

Heterocyclic Amines

Introduction

When it came time to pick a topic for our fact sheets there weren't many left when I got to the sheet. I chose this topic because I had never heard of it and thought it would be interesting to learn about something new. Heterocyclic Amines are chemicals formed in food, mainly meat that can be dangerous towards your health. I find it interesting how people can put this stuff in food that we eat, knowing it can be harmful and cause problems. If you know it's bad why continue to put it in the food? I've never heard of this before, and if it's harmful how come no one is educating people about it and informing the public in what it is and how to deal with it. I want to find out why this is dangerous and a problem and how we can do something to fix it.

Section 1: Background and Problem Statement

- **Web site #1 Name:** Heterocyclic amines in foods and their implications for health
- **Web address:**
<http://www.beefnutrition.org/uDocs/HA%20paper%202003.pdf>

- **Background Information:**

I could not find any information on HP2010 or on a government agency or nonprofit organization Web site, there's just not a lot of research done about it. It's not completely understood what the mechanisms for formations of HCAs in food are but scientists think there are two different routes. The first one is that they form when food proteins or certain amino acids by themselves are exposed to high temperatures. The second route which is the one more people are focused on has to do with certain amino acids at high temperatures reacting with creatine compounds which are only found in meat. This

seems more plausible since because these HCAs form at a more realistic temperature than if the first ones were to react alone.

- **Web site #2 Name: National Cancer Institute**
- **Web address:** <http://www.cancer.gov/cancertopics/factsheet/Risk/heterocyclic-amines>
<http://www.cancer.gov/dictionary/?CdrID=446556>
- **Background Information:**

Heterocyclic Amines (HCAs) is a chemical created in meat, fish, and poultry when cooked at high temperatures, such as frying, broiling, or barbecuing. There are four factors that the formation which are type of food, cooking method, temperature, and time. Temperature is the one to watch out for, because frying, broiling, and barbecuing produce the largest amount of HCAs because those methods use such high temperatures. It's difficult to know how serious of a problem it because there's not a lot of evidence to support it and everyone responds to the HCAs differently and it depends so much on the cooking conditions. While studies are being done to how much HCAs are in the average American diet there is currently no maximum daily intake of them that's been established, and no federal agency monitors the HCA amount of cooked meats. This means that we can't be sure how much would increase the cancer risk and that there are no guidelines concerning the consumption of foods that have HCAs in them.

- **Web site #3 Name: MedicineNet.com**
- **Web address:**
<http://www.medicinenet.com/script/main/art.asp?articlekey=47818>
- **Background Information:**

They are carcinogenic chemicals formed in muscles meats when cooked like beef, pork, fowl, and fish. HCAs form when amino acids which are the building blocks of proteins and creatine a chemical found in muscles react at high cooking temperatures. Researchers have identified 17 different kinds of HCAs from the cooking of muscle meats which could create a human cancer risk.

Section 2: Research

- **Web site #1 Name: Medicinenet.com (got if off of Scirus Search Engine)**
- **Web address:**
<http://www.medicinenet.com/script/main/art.asp?articlekey=47818>
- **Summary of the research:**

Some research has been done by the National Cancer Institute (NCI), Japanese, and European scientists. All of their information shows that HCAs are created within muscle meats during most types of high temperature cooking. They also have found research on HCAs connecting to different types of cancer. NCI found a link between people with stomach cancer and cooked meats they ate. They researched the diets and eating habits of 176 people with stomach cancer and did the same thing with 503 people without cancer. They discovered that those who ate beef medium-well or well done were more than three times at risk for stomach cancer than people who ate their beef rare or medium-rare. Another study found that people who ate beef four or more times a week had more than twice the risk of stomach cancer than those who ate it less frequently. It is also showing that there is an increased risk for developing not only stomach cancer but colorectal, pancreatic, and breast cancer in association with high intakes of well done, fried, or barbecued meats. (paragraph 2 and 3)

- **Web site #2 Name: Science Resource Center**
- **Web address:**
<http://galenet.galegroup.com/servlet/SciRC;jsessionid=507785F5B618092F898F8A36A11EF4AA?alf=ac%20fulltext&locID=a30sc&c=8&t=2&ste=42&ai1=KE&n=10&at1=heterocyclic%20amines&docNum=A20776403&st=a&tc=14&tf=0>
- **Summary of the research:**

This research shows how cooking the food in different ways affects the amount of HCAs within the food and while charred meat and poultry have more, it's not always sure

which meats have the most. It also gives you information on how to avoid them, through different cuts of meat, preparing it and how to cook it.

- **Web site #3 Name: You are not alone**
- **Web address: <http://www.enotalone.com/article/7545.html>**
- **Summary of the research:**

This research shows how HCAs affect fast food restaurants. They evaluated five different kinds of meat products from different fast food chains. The study showed that HCA levels are lower in fast foods due to the cooking temperature and how long they cook the meat. This shows that you're more likely to be susceptible or exposed to HCAs from home cooking and non-fast food restaurants because that's where a larger amount of meat is consumed and is also cooked to order.

Section 3: Statistics

- **Web site #1 Name: Cancer and diet Heterocyclic Amines**
- **Web address: <http://www.aapn.org/hca1.html>**
- **Summary of the statistics:**

In September of 1997 the World Cancer Research Fund and the American Institute for Cancer Research came out with a 650 page report based on the examination of 4,000 studies of diet and cancer by an international panel of 15 scientists. It said that 66-75% of colon cancers are preventable by having a healthy diet. Heavy red meat eaters were also twice as likely to get prostate cancer which was shown in a study of 50,000 health professionals.
- **Web site #2 Name: Heterocyclic amines in foods and their implications for health**
- **Web address: <http://www.beefnutrition.org/uDocs/HA%20paper%202003.pdf>**
- **Summary of the statistics:**

About twenty years ago HCAs were found to be potent mutagens; about 80% of all mutagens are also carcinogens in laboratory animal studies. Scientists have estimated using preliminary data from studies of rats and mice that Americans have about one in 10,000 chance of getting any form of cancer during a lifetime. That's about 40% or two in five people in the U.S. depending on the person though they may have a greater risk if they're ingesting a lot of HCAs and also on a person's genetic makeup.

- **Web site #3: About.com**
- **Web address:**
<http://altmedicine.about.com/od/healthykitchenrecipes/a/meatcarcinogens.htm>
- **Summary of the statistics:**
Cooking with cherries helps to reduce the amount of HCAs by 69-78.5% because of the antioxidants produced from the cherries. Studies show that using 120 milligrams of vitamin E powder mixed into the meat helps to also reduce the amount of HCAs.

Section 4: Consumer Information

- **Web site #1 Name: Science Resource Center**
- **Web address:**
<http://galenet.galegroup.com/servlet/SciRC;jsessionid=507785F5B618092F898F8A36A11EF4AA?alf=ac%20fulltext&locID=a30sc&c=8&t=2&ste=42&ai1=KE&n=10&at1=heterocyclic%20amines&docNum=A20776403&st=a&tc=14&tf=0>
- **Summary of the information:**
I found this one study very interesting. It asked people about their eating habits and how they cooked their meat and how much they ate meat, and then over a period of time see how many people developed cancer. 10,000 Finns were monitored over an increment of 24 years and the results were interesting. Women who reported eating a lot of fried meat

had a 77% greater risk of developing breast, endometrial, or ovarian cancer than women who ate less. And men who ate more fried meat had no greater risk than men who ate less. I think this is really interesting, I wonder if it has to do with our bodies and how we're made up, our metabolisms and how we process things.

- **Web site #2 Name: Health and Wellness Resource Center**

- **Web address:**

<http://galenet.galegroup.com/servlet/HWRC/hits?r=d&origSearch=false&bucket=per&o=&rlt=2&n=10&l=d&searchTerm=2NTA&index=BA&basicSearchOption=KE&c=114&tcit=0 1 0 0 0 1&docNum=A10727128&locID=a30sc&secondary=false&t=RK&s=1&SU=heterocyclic+amines>

- **Summary of the information:**

I found it interesting and was a little surprised about how microwaving the meat beforehand for just a couple minutes can cut down on HCAs quite a bit, and that it is also considered one of the safest possible ways to lessen them as well. I thought the opposite would happen just because of the radiation emitted from the microwave and just how there's this kind of negative connotation about cooking with a microwave.

- **Web site #3 Name: Gale Cengage Learning**

- **Web address:** http://find.galegroup.com/gps/retrieve.do?contentSet=IAC-Documents&resultListType=RESULT_LIST&qrySerId=Locale%28en%2C%2C%29%3AFQE%3D%28ke%2CNone%2C19%29heterocyclic+amines%24&sqHitCountType=None&inPS=true&sort=DateDescend&searchType=BasicSearchForm&tabID=T003&prodId=IPS&searchId=R2¤tPosition=4&userGroupName=fair55133&docId=A192485315&docType=IAC&contentSet=IAC-Documents

- **Summary of the information:**

I found it interesting how marinating the meat in alcohol reduced the amount of HCAs by a lot and what's even more interesting is they're not really sure how the marinade does it. They say if you marinate a steak or piece of chicken in beer or wine for up to six hours that it cuts the risk of these harmful carcinogens by up to 90%! They think that the beer or wine absorbs the sugar that would have gone up to the meats surface and turned into

HCA's. It's weird to see how there are different methods that are successful in doing this but how is a mystery!

Section 5: Solutions to the Problem (or Issue)

- **Web site #1 Name: About.com**
- **Web address:** <http://altmedicine.about.com/od/healthykitchenrecipes/a/meatcarcinogens.htm>
- **Summary of the information:**

These are some ways to reduce HCAs from forming by cooking with cherries reduced the amount because cherries are full of antioxidants that help get rid of the chemical. Using vitamin E has also been found to minimize the amount of HCAs. Adding garlic, rosemary, and sage and cook with olive oil, they are all antioxidant seasoning that help block the formation. Drinking green tea with your meal because the polyphenols from the tea help our bodies excrete the carcinogenic compound.
- **Web site #2 Name: Gale Cengage Learning**
- **Web address:** http://find.galegroup.com/gps/retrieve.do?contentSet=IAC-Documents&resultListType=RESULT_LIST&qrySerId=Locale%28en%2C%2C%29%3AFQE%3D%28au%2CNone%2C14%29David+Schardt+%3AAnd%3AFQE%3D%28au%2CNone%2C15%29Leila+Corcoran+%24&sqHitCountType=None&inPS=true&sort=DateDescend&searchType=AdvancedSearchForm&tabID=T004&prodId=IPS&searchId=R4¤tPosition=2&userGroupName=fair55133&docId=A20776403&docType=IAC&contentSet=IAC-Documents
- **Summary of the information:**

You should have a well rounded diet, we know meat produces the highest amount of HCAs so you should also eat seafood which produces a lot less and also eat plant foods like veggie burgers, fruits, and vegetables because they produce little to none HCAs as well. You should use different methods of cooking, barbecuing broiling and frying are

not good for you, so some alternatives would be baking or roasting as well as cooking with liquid by boiling, steaming, poaching or stewing because those methods generate no HCAs because the temperature never tops the boiling point of water. Precooking or marinating cuts HCAs and sausage casing and hot dog outer skins also prevent HCAs. The Web site also gives you tips on what to cook, how to prepare it, and how to cook it, which are all helpful in helping to minimize or get rid of HCAs.

- **Web site #3 Name: Gale Cengage Learning**
- **Web address:** http://find.galegroup.com/gps/retrieve.do?contentSet=IAC-Documents&resultListType=RESULT_LIST&qrySerId=Locale%28en%2C%2C%29%3AFQE%3D%28ke%2CNone%2C19%29heterocyclic+amines%24&sqHitCountType=None&inPS=true&sort=DateDescend&searchType=BasicSearchForm&tabID=T003&prodId=IPS&searchId=R5¤tPosition=13&userGroupName=fair55133&docId=A55426684&docType=IAC&contentSet=IAC-Documents

- **Summary of the information:**

Other ways to cut down on HCAs are to use marinades which shut down HCA production in the meat. Precooking the meat in a microwave also helps and is the simplest way to cut down on them. A study showed that microwaving meat patties for two minutes before putting them on the grill cut the amount of HCAs in the finished burgers to 10% of the amount in grilled burgers that weren't precooked in the microwave. The heat from the microwave drives off a good amount of the liquid which removes many of the HCAs raw ingredients. Another interesting way is to have a beer; it does not work for all types of HCAs. With the meat there are bacteria within the HCAs which help create the often carcinogenic mutation. When the beer is introduced though to the microbial communities it inhibited the HCAs ability to form the mutations.

Conclusions:

I learned a lot about what exactly HCAs are and do. I've learned and I hope others take this with them to on how to prevent and handle food in order to reduce your intake of these carcinogenic chemicals, in order to stay healthy. While there is little research down about how effective they are since it depends on so many factors and varies from person to person you should still be aware and be careful, better to be safer than sorry. I learned how they are formed and see how they affect us. I also think a real message was just to make sure you're eating a well balanced healthy whole diet and to not just rely on meat as an everyday meal. While I did find it interesting to learn about something I knew nothing about this was a very difficult topic to find research on since it was hard to obtain information and is something that is just being brought to our attention.

Back to Betty C. Jung's Web site	http://www.bettyjung.net
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