

ACRYLAMIDES AND COFFEE

Introduction:

Today many Americans are not aware of the food that they are eating may be harmful to their health. There are numerous studies that certain foods can even cause cancer. An even bigger concern is that some of the harmful ingredients in food aren't even added; they become present when cooked or processed. Acrylamide is known as an industrial chemical. It is a chemical that is used to make polyacrylamide materials, and is a white crystalline, odorless solid. One of its main purposes is the treatment of our water. Materials like plastics, grouts, adhesives, cosmetics, and cigarette smoke also all have traces of it. Scientists recorded that it has also been found present in food which started raising concerns in the United States a few years ago. Acrylamide is not something that is added to food, it becomes present when cooked at particularly high-temperature processes like frying, baking and roasting. Acrylamide is found in food items high in starch like potato chips, and French fries. Acrylamide in large amounts can cause cancer and reproductive problems; that is why research is being done to make sure amounts in coffee and other foods aren't too high.

Although I did not choose the topic of acrylamides and coffee, this was a very informative and interesting topic to perform research on. It is an issue that almost everyone is exposed to. A lot of the food that I consume could potentially be dangerous to my health and I did not even know which is an extremely scary thought. I drink at least one cup of coffee a day, every morning when I get up, and sometimes half way through the day. Snack foods and cereal, which also contain acrylamides, are also very much apart of my diet. Acrylamide is around or consumed by everyone at some point, that is why it is very crucial that research determines the risks in humans.

Section 1: Background and Problem Statement (HP did not specifically have any information on my topic)

Web site # 1 Name: National Cancer Institute

Web address: <http://www.cancer.gov/cancertopics/factsheet/risk/acrylamide-in-food>

Asparagine is an amino acid which is a building block of proteins, found in many vegetables, with higher concentrations in different types of potatoes. Heating at a temperature above 120 degrees Celsius, is when amounts of this amino acid are present. High temperatures and the presence of certain sugars, asparagine can form acrylamide. High-temperature cooking methods, such as frying, baking, or broiling, have been found to produce the highest amount of acrylamide. Longer cooking times also increases the amount created. "The National Toxicology Program (NTP) and the International Agency for Research on Cancer consider acrylamide to be a "probable human carcinogen," based on studies in laboratory animals given acrylamide in drinking water." This poses a serious threat, since studies are still not sure of all the risks. Researchers know there is relationship between dietary intake of acrylamide and the risk of developing cancer.

Web site #2 Name: World Health Organization

Web Address:

http://www.who.int/ipcs/food/jecfa/summaries/summary_report_64_final.pdf

Research on acrylamide formation is currently ongoing and has been the subject of several international scientific researches. The European food industry conducted a study and was able to achieve a decrease of acrylamides present in food in 2004. They were able to reduce 30-40% of the amount in potato chips just by changing the production process. One set back is there was no change in the process of roasted coffee and breakfast cereals. Mitigation means to lessen the amount of precursors that provoke the acrylamides to become present. The most efficient reduction has been achieved by using the enzyme asparaginase to selectively remove asparagines prior to cooking.” Other mitigation possibilities include alteration of the product composition, e.g. addition of competing amino acids or acidic compounds, and alteration of process conditions, e.g. lowering the frying temperature.” In conclusion they felt further precautions and efforts to reduce the amounts should continue for the safety and well being of consumers.

Web site # 3 Name: Chemical Summary for Acrylamide

Web Address: http://www.epa.gov/chemfact/s_acryla.txt

Acrylamides are potentially dangerous to humans if too much is consumed. Toxic effects are central and peripheral neuropathy causing drowsiness, hallucinations, and dumbness. EPA has derived an oral reference dose of 0.0002 mg/kg/day for acrylamide, based on nervous system effects in laboratory animals. Although most exposure is by the ingesting, The Clean Air Act Amendments of 1990 lists acrylamide as a hazardous air pollutant. This chemical when present in water and air, can be absorbed through ones lungs. Also, in a study with rats when they digested acrylamides it was proven to dramatically lower fertility rates and caused cancerous tumors.

Section 2: Research

Web site #1 Name: Food Standards Agency

<http://www.food.gov.uk/multimedia/pdfs/fsis712005.pdf>

There is a lot of research being performed about the effects of acrylamides. The Food Standards Agency continues to recommend that people should still eat a balanced healthy diet, and try to limit the amount of sugary and fatty foods such as fried food. Acrylamide is known to cause cancer in animals and has been classified by the World Health Organization’s (WHO) International Agency for Research on Cancer (IARC) as carcinogenic to humans, which will cause harm if one consumes too much. Researchers conducted a survey to determine an estimate of what healthy exposure to the chemical would be. The total diet study survey has been working since the 1960s. The TDS is made up of 119 varieties of foods purchased from 24 locations throughout the UK each year (total of 480 samples) which are combined into 20 groups of similar food. It was

present in 7 out of the 20 groups, including, bread, meat, poultry, sugars, and potatoes. With this conclusion the formation of acrylamide suggests that acrylamide is mainly formed in starch-rich foods; however, acrylamide was also quantified in the carcass meat and poultry groups, and also chocolate.

Web site #2 Name: The Journal of Toxicological Sciences

Web address: http://www.jstage.jst.go.jp/article/jts/34/4/407/_pdf

The National Institute of Health Sciences, in a long-term study of rats, found that acrylamide does in fact cause certain types of cancer. Multi-organ tumors arose, including scrotal mesotheliomas in males and mammary gland tumors in females. Thyroid follicular cells were present in both males and females. The connection to humans is not yet definite but strongly supported by the results from laboratory rats. Rats were treated with a substance to see how it would react with Acrylamide and the rats were shown to have significantly more tumors than the ones that did not receive Acrylamide.

Web site #3 Name: Acrylamide and Cancer Linked Confirmed

Web address: <http://www.rsc.org/chemistryworld/News/2007/December/05120703.asp>

Members of government and non government scientists have been doing research since 2002 to discuss results and determine through scientific evidence that acrylamide is a reproductive or developmental toxicant based, and a threat to people and animals. "In a study on diet and cancer, in which 120,000 people, and more than 62,000 women, aged 55-70 years, were asked details about their diet. The Dutch researchers used this data, and followed up the participants through cancer registries. After 11 years, women who had eaten around 40g of acrylamide a day were twice as likely to develop womb and ovarian cancer as those who'd eaten around 9g a day." Mucci, a researcher at Harvard School of Public Health in Boston stated "In Swedish and US populations, coffee and fried potato chips are the main sources of Acrylamide," which is a scary thought since Americans either consume one or the other and like myself, both.

Section 3: Statistics

Web Site Title #1: FOOD SAFETY

Web Site:

http://www.who.int/foodsafety/publications/chem/en/acrylamide_summary.pdf

The Joint Expert Committee on Food Additives (JECFA) reports that the major contributing foods to total acrylamide intake for most countries are potato chips (16-30%), potato crisps (6-46%), coffee (13-39%), pastry and sweet biscuits (10-20%) and bread and rolls/toasts. This means that almost all of the population is affected. People who eat more fatty and fried foods will have a higher chance of developing cancer. "Based on the available data, food is estimated to make a significant contribution to total exposure of the general public to acrylamide. Average intakes for the general population were estimated to be in the range of 0.3 to 0.8 microgram of acrylamide intake per

kilogram of body weight per day. Within a population, it is anticipated that children will generally have intakes that are two to three times those of adults when expressed on a body weight basis. Dietary intakes of acrylamide by some consumers may be several times higher than the average limit of exposure (10-30%).”

Web site #2 Name: Exposure

Web address:

http://www.cdc.gov/exposurereport/pdf/FourthReport_ExecutiveSummary.pdf

http://www.atsdr.cdc.gov/HAC/pha/BelvidereSandGravelSite/Belvidere_Sand_Gravel_Site%20HC%208-20-2008.pdf

“Because acrylamide is a reactive chemical, it can bind to proteins. These reaction products are called adducts. CDC’s Environmental Health Laboratory developed a new method to measure Acrylamide and its metabolite, glycidamide, as adducts of hemoglobin, a major blood protein. The data showed that acrylamide exposure is extremely common in the U.S. population.” Although food is a main source of Acrylamide it is also found on job sites. In New Jersey, Acrylamide was considered a chemical of concern (COC). Even though children do not access this site, they do have a higher risk of becoming ill due to the chemical. “They are shorter than adults, which means they breathe dust, soil, and heavy vapors closer to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages.” In New Jersey this site went through thorough investigation and even though high traces of the chemical were present, since they said no one was obtaining water through it, it was considered to be a Non-Threat. Just because it’s not directly affecting people doesn’t mean it isn’t in other ways. Hopefully further action will be taken on job sites with high exposure to this chemical.

Web site #3:

Web address: <http://www.medicinenet.com/script/main/art.asp?articlekey=89411>

http://solutionsforyourlife.ufl.edu/hot_topics/lawn_and_garden/potatoes_home_garden.html

Consumers need to be aware of the risks that fried foods, coffee, cereal, bread, and other products potentially can cause to their health. The FDA has reported that 100% of Americans consume Acrylamide. Although the actual amount of Acrylamide that causes cancer is unknown, the average US person eats about 22 micrograms of Acrylamide a day. In one year an average American can consume roughly 125 lbs of potatoes alone. Consumers need to know the proper way of avoiding fatty foods to maintain a healthy diet. Eating in moderation is the best way to achieve this.

Section 4: Consumer Information

Web site #1 Name: Food Insight

Web address:

http://www.foodinsight.org/Resources/Detail.aspx?topic=Consumer_Behavioral_Shifts_Understanding_Consumer_Response_to_Acrylamide_Other_Food_Health_Issues

Many consumers are not aware of risks associated with food. Also, it has been proven many people will not even change their eating habits even knowing the risk acrylamide can cause. There are a few reasons why this is happening. The first is misconceptions. Some people totally confuse acrylamide with other health issues; like, the trans-fat issue that resulted from fast food changing their oil in order to make French fries healthier. This is from lack of knowledge about acrylamides. While many consumers do understand that acrylamide is a naturally occurring compound that is the result of cooking or heating, there are still a number of participants who feel it is only found in processed foods, not in foods made in the home. They are causing themselves to be at risk and don't care. People need to be more aware of what they are eating, if they want to stay healthy.

Web site #2 Name: New Tests Confirm Acrylamide in American Foods

Web address: <http://www.cspinet.org/new/200206251.html>

“Popular American brands of snack chips and French fries contain disturbingly high levels of acrylamide, according to new laboratory tests commissioned by the Center for Science in the Public Interest (CSPI).” The Swedish scientists who first discovered Acrylamide in food in 2002 conducted the study and they found some frightening results. Since Acrylamide is used for water treatment, there are traces of it in water, but what they found was that the amount of acrylamide in order of fast-food French fries is at least 300 times more than what the U.S. Environmental Protection Agency allows in a glass of water. The limit of exposure in an 8 oz glass of water is less than 3 micrograms. The amount of Acrylamide in an order of McDonalds French fries is 82 micrograms. “I estimate that acrylamide causes several thousand cancers per year in Americans,” said Clark University research Professor Dale Hattis. Consumers need to be more aware of the levels of these toxins in food. Hopefully in the years to come, with more conclusive evidence, something will be done to cause fewer risks of cancer in foods.

Web site #3 Name: Health Implications of Acrylamide in Food

Web address: <http://www.fda.gov/ohrms/dockets/dailys/02/Oct02/100402/02n-0393-rpt0001-vol1.pdf>

Acrylamide is formed when certain foods are cooked or processed at high temperatures. It seems to happen when different food components react together. Foods high in carbohydrates, proteins, amino acids, and lipids seem to have the most present. It is also in coffee beans. Scientists have not developed a good way to stop the reaction from roasting coffee beans just yet. The reaction is promoted by heating and increases with the time of heating, but it is not clear what combinations of food components are involved that creates it.

Section 5: Solutions to the Problem (or Issue)

Web Site #1 Name:

Web site:

<http://www.fda.gov/Food/FoodSafety/FoodContaminantsAdulteration/ChemicalContaminants/Acrylamide/ucm194482.htm>

The FDA is working towards addressing the issue of acrylamide. They have been working with acrylamides and toxicology. FDA's National Center for Toxicological Research (NCTR) has published 11 papers on acrylamide toxicology. In 2008, NCTR completed a new long-term rat and mouse carcinogenicity experiments that address deficiencies in earlier carcinogenicity experiments to provide more reliable data on potential carcinogenic risks of acrylamide exposure. If they can be more precise in the risks it will be very helpful when the information is released to the public. The FDA is still in the information gathering stage on acrylamide, and has not instituted any action. FDA's current dietary advice on acrylamide is unchanged since acrylamide was discovered in food in 2002. They recommend consumers eat a balanced diet, choosing a variety of foods that are low in Trans fat and saturated fat, and rich in high-fiber grains, fruits and vegetables

Web site #2 Name: Food Contaminants

Web site:

<http://www.fda.gov/Food/FoodSafety/FoodContaminantsAdulteration/ChemicalContaminants/Acrylamide/ucm194482.htm>

“The Safe Drinking Water and Toxic Enforcement Act of 1986, is a state law that requires businesses in California to warn citizens of significant exposures to chemicals that can potentially cause cancer or reproductive harm. Businesses can either reformulate products to lower exposures below the level deemed significant by the state, or they can warn citizens of the exposures by labeling their products or posting a warning sign.” the California Attorney General has filed law suits saying that the law is being violated by not warning the people. Now companies like Lays and Fritos may need to warn consumers the risk in potato chips. This would create public knowledge, but the FDA made a statement saying they feel it may not be a good idea since no finalization on the topic is concluded, it may scare consumers too much. Another group for safety, the Environmental Health Hazard Assessment (OEHHA), is responsible for setting a risk level for acrylamide and suggesting appropriate warning language and has been working on this since 2006. Efforts on lowering levels in the foods have been working, so they will not have to put a label on it since the exposure in the food will be under the recommended dose.

Web site #3 Name: Confederation of Food and Drink Industry of the EU

Web address:

<http://www.ciaa.eu/documents/others/french%20fries-EN-final.pdf>

The Confederation of the Food and Drink Industry of the EU (CIAA) have made up a series of detailed brochures to identify how to reduce acryl amide in biscuits, crackers, bread, cereal, and potato products. This created the “toolbox” and is available in 20 different languages on the Internet for use. The French fry pamphlet in particular allows manufacturers information on what to do to reduce levels. How the potatoes are stored and transported can make a difference, also blanching the potatoes and par frying is shown to significantly lower the amount, too. Even things like cutting the potato thicker are very successful in reducing the amount present. With all this new insight, manufactures will be able to produce and cook foods that won't be as harmful to the people who consume it, and everybody knows, French fries are an American Favorite.

Conclusion:

In conclusion, Acrylamide has been proved to be harmful to animals, and people in high doses. Laboratory animals that have been exposed to Acrylamide have encountered reproduction problems, tumors, and cancers. The exact amount in humans has not been determined yet, but it is highly recommended that one stay away from high concentrations of it. Coffee and potatoes are the two main sources of food contributors as well as water treatment products. Hopefully in the years to come the FDA will have better understanding on the concept of the harm of Acrylamides and offer an improved plan of action rather than just saying to balance your diet properly.

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