

# Nitrosamines and Cancer

## Introduction

The topic I chose was on nitrosamines and the relation it has to cancer. On the list I had to choose from, this one seemed the most interesting to me because I had no idea what nitrosamines were and I've had people in my life that had cancer. I never fully understood the kind of cancers there are in the world; so this topic helped me further understand a specific kind.

Many cancers that I have ever heard of are the most common ones such as liver and lung cancer, but this kind caught my eye because it was something I have never heard of before. I was very shocked to find out that nitrosamines have carcinogen properties that were a leading cause in some cancerous diseases.

## Section 1: Background and Problem Statement

Nitrosamine is a chemical compound that causes cancer, also containing carcinogens. They are produced from nitrates and secondary amines but only form under certain conditions such as being exposed to the acidic conditions in the stomach. It has been proven by scientists that when injected into laboratory rats, tumors were formed primarily in the liver.

- **Web site #1 Name: Healthy People 2010**
- **Web address:** <http://www.healthypeople.gov/Document/HTML/Volume1/03Cancer.htm>
- **Background Information:**
  - Healthy People 2010 does not address nitrosamines directly but it does talk about cancer. Cancer is the second leading cause of death in the United States and the rates can vary by gender, race, and ethnicity. Evidence has show that several types of cancer can be prevented and the survival rate continues to improve. Since nitrosamines are a part of what causes a type of cancer in the human body, these problems apply.

- **Web site #2 Name: Nitrosamines and Cancer**
- **Web address:** <http://lpi.oregonstate.edu/f-w00/nitrosamine.html>
- **Background Information:**
  - Nitrosamines are a class of chemical compounds that were first described in the chemical literature over 100 years ago, but started to receive more attention in 1956. It was reported that dimethylnitrosamines produced liver tumors in laboratory rats. It was also shown that some of the tobacco specific nitrosamines caused lung cancer. Nitrosamines can be found in cured meat because it contains amines and sodium nitrate, the two components that make up nitrosamines.

- **Web site #3 Name: Intelligence Bulletin 15**
- **Web address:** http

- **Background Information:**

Nitrosamines are regarded as one of the most potent families of animal carcinogens. It's considered a health issue for workers that are exposed to cutting fluids in metal machining jobs. A development in the recognition of the potential for formation of nitrosamines in the air and other non-acidic media is by the reaction of secondary and tertiary amines with nitrites and other oxides of nitrogen. Exposure to nitrosamines is a serious health concern.

## Section 2: Research

**Web site #1 Name:** THE IMPACTS OF UV DIRECT PHOTOLYSIS AND UV/H<sub>2</sub>O<sub>2</sub> ADVANCED OXIDATION PROCESSES ON THE FORMATION OF NITROSAMINES AND ORGANIC CHLORAMINES FROM SUBSEQUENT

- **Web address:** <http://www.scirus.com/srsapp/search?q=nitrosamines&t=all&sort=0&g=s> (number 5)
- **Summary of the research:**
  - Nitrosamines are one of the few groups of chemicals that have been acknowledged as directly carcinogenic and the health effects have been extensively studied. Exposure to nitrosamines has been found to cause

hepatocellular carcinomas and various tumors of the liver, esophagus, fore stomach, bladder, kidneys, nasal cavity and in some cases in the testes.

- **Web site #2 Name: Nitrosamines and Cancer**
- **Web address:** http
- **Summary of the research:**
  - In 1970 it was discovered that ascorbic acid inhibits nitrosamine formation. But in the late 1960s, researchers at the University of Nebraska Medical Center were studying nitrosamine formation from a drug called aminopyrine. They discovered that when using a batch of aminopyrine with ascorbic acid as a preservative, nitrosamines are not formed.
  
- **Web site #3 Name: Nitrosamines and Cancer**
- **Web address:** <http://ipi.oregonstate.edu/f-w00/nitrosamine.html>
- **Summary of the research:**
  - Two scientists named John Barnes and Peter Magee discovered dimethylnitrosamines produced liver tumors in rats. It was discovered during a routine screening of chemicals that were being proposed for use as solvents in the dry cleaning industry. Their discovery caused scientists around the world to investigate the carcinogenic properties of other nitrosamine compounds.

### Section 3: Statistics

- **Web site #1 Name: Cancer**
- **Web address:** <http://www.healthypeople.gov/Document/HTML/tracking/OD03.htm>
- **Summary of the statistics:**
  - Nitrosamines is a factor in the cause of cancer and the way to calculate the death rate due to cancer is by dividing the number amount of people by the number about of deaths caused by cancer times 100,000 to figure it out.

- **Web site #2 Name: Cancer**
- **Web address:** [http://www.healthypeople.gov/Document/HTML/Volume1/03Cancer.htm#\\_Toc490540734](http://www.healthypeople.gov/Document/HTML/Volume1/03Cancer.htm#_Toc490540734)
- **Summary of the statistics:**
  - Cancer death rates vary by gender, race and ethnicity. In 1990 male cancer death rates peaked at a 220.8 per 100,000 and female deaths peaked a year later at 142.2 per 100,000. For the following six years males averages decreased by one percent, and females decrease on average by 0.4 percent. These statistics were significant in lung, prostate, brain and other nervous system cancers.
  
- **Web site #3: Occupational and Environmental Medicine**
- **Web address:** <http://oem.bmj.com/content/57/3/180.abstract>
- **Summary of the statistics:**
  - Exposure to nitrosamines was significantly associated with an increased mortality from cancers of the esophagus (13 deaths), oral cavity (17 deaths), prostate (26 deaths), and the brain (6 deaths). These were the results from a study in October of 1999.

## **Section 4: Consumer Information**

- **Web site #1 Name: Cosmetic Product Manufacturers**
- **Web address:** <http://www.fda.gov/ICECI/Inspections/InspectionGuides/ucm074952.htm>
- **Summary of the information:**
  - In a study of 29 cosmetic creams and lotions, N-Nitrosodiethanolamine (NDELA) was determined in 27. The levels of NDELA contamination ranged from less than 10 ppb to 50 ppm. Of the more than 300 cosmetic samples analyzed in 1978, 1979 and early 1980 in FDA laboratories, 7% contained less than 30 ppb NDELA, 26% contained 30 ppb to 2 ppm, and 7% contained between 2 ppm and 150 ppm.

- **Web site #2 Name: CPG Sec. 500.450 Volatile N-Nitrosamines in Rubber Baby Bottle Nipples**
- **Web address:** <http://www.fda.gov/ICECI/ComplianceManuals/CompliancePolicyGuidanceManual/ucm074418.htm>
- **Summary of the information:**
  - A German study on the occurrence of volatile N-nitrosamines (nitrosamines) in rubber baby bottle nipples was presented at the meeting of the American Chemical Society in the spring of 1981. FDA's subsequent investigation of the problem revealed the presence of nitrosamines in rubber nipples marketed in the United States and showed that the nitrosamines could migrate into foods, such as milk and infant formula that come in contact with the nipple during the conventional sterilization process. FDA expressed concern to the industry over infant exposure to nitrosamines, many of which are carcinogens, and informed manufacturers that appropriate measures must be taken to reduce nitrosamine formation in rubber nipples to the lowest level that is technologically feasible.
- **Web site #3 Name:**
- **Web address:** <http://www.cancer.gov/cancertopics/pdq/prevention/control-of-tobacco-use/healthprofessional/allpages/print>
- **Summary of the information:**
  - Environmental tobacco smoke has the same components as inhaled mainstream smoke, although in lower absolute concentrations, between 1% and 10%, depending on the constituent. Carcinogenic compounds in tobacco smoke include the polycyclic aromatic hydrocarbons, including the carcinogen benzo(a)pyrene and the nicotine-derived tobacco-specific nitrosamine, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone. Elevated biomarkers of tobacco exposure, including urinary cotinine, tobacco-related carcinogen metabolites, and carcinogen-protein adducts, are seen in passive or secondhand smokers.

## Section 5: Solutions to the Problem (or Issue)

- **Web site #1 Name: Other Achievements: Highlights**
- **Web address:** <http://cisnet.cancer.gov/lung/achievements.html>
- **Summary of the information:**
  - This site is a government site from the cancer intervention and surveillance modeling network and the motive is to model the guide to public health research and priorities. CISNET investigators from the Pacific Institute for Research and Evaluation convened expert panels to predict the mortality risks and impact on tobacco use in the US of a “harm reduction” policy requiring that smokeless tobacco products meets low nitrosamine standards, but be marketed with a warning label. The panel concluded that low-nitrosamine smokeless tobacco products may have a substantially lower risk than smoking, and that the new policy could produce a modest acceleration in the decline in smoking prevalence over 5 years. Efforts to quantify the impact of policies of this type provide starting values for tobacco control modeling efforts, and provide a basis to initiate the public policy debate.
  
- **Web site #2 Name: Cancer Prevention**
- **Web address:** <http://www.cdc.gov/cancer/dcpc/prevention/>
- **Summary of the information:**
  - The Centers for Disease Control and Prevention is a government-based site. It states that the number of new cancer cases can be reduced, and many cancer deaths can be prevented. Research shows that screening for cervical and colorectal cancers as recommended helps prevent these diseases by finding precancerous lesions so they can be treated before they become cancerous. Screening for cervical, colorectal, and breast cancers also helps find these

diseases at an early, often highly treatable stage. A person's cancer risk can be reduced in other ways by receiving regular medical care, avoiding tobacco, limiting alcohol use, avoiding excessive exposure to ultraviolet rays from the sun and tanning beds, eating a diet rich in fruits and vegetables, maintaining a healthy weight, and being physically active. Vaccines also help reduce cancer risk. The human papillomavirus (HPV) vaccine helps prevent most cervical cancers and some vaginal and vulvar cancers, and the hepatitis B vaccine can help reduce liver cancer risk.

- **Web site #3 Name:** The potential impact of a low-nitrosamine smokeless tobacco product on cigarette smoking in the United States: estimates of a panel of experts.
- **Web address:** <http://www.ncbi.nlm.nih.gov/pubmed/16256276>
- **Summary of the information:**
  - Pub Med is a government based Web site about health and medicines. An article states that a panel predicted that the new policy would accelerate a decrease in smoking prevalence from 1.3 to 3.1 percentage points over 5 years compared to the current SLT product policy, with greater effects on males than females. Introduction of the new product was also predicted to result in modest additional use of SLT overall, with the greatest increases among males who initiated tobacco use under the new policy.

### **Conclusions:**

Had it not have been for this assignment, I never would have found out about the chemical compound called nitrosamine. I learned that it got its name from nitrates and secondary amines and can lead to cancer. The worst part about it, in my eyes, was that it was found in every day products such as cured meats, bacon, beer, baby bottle nipples, and cigarette smoke.

The majority of where the compound is found is meats, cigarette smoke, and the stomach. By having people read this research, I hope they will obtain the knowledge to get regular screens for cancer, will stay away from smoking tobacco and that people will be more conscious of what they consume food wise and even some beverages.

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