

Continuing Chemical Consciousness: Is the Public aware of the concerns related to harmful chemical use?

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Abstract

People are aware of the serious risks of DDT/PCB/CFC use and the hazard they pose due to climate change; the younger public less aware than the older. However, motivation is lacking in the public to take a pro-active approach to protecting themselves from being victim to harmful chemical use which they believe exists in the food they eat that is not grown by them personally. Based on this information, it is evident that the public needs to be re-educated about the risks that threaten their health and the ecology of the planet. To best educate the public and inspire motivation to change requires not only an understanding of the audience but implementing constructivist learning theories to have long-lived understanding.

Introduction

Quoted to be the “foundational text of a modern social movement” In 1962 Rachel Carson wrote the book “Silent Spring” that took the world by storm (Killingsworth, 1992; Kroll, 2001). The book alerted a large audience to the environmental and human dangers of indiscriminate use of pesticides, DDT/PCB/CFC’s, “elixirs of death” as Carson (2002) calls them, spurring revolutionary changes in the laws affecting our air, land and water (Killingsworth, 1992; Kroll, 2001).

In present day, DDT/PCB/CFC use is banned in most of Western culture, however still abundantly used by developing nations which can afford nothing else, and know no better (Killingsworth, 1992; Kroll, 2001). There is great cause for concern with

this situation (Killingsworth, 1992; Kroll, 2001). Not only is it possible for these chemicals to still travel via the food chain and plague the Western world, despite their elimination, but there have been frightening studies done illustrating that their threat is present again with the effects of climate change (Killingsworth, 1992; Kroll, 2001). We find ourselves come full circle; once again we are faced with the threat of our own creation (Killingsworth, 1992; Kroll, 2001).

Because of my interest and concern, I have made it my mission for this project to determine an audiences' understanding regarding harmful chemical use and related risks associated with food consumption. It is my objective to determine what the audience's understanding of DDT/PCB/CFC's is and to further endeavor what their concerns are (if any) regarding current chemical use on the food which they purchase. To this, I wish to discover where their interests lie, i.e. whether they express greater concern over bodily harm or ecological damages, which Kroll (2001) states, as result of chemical use. After establishing the audience's interests, I wish to learn more about their motivations, i.e. what have or haven't they been doing to protect themselves from potentially harmful chemicals.

Authors such as Lewenstein (2000) have stated, "what the audience thinks is important." There has been growing critical need identified for public communicators of science to pay more attention to understanding their audiences (Lewenstein, 2000). With higher knowledge of one's audiences' interests and motivations, a public communicator of science can then provide to the needs of the audience which brings

him or her closer to achieving their goals of education (Driver et. al., 1994; Gregory and Miller, 1998; Hein, 1996; Lewenstein, 2000; Mayfield, 2004). With that said, it is my intention to put the results from this study to use. After gauging my audience's prior knowledge, interests and motivations, with this study, I intend to develop programming based on constructivist theories, targeting those who are least informed.

The results of this study are laid out in the tradition of all social sciences papers; first I outline my methodology for the study, followed by a presentation of the results. The discussion section explores connections and patterns within the data. There is a brief section outlining recommendations to better the study for future researchers and finally, the conclusion of the study in whole, which also reiterates key findings.

Methodology

A preliminary questionnaire (Appendix A) was drafted and peer reviewed. Following the review, edits were made to generalize some of the questions to meet the project's objectives. Questions were added to gain more insight on people's motivations related to chemical usage. A separate section following the survey allowed for gathering demographic information.

The survey was created as a Microsoft Word document which allowed for the insertion of easy-to-use drop-down menus and check-boxes to fill in answers. The survey was then distributed to thirty-two people of age greater than twenty years in

December 2005. Results were tabulated and organized on a customized spreadsheet using Microsoft Excel. Data were manipulated to best display results and draw patterns and connections.

Results

In total, eighteen questionnaires were received back from the thirty-two sent out; see Appendix B for tabulated results. Almost all questionnaires were completed in total, not all provided additional comment when prompted, such as question 4, this question asked the participant's knowledge of DDT/PCB/CFC's.

Some general observations include skewed results for questions 1, 2, 5,7,8,10,11 and 12. More moderate distribution of results for questions 4, 6, and 9. The remaining questions contain no obvious patterns. All of the results can be found in Appendix B for further detail.

Question 1

The majority (67%) of participants felt that they were "somewhat aware" of how their purchased food is grown.

Question 2

The majority (83%) of participants felt that "Yes" there are potentially harmful chemicals used on their food.

Question 3

By slight majority (56%), of participants receive a regular source of food which they know how the food is grown.

Question 4

In general, if a participant knew about one of the mentioned harmful chemicals they knew all of them and those that provided further explanation all had a reasonable understanding of what they are.

Question 5

The majority (67%) of participants knew the associated health risks with DDT/PCB use on food that humans may consume.

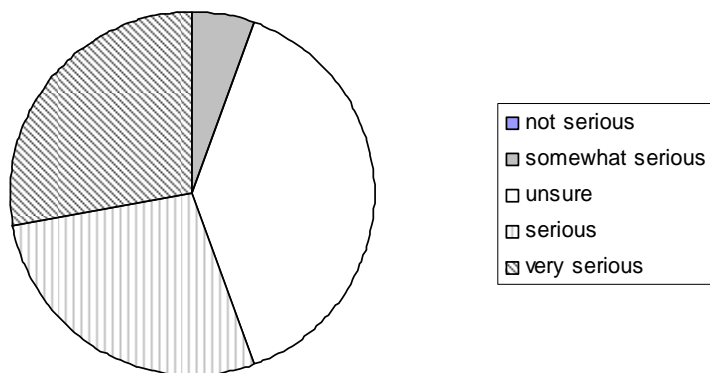


Figure 1 – Distribution of responses when asked how serious participants thought how serious the health risks associated with harmful chemical use was.

Question 6

The majority (56%) of participants felt that the health risks to humans with DDT/PCB use were serious or very serious (Figure 1). 39% felt unsure about these risks (Figure 1).

Question 7

All participants (100%) stated that this issue was a factor on a global scale.

Question 8

The majority (72%) of participants knew the associated ecological risks with DDT/PCB/CFC use, similar distribution of results as the knowledge of human health risks.

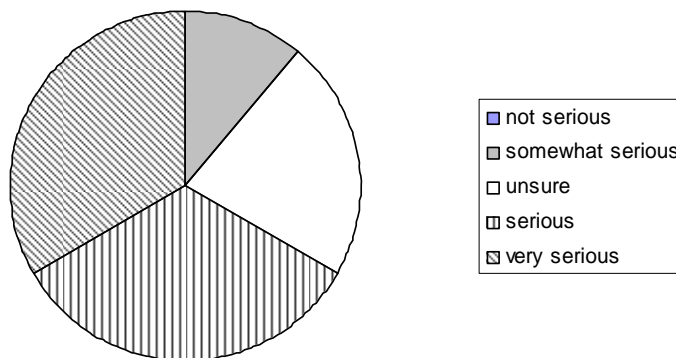


Figure 2 - Distribution of responses when asked how serious participants thought how serious the ecological risks associated with harmful chemical use was.

Question 9

The majority (67%) of participants felt that the ecological risks with DDT/PCB/CFC use were serious or very serious, similar distribution of results as the human health risks (Figure 2).

Question 10

All participants (100%) stated that this issue was a factor on a global scale.

Question 11

The majority (83%) of participants felt aware that DDT/PCB/CFC's may pose serious threat to the Earth due to the effects of climate change.

Question 12

The majority (72%) of participants were not aware of the book *Silent Spring* by Rachel Carson or various related media.

Demographic Information

Age ranged from 10 to 51 + years old. The majority (8/18) of participants fell into the 20-25 year old category. 5/18 in 26-30 years of age; 1/18 in 31-35 years of age; 1/18 in 36-40 years of age; 1/18 in 41-45 years of age and none in 46-50 years of age.

The highest level of education completed by the majority of participants is university (7/18). 5/18 completed high school; 4/18 completed graduate studies; and one completing a PhD.

Specializations varied, but were not skewed towards environmental/biology or chemical nature which could potentially increase the number of people aware of elements asked in this survey.

Discussion

People generally feel some degree of awareness towards what chemicals, treatments, procedures that may or may not be in their food from the grocery store/market represented by question 1 (Appendix B). Perhaps a result of this awareness, the majority of people in my study feel that, “Yes” there are potentially harmful chemicals used on their food from the grocery store (Appendix B). For example, one response states: “I’d like to believe that the government is not letting us eat chemicals that are harmful but deep down I know that’s probably not true.” Despite this conviction, less than half of the participants take a pro-active approach to the issue as indicated by question 3, which inquires about people receiving food from a source in which they know how the food is grown (Appendix B). If people are sure of potentially harmful chemicals being used on their food purchases from grocery store, why are more people not finding alternative methods of food supply? There is clearly interest and perhaps concern over harmful chemical use, but why is there a lack of motivation to take control over reducing harmful chemical intake? As stated by one participant, “If the growers are lobbying for chemical use and the consumers are not lobbying, it doesn’t take a genius to figure out who wins.” If we do not protest or inquire about harmful

chemical use, there is no one else who will do it for us. How do we know that the chemicals that have replaced DDT/PCB/CFC are not just as harmful if not more?

With regards to people's understanding of DDT/PCB/CFC's asked in question 4, people generally know about them; only six people of the eighteen in the study did not know (Appendix B). People were also very aware of the associated human health and ecological risks with the use of DDT/PCB/CFC's with neither of the risks being considered more serious than the other; people felt both were equally serious (Appendix B). The participants unanimously agreed that the risks were a global issue (Appendix B). Supporting this statement, one answer is: "due to long half-lives, bioaccumulation, ocean and weather cycles, and the increase worldwide [of] food trade, the chemicals pass more quickly to new world regions before they can be broken down by natural processes." People were also able to make the connection between these risks being global and therefore, posing threat to the Earth with the onset of climate change (Appendix B). Again, there is clearly interest and concern in the participants exemplified by their acknowledgement of the risks being varying degrees of "serious." However, where is the public's motivation to abolish the export of DDT/PCB/CFC's when they recognize that the use of any or all of these chemicals is involved with the harmful effects of climate change which they know to be a serious issue.

According to my research, there has clearly been a shift in the public's perception of harmful chemical use since the days of Rachel Carson's book. As stated by Kroll (2001), Carson "effectively educated the globe on harmful chemical use." People were

no longer unaware of the fact that these chemicals were slowly killing the Earth around them, and fellow members of the human race (Killingsworth, 1992; Kroll, 2001).

However, as indicated by my study, people are still greatly aware of these risks but have not taken the next step. One response by a younger participant states: “I am unaware of how much they [DDT/PCB/CFC] are used, I presume they have serious health risks, but I am not sure how much they are really being used.” The next step must be to inspire and show people how they can become in better control over the chemicals allowed in food production (Killingsworth, 1992). It seems to me that this study indicates the need for communities to develop workshops, media or any type of tools that will show the public that it is partially their responsibility to do something about this pressing matter (Killingsworth, 1992).

With “understanding our audience” in mind and the results of this study, it is clear that whether workshop, media etc. is chosen, an “engagement model” of science communication must be implemented. Professionals, such as Gouthier (2005) and Lewenstein (2000), outline how important it is to have the public understand science through means which are most optimal for them to understand and adapt. Historically, the public have difficulty assessing complex scientific issues (Doble, 1995). Perhaps this is the reason why my public understands the risks of harmful chemical use, but has difficulty assessing the situation and decision-making based on that knowledge. To prevent miscommunication, professionals urge the use of applying the dialogue-model of communication to create desirable change (Gouthier, 2005; Gregory & Miller, 1998; Lewenstein, 2000).

The same motivations which drove people forty years ago to investigate how their food was processed are not present today because the death and destruction is no longer “next door” or “in our backyard” (Killingsworth, 1992; Gouthier, 2005; Gregory & Miller, 1998). The concept relates, in part, to constructivist learning theory. People learn best by making connections to prior knowledge and without the harmful chemical use being as prominent in society the younger public are not as aware of the repercussions (Falk & Dierking, 2000; Lewenstein, 2000; Mayfield, 2004; Roschelle, Russell, 1999). Recent research illustrates how following constructivist learning theories when communicating science can increase an audience’s motivations to learn, heighten the overall experience and further learning outcomes (Driver et. al., 1994; Hein, 1996; Lewenstein; 2000, Mayfield; 2004).

Forty years ago, when Carson’s book made its impact on the world, most people had some personal experience associated with harmful chemical use which motivated them to take control (Killingsworth, 1992; Kroll, 2001). For example, someone may have known a family member suffering from neurological damage inflicted by elevated DDT levels. Personal connections to health problems, for example, more often instills the desire to learn and take control (Falk & Dierking; Gouthier, 2005; Gregory & Miller, 1998). With DDT/PCB/CFC’s banned in North America, the younger public does not have those personal connections, therefore less desire to take control (Killingsworth, 1992; Gouthier, 2005, Kroll, 2001). This is what Gouthier (2005), calls a “vocational crisis.” She defines it as: “a lack of interest in science” and a factor attributing to this

lack of interest are young people (Gouthier, 2005). The data indicate that as age increases, so does the understanding of harmful chemical use. The explanations of DDT/PCB/CFC's illustrate this point. From a younger participant I received this answer: "DDT is a pesticide, no longer used." In comparison, from an older participant, they not only defined DDT, as did the younger, but they provided further information regarding their personal experience with it.

"DDT was used by farmers generations previous in my family, until it was banned because it was seeping into groundwater. DDT makes bird's egg shells weak and can be found in the blood of polar bears as it spreads across the world and bioaccumulates. It is cancer causing and interferes with reproduction."

I think that we now face a serious problem regarding the awareness of harmful chemical use. My study has brought to my attention that Western society is far removed from the issue because of the ban. Although many people said that they were aware, their actions speak of them having done nothing. The time to re-educate the public is way past due. Something needs to be done to motivate the public once again to take control. I think with the growing issue of climate change and therefore the reappearance of DDT/PCB/CFC's this may be the best hook into people's prior knowledge. Doble (1995), states that: "the public can make a logically consistent assessment about issues after a minimal educational intervention and a short period of time." With a better understanding of the audience, accompanied with an understanding of learning theories, and dedication, the task of re-educating the public of harmful chemical use may be just as successful as Rachel Carson's efforts were.

Recommendations

I think my research fell just short of completing the puzzle on where people's motivations lie regarding harmful chemical use. In hindsight, it would have been advantageous to have suggested outlets, potential venues etc. to discover how next best to educate the public on harmful chemical use. It may also be of use to reconsider my evaluation technique as well. As stated by Lewenstein (2000), "interest is harder to measure than specific levels of knowledge," so perhaps modifying the research methods may produce data that provides even greater understanding of the audience which can only lead to better things.

In conclusion, people are generally aware of the risks, both to human health and the Earth's ecology, associated with the use of DDT/PCB/CFC's. The public also believes this to be a serious, global issue. These statements conclude that there is an associated interest with the public. The understanding of the risks in the participants increases with age. Although my study fell short of how to better motivate the public to make pro-active decisions regarding their food consumption, there were several suggestions made, based on other research, to determine why there is a lack of motivation. Due to climate change there are associated risks involving DDT/PCB/CFC's, people are aware of this fact. Perhaps to best motivate learning of DDT/PCB/CFC's, it should be taught in conjunction with climate change because climate change is prior knowledge for younger public but DDT/PCB/CFC's are not. This

strategy incorporates constructivist learning theory which I intend to use to help structure my learning presentation. Upon completion of this survey, I feel that I have a better understanding of my audience's interests and motivations.

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Appendix A

Please answer the following questions.

Select your answers from the list, check in the grey boxes or type your answer in the grey area accordingly. Elaborate in the 'Additional Information' space at the end where you feel necessary.

1. How would you rate your awareness of how your purchased food from the grocery store/market etc. is grown? i.e. what chemicals, treatments, procedures may or may not be involved.
Select one: very aware
2. Do you think there is any use of potentially harmful chemicals used on your food that you purchase from the grocery store?
Select one: Yes
3. Do you personally have a garden or receive food from a garden in which you know how the food is grown? i.e. what chemicals, treatments, procedures may or may not be involved. Please check.
Yes No
4. Do you know what the following are? Please check to indicate yes. Provide a brief explanation (1-3 sentences is fine) of what each one is that you know.

Dichloro-diphenyl-trichloro-ethane (DDT)

Polychlorinated Biphenyls (PCB)

Chlorofluorocarbons (CFC)
5. Are you aware of the human health risks associated with the use of DDT's/PCB's on food we consume?
Yes No I don't know
6. In your opinion, how serious are these health risks? Please provide a brief explanation in shaded area provided.
not serious somewhat serious unsure serious very serious

7. In your opinion, are the health risks a local or global issue? Select one and please provide brief comment.

Select: Local

8. Are you aware of the ecological risks associated with the use of DDT's/PCB's/CFC's?

Yes No I don't know

9. In your opinion, how serious are these ecological risks? Please provide a brief explanation in shaded area provided.

not serious somewhat serious unsure serious very serious

10. In your opinion, are the ecological risks a local or global issue? Select one and please provide brief comment.

Select: Local

11. Are you aware that DDT/PCB/CFC's may pose serious threat to the Earth due to the effects of climate change?

Select: Yes

12. Are you aware of the book *Silent Spring* by Rachel Carson and/or the various media produced based on it?.

Select: Yes

For statistical reasons could you please provide the following:

Age:

16-19

Highest level of education achieved:

High-School

Specialization:

Please provide any additional comments below:

Appendix B

| | | | | |
|-------------------|----|--------------------|----|-----------------------------------|
| Question 1 | | Question 7 | | Age |
| very aware | 1 | global | 18 | 16-19 |
| aware | 3 | local | | 20-25 |
| somewhat aware | 12 | unsure | | 26-30 |
| unaware | 2 | | | 31-35 |
| Question 2 | | Question 8 | | 36-40 |
| yes | 15 | yes | 13 | 41-45 |
| no | | no | 3 | 46-50 |
| maybe | 3 | I don't know | 2 | 51+ |
| I don't know | | | | |
| Question 3 | | Question 9 | | Highest Level of Education |
| yes | 10 | not serious | | high school |
| no | 8 | somewhat serious | 2 | university |
| | | unsure | 4 | graduate studies |
| | | serious | 6 | phD |
| | | very serious | 6 | |
| Question 4 | | Question 10 | | |
| ddt | 13 | global | 18 | |
| pcb | 12 | local | | |
| cfc | 12 | unsure | | |
| Question 5 | | Question 11 | | |
| yes | 12 | yes | 15 | |
| no | 3 | no | 2 | |
| I don't know | 3 | unsure | 1 | |
| Question 6 | | Question 12 | | |
| not serious | | yes | 5 | |
| somewhat serious | 1 | no | 13 | |
| unsure | 7 | unsure | | |
| serious | 5 | | | |
| very serious | 5 | | | |