion. It is not designed to permit risk comparisons. The Risk Profile should only be read together with the Opinion.
### BfR Risk Profile - Further examples:
**Melons: Health Hazard through Contamination with Pathogenic Bacteria**

#### A Affected group

1) General population  
2) Pregnant women, infants, elderly and ill people

#### B Probability of health impairment due to one-time consumption of large portions of products with high concentrations

- Practically impossible
- Improbable
- Possible
- Probable
- Certain

#### C Severity of health impairment due to one-time consumption of large portions of products with high concentrations

The severity of impairment can vary

#### D Validity of available data

- High: the most important data is available and there are no contradictions
- Medium: some important data is missing
- Low: much important data is missing or contradictory

#### E Controllability by the consumer [1]

- Control not necessary
- Controllable through precautionary measures
- Controllable through avoidance
- Not controllable

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**Notes**

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New Formats

Videos based on questions from consumers

SIE FRAGEN, DER PRÄSIDENT ANTWORTET

1. Sie stellen Fragen
2. Sie stimmen ab
3. Der Präsident antwortet

Mobile Website / Apps

Twitter

New 2013
What is certainty?

Absolute certainty cannot be achieved.
Thank you

Walter Pechmann
Gesellschaft für Konsumforschung GfK, Nürnberg

Mario Hopp
HOPP & PARTNER Kommunikationsforschung, Berlin

Gaby-Fleur Böl
Astrid Epp
Klaus Jürgen Henning
Anne-Katrin Hermann
Stephanie Kurzenhäuser-Carstens
Mark Lohmann
Unit Press and Public Relations

Abteilung Risikokommunikation
Bundesinstitut für Risikobewertung

Regine Rehaag
Gabriele Tils
Katalyse, Institut für angewandte Umweltforschung, Köln

Carl Vierboom, Ingo Härlen
Wirtschafts- und Kommunikationspsychologie, Bonn

Oliver Pfirrmann
prognos AG, Berlin

Ortwin Renn
Dialogik gGmbH, Stuttgart

Christopher Coenen
Inst. f. Technikfolgenabschätzung u. Systemanalyse, Forschungszentrum Karlsruhe

Dirk Scheer, Ulrich Petschow, Gerd Scholl
Inst. f. ökologische Wirtschaftsforschung, Berlin
Thank you for your attention

Suzan Fiack

Federal Institute for Risk Assessment
Max-Dohrn-Str. 8-10 ● 10589 Berlin, GERMANY
Tel. +49 30 - 184 12 - 0 ● Fax +49 30 - 184 12 - 47 41
bfr@bfr.bund.de ● www.bfr.bund.de