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Communication Needs of Chemical Risks –
a Consumer/Public Perspective

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Abstract

The consumers’ perception of risks in everyday life differs from experts’ views and their judgement. The views on risks also differ among the consumers. So what drives the perceptions of chemical risks and how can communication be designed to address the heterogeneous concerns of different consumers? The crucial question of communication, concerning the what, how, through which channels and by whom still await systematic and scientifically valid answers.

In order to gain knowledge about the communication of chemical risks and combined risks, DIA organised and conducted three focus groups, two with engineering students and one with mothers with young children. The main objectives were to demonstrate the variability of the consumers’ behaviour and needs and explore the mechanisms of coping with complexity, uncertainty and ambiguity. The results confirmed the variability of answers and provided rich empirical data of which aspects should be taken into consideration when communicating chemical risks.

Keywords: focus groups, risk communication, chemicals, consumer
1 Introduction

The consumers’ perception of risks in everyday life differs from experts’ views and their judgement. The views on risks also differ among the consumers. So what drives the perceptions of chemical risks and how can communication be designed to address the heterogeneous concerns of different consumers? The crucial question of communication, concerning the what, how, through which channels and by whom still await systematic and scientifically valid answers (Benighaus/Renn 2008; OECD 2002).

In order to gain knowledge about the communication of chemical risks and combined risks, DIA organised and conducted three focus groups, two with engineering students and one with mothers with young children. The main objectives were to demonstrate the variability of the consumers’ behaviour and needs and explore the mechanisms of coping with complexity, uncertainty and ambiguity. The results confirmed the variability of answers and provided rich empirical data of which aspects should be taken into consideration when communicating chemical risks.

The aims of the focus groups were

- to get insights how consumers perceive chemical risks as being a part of their lifestyle,
- to learn more what consumers think about multiple chemicals and cumulative stressors,
- to analyse what the public would like to know, which actors they would like to get involved in the communication process (media, regulation, NGOs e.g.) and how the public wants the information of chemicals and theirs risks represented in the material,
- to discuss and understand the need for risk communication from a consumer perspective, and
- to reconsider how consumers deal with uncertainty and how consumers can be assisted to understand uncertainty and ambiguity.

2 Target Group, Size and Structure of the Group

DIALOGIK conducted three focus groups representing a broad spectrum of affected consumers. We invited a group of mothers who take care of small children to get their perspective of risk communication. Two groups of engineering students close to graduation were also asked to participate in order to get a perspective of young natural scientists. The students group was conducted twice with different participants, one with male students only and one with a mixture of female and male students so gender influences could be studied. Most of the students had three or four years of university education in one of the classic engineering disciplines.
Most analysts (Witte 2002, Bloor et al. 2002, Henseling et al. 2006, Steyaert et al. 2006) recommend limiting the size of the focus group to 4 to 12 persons. With sizes less than 4 persons or more than 12 persons quiet often group interaction is impeded, which could affect the dynamic of argumentation and opinion building and impact on the discussion results. One student group included 10 participants and the other group 12. The mothers’ group consisted of 7 participants.

2.1 Focus Groups as a qualitative Method on analysing Risks

Characteristically, a focus group is a discussion around a given topic between 6 to 12 participants, which is monitored, guided if necessary and recorded by the researchers (Bloor et al., 2001: 78).

The method of focus groups belongs to the reservoir of qualitative research methods. An information input is given as a stimulus to activate a group of persons to discuss the implications of the stimulus (based on Henseling et al. 2006:10). This method reveals preferences and values from persons and specific target groups, as well as discloses reasons for different preferences and opinions (Steyaert et al. 2006: 127). Focus groups are usually organised as single events and take usually two to three hours. The focus groups within NoMiracle lasted three hours. The focus group with mothers was conducted in Heidelberg, the other two with students in Stuttgart. Both cities are located in the south of Germany.

The complete discussion was recorded for internal analysis. Additionally, the moderators composed handwritten notes.
2.2 Principal Structure of the Focus Groups

Within the group dynamic process of focus groups, five phases are usually distinguished (based on Witte 2002: 12), and DIALOGIK has organised its approach accordingly:

**Phase 1: Welcome and introduction**

Goals: Introductory round, presentation of the goals, programme, discussion rules and handling of the results, financial compensation

**Phase 2: Introductory question**

Goals: Start with a well-prepared introductory question; facilitator asks all participants to report their general experience with the topic at hand to start group discussion.

**Phase 3: Transitional question**

Goals: Develop group dynamics; facilitator asks group to discuss questions from their own experiences and the practical side; the participants learn through different views and opinions of group.

**Phase 4: Main questions**

Goals: With five to seven key working questions the topic is further discussed in-depth.

**Phase 5: Final**

Goals: Put together opinions of the group, summarizing results of the group discussions, final judgements or statements to comment the interpretations developed during the course of action and to add possible, missing information, closing.
2.3 Catalogue of Working Questions

Characteristic for focus groups is a catalogue of working questions. That is the reason why the method is also called „focussed interview“ or „structured group interview“ (Witte 2002: 3, Lamnek 1998: 18). For the moderation of our focus groups the so called „Questioning-Route“-Technique1 was used. This method asks for a pre-fixed list of working questions that are sequentially posed to the focus groups. This standardization enables the researcher to compare the results of different focus groups to the same subject area. Alternatively, the team was prepared to use the „Topic-Guide-Technique“ (which includes variations of the program and prompts by the moderators) in case the discussion would not proceed.

The moderators introduced each stimulus in order to ensure that the participants focus on those issues that are of prime interest to the researchers. In addition, the participants were encouraged to add their own topics if they felt that other aspects were important in connection with risk communication.

The following list of questions was prepared for each of the phases:

**Phase 1: Welcome and introduction**

**Topics and guiding questions**

- Round of introduction (Name, profession, institution/company)
- What are your tasks (What is your job? Your profession?)?

**Phase 2: Introductory questions**

**Topics and guiding questions**

- To which chemicals do you think are you exposed to in everyday life?
- How do you inform yourself about risks of chemicals?

**Phase 3: Transitional question**

**Topics and guiding questions**

- Have you ever considered cumulative risks? What is your understanding of this term?

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1 The „Questioning-Guide-Technique“ fixes exactly the working questions in the preposition of the focus group, whereas the „Topic-Guide-Technique“ only gives a list of topics, and let the moderator formulate the questions (Witte 2002: 12).
Phase 4: Main questions

Stimuli

- Respirable dust in the Leipzig Region

Topics and guiding questions

Communication context

- What should be communicated (frame) in this case and to whom?
- What could cause problems of understanding or comprehension?
- What channels are most preferred (least important)? And why?

Special topic: media types

- Second stimulus: Different media types/material such as brochures, press article, web-site in the internet, testing reports from different organizations (Industry, government, NGOs, consumer services etc.) about pesticides in the environment
- Which kind of media do you prefer? Brochures, maps, short press article, web information, newscast? And why?
- Who should communicate what (credibility of authorities, press, NGOs, researchers e.g.)?
- Which channel is credible? Why are some sources more credible?

Uncertainties

- How do you experience uncertainty (associations)?
- What do you want to know about uncertainties? How do you deal with the disagreement among experts with respect to possible negative impacts?

Phase 5: Final

Closing question

- What do you recommend now? What lessons do you want us to take away from this focus group exercise?
Agenda of Focus Groups

2.00 pm  Welcome, goals and programme of the focus group

_Moderation and Inputs: Christina Benighaus, DIALOGIK_

2.15 pm  Communication of chemical risks

- To which chemicals do you think are you exposed to in everyday life?
- How do you inform yourself about risks of chemicals?
- Have you ever considered cumulative risks? What is your understanding of this term?

3.30 pm  Coffee break

3.45 pm  Communication of chemical risks

- Communication context and credibility
  - What should be communicated (frame) in this case and to whom?
  - What could cause problems of understanding or comprehension?
  - What channels are most preferred (least important)? And why?

Special topic: media types

- Which kind of media do you prefer? Brochures, maps, short press article, web information, newscast? And why?
- Who should communicate what (credibility of authorities, press, NGOs, researchers e.g.)?
- Which channel is credible? Why are some sources more credible?

Uncertainties

- How do you experience uncertainty (associations)?
- What do you want to know about uncertainties? How do you deal with the disagreement among experts with respect to possible negative impacts?

4.45 pm  Resumè

- What do you recommend now? What lessons do you want us to take away from this focus group exercise?

5.00 pm  Finish of the focus group
3 Results of the Focus Groups

3.1 Exposure to chemical Risks in Everyday Life

*Question: To which chemicals do you think are you exposed to in everyday life?*

**Chemicals omnipresent in every day life**

The first guiding question opened the discussion. The facilitator asked *“Think about the normal routine of a working day, when do you come into contact with chemical substances, what is in your mind? Think about your job, housekeeping and family life.”* The group of mothers listed as main candidates for chemical risks:

- Food, drinking water
- Packaging material of food and drinking water (plastic bottles)
- Toys
- Clothes, shoes
- Indoor pollution through paint of furniture and floor
- Printer's ink of newspaper or paper money
- Detergent and cleaning agents, sanitary products

The group of mothers shared the view that chemicals are omnipresent in everyday life. The following quotes illustrate this perception:

- “All objects contain chemicals. Chemical substances are anywhere in my mind.”
- “The whole life is contaminated with chemicals. All things we use are chemicals, all is chemical, but we can’t go back and life without them”.

The members of the group were, however, not overly concerned or worried about multiple chemical exposures. *“I’m not driving myself crazy. I have the feeling, that it could be dangerous and try to minimize it but I don’t read all things about the topic.”* Some of them reported they would be aware of the warnings or recommendations that are reported in the media. However, they would not like to spend too much time thinking about risks and would mostly ignore them. *“I act on impulse. I’m interested in a product. I look it up in the internet, if the product is tested or not tested.”* They pay only attention to warning information when they buy food, clothes or toys. They focus their attention on special items such as fruit, vegetables or mineral water. Due to some actual reporting in the media about softeners in rubber shoes and cloths they were also concerned about crocs and “mud-trousers”.

**No worry about the exposure of chemicals**

The students associated a broader spectrum of chemicals when thinking about chemicals in everyday life. They listed in addition to food and packaging material or cleaning detergents, the indoor and outdoor pollutants, ultra-fine particles and hazardous chemicals in general:

- Food with food additives, pesticides and nitrates,
- Plasticizers such as phthalate, acids and bases, chemical elements (nickel, antimony, lead)
- Packaging material of food and drinking water (plastic bottles)
- Detergent and cleaning agent, sanitary products, cosmetics
- Gas propellants of aerosol cans
- Building materials, thermal insulation of buildings, polychlorinated biphenyl (PCB), formaldehyde
- Smoking
- Noise
- Exhaust gases from traffic, particulate matter, respirable dust or nano material
- Mildew and mould.

Similar to the mothers’ group the students also explained that they are permanently exposed to a mixture of chemicals, as “clothing, food, in housekeeping, medical area as drugs, in the job such as lubricants of machines.” “We are totally exposed to chemicals”, one student said. They expressed that they are not worry about the chemical exposure at all. Both students’ groups explained that they will be normally informed indirectly by the media and don’t search actively for information if they are not personally concerned. “Only if the risks concern me I would inform me.” “Most of the time we are using products that are in everyday use and we don’t think about the usage. I inform myself only when I am directly confronted with or when I got ill.”

Only if they are affected individually or got ill they would collect information about the topic. “I don’t inform myself. If there are crucial issues, temporary discussed in the media or in our group and than it could happen that I inform myself a bit more.” Some of them mentioned they acted on the basis of their instincts and gut feeling (“Bauchgefühl”) as some of the mothers do too. “I bought the tooth path, and changed to another type. I ask my instinct.”

When they are buying products, some of them explained that especially for food, they sometimes look from which country the products originate. They prefer to purchase locally grown produce because they think the exposure with chemicals from local products is less.
3.2 Combined Chemical Risks

Questions: Have you ever considered combined risks? Do you know the term “cumulative risks” or “combination of risks”?

The term “cumulative risk“ or “combination of risks” is not common

The term “cumulative risks” is not common and most of the students and mothers have not heard anything about the term or its meaning. Some of them infer that this term includes an interaction of substances or a cumulative impact, but they are not sure about it. They understand the concept however when the moderator explained the analogy with “medication and alcohol”. Some mothers mentioned allergies as a problem of mixtures. They wanted that regulatory agencies should inform consumers about the effects of mixtures.

Mothers answers:
- “I have no idea about the meaning of the term.“
- “That could be dangerous substances in a product which could activate allergies?”
- “More risky impacts of substance.”
- “What I guess is very important in this context that the public should be communicated that we have new diseases such as Neurodermatitis with implication on pollution. These diseases are not well known in the public. And that it would be very important to show the public which new diseases children can get, to make them aware and to show how to handle them and protect themselves beforehand.”

Students answers:
- „I don’t know the term. “
- „A product, which is under suspicion to be pathogen and a threshold does exist which is an individual case, not dramatically but in combination with a second product which is pathogen too, the excess of the threshold has dramatically implications."
- “Chemicals are in an individual case harmless and in combination dangerous as the combination of drugs.”
- “Spontaneously I can say nothing.”
- “It could be the combination of drugs and driving a car.”
- “Chemicals and detergent and cleaning agent react in combination?”
- “A substance source with acid will produce a gas which should not be inhaled.”
3.3 Sources of Information

Questions: How do you inform yourself about risk of chemicals? What are your sources of information?

Mouth-to-mouth recommendations and magazines are perceived as credible

The mothers with little children got their information primarily from TV, newspapers or internet. They prefer to consult the local newspapers or the TV newscast. Beyond this they would not search for information. “Local newspaper, otherwise it won’t reach me or reach me too late.”

“I’m lazy: in the newscast on TV.”

But some of them also systematically read independent magazines with testing reports, such as “Oekotest” or “Stiftung Warentest”.

Other sources of interest are magazines or pamphlets about education, caring children, from “bio-supermarkets” or public institutions. One woman collects information (pamphlets) from the stakeholder organisation/NGO Greenpeace. They also use mouth-to-mouth as an important source and ask friends or the neighbours in order to receive more information about a particular product.

The group of mothers explained that it is not a problem to get information if one wants this. But the main problem is to find out which information someone needs to know. “If I need information I will get it. More complicated is to know which information I need, which topic is interesting for me.”

Another remark referred to the quality of information: The information on TV is not detailed enough because the coverage is normally too short. The information should be, however, more detailed, balancing the pros and cons and showing various options for how to handle the hazard.

• “I need information more in detail. The newscast is not informative enough and influenced by the economy.”

• “In the newscast we don’t get such information at the moment, but I can’t image that they will do this, but if yes, it would be perfect.”

In summary the mothers preferred a more cautious approach to risk taking compared to the students. But some of them also trust their “gut feeling”. “I’m pragmatically. Some products are discarded because of a bad reputation or the price-performance ratio. That can be a prejudice, but anyway I have to justify my action for myself. I have a “gut feeling” that always served my well.”

They consider the information that they get from the normal reading of newspaper or newscast reports but normally do not search for information of their own.
Mother’s answers:

- “I got the advice from the newscasts. I don’t read systematically testing magazines.”
- “I read Oekotest, this is the first magazine which I have in the hand when I get a bundle of magazines every week. I don’t like the magazine but there are sometimes very interesting topics. In case I want to buy a product, then I look in the Internet if the product is tested or not tested.
- “Now I read only something what is in the newspaper or the newscast, but I don’t read any magazines anymore.”
- “I proceed different. I have my products which I buy since years and I buy this product continuously as long as an advice arise that this product isn’t recommended anymore. Then I buy another product until a new advice, normally on the newscast, is given and so on. In the meantime I live under an illusion of security.”
- “My neighbour informs me about the potential hazard of plastic bottles. He knows all things about potential risks and I ask him”.
- “I tried to life different, not with a “gut feeling”, but this costs a lot of time and in the end I was totally insecure what to buy and eat and not more intelligent than before. Then I have consequently stopped reading testing reports or magazines.”

Internet and mouth-to-mouth recommendation preferred sources

The two student groups gave similar answers when asked about their sources of risk information. The students got their information mostly from the media, i.e. newspaper, TV features or the Internet. Some of them tend to read the product descriptions and labels when buying a product. Similar to the mother samples, mouth-to-mouth recommendations were highly appreciated and appraised as mostly credible and reliable. Some of them receive information from their parents, their working groups or friends. If a friend told them about a potential risk, they would trust him more than a non-personal source such as media report or a science-based brochure. Some would not even check the information but act immediately in line with the friends’ recommendations.

Selected students’ answers:

- “We are desensitised about risks. First risks come to our attention by the news in newspapers TV or radio and then I inform myself. I’m not the person who will search for information.”
- “I don’t search about risks. I got informed by the media, newspaper or news on TV and if I think that could be relevant for me I would inform me in more detail.”
- “If someone will tell me personally, „I have read…” then I would inform myself about the issue.”
- “I got a mouth-to-mouth-advice from someone about a hazard. I would act on this
recommendation and don’t get more information about the issue."

3.4 Commitment to Communication

Questions: Who should communicate? What sources are least important?

Commitment of chemical risks
With the next guiding question the moderator focused on the risk communicator. Who should communicate the risks? The mothers listed their priorities (in descending order):

- Federal Institute of Risk Assessment in Germany (after they have heard of its existence)
- Newscast on TV
- Local newspaper
- Special magazines which mothers should get for free
- Information leaflets, picked up in the community centre, local magazines such as eco-news or Rhein-Neckar-Child
- Information leaflets in the local newspaper
- Child care professionals (kindergarten staff)
- Parents-child-newspapers
- Paediatrics or physicians
- Hospital staff, health insurance professionals

The mother group was aware that they could not escape the exposure to chemical risks. They felt it would be the task of the regulatory agencies to secure that they are protected from exposure to highly risky conditions. “The task of the regulation/policy is to secure that the contamination of the public is as low as possible.”

The students listed their first priorities in terms of contacts:

- Ministry of health, health authorities
- Relying on different sources rather than on one
- Internet
- Newscast and newspaper
- Institutions of the EU
- Independent institutions (scientific sources)
- Consumer protection groups
- Research papers
- WHO
The students explained that they expect the information to be authorized by agencies and free to use. They demand information from an authorized institution, because this “sounds always very well.”

**Federal Institute of Risk Assessment in Germany**

Neither the students nor the mothers were aware of the Federal Institute of Risk Assessment in Germany, the national risk agency responsible for assessing and communicating health risks to the consumer. As the facilitator explained the tasks of the institute, some participants got more interested in the institute and asked for the Internet address. They explained they would consult the webpage in the future.

### 3.5 Trust and Credibility in Sources

*Questions: What sources are most preferred (least important)? And Why? Which source is credible?*

**Mothers trust in regulation and magazines**

The mothers have confidence in governmental and/or independent institutions. “I would trust the federal institutions, but normally they are too late with their information.” They do not trust institutions paid by industry. “I ask myself why someone is doing something.” “I won’t trust the chemical or pharmaceutical companies, who sell the product.” “I impute the companies that they like to earn money.” Some of them make their buying decision in addition to price depend on the test results of magazines and personal recommendation of friends, relatives or neighbours. “I like the independent institutes which are not influenced by industry.” They actively look for product safety, study the ingredients or possible emissions, and consider health consequences and search for potential side effects of the products.

However, as explained earlier they do not spend much time for these activities. The mothers rely on consumer information in popular magazines that include consumer tests and compare the results. They often internalize the quality criteria of the tests in the magazine propose for evaluating products when buying products. In addition to magazines, they place high trust in mouth-to-mouth recommendation similar to the student samples.

Some of the mothers explained that the magazines have raised their awareness of product risks.
They tend to act in accordance with the recommendation in the magazines, but still are uncertain whether they can trust these tests. On the one hand it is an easily available source to justify their purchases but on the other hand they experience confusion when the test results differ in the various magazines and/or different aspects receive more or less relative weights (such as health impacts versus price).

They explained that magazines from “Stiftung Warentest” (the official journal of the national consumer organisation) give more technical information on overall quality or safety whereas magazines such as “Oketoest” (a commercial magazine focusing on consumer risks from an ecological viewpoint) focus more on health impacts of the consumer and the environment.

In summary: The tests do not satisfy their needs for questions such as: Can we buy these products or not when tests reveal small fractions of pollutants? Are the testing strategies sufficient and complete? What about products where the composition changes every day such as milk and butter?

Mothers’ answers:

• “I trust the channel/sources less when I know they earn money.”
• “German Standing Vaccination Committee: They work independently. I trust them.“
• „I have been totally concerned with vaccination. The German Standing Vaccination Committee does not write anything about damages of vaccination.”
• “If it fits to my plans I would act on the testing reports of the magazines, but if the effort is to high, for example, the store is in a different quarter of the town then I buy the product else where. I would buy the second best rated milk.”
• „I read the testing reports; I know the milk from Aldi (a low-cost-supermarket) is tested excellent. I buy the milk and I feel safe.“
• “The testing reports are not helpful. I read Oekotest to know something about the health of the products and Stiftung Warentest to get information how the products work and if they are functional and effective.”
• “Should I buy a product which is effective or the product which has the best testing report? This makes me angry. For example “Dandruff Shampoo”, I know both but this doesn’t help me to decide. I have to decide in which direction I want to go less healthy and more effectiveness or vice versa.”
• „I bought the baby food from organic food-shop. After years I read that this was just the products which was tested insufficient and had the highest contamination.”
• “When I am reading the testing reports, I am asking me, is it really dangerous? In which extent, when it is a hazard? What does it mean, can’t I buy the product?”
• “What about milk and butter? What is when the composition is changed every day? Can I trust the results anymore?”
Students trust in regulation

The students’ value diversified and heterogeneous sources because in their eyes nobody is truly independent and most likely paid by someone. They do not trust any institution neither the European research institutions or regulatory agencies nor the universities. “I don’t trust any source.”

They believe that many research projects are paid by the industry. They have experience with the experts’ dilemma: “If one institution saying this is right and another institution this is wrong who then is right?” If many studies from different institutions go into the same direction, they will assign more credibility to the results.

When they buy products they do not think about risks and trust the products, which are on the market. Indirect they trust the German regulation of risks even though they have hardly any idea of how the regulation is organised. “I trust the German regulation. I’m not informing myself about risks. I will not read about risks by myself.”

In most cases the price is the main determinant of their choices of products. Reputation also plays a role as well as brand names. The respondents felt that products from a good brand could be associated with better health effects than no-name products. “Sometimes I buy a product which has a good reputation and is more expensive than products from Aldi as a low-cost food market, but normally I trust the regulation and don’t inform me about possibly risks of products.”

Some of the students explained they rely on their gut feeling. They agreed with the statement: “Intuition is a good guide for action if none of the sources for information is trustworthy”. They liked industry to be openly named and blamed by public authorities if they violate any regulation. They believe that this is a good practice in other countries.

In contrast to the mothers group most of the students reported that they would not read consumer magazines. Similar to the mothers the students had only little faith in TV reporting. They found the TV newscast to be too superficial to get a full picture of the story. However, they acknowledged that public TV stations (there are two man nationwide public stations in Germany) do a much better job in providing accurate and complete information than the private companies.

More students’ answers:

- “I trust that the products which are on the market are safe and that there is no direct hazard for me in buying and using them.” “You have a transmitter and a receiver and the transmitter will influence you always.”
- “I have to trust one source but I will do this only if there are multiple sources which are telling the same.”
- “I need information from different sources.”
- “I always ask myself if the risk is really a huge one and in most cases I got the feeling there
is no danger for me.”

- “I can’t know and assess all the risks which are possible. Sometimes I look closer while buying clothes, but I have not the time and money to inform myself. I have trust in the products”.

### 3.6 Evaluation of selected Media Material

The participants were asked to review material from five different sources providing basic information about chemical risks, mostly pesticides.

1. **Governmental institutions:** such as the Federal Institute of Risk Assessment and the Federal Environmental Institute (the German equivalent of the US EPA)
2. **Chemical company:** Beyer
3. **Stakeholder initiatives, NGOs:** Greenpeace, foodwatch or PAN (Pesticide Action Network)
4. **Consumer initiatives:** Stiftung Warentest, Ökotest, consumer information centre
5. **Knowledge Institutions:** Wikipedia and an independent research lab called the Environmental Research Institute

**All respondent voted for governmental institution as communicator**

All mothers placed the governmental institutions on top of their priority list. They also liked to get information from independent consumer initiatives and a few from Greenpeace. Several participants assumed that NGOs inform consumers one-sided and often incorrectly.

The media material from the Federal Institute of Risk Assessment was evaluated as being most informative. They liked the quota listing of references, but there was also agreement among the group members that the communication was not very attractive. “The brochures from the governmental institutions motivate me to think about hazards. And what is really good that they list the persons or institutions that have written or have been involved in the development of the brochures”. Nobody trusted the information from the company.

The group of students also placed most trust in governmental institutions, but added the consumer magazines. Consumer information centres and Wikipedia were important additions to the governmental viewpoint. Most of them were not or only slightly aware of the consumer test magazines and the local consumer information centres before they received the material during the focus group. They could imagine that they will use these sources more often from now on.

The information from these sources was rated as being easy to read, comprehensible and complete. The brochures of the governmental institutes were criticized of being too wordy and not enough illustrated.
• “I would use the governmental institutions as a source.”
• “I always visit the internet and search in wikipedia. If the article is written by many users I trust them, if it is written only by one, I would not take over the opinion.”

It was important for them that they did not feel coerced or directed into a specific judgement but exposed to neutral information or arguments from both sides in order to make up a decision of their own. Normally they would use the Internet as a first contact source. They explained they would search for information on all sides of an opinion and construct their own judgment on the basis of all the information available. Greenpeace and Bayer were both seen as extreme in their position. The group lauded Greenpeace for having the most appealing layout, for offering attractive brochures and for easily grasping conclusions and recommendations. However, the level of trust in Greenpeace was low and was similar to the trust in the chemical company. Both sides so the common accord want to sell their specific point of view to the audience.

• “If only one side is reported then it looks like someone intends to influence me.”
• “The governmental institutions? They inform moderate in between extreme positions. The consumers should decide by their own.”
• “Bayer communicates not false information but doesn’t report the negative side.”
• “Greenpeace is right. It explains what I should do exactly.”
• “Greenpeace isn’t independent. It is a company, which has the task to persuade the public. It is the same like Bayer. I wouldn’t trust them.”

4 Case Study “Health Hazard Respirable Dust” in the Leipzig Region Germany

During all three focus groups the moderator presented a poster (depicted below) entitled “Health Hazard Respirable Dust” published by the NoMiracle partner “Center for Environmental Research” in Leipzig. It informs the reader about the hazard of respirable dust with indoor and outdoor exposure. The poster starts with the common question “Did you know, that…” right in the centre and is structured into four sectors explaining the problem.
4.1 Issues of Communication

Questions: What should be communicated (frame) in this case and to whom? What should not be communicated? What information is missing? What kind of information do you like?

Statistical data and personal recommendations are required

The mothers’ group analysed the poster and listed the following questions and issues of what they want to know about the case and the risk behind:

- “What are the implications?”
- “How is the statistic calculated? How can I know that respirable dust is more dangerous than alcohol or smoking? How can I know that more people die because of respirable dust than of alcohol or smoking?”
- “What does respirable dust in a room mean? How many thousands of candles do I have to light, that the dust in a room becomes dangerous for me? What is about cooking and roasting in the kitchen?”
• “I need numbers, how much is in it.”
• “What is the government doing against this problem?”
• “What can I do as an individual?”
• „How can I avoid the contamination as an individual?“
• “What are the solutions to avoid the respirable dust? Light no candles any more? Using an extractor hood or a vacuum cleaner?”
• „I can’t avoid the contamination as a single person completely.“
• “The problem is that we are endlessly overtaxed. If I live in a street what can I do to prevent respirable dust? Shall I move?”

They wanted to know how the statistical data are calculated and they asked for recommendations how to handle the hazard and reduce their personal risks of exposition.

**Statistical data, insights and recommendations are needed**

The two students groups raised the following questions about the case and specified their information needs:

• “What does respirable dust contain? What are the constituents? Which particles are especially dangerous? What is unhealthy? Lightening candles? Smoke of roasting or barbeque?”
• “How can we explain the statistic? How is the statistic calculated? How do they collect the data from for their statistic?”
• Why is the indoor pollution not reported in the media? Is the risk lower?
• Is that an European wide problem? How is it regional limited?
• What are the sources of respirable dust? Where does is come from? What is the composition of respirable dust? What are the reasons for? Is it the industrial development? Is it the loss of expectation of live in combination with the industrial production? What was the development of respirable dust in the last 100 years? Is the problem more drastic? What are the natural values of respirable dust?
• What will happen if the human is exposed to respirable dust? What could that mean for me as individual? What are the diseases that I can get from respirable dust? Is it life threatening?
• What are recommendations to avoid the risk?
• How can I protect me? What can I do as an individual person? If we are exposed to such a high contamination, how can I stay alive? How long can I am exposed to respirable dust without any risk?
• What does 50 ug/m³ mean? Is this dangerous? Is it sufficient to get the doses once or rather over the years to turn to be dangerous? What is the scale? I can’t image anything about the “m³-unit”. Could the unit be changed?
• Make the threshold sense? What is the basis?
• How is respirable dust measured? Which locations are chosen and why?
• How consistent are the research studies about respirable dust and its implications? Are the research reports different or are they all giving the same results? How was the research done?

The students commented it would be helpful to know all facts and details in order to make their own decisions. Many of them wanted to know how the statistical data was calculated. They demanded more insight information as a means to understand the seriousness of the risk. One student quoted a well-known German statement “The only statistics you can trust are those you falsified yourself”. The statistical basis should be absolutely clear and every step of the calculation should be reproducible. They also asked about the sources of respirable dust, how it is measured and whether the problem is an industrial one or also exists in nature.

They wanted to get recommendations of how to handle the hazard and what they can personally do to reduce their risks. However, they would not follow these recommendations if their behaviour were overly restricted. They would like several response strategies for behavioural changes from which they could choose.

5 Recommendation for Risk Communicators

5.1 Dealing with Uncertainties

Questions: How do you experience uncertainty (associations)? What do you want to know about uncertainties? How do you deal with expert dissent with respect to possible negative impacts?

Right to know how it is, but no overtaxing

The opinions of the mothers group were split. Some of the mothers wanted to know the full picture or as they said “How it really is”. The uncertainty of a potential hazard should be communicated, along with the possible implications to human health and environmental quality. People should have the right to know the present status of research including the problems and uncertainties associated with the results. The government should tell the public that a recommendation on a safe dose could not be given with a high degree of confidence as long as the research is still inconclusive or ongoing. They claimed that they understand the problem of uncertainty and that information about the remaining problems and knowledge gaps is essential for gaining an adequate picture of the respective risks. Furthermore, waiting for certainty in the results would mean to leave the public in the dark for a long time.

• “They should communicate how it is.”
• “I like to know what they know.”
• “They should tell us that there is a huge uncertainty and not all things are yet analysed. They should tell us that there is a coherent between pesticides and Parkinson and that it is not clear which pesticides are dangerous or how much we can consume. And a threshold doesn’t exist at the moment.”
• “For me detailed information is important because that helps me to build a rounded overall picture. I see more clearly.”
• “I like to know things as early as possible. Not when they got all the information in the end.”
• “I would like to know the information even though the coherent isn’t clear between Parkinson and pesticide.

Other participants in the mothers’ group saw no need for information about uncertainty. They only wanted to be warned when a hazard is clearly present and effective recommendations to prevent exposure could be given. They wanted to know how to avoid a hazard if experts are sure that such hazards exist. They did not want government to communicate uncertainty or to be confronted with a wide range of possible but uncertain hazards. As long as these hazards would not affect their lives, they rather would not like to hear about them. They expressed a feeling of being overtaxed or even disturbed when they are asked to act on uncertain situations to which even experts had no clear answer.

• “They should communicate how we can handle the hazard and uncertainty.”
• “We would like it is safe, I would like to know how I should act.”
• “I don’t like to know all things; I would get nervous. I don’t like to know the uncertainty. I like facts.
• “I don’t like to know the coherence of pesticides and Parkinson disease.”
• “Pesticides can cause Parkinson. And what shall I do now?”
• “I like to know how to handle it. What can I do?”
• “It is not wrong that the information do exist, but I don’t like them to know, only if they are relevant for me.

Background information and own decision-making wanted
The students had a more unanimous opinion. They wanted to be informed about uncertainties. They want to learn about the properties of chemicals, the potential causes for toxicity or eco-toxicity even if the research results are still inconclusive. Governmental institutions should provide the foundations for making people knowledgeable about their risk reduction options but they should not intervene in the process of decision-making when consumers make their choices. The students asked for factual background information and carefully drafted recommendations so that consumers are empowered to make their own prudent choices. At the same time, the
students demanded that the information should be simple and easy to understand. Consumers
should be able to use the recommendations when shopping in the supermarket. Some students
stated it would be better to use a higher safety factor in order to be on the safe side in the face of
uncertainty.

Comments on the uncertainty of information from the mothers group:

- „They should tell us the studies they know and explain us what they know and tell us that they
  still do research for a better understanding. That would be credible.“
- “The government should only tell us the facts and the coherence what we could not know. They
can give a careful recommendation.”
- “They should tell us the facts but without any evaluation of the facts.”
- “I ask for more information about the substance and the effects.”
- “The consumers should be better protected. They should weaken the consumption and set the
  safety factor high enough.”
- “Years later, they communicate false, I won’t trust them anymore.”
- “Governmental institutions should not communicate safety if it isn’t there. Otherwise I
  wouldn’t trust them anymore.”
- “The government should not intervene in this discussion otherwise I can’t trust anybody
  anymore.”
- „I wouldn’t be interested in listening to anything that is not clear.“
- „Thresholds don’t attract public and media attention.“
- “In the normal live I would not think about the reliable of studies.”

Comments on the uncertainty of information from the students group:

- “I would use all information sources.”
- “10 institutions, 10 opinions. I like that.”
- „I compare the answers and if the topic is interesting for me or concerns me, I would make
  up my own mind.“
- “I will listen to two or three opinions in this topic.”
- “I would compare the opinions from Greenpeace and Bayer and would take the middle
  position.”
- “I would trust the person who I would think he or she is more reliable.”
- “They are both reliable. I would rely more to the position which is less dangerous because I
  believe in engineering.”
- “I would believe in the more dangerous position.”
- “I balance with my own gut feeling.
- “I would use all sources including Bayer. If they all say the substance is toxic it is easy, if
  only Bayer says it is harmless I have to build up my own opinion about the safety.”
5.2 Recommendations for Credibility and Trustworthiness

Questions: What should the communicator do in order to appear credible and trustworthy?

Recommendation for the better communication

The information should be presented in a fair manner (providing arguments from all sides), highlighting the pros and cons of the respective products or services. If credible studies differ in their assessment, the range of results should be reported. Sources who are emphasizing the positive effects only are met with distrust. The mothers wanted to be respected as a sovereign individual who has the right to know all effects and implications, who is aware of the consequences of different behavioural options and who prefers to decide on their own without paternalism from third parties.

Some of the students think that overstating the seriousness of the hazard could be helpful to get public attention and to persuade people to take the risk seriously. But if people felt forced to take action they would probably ignore the recommendations. So the risk communicator has to balance between the task to reach public attention and communicate open, neutral and trustworthy. In addition to the statistical information they would recommend messages with emotional appeal. Useful would also be a story illustrating the risk. “Pure numbers do not sell”, was the main accord of the student samples.

The students recommended four components for an effective risk warning:

- A factual statement about the risks (statistical information)
- An affective or emotional appeal to the consumer of the information
- An explication of the consequences for each individual if the risks are ignored
- Recommendations of what each person can do to protect him- or herself from the hazard

The respondents (mothers and students) mentioned the short half-life of warning information. If risk disappears from the media, people tend to forget about them unless a new routine has been established. One participant stated: “Two years ago, it was Benzopyrenes, no one wanted to eat crisp bread and cornflakes but today nobody is interested anymore”. They also recommended to the risk communicator to gain momentum by inserting sustainable changes to daily routines. The adaptive behaviour would need to be internalized in a person’s agenda.

Here are the mothers’ answers:

- “I have informed me about disadvantages of vaccination in thousands of sources. I'm frightened about the damages. I know the vaccinations help, I know people with injuries that
the Commission would never report.”

- “I have read books about disadvantages of vaccination. They were not great. I have only seen a film which showed the pros and cons. I wasn’t more intelligent afterwards, but there was only one physician who explained that: The injuries of immunisations are awful. There are injuries from immunizations, but we have to live with the injuries and they are very seldom. That is information. That is coherent. But not to say they don’t exist, that is not correct.”

In the end the mothers recommend to inform the public early about potential hazards and give them the opportunity to decide what they deem relevant for their own life. The public would be able to understand and handle risks better if the implications of the risk are related to their own life. If then uncertainties are present, it may be beneficial to report about them as well. “If the public is informed earlier, the public opinion is more sensible for hazards and they can react earlier.”

The students suggested to rely on the so-called light system that enables consumer to make better choices. This instrument has been applied by Greenpeace in their risk communication strategy or on energy efficient refrigerators. They welcomed variety and diversity in information sources. As mentioned before they like to be able to balance risks and benefits, the pros and the cons, the positive and negative effects.

The short quotes “We are all prejudiced”, „Communication is better than no communication” and “Uncertain communication is better than a false communication” illustrate the challenge to communicate risks in a way that meets the expectations of all target audiences.

6 Conclusions
Chemicals are part of our every day life and we are exposed to them in clothes, consumer products, housekeeping items and drugs, or in our professional life. All participants were aware that they are exposed to chemicals every day, but they are not overly concerned about risks. Risk is a part of life seemed to be the predominant attitude.

Getting information from the media
Most of the participants received information about risk from the TV and print media, or the Internet. An additional important source is mouth-to-mouth communication with friends and neighbours. In everyday life most of the respondents are not actively searching for risk information but pay attention to such information if presented in the media. They are likely to get confused with a multitude of information although the student groups expressed a preference for diverse and multi-stakeholder information as a means to make up their own mind when
confronted with controversial viewpoints. Most respondents were convinced that the German regulatory authorities are trustworthy and that the information that they offer is basically unbiased and accurate. Beyond the access to information through the media they claim to act predominantly by intuition and gut feelings. Some of them, especially the mothers rely their risk judgments on the results of test published in consume reports and magazines. They use these magazines to learn more about food safety, environmentally benign products and health risks of clothes or special products. Learning about the test results, however, does not mean that the respondents acted accordingly. Many students and some mothers stated clearly that the price of a product is the prime reason for a purchase and that a negative test report would not automatically imply a negative decision to use or buy such a product. Often the focus group participants expressed their confusion about contradicting information. The students believed that all sources of information are more or less biased and that such biases prevent clear-cut recommendations. The mothers put more faith in regulatory agencies and the consumer magazines without taking them too seriously in their own purchasing behaviour. All agreed that the communication should be focused on relevant information and limited to the amount that is necessary for consumers to make prudent choices. However, the groups differed, for example, in the extent that they would like to receive information about uncertainties or gaps in expert knowledge

**Types of information**

First respondents expressed a clear preference for simple and comprehensible information. They want to have the facts without any (paternalistic) evaluation in order to make their own decisions. They want respect for their own capacity to decide what is good or bad for them. In summary the message should contain four components when communicating chemical risks:

- A factual statement about the risks (statistical information)
- An affective or emotional appeal to the consumer of the information
- An explication of the consequences for each individual if the risks are ignored
- Recommendations of what each person can do to protect him- or herself from the hazard

Uncertainty is not easy to communicate and interestingly enough. All participants do not request it: The students opted for open communication about all uncertainties and research and knowledge gaps. Most mothers, however, wanted information about uncertainty only when it had a measurable impact on their own life. Risk communicators should be advised to make information about uncertainty available to those who want to be informed but there is no need to provide this information to all consumers.

Trust is a critical issue. Although the governmental agencies and research institutes received a high degree of trustworthiness most students and several mothers expressed a clear preference for information from both sides. They want to know the pros and cons from those who represent
them in their views. Risk communication should therefore include information about benefits and risks of a product, preferably citing those actors who have taken stances in the debate.

Sources of information
All participants assigned the highest degree of trustworthiness to governmental institutions, which were seen as less biased as other potential sources. Second in the list of trustworthy institutions came the offices of the consumer associations and the communication channels of various NGOs. However, NGOs were seen as biased in their opinion, yet the information presented from NGOs was rated as interesting, attractive and easy to understand. We would advise a risk communicator to report about different opinions and present the pros and cons before making a recommendation with respect to the behavioural options. Again several options are better than one if these options can easily be explained.

For day-to-day information most of the participants prefer TV news or local newspapers. They are aware, however, that risk coverage on TV is likely to be superficial. Since risk is not the most important item on their attention list, they are satisfied with what the electronic media offer to them. However, if a crisis occurs or a risk seems to be close to home, they actively search for more information in the print media or the Internet.

It is interesting to note that both groups place high trust in mouth-to-mouth information. Normally the information they get from a friend is probably as biased as any other information in the media. But trust in the positive intensions of friends or neighbours compensate for potential bias and play a major role in the opinion forming process. For risk communication to be effective one should place more emphasis on developing informal networks that can act as catalysts for adequate information transfer. It would be important to educate opinion leaders in different communities such as in kindergarten, the community centre and others.

Cumulative Risks
The participants are not aware of combined or cumulative risks. Asked to comment about them they tried to mobilize common sense but were basically unable to rely on previous information. Obviously there was little interest in this issue. It may be difficult to include information about cumulative risk in communication programs.
References


