Natural Insecticide Pyrethroids Project

Proposing new regulation and restriction on the advertising statements regarding safety

Tag Words: Rutgers, pyrethroid, insecticide, natural, safety

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Summary

Word “Natural” is very popular today. Every advertisement tries to use it to attract consumers. The average consumer misguided by wording, thinking that it is safe, starts using the insecticides inaccurately as in the example of Amber Nickol published in “‘Safe’ Insecticides Now First in Poisoning” article by M. B. Pell and Jim Morris. The purpose of this project to stop the careless profit makers and to open the eyes of the average consumers showing that “natural” does not necessarily means safe or harmless. Dose makes the poison even in case of the safest household products. Pyrethroids are a group of synthesized insecticides similar to the natural pesticide pyrethrum, which is produced by chrysanthemum flowers. There is no doubt that pyrethroids are safer than the organophosphate insecticides, but they are not “natural” as media advertises it everywhere and has its own health risks. Modified pyrethroids have the longer half-life compared to the naturally produced pyrethrins and tend to accumulate in the body leading to different health problems. Our task was to search the information about so-called “natural” household insecticides, to interview someone who does the research with pyrethroids in the department of biochemistry and to write the legislative bill including all pros and cons of the topic.

Video Link

Natural Insecticide Pyrethroids: http://www.youtube.com/watch?v=2Ujf2xACiSk
The Issue: Pesticides

Introduction and Research (EK)

“Natural” should mean something simple, pure and beautiful, without signs of human modified chemicals, like an apple, a caterpillar or a river. Average citizen of any country thinks that “natural” means “safe”. Any business holders are ordinary people, and they understand that they can use the wording to make a profit. Dr. Sara Welch, National Products Association (NPA) Coordinator for Science and Regulatory Affairs, said that the word “natural” had lost its meaning, because more and more mainstream companies have begun using “natural” to describe their products. To stop the uncontrollable use of word “natural” NPA even set a meaningful bar that is higher than what many companies might set for themselves while helping consumers make the right choice when they shop. But is it enough? When the standards are not mandatory and the word “natural” can easily be abused... When the standards does not reveal the product’s entire life cycle, which includes the environmental and human health impacts of manufacturing, energy use, waste, and disposal in addition to ingredients... When the standards has been developed by those who have the most to gain from it financially – the manufacturers and retailers of “natural” consumer products... When it is impossible to understand the ingredients the NPA considers natural or non-toxic, permissible synthetic... No! So what should be done? First of all federal government or enough state governments should act to legally define what natural means and make it mandatory for all manufacturers and retailers. Then ingredients, toxicity and health risks should be presented to the consumer. Natural products are usually more expensive and I believe consumer deserves to get “the whole package” – that is safe from inside out.

Our project is concerned about the regulation of “natural” insecticides use. To see what is going on with it, we will answer the questions like: “what is pesticide?”, “are there existing natural insecticides in environment?”, “what kind of government structure regulates the use of insecticides?” We will look particularly at the pyrethroids and pyrethrins, answer the questions like: “are we exposed to it?”, “what can the exposure lead to?”, “what health issues can appear after exposure?”

Pesticide, according to dictionary, is a substance that disrupts or kills organisms that is considered to be pests such as weeds, damaging insects, or microbes that cause disease. The word “pesticide”, seems like, does not correlate with the word “natural”, because it is used to eliminate the part of the nature. But, there is actually, “natural” insecticides existing in the environment that are made by other organisms usually for their own defense, or are derived from a natural source such as minerals. Something similar to a natural selection… Numerous advantages and disadvantages of natural insecticides are known. Advantages are: eco-friendly, safer for consumer or user and very effective when it is used correctly. Disadvantages are: short residual activity, could be more expensive, and somewhat less pest-specific especially when compared to newer synthetic insecticides.

We are particularly interested in the use of “natural” insecticides. The national Pesticide Use Data (2002), collected by the Crop protection Research Institute of the CropLife Foundation and shown below, contains quantitative data on the use of insecticides in the United States crop production.
Pyrethrum was first recognized having insecticidal properties around 1800 in Asia and was used to kill ticks, fleas and mosquitoes. Pyrethroids are manufactured chemicals that are very close in structure to the pyrethrins, but are often more toxic to insects, as well as to mammals, and last longer in the environment than pyrethrins. Pyrethrins and pyrethroids are often combined with synergists, which enhance the insecticidal activity. The synergists are the chemicals that prevent some enzymes from breaking down the pyrethrins and pyrethroids, thus increasing their toxicity. Pyrethroids, being chemically modified compounds, represented by the media as “natural” insecticide. As a result for at least a decade, pyrethroids, being acute neurotoxicants, have been the insecticides of choice for consumers, replacing more toxic for humans and wildlife organophosphates. Pyrethroids are found in more than 3500 products used inside homes and on crops, yards and gardens – including lice shampoos, indoor foggers, flea sprays for pets and insecticides to fight ants, wasps, mosquitoes, aphids and spiders (Ferris Jabr, 2010). Pyrethroids usually enters the body when people eat contaminated food, breathe air containing the compound or dermal exposure when use commercially available insecticides that contain pyrethroid. About seventy percent of people in the United States have been exposed to pyrethroids, with children facing the highest exposure, according to studies published on February, 2010. In the new study, 5046 urine samples collected from US adults and children between 1999 and 2002 were tested for five metabolites of pyrethroid insecticides. The metabolites were found in seventy five percent of people tested 2001-2002, and in sixty six percent – tested in 1999-2000. The concentration was fifty percent higher in children than the amount found in adults, according to the study by Barr and colleagues published online in Environmental Health Perspectives on February, 3. Due to the size of children, they are not only much physically closer to the distributed insecticides, but their bodies, including children who are not fully developed yet, are unable to eliminate or resist toxins making them much more vulnerable to toxins. A 2008 study found pyrethroids and their metabolites in vacuum cleaner dust collected from homes and daycare centers in North Carolina and Ohio. In a
survey of New York was found that 87% of the state’s school use insecticides containing substances that cause immediate or long-term health problems. As you can see numerous studies depict that we are exposed to the pyrethroids.

The population of the United States is exposed to pyrethroids. What is the possible future prognosis for our population? Children are our future, so let’s look at the case studies and how the exposure affects children. A National Cancer Institute study found children’s risk of developing childhood leukemia increased sixfold among those living where insecticides were used in the home and gardens. As a result of exposure children may exhibit a reduction or inability to pay attention in school, diminished IQ, hyperactivity, aggression, unruliness and sleepiness. The more serious long-term consequences are damaged immune system that affects the ability to fight off serious illnesses and cancer. Pyrethroids affect the nervous system, which is conserved in all animals; therefore the animal studies are relevant to human health. Studies with animals have linked pyrethroid exposure to the thyroid, liver and nervous system, as well as impairment of behavioral development, changes in the immune system and disruption of reproductive hormones. There is some indication that the developing brain of some young animals could be affected by pyrethroids. Some pyrethroids imitate the hormone estrogen and can increase levels of estrogen in breast cancer cells, and some are suspected carcinogens. Other data suggests that people using pyrethroids are at risk of aggravated allergies or asthma. Summing up all the possible consequences from pyrethroid can lead to the scenario of the horror movie. In spite of the overwhelming amount of case studies, research, reports and statistics relating to the negative effects of insecticides, they continue to be utilized. The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency, The Occupational Safety and health Administration and the Food and Drug Administration. The EPA has recommended daily oral exposure limits for 10 different pyrethroids, ranging from 0.005 to 0.05 milligrams per kilogram of body weight per day. The problem is that recommendations provide valuable guidelines to protect public health but cannot be enforced by law. It seems that Environmental Protection Agency (EPA) should protect the consumers, but it turns out, it just registers insecticides and herbicides. EPA determines whether or not the product will kill its target, but it is not responsible for consumer safety, it can only recommend the safe dose. It was registered that EPA provide safety assurance for only six of six hundred active insecticides. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry and the National Institute for Occupational Safety and Health. So there is nothing to set restrictions to pyrethroids except some recommendations by EPA. Our purpose of this project is to write the legislative bill and to try to pass it. The so-called “natural” insecticides should be restricted “not only because of what we know, but also because of what we do not know” as said Weston in the article by Ferris Jabr. Links used are: 1) http://www.idph.state.il.us/envhealth/factsheets/pyrethroid.htm 2) http://blog.biggreenpurse.com/biggreenpurse/2010/02/what-does-natural-mean.html 3) http://www.atsdr.cdc.gov/phs/phs.asp?id=785&tid=153 4) http://www.medvet-cves.com/pdf/Pyrethroid_Toxicity_In_Cats.pdf 5) http://www.publicintegrity.org/investigations/insecticides/pages/introduction/ 6) http://www.livingwithbugs.com/natural_insecticides.html 7) http://eartheasy.com/blog/2009/01/insecticides-kids-why-you-should-be-concerned/ 8) http://eartheasy.com/blog/2009/01/outdoor-insecticides-are-they-worth-the-risk/2/ 9) http://home.mcn.net/~montanabw/bills.html 10) http://www.environmentalhealthnews.org/ehs/news/pyrethroids-raise-concerns
There is misconception by the company’s advertisements on the products that include particular insecticides being completely safe because it is derived from nature. Today, due the concerns toward harmful anthropogenic substances, many people consider using products derived from nature; however the most important question that rises is that product completely safe because it is natural? The answer is no. For many people, the word “natural” somehow links to the word “harmless”.

The focus in our project is on products that include pyrethroid or pyrethrins. Pyrethrin is a component in many different household products. “Pyrethrins are natural insecticides produced by certain species of the chrysanthemum plant” (Extension Toxicology Network, 1994) Pesticides have the ability to kill insects, which are smaller creatures and more sensitive to the toxicity of the product, but these chemicals are apparently harmful to humans as well. Many incidences were reported in which people had side effects from products including pyrethroids, starting from a simple headache, and leading to serious skin conditions and even death. Synthetic pyrethroid compounds vary in their toxicity as do the natural pyrethrins, pyrethrum carries the signal word CAUTION. Inhaling high levels of pyrethrum may bring about asthmatic breathing, sneezing, nasal stuffiness, headache, nausea, tremors, convulsions, facial flushing and swelling, and burning and itching sensations (Extension Toxicology Network, 1994) There are many advertisements in all different types of media that “natural” product is the safest one—it is the better choice. “Go green” is the logo however, what do these natural products include, the specific contents of different household products that include insecticides isn’t specified. The law doesn’t require that information and the regulation haven’t been followed. However, us the public who will use these products don’t know the consequences of its usage, how it can affect our health and the health of our children.

The goal of advertisement is to increase production and make profit. We are being “fooled” by the media; the success in their goal is to convince us to buy the product. They make us believe the Green=natural and natural=safe without giving out all of the facts. Green and natural isn’t always the safest product, we need to demand more information, more details on the products and list of all the ingredients that can be safe as well as non-safe.

The following pictures illustrate and example of advertisements on pyrethroid products, “Biorganic” makes us associate with the word organic, which is natural and safe, using animals in a background of nature trying to indicate the safety of the products to our pets, and the colors that are used are mostly green and blue, that make an association with nature. But all these advertisements aren’t obligated to show the ingredients of the products and its harmful side effects.
The following two graphs illustrate the harmful effects of pyrethroid product as well as bring across the main point, natural isn’t always safe when it comes to pesticides and high caution should be used when using pyrethroid pesticides in your household, because the main concern is for your health and the health of your children.

“Pyrethroid insecticide exposure in the U.S. population is widespread, and the presence of its metabolites in the urine of U.S. residents indicates that children may have higher exposures than adolescents and adults” (Barr et al., 2009).

Therefore, when following an advertisement for insecticide that includes pyrethroid high caution should be used. First, the ingredients of the product should be researched before purchase, then all the potential side effects have to be known, finally the benefits versus risks have to be weighted out. If after all that the product is being used in the household, high caution have to be used and the presence of children have to be avoided in that area.

Cited:

EXTOXNET”. Extension Toxicology Network. Pyrethrin-pesticides information profile. Cornell University

Service Project: What actions can we take? (AT)

Acknowledging the fact that the chemicals are not completely safe; however, the companies still send out the subtle message in their commercial that their products are safe. In the advertisement, they claim that the products are natural. There are several problems with that statement. First of all, the products are not natural. It is true that the compounds are derived from plants but they are modified to increase their ability to kill insects and to stay around longer. Real natural and original compounds degrade quickly in the environment. However, the modified derivatives can stay around as long as several weeks. With the constant exposure that children are getting, the time is enough to let the compounds accumulate in the body to toxic doses. Second, the companies take advantage of the natural movement in the society right now to advertise their products. For most Americans, the idea of natural product is somehow associated with the idea of harmless and safe products. This is of course not true as many drugs and toxic compounds are in fact found in nature. The simplest example is water. Pure water for many people is safe but if one drinks too much
water, the electrolytes in the body will get diluted under physiological concentrations, causing major problems. Water has never been a problem because to cause a toxic response, one has to drink a lot of it. However for something that is an insecticide which is made to kill insects, the toxic doses are much lower; especially when the group of victims that are focused here are children; they are much more vulnerable. It is worth noting that the companies often time do not state that the products are safe but they use the idea of natural products to imply the idea of being safe to the consumers.

In response to this situation going on in the media, it is crucial to inform and to draw the real picture to everyone about the issue. Each member of the group wrote an editorial and sent it to the newspaper to publish the ideas out there to the public. We also interviewed Dr. Keith Cooper, professor of Environmental Toxicology from Department of Biochemistry and Microbiology at Rutgers University to get his opinions on the issue. We incorporated the interview into a short video regarding insecticides and natural products and broadcasted it in on the internet to allow everyone to watch it. These are actions that the group took to inform the public about the issue. The video can be found in the following link: http://www.youtube.com/watch?v=2Ujf2xACiSk

Most importantly, the group has also prepared a legislature bill to send it to the government along with a cover letter. The bill will require the statements made by the companies in their advertisement to be screen and approved by the government before broadcasting them both on the media and on their products containers.

Cover Letter
By Andrew Truong

Dear __________:

I would like to thank you for taking your time to review our proposed legislature bill. It is part of the project that is undertaken by my group right now at Rutgers University, the State University of New Jersey under the guiding of Dr. Julie M. Fagan. This course requires the students to work on the issues that bother them the most. My group and I decided that we wanted to address the problems with insecticides, especially pyrethroids, and how they are advertised in the media.

The companies often claim that their products are natural. However due to the new awareness in the public towards the toxic effects of anthropogenic compounds, the consumers will think that the products claimed to be natural will be safe. Unfortunately it is not the case. Since the insecticides target the nervous system, children and babies become the most vulnerable. First, they spend more time than adults playing on the ground, on the floor and on the grass where the insecticides are applied. Second, their nervous system is still maturing; hence, it is very vulnerable to any changes or stresses caused by xenobiotics like insecticides. Research has shown the pyrethroid insecticides can cause neurological disorders in animal models used such as mice, rats and fish at very low doses. In human, a cohort of children was tested and breakdown product of pyrethroid was found in the urine samples. Later on, epidemiological data shown that these children were at higher risk of being diagnosed with Attention-Deficit Hyperactive Disorder.

Therefore, the legislature bill will focus on requiring the statements made by the companies in their advertisement to be screen and approved by the government before broadcasting them both on the media and on their products containers.
If you have any questions about this proposal, please feel free to contact me via email at __________________, or by phone at ___________________. Thank you again for your consideration and I look forward to hearing from you.

Sincerely,

Appendices

“NATURAL” INSECTICIDES LEGISLATURE OF THE STATE OF PENNSYLVANIA

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Introduced by: Julie M. Fagan
Authored by: Diana Kuravsky, Elmira Kirichenko, Andrew Truong
Delegation: Rutgers, The State University of New Jersey

Referred to Committee:

1. A BILL FOR AN ACT ENTITLED “An act that requires all statements made by companies in their commercials about natural products, especially insecticides, to be approved by the government.”

2. Insecticides such as pyrethroids are a group of modified insecticides similar to the natural insecticide pyrethrin, which is produced by chrysanthemum flower. There is no doubt that pyrethroids are safer than organophosphate insecticides, but they are not natural as media advertise them and can pose health risks even at low exposure dose. Modified pyrethroid insecticides have longer half-life compared to pyrethrin and remain in the body for the longer period of time, which can result in adverse effects.

3. Insecticides are designed to kill insects to target their nervous system. Because of the importance of the nervous system, evolutionarily speaking, the biochemical and physiological structure of human’s nervous system is similar to that of insects. Therefore, human are also affected by the insecticides disregarding whether the compounds are derived from nature or not; if they can kill insects, then they can definitely inflict adverse effects on human.

4. Since the insecticides target the nervous system, children and babies become the most vulnerable. First, they spend more time than adults playing on the ground, on the floor and on the grass where the insecticides are applied. Second, their nervous system is still maturing; hence, it is very vulnerable to any changes or stress caused by xenobiotics like insecticides.

5. Research has shown the pyrethroid insecticides can cause neurological disorders in animal models used such as mice, rats and fish at very low doses. In human, a cohort of children was tested and breakdown product of pyrethroid was found in the urine samples. Later on, epidemiological data shown that these children were at higher risk of being diagnosed with Attention-deficit Hyperactive Disorder.

6. SECTION 1: This act may be cited as, “Commercial Accuracy Regarding Safety”
7. **SECTION 1**: The purpose of the following bill is for the State Health system to adopt and implement certain regulations on the household products which include insecticides such as pyrethroids.

8. **SECTION 2**: Synthetic insecticides shall not receive the right to use word “natural” in any advertisements, due to its modified structure.

9. **SECTION 3**: Labels should provide the chemical content of the insecticides.

10. **Sub-SECTION A**: Active and inactive ingredients, as well as the half-life of the compounds.

11. **Sub-SECTION B**: The information how to minimize exposure to the product should be provided.

12. **SECTION 4**: All potential side effects should be listed on the label

13. **Sub-SECTION A**: how it affect human health, children and pregnant women.

14. **SECTION 4**: The bill should go into effect within ______ days after passage.

a. **END**

### Editorials

*By Elmira Kirichenko*

This letter is the part of the ethics in science class at Rutgers University. It is about the natural insecticides in the everyday household use. The goal of the letter is to show that even natural insecticides can be dangerous if it is not appropriately used, because all chemicals are toxic at high enough doses. The dose makes the poison.

A lot of people do not understand the difference between words “natural” and “safe” when it comes to the household products. But does natural really mean safe? “Natural” insecticides, particularly pyrethroids, are safer than the organophosphates but not completely harmless. Its improper use can result in multiple health complications and in severe cases even death. Though consumer can recognize the presence of pyrethroids by reading the “thrin” ending of the compounds on the label of the bottle the additional warning sign should be used to inform about its side effects, because the average consumer does not know what this compound represents. Consumers should understand that even “natural” pyrethroids, that are similar to the pyrethrins which are synthesized from the Chrysanthemum flower, are not so harmless after all.

Pyrethroids are present in more than 3500 household insecticides, anti-lice shampoos and bug sprays. No child or adult deserves to be harmed or even die, like in the example of Amber Nickol published in “‘Safe’ Insecticides Now First in Poisoning” article by M. B. Pell and Jim Morris, because of careless profiteering of some corporations. And obviously, if consumer is willing to pay more money for any “natural” product thinking that it is safe, should not there be a regulation or a law to enlighten the user about the chemical composition and possible health risks on the label of the product?

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*The Safety Matter Behind Products Labeled “Natural”*

*By Andrew Truong*

Since the late 1900s when environmental contaminations via anthropogenic activities became a big concern, many people have started using products derived from nature. Whether natural products are safe or not did not become an issue to me until I started working in a lab investigating the toxicity of a product come from nature, pyrethroid.

Pyrethroids are a class of insecticides that is now used very widely after the banning of organophosphate in the US. The parent compound, pyrethrin that they are made from is produced
by some species of chrysanthemum. Pyrethroid insecticides present in many products used for lawn, and in-door. Studies have shown a high correlation between the children that had the compound found in their body and the higher risk of being diagnosed with ADHD. Just like many of the banned insecticides, these compounds target the insect’s nervous system. Anything at high enough doses will definitely be able to put the living things that expose to it into big troubles, including death. The research actually focuses on the toxicity on these compounds at very low doses which mean the animals will not die and these doses are way below the regulation by USEPA. Children will play on the floor or the lawn that has been exposed to the insecticides at very low doses. Right now, we are trying to elicit the mechanism by which these compounds exert the toxicity at very low doses, which we actually see in our testing model. If you look at the compound’s structure, it has similarity of compounds such as PCBs which has been found in brain of patients with Parkinson disease (PD). Strikingly, scientists know that PD and ADHD are actually related to each other.

My whole point of telling this story is let people know that products derived from nature are not necessarily safe especially if they are designed to kill something. Unfortunately, there are commercials out there advertising the product and telling people that the products are safe because of being naturally derived. I wish that these companies could be more careful of the statements they make or better of just tell the truth to warn consumers and not work towards their own profits.

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**Natural Insecticides**  
**By Diana Kuravsky**

This letter is in regards to “Natural Insecticides project” done as a part of ethics in science class at Rutgers University. Our mission is to prove that insecticides that are present in household products aren’t always safe for the environment and the consumer. Especially when indicated that these products are natural, it does not necessarily mean the product is safe. Over the past few years, due the concerns toward harmful anthropogenic substances, many people consider using products derived from nature. Recently, pyrethroid insecticides became popular, pyrethrin is a component in many different household products, it is natural insecticides produced by certain species of the chrysanthemum plant and derived from the plants flower, thus considered to be “natural” yet, can cause very serious harmful side effects in human.

The goal of advertisement is to increase production and make profit. We are being “fooled” by the media; the success in their goal is to convince us to buy the product. They make us believe that green is natural and natural is always safe without giving out all of the facts. In addition many companies do not specify the ingredients of the product on its label, and apparently there is no law to demand that. However, the consumer has the right to know the product and its component that is being used in his household. Therefore, the mission of our project is to bring awareness to consumers about the hidden evil behind these claimed to be harmless products by the manufactory.