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Public Understanding of Chemicals and Chemical Risk Information

Abstract. The public needs to be literate in chemistry both to understand the surrounding world and to be able to be actively involved in democratic processes. This paper concerns the public understanding of chemicals and chemical risk information. Preschool teachers and teacher students, representing the general public, have been asked about e.g. what they mean with “chemicals”, how they think chemicals are absorbed into the body and their view of the difference between natural and synthetic substances. Furthermore, their knowledge about some chemical substances – e.g. antioxidants and dioxins – have been investigated, and also their understanding of some different kinds of chemical risk information. For most of the informants “chemical” is synonymous to something synthetic, artificial, unnatural, toxic, dangerous and harmful. There seems to be a contradiction between the natural on the one hand and the toxic and chemical on the other hand. The common statement “the natural is always best” is problematized in the paper.

INTRODUCTION

The 1981 Nobel Prize winner in Chemistry, Roald Hoffmann (1995, p. 227-228), writes:

I view [general science] education as a crucial part of the democratic process, a privilege and a duty of the citizen. In fact, I’m not concerned about scientific illiteracy […] so much from the point of view of its limiting our man- or woman-power base or affecting our global economic competitiveness. What worries me about prevalent chemical illiteracy – a failure of the educational process – are two other matters. […] First if we do not know the basic workings of the world around us, especially those components that human beings themselves have added to the world, then we become alienated. Alienation […] makes us feel impotent, unable to act. […] My second point of concern about chemical illiteracy returns me to democracy. Ignorance of chemistry poses a barrier to the democratic process. I believe deeply […] that ‘ordinary people’ must be empowered to make decisions

In our contemporary and future complex society – characterized with both knowledge systems (Böhme & Stehr 1986) and diffuse risks (Beck 1992) – all citizens need competences such as ability to examine information critically and making well-informed decisions about e.g. life-style and consumption patterns (Jensen & Schnack 2006).

Beck and Beck-Gernshein (2002, p. 44) use the term “self-politics” when discussing the political implications of all the choices we make in everyday life: “[M]any new aspects become matters for decision. These concern […] various publicly contentious issues where the political bursts into the centre of the private.” It is about the many different matters connected with life and work, such as transportation, shopping and washing-up. Self-politics can be described by “ad hoc actions” of the individuals,
however influenced by e.g. mass media reporting. Hereby the – at least at the first sight – non-political actions of the citizens become political actions.

As citizens we are supposed to be “clever citizens” (Giddens 1994), not meaning more intelligent than before, but with a “practical ability to cope in a world where contradictory information and impossible decisions are the stuff of daily life” (Beck and Beck-Gernsheim 2002, p. 46). Giddens (1994, p. 7) himself writes: “Information produced by specialists (including scientific knowledge) can no longer be wholly confined to specific groups, but becomes routinely interpreted and acted on by lay individuals in the course of their everyday actions.” One such everyday action, with both health and environmental consequences is our choice of washing – or not – new textiles before using them.

It is mainly in decisions about health and/or environment, in a broad sense, where knowledge in and about science/chemistry is useful (Ratcliffe & Grace 2003). The competence of making well-informed decisions is often called “action competence” (Mogensen 1997). This term has been developed in democracy and environmental education and stands for citizens’ ability to act both on an individual and a societal level. It can be described by social, value-based, personal and knowledgeable aspects (Breiting et al. 1999, p. 47). According to Aikenhead (2006, p. 97) thoughtful decision making is a major component of socially responsible action and it can be enhanced by a more humanistic school science.

Based on an empirical research material in the form of semi-structured interviews with preschool teachers and questionnaires answered by teacher students, I will in this paper discuss the following research questions:

- How does the public understand terms like “chemicals” and “poison”?
- How do they think about risks with natural substances compared to synthetic?
- How do they think about absorption of chemicals into the human body?
- What knowledge do they have about some examples of chemical substances and chemically containing products, respectively?
- How does the public reason when making benefit-risk-assessments in everyday life decision-making involving chemical risks?

**METHOD**

The first group of informants consisted of thirteen preschool teachers that were asked about their thoughts about and relations to chemicals in products. This was done during semi-structured interviews going on for about one hour each. In the interviews the informants were asked to select – and give their arguments to why – in which order they would like to serve four different bottles of ketchup to children, as reported elsewhere (Sjöström 2010a), but also – as reported here – their associations about terms like “chemicals” and substances like “omega 3” etc. Furthermore, they were asked about their associations when looking at cards with some chemically related news headings and photos of different chemically containing products, respectively. The interviews were transcribed and selected quotations have been translated from Swedish to English.
The second group consisted of 33 teacher students that answered a questionnaire. The teacher students followed a course in general science (Malmö University: course code NM112F) for students with no previous background in science. The questionnaires were given two different times with different groups of students each time. Selected quotations have been translated from Swedish to English. In Table 1 there are aggregated background information about the empirical study and the informants.

Table 1. Background information about the empirical study and the informants.

<table>
<thead>
<tr>
<th>When?</th>
<th>Who?</th>
<th>Sex?</th>
<th>Age?</th>
</tr>
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<tbody>
<tr>
<td>13 interviews</td>
<td>From 22-05-2008 to 13-06-2008</td>
<td>Educated preschool teachers from nine different preschools in a middle-sized town in Sweden</td>
<td>Only women</td>
</tr>
<tr>
<td>33 questionnaires in total</td>
<td>Two occasions: • 04-09-2009 (15 answers) • 01-12-2009 (18 answers)</td>
<td>Mainly teacher students with different specializations: • 15: children and youth • 6: mathematics • 4: political and social sciences • 3: Swedish</td>
<td>29 women and 4 men</td>
</tr>
</tbody>
</table>

RESULTS AND DISCUSSION

Public understanding of chemicals

I will start with the question of how the public understands terms like chemical and poison. For most of the informants “chemical” is synonymous to something synthetic, artificial, unnatural, toxic, dangerous and harmful. One typical answer from one of the teacher students is: “Chemical” for me is something unnatural. Something that has been produced in a chemical way. I am thinking about cleaning agents, when I hear the word.” Except products like cleaning agents, some of the informants also say that they associate chemicals with additives, biocide sprays or pollution. When asked if they do think that all chemicals are dangerous a majority of the informants answered that they do not think that, but at least a third of them do actually think so. However, there are also exceptions with one student with an answer that could have been given by a chemist: “Chemical = chemical compound. Can be both natural and unnatural – toxic and non-toxic”.

When instead asked about the term “synthetic substance” eight of the thirteen interviewed preschool teachers associate it with something artificial. However, one of them said that she had never heard about it and three of them had a very vague idea about the term; they mainly associate it with textiles.
Environmental poisons ("miljögift" in Swedish) are associated with pollution, sprays and car exhausts. Five of the thirteen interviewed preschool teachers mentioned the BT Kemi scandal in Teckomatorp in Scania, Sweden in the late 1970:th. At least one of the informants does also think that a person can be an environmental poison, for example a car driver. More generally the word “poison” is associated with such diverse things as chemicals, radiation, diseases, HIV, drugs, medicines, vaccines and wasp stings.

What then does the public think about risks with natural substances compared to synthetic substances? From the answers it is clear that there is both a human toxicological aspect and an environmental aspect. The views of the interviewed informants are ranging from emphasizing “natural is always best” to “Synthetic substances can be similar to natural substances. It is only that they are made in an artificial way.” Many of the informants said that synthetic substances are worse for the environment than natural substances. One of the informants mentions textiles and say that production of a synthetic material is probably worse for the environment than the production of natural textile fibres. However, another of the informants is focusing on the human toxicological aspect and says that “there are many plants in nature that are more toxic and dangerous than what has been produced in a synthetic way.”

It seems common to think that there is a fundamental difference between the properties of natural and synthetic substances, although, as Hoffmann (1995, p. 113) points out, “[p]ure vitamin C, synthetic, is identical to natural vitamin C”. I will quote the popular lecturer Tommy Svensson for some examples indicating a diffuse understanding of that molecules identical of naturally occurring molecules can be synthesized chemically in a laboratory (my translations from Swedish):

The synthetically produced citric acid [E330] is not identical with the natural citric acid which can be found in for example citrus fruits. […] E330 has therefore nothing in common with natural citric acid” (Skånska Dagbladet 2010)

Synthetic betacarotene is suspected to increase the risk of lung cancer, while natural betacarotene contains a powerful cancer preventing substance (Svensson 2010)

Caffeine in energy drinks is often chemical […] Artificial caffeine can’t be recognized by our body, because we have not been in contact with it before and our organs have not learned to break it down. (Svensson 2007)

However, it is possible – but not probable – that Svensson is not referring to the identical molecules, but instead to the product formulations that can be different due to impurities, naturally occurring or from the production process. Hoffmann (1995, p. 113) continues the quotation above with: “a bottle of vitamin C made from rose hips is certainly not identical to a bottle of vitamin C made by a chemical manufacturer – at a parts-per-thousand level. I’m not implying that there are important differences, simply that there could in principle be differences in substances that are perforce impure and hence mixtures.” According to the health care company ACO (2010) synthetic vitamins are preferred to natural, because the latter can consist of allergenic impurities. Similarly, Obikoya (2010) writes: “It is ironic to note that some of the most highly contaminated products in health food history were ones which made the most fanfare of the ‘all natural’ issue”. However, he also writes:
A natural source contains co-factors that come with the nutrient in nature. For instance, some co-factors that are usually found with Vitamin C are various bioflavonoids. [...] Synthetic vitamins are made in a laboratory setting from coal tar derivatives. No co-factors are present. [...] In fact, the bioflavonoids are essential for better absorption. They increase bioavailability by 30%. This suggests you should take the natural form of vitamin C.

**Public understanding of chemical absorption**

How does the public understand the absorption of chemical substances into the human body? The interviewed informants were asked about the newspaper heading “Toxic substances in the blood” (“Giftiga ämnen i blodet”, Sydsvenskan 2007-11-28) and how they think toxic substances reach the blood. Some of the informants only mention food, whereas others also mention other ways of exposure and absorption, such as the skin, the air, piercing etc. When asked about body paints and the risk of exposure it was clear that there is a contrast between one of the preschool teachers that say that she have never thought about that substances in the paints can be absorbed through the skin and another that said: “Everything you take on the skin will pass, so I am not so very fond of that. You have holes all over the skin and if you put something on the skin it will pass.”

**Public knowledge about some chemical substances**

It is also interesting to study what knowledge the public has about some common chemical substances. Figure 1 shows the teacher students’ knowledge about some substances. For example all of them know what caffeine is, but none of them what dioxin is. About half of them know what antioxidants are.

![Figure 1. Teacher students knowledge about some chemical substances.](image)

In the interviews with preschool teachers some of the chemical substances were also discussed. Just like for the teacher students about half of the preschool teachers knew what antioxidants are. However, for trans fat and acrylamide a higher percentage of the
preschool teachers knew about the substances. Most of them knew about trans fat, although many mix it up with saturated fat, and about half of them knew about acrylamide. The reason for this is probably the much higher average age of the preschool teachers and that they mainly have learned about trans fat, acrylamide and other chemical substances from the media. However, for antioxidants it is interesting that about a quarter of the preschool teachers had no idea about the word. One of them said: “It does not sound good – no oxygen! [laughing]”. Another preschool teacher, that neither knew what it was, but had heard about the term and though it had something to do with food, said: “It sounds negative”.

I will now report some more details about the teacher students’ knowledge about and associations with the chemical substances. They were for each of the substances asked about what it is and where you can find it, but also to mark on two scales if they think that the substance is toxic and natural, respectively. The scales used were ranging from non-toxic (-2) to toxic (2) and from unnatural (-2) to natural (2). For those students that I have judged knowing about the substance, average numbers were calculated. The results are presented in Figure 2. To get a better understanding of what the informants mean with “natural” and “toxic”, respectively, they were also asked to define the terms. For many of the teacher students “natural” means substances from nature, which are not harmful for neither the health nor the environment and that is not containing synthetic additives/chemicals. For many “toxic” is about the same as “chemical”, or in other words something synthetic and unnatural.

Figure 2. Teacher students’ thoughts about some chemical substances.

*Caffeine is by most of the informants regarded as natural, but there is a big span in the view of if it is toxic or not. *Omega-3, *vanillin and *antioxidants, three substances that many people seems familiar with (as shown in Figure 1), are all regarded as natural and non-toxic. Almost all of the informants associate omega-3 with fish and half of them mention fat fish as a place where you can find it. Most of the informants that have an idea of what vanillin is think that it is the same as natural vanilla: “Exists
naturally and is produced in nature”. However, some of the informants know that it is human-made: “A chemically produced vanilla tasting powder”. Many of the informants that have an idea of what antioxidants are think that it is something that can be found in food and that is good for the body: “Exists in food. Healthy for our cells.” However, only one of the informants is problematizing that it can be both natural and unnatural, because it can be found in e.g. both blueberries and tablets. The teacher students think that antioxidants and omega-3 are natural and non-toxic. However, both the substances can be problematic for the health if taken in the form of tablets and in a large amount.

The informants that have an idea of what trans fat and aspartame are think that it is unnatural substances and that trans fat is a little bit more toxic than aspartame. One quotation for trans fat: “Unnatural fat. Don’t remember how and why. Not good!” And one quotation for aspartame, which many of the informants know is an artificial sweetener: "It is not good for the body, I think that the body is not able to destroy it.” Trans fats has been debated in the media due to their occurrence in much industrially produced food, but they also exists naturally in some food. According to a study made by the insurance company If four of five Swedes think that trans fats are very bad for our health (Ny Teknik 2009). Aspartame is a questionized artificial sweetener (Svensson 2010).

Nitrites, glutamate and acrylamide have in common that only a quite low percentage of the teachers students know about the substances. Those how know about them think that they are more unnatural than natural. Acrylamide is correctly regarded as the most toxic of the substances, whereas nitrites and glutamate are regarded as mainly non-toxic. Many of the informants associate, not quite correctly, acrylamide with paints and clothes. Only a few of the informants mention potato crisps or the railway tunnel through the Halland ridge, two cases where acrylamide have been discussed in the Swedish media during the last decade. In the building of the railway tunnel unnatural, synthetic acrylamide was used, but the acrylamide in e.g. potato crisps is formed naturally when some carbohydrate containing products are heated up to high temperatures.

There is also a lack of knowledge about nitrites. Some of the informants guess that it can be found in water, probably thinking about nitrates, and some that it is a product of combustion. Only a few of the informants associate nitrites correctly with the questionized and quite toxic (cancerogenous) preserving agent used in e.g. sausages and ham. For glutamate some of the informants associate it, incorrectly, with gluten in wheat. Only few of the informants associate it, correctly, with taste enhancers. The glutamate added to food is often produced synthetically, but glutamate is also a natural transmitter substance in the nerve system and one of twenty naturally occurring amino acids in proteins. However, it is questionized as a food additive (Svensson 2010).

With one exception in some cases, none of the informants knew about ascorbic acid (=vitamin C); the toxic metal cadmium; phthalates, that are used as softeners in e.g. PVC plastics; dioxins, which can be formed when chlorinated organic substances (e.g. PVC plastics) are burned uncontrolled; and formaldehyde, an irritating and allergenic gas that can be released from e.g. furniture in our home. According to a psychometric map presented by Öberg (2009, p. 271) the public both have fear and are uninformed about environmental poisons like cadmium, mercury and PCB:s. However, for
chemical risks common in everyday life like alcohol, caffeine and fluoridated drinking water there is a quite low fear.

**Public understanding and use of chemical risk information**

With the, as shown, often limited knowledge of the public, how does it understands chemical risk information and how is it reasoning when making benefit-risk-assessments in everyday life? Here I will present four different cases with chemical risk information: (1) newspaper heading, (2) product information, (3) information from authorities, and (4) “nose information” (the smell of new products can be regarded as “nose information”, in contrast to written “eye information”). The purpose of the cases is to illustrate the tension in reasoning of the public.

From the discussion above one can conclude that the public in general do not seem to be capable to describe – what it is and where to find it – chemical substances that are quite frequently discussed in media and the public debate. Of course it is then often not easy for the public to understand news heading related to chemicals and poisons. The *first case* is about the newspaper heading “Dangerous substances in ethanol exhausts” (“Farliga ämnen i etanolavgaser”, Sydsvenskan 2008-04-21). A majority of the interviewed preschool teachers are not capable to reason about its meaning and some misunderstandings about ethanol as a fuel were found. For several of the informants it was not clear why ethanol is regarded as better than petroleum and some answered that they think it is better because it contains less lead. One of the informants answered the following on the question why she think ethanol is better than petroleum: “Actually I can’t understand it, but I know that they have talked about that it’s good. I thought that it was because the oil is getting so expensive and that it is becoming rare and they try to find something else.” (In appendix 1 there is a longer interview transcript in Swedish, from another interview, dealing with ethanol exhausts and scientific controversies.) However, there are some exceptions with informants trying to problematize the newspaper heading: “No fuel, and nothing, can be 100% good. I think […] that you can get too much of everything, or everything in some amount can be dangerous.”

Examples of everyday products with obvious risk aspects – e.g. due to its content of different (most often not specified) chemicals – are toys and textiles. One everyday action, with both health and environmental consequences is our choice of washing – or not – new textiles before using them. The *second case* is about “toxic free” crayons and the *third case* about clothes. The informants have been asked about the more and more common Öko-Tex-label and if they wash new textiles before use. The Swedish Chemicals Agency recommends that new textiles should be washed before using (Kemikalieinspektionen 2009).

During the interviews the informants were shown a picture of a box of crayons and asked about their risk associations. The interview quotations could be categorized into the following three categories, with one example from each category: (1) Have never heard that crayons could be toxic: “I don’t know any risks with them. Those you can take a bit of and eat without something happen.”, (2) Is a little bit sceptical, but trust the ’toxic free’ information: “Crayons – they assert on the box that they should be non-toxic. […] You are forced to trust it. On a ketchup or juice bottle you can read and understand whether it is dangerous or not, but on a crayon – I have no clue what
crayons are made of.”, and (3) You should avoid exposure: “Crayons made for small children is supposed to contain as little poisons as possible […] However, they can never be healthy […] Young children test to eat crayons and they will always do, so therefore there should be as little poison as possible in them.”

Both during the interviews and in the questionnaires the informants were asked if they wash up new textiles before using them and if they knew about the Öko-Tex-label (they were shown the label on a card; the meaning of the label is that the labelled textile is tested for harmful substances). Most of the interviewed preschool teachers did not wash their textiles before using. Some are not aware about the health risk of not washing – “I don’t see any risks with that” – but many of them had heard about the health risks, but chosen, for different reasons, not to wash before using. One preschool teacher that does not wash her textiles before using them for the first time says: “You should do, because there are a lot of chemicals left in the clothes from the production, from dyeing and… yes, I can’t the whole process.” She says that she had read about it in the newspaper. However, she is not so worried that she manages to cope with it, but says that she would have washed clothes for small children. Another of the interviewed preschool teachers reason in a similar way and says: “I am presumably not so careful about myself”, but also that she would have washed the clothes before using if she knew that many people has tested them. In other words hygiene is a more important reason for her to wash before using than the risk of exposure of chemicals. About 75% of the preschool teachers say that they have seen the Öko-Tex-label before and most of them associate it with something positive. However, it is only two of the thirteen interviewed informants that associate it with no harmful substances in the final product. As many associate it with a general environmental label or ecological clothes.

Of the teacher students about a third said that they wash new textiles before using them and only 15% knew about the Öko-Tex-label. Their arguments for washing – always, sometimes or never – are summarized in Table 2.

Table 2. Arguments for washing new textiles before using them: always, sometimes or never

<table>
<thead>
<tr>
<th>Always washing</th>
<th>Sometimes washing</th>
<th>Never washing</th>
</tr>
</thead>
<tbody>
<tr>
<td>The clothes are nicer after washing</td>
<td>If they smell &quot;chemically&quot;</td>
<td>The clothes are more comfortable before washing</td>
</tr>
<tr>
<td>Others have tried the clothes before – health reasons</td>
<td>Children’s clothes are washed, especially the once of infants</td>
<td>The clothes are clean when they are bought</td>
</tr>
<tr>
<td>Contains excess color (and other chemicals)</td>
<td>Intimates are washed</td>
<td>Takes too much time, energy and money</td>
</tr>
<tr>
<td></td>
<td>Illustrated clothes are washed</td>
<td>The clothes look is more important than that they are without excess chemicals</td>
</tr>
<tr>
<td></td>
<td>Jeans that will be sewn up are washed</td>
<td>Adult bodies can withstand the chemical substances</td>
</tr>
<tr>
<td></td>
<td>Have heard that you should wash (and have experience of the itch if you do not wash), but usually don’t manage to cope with it</td>
<td></td>
</tr>
</tbody>
</table>
From Table 2 it is clear that also in cases when the informants are well-informed, the chemical risk information does not seem to be important compared to other arguments. Other aspects, such as aesthetic or hygiene, seem to be at least as important as chemical risks. Common for benefit-risk-assessments in everyday life decision-making involving chemical risks are that chemical risks exist, but also a desirable function, for which the chemicals are important.

The fourth case is about strongly smelling consumer products. The informants were asked about their feelings and thoughts when they had bought products with a strong smell, something that all of the informants were familiar with. However, their reaction was very different, from a positive feeling of something new: "it smells new", to a quite strong fear: "It smelled a lot, I can say. The entire kitchen smelled of it. [...] I associate it with someone hiding something.", “There come up some thought that – this can’t be good; why does it have to smell like this?” This shows that with the same information – in this case “nose information” – the interpretation can be different depending on e.g. factors like knowledge base and willingness and acceptance of taking risks.

CONCLUDING REMARKS

If the informants used in this study can be regarded as representative for the general public, which I think is reasonable, the following can be concluded: In general the public associates “chemicals” with something synthetic, artificial, unnatural, toxic, dangerous and harmful. “Poison” is associated with chemicals, radiation, diseases, viruses, drugs, medicines, vaccines etc. For both these words, as for sure is true also for many other scientific words commonly used in media, there is a quite big scope in the public’s interpretation and use of the words.

As indicated in Figure 1, the public know much more about food and its connection to health questions than about the environment and its connection to health questions; many have heard about omega-3 and antioxidants, but very few about dioxins and cadmium. Another supporting example, not discussed before, is that many of the interviewed preschool teachers had heard about the news of health problems with ZnO in sun lotions – a news topic of the month when the interviews were done, but no one about textiles that spread toxic substances to the sea when washed, another news topic of the month.

For the public “natural” means substances from nature, which are not harmful for neither the health nor the environment and that is not containing synthetic additives/chemicals. “Toxic”, on the other hand, is for the public about the same as “chemical”, or in other words something synthetic and unnatural. It is therefore understandable that none of the substances in Figure 2 are placed in the upper-right field (natural and toxic). For the public there seems to be a contradictory between natural and toxic and this is probably a reason to why it has been more and more common to emphasize the natural in marketing of e.g. food products. However, the most toxic substance for humans that is known – Botulinum toxin – is natural. Actually it is impossible to avoid toxic substances, which are almost everywhere and often naturally. Toxic substances are not dangerous in small amounts and many are essential for plants and animals to survive. According to Kemikontoret (1998) (my translation):
"It is often easier for us to accept risks of substances derived from nature because they ‘anyhow is there and we can’t do anything about it’. A ‘synthetic’ risk, which, unlike the natural have a responsible originator, can be perceived as unnecessary but still possible to do something about.”

The statement “natural is always best” is more reasonable in relation to environmental questions than in relation to health questions. The problem is that health questions for the public in general seem to be more important than environmental questions. When they use the statement “natural is always best” in relation to health questions the consequences can be undesired. For example, as previously mentioned, the natural can contain allergenic impurities, and (synthetic) preserving agents are very useful in restraining microorganisms from growing.

Another conclusion that can be drawn from the empirical material is that the public in general has a quite diffuse idea of how chemical substances reach the blood system, i.e. how the substances are absorbed. More exactly which images the public has of the processes of exposure, absorption, distribution, metabolism and elimination of chemical substances in the body would have be interesting to study further in future research.

As also shown in this paper the public in general has a lack of knowledge about specific chemical substances and risks of chemically containing products. From this it is clear that there is a need for a better chemical literacy among the public, and questions that then become relevant are:

- Which knowledge base does the public need for understanding information about chemicals in media and on consumer products? and
- How can the citizens’ learning about and understanding of chemicals and poisons be supported in school and later in life (e.g. through risk communication)?

In this paper there is not room for discussing these questions, but they will be discussed in a forthcoming paper (Sjöström 2010b).

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Appendix 1

Interview transcript in Swedish about ethanol exhausts and scientific controversies
(I=intervjuare; R=respondent)

I: "Sista […] rubriken: Farliga ämnen i etanolavgaser."
R: "Ja, det skulle jag ju kunna tro att där är, för det luktar ju inte gott om sådana bilar eller bussar."
I: "[…] Du blandar inte ihop det med biogasbussarna?"
R: "Det vet jag inte. Det är mycket möjligt att jag gör det. Ingen aning. [skratt …]"
I: "[…] Du förknippar etanol med trafik i alla fall? Med fordon?"
R: "Ja"
I: "Men varför ska man köra dem på etanol istället för bensin?"
R: "Ja, det är miljövänligare."
I: "Varför det?"
R: "Det ska väl inte släppa ut lika mycket avgaser, koldioxid, skulle jag tro."
I: "Men det släpper ut koldioxid också eller?"
R: "Nej, det tror jag inte. […] Jag kan ingenting om sådant, så jag vet inte, men jag tror inte att det släpper ut det."
I: "Bensinen släpper ut koldioxid, men inte etanolen då ja?"
R: "Ja"
I: "Men nu står det 'Farliga ämnen i etanolavgaser'."
R: "Jaa… [längre tystnad]"
I: "Det måste ju vara något som även dom släpper ut då?"
R: "Ja, är det inte någonting med… är det någon sorts salt någonting?"
I: "Jaa, nej men vi lämnar det. Du nämner koldioxid som utsläpp från bensindrivna bilar. Varför är det problematiskt då?"
R: "Bryter ner ozonskiktet […] så att strålningen blir starkare."
I: " […] Varför är det farligt med mer UVb-strålning?"
R: "Hudcancern ökar till exempel."
I: " […] Så det är därför vi minskar […] antalet bilar som körs på bensin?"
R: "Alltså det är ju hela jordklotet ju, alltså det blir någon form av växthuseffekt också"
I: "Också?"
R: "Ja, så att polerna smälter och det här och så."
I: "Det är kopplat […] ozognrets uttunning och växthuseffekten?"
R: "Ja, det tror ju hälften av forskarna att det är så."
I: "Jo, där är ju en debatt. Hur tänker du kring det, att man i media ser att ibland säger forskarna någonting och så säger andra forskare någonting som kanske motsäger det som de första sa? Vem har rätt då liksom? Eller har båda rätt?"
R: "Ja, alltså man brukar ju välja sida själv vad man tror på, men det är ofta lätt att man tror på den första som kommer. Och sedan när nästa kommer och det inte är så, då lägger man sig någonstans mitt emellan och bryr sig inte nästan."
I: "Du menar att man som medborgare när man får all den informationen så… Man kan tänka sig att man intar en slags mellanposition, att man försöker väga för och emot, men man kan också bli likgiltig inför hela rapporteringen?"
R: "Ja"
I: "Men du känner snarare det senare, att man liksom: jag paller inte bry mig."
R: "Ja, att man är lite skeptisk. […] Alltså som det här med potatischips och friterad potatis och sådant, alltså det slutade man ju att äta dä ett tag, men sedan kom det ju att det inte var så farligt och så. Och då åter man ju det, fast man kanske tänker då att man ska inte överdra det där. Man ska ju inte ha det tre gånger i veckan till lunch, utan lite mer sällan."