



## Note about the Curriculum

The Pesticides and Toxic Substances Curriculum Enhancements have over 40 computer inquiry based exercises divided over 7

categories of environmental concern. Each Category begins with a background introduction of the broad topic, then the exercises, followed by a comprehensive reference section.

The exercises are designed to challenge the students to expand their internet research skills, and cognitive ability to look at both sides of a problem. All of the substances discussed in this program have had a significant impact on both local and national economies and are of ubiquitous distribution. In many cases the student is challenged to identify and balance the economic benefits of the product to the environmental or human health costs that have been identified, often long after the products have been integrated into society, or even long after they are removed from the marketplace. The Power point and oral presentations are designed to strengthen organizational skills, development of a balanced argument, public speaking skills, and note-taking and interpretational skills.

Most exercises are geared for the advanced cognitive and developmental abilities of older students able to process complex concepts. Be advised that not all of the questions posed in the exercises have a clear-cut, definitive answer or solution. In some cases, what the students would like the outcome to be, may not be possible to realize, even within their lifetimes.

*There are three exercises that may be used as an entire lesson on their own: Chapters 1&3: Plastic Pollution; and in Chapter 2: Reducing the use of pesticides in the agricultural / urban environments. These exercises offer the student and instructor the maximum flexibility of topic and directional choices. The instructor should ensure that no two students choose the same crop, or pest. These exercises may also be used in earlier grades or may be used for 'standard' or 'special needs' students.*

## Note for High School Educators

Project conforms to the National Science Core Curriculum standards for High Schools

Specifically, this program focuses on 'Content Standard F: Science in Personal and Social Perspectives'. The Core Content Standard 'F' states that " as a result of activities in grades 9-12, all students should develop an understanding of: 1.) *Personal and community health*, 2.) *Population growth*, 3.) *Environmental quality*, 4.) *Natural and human-induced hazards*, and 5.) *Science and technology in local, national and global challenges*."



### About the Author

Marcia Anderson designed this project solely for the safety and forewarning of future generations, and has received no pay or profit from its creation.

She holds a Bachelor of Science in Biology from Monmouth University, a second Bachelor of Science in Environmental

Design: Landscape Architecture from Rutgers University, a Master of Arts in Instruction and Curriculum in Earth Science from Kean University, is a PhD Candidate of Environmental Management at Montclair State University, and is a George H. Cook Scholar.

She is a Certified Tree Expert for the State of New Jersey, was the program specialist for the Central Caribbean Marine Institute: designing the Eco-weekends and Ocean Literacy programs for CCMI and has designed numerous science and environmental education lecture series. (Most are posted on the University Website: <https://sites.google.com/a/kean.edu/marcia-anderson>).

She has been a professor at Kean University for 13 years, teaching Geology, Geography, Earth Science and Oceanography. This project was conceived as a result of a background of research in toxic substances, pesticide exposure, pollution remediation, and ocean issues. Ms. Anderson is a specialist at synthesizing research and turning it into educational programs, and produces these programs professionally and for the federal government. She also writes regularly for the US EPA blog "Greening the apple" .

Disclaimer: Although Ms. Anderson is also employed by the U.S. Environmental Protection Agency , the contents of this program do not speak for the EPA in any way.

## Pesticide and Toxic Substance Exposure Awareness Project; Inquiry Based Curriculum Enhancements



**For Grades 11-12 and Beyond High School or College: Health, Environmental Science, Chemistry Earth Science, Environmental Science, Public Health, Environmental Health Curricula**



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## Introduction

Since WWII, the production of pesticides and industrial chemicals has risen rapidly, with the US generating or importing about 42 billion pounds (19 billion kg.) per day, leaving Americans swimming in a sea of synthetic chemicals. These pesticides and toxic substances are a demonstration that “better living through chemistry” has been integrated in all aspects of our daily lives. These man-made chemicals are found in everything from unbreakable baby bottles, to large screen TV’s and cell phones. The same chemical products then soon find their way out of the everyday products and into the environment – and ultimately into our bodies, or the bodies of other organisms around the world.

A recent biomonitoring survey conducted by the CDC, found traces of 212 toxic chemicals in Americans – including toxic metals, arsenic, cadmium, pesticides, flame retardants, PCBs, DDT, and even perchlorate, an ingredient in rocket fuel.

As scientists are getting better at detecting the chemicals in our bodies, they are discovering that even tiny quantities of toxins can have a potentially serious impact on our health, and our children’s future.



### Goals of this Project

The goals of this project include: 1.) heightening the awareness of the student to the ubiquitous nature of pesticides and toxic substances in the environment; 2.) the realization that we are all exposed to many toxic substances on a regular basis, 3.) the education of students who are of reproductive age, about the special effects and dangers of pesticide and toxic substance exposures, not only to themselves, but to fetuses and very young children, especially during system development stages.

The hope is that by introducing young people to these issues now, at an early age, as they enter the adult world, they will be more prepared to take the precautions necessary, thereby averting toxic exposures to themselves, their loved ones, and their offspring, in the years to come.

# Pesticide and Toxic Substance Exposure Awareness



## Contents

### Chapter 1. Fate and Transport

Background: Global Distillation: The Fate and Transport of Pesticides and Toxic Substances into the Arctic .

1. The Chemical Burden in Belugas of the St. Lawrence
2. Bioaccumulation of Toxins in Native Arctic Populations
3. Impacts of POPs in Arctic Marine Mammals
4. Atmospheric Dust: What is in the Air we Breathe?
5. Airborne Methyl Mercury
6. Plastic Pollution: Marine Debris

### Chapter 2. Pesticide Exposure

Background. Pesticide Exposure

1. Chemical Christmas
2. What is the cost of a cup of coffee?
3. Farm Workers pesticide exposure
4. Organophosphates
5. Organochlorines
6. Methyl Bromide
7. Malathion Spraying for WNV in New York City
8. Reducing pesticides use in Agricultural environments
9. Reducing Pesticides use in Urban Environments
10. CCA on Playgrounds
11. DDT to DDE and Phytoremediation Clean-up



### Chapter 3. Plastics: Other

#### Synthetic Organic Compounds

Background. Plastics: In Our Environment and in our Bodies

1. Polyvinylchloride (PVC),
2. Phthalates: Plasticizers
3. Bisphenol-A: Cans & Bottles
4. Formaldehyde
5. Dioxin
6. Plastic Pollution: Marine Debris
7. Synthetic turf playing fields



### Chapter 4. Children and Pesticide / Toxic Substance Exposures

Background. Children and Pesticide Exposure

1. Children and Pesticide Exposure in Food
2. Prenatal Exposure Risks
3. Young Children and Tobacco Smoke
4. Lead: The Most Significant Environmental Health Threat to American Children
5. 9/11 Toxic Legacy for NYC Newborns and Children
6. Arsenic and Apple Juice
7. Pesticides in Milk
8. Head Lice Products & Pesticides
9. Phthalates and Children



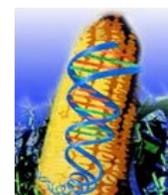
### Chapter 5. Toxic Substances

1. Lead Poisoning
2. Artificial food dyes
3. Lead in lipsticks
4. PCB's - Betrayal of the Public

### Chapter 6. Genetic Engineering.

Background. Genetic Engineering

1. Genetic Engineering (GE) Soy
2. Genetic Modification (GM) Corn
3. Genetic Engineering (GE) Cotton
4. GE/GM Human and Environmental Health Effects: Fact or Fantasy?



### Chapter 7. Superfund

Background: EPA and Superfund Sample Sites:

1. PAHs and the Gulf Oil Disaster
2. *The Few, The Proud, The Forgotten*; VOCs in Water
3. Polychlorinated Biphenyls (PCBs)
4. The Toxic Aftermath of 9/11
5. Love Canal—the history
6. Caribbean Petroleum Refining Limited (Cidra site)
7. The Puerto Rican Island of Vieques
8. The Superfund chapter is designed for the addition of regional superfund sites for study.