

Encouraging Healthy Lifestyle Practices to Protect Health from Environmental Pollution

Dawn Brewer, PhD, RD, LD

July 26, 2019

NIEHS Superfund Research Program (SRP)

Purpose:

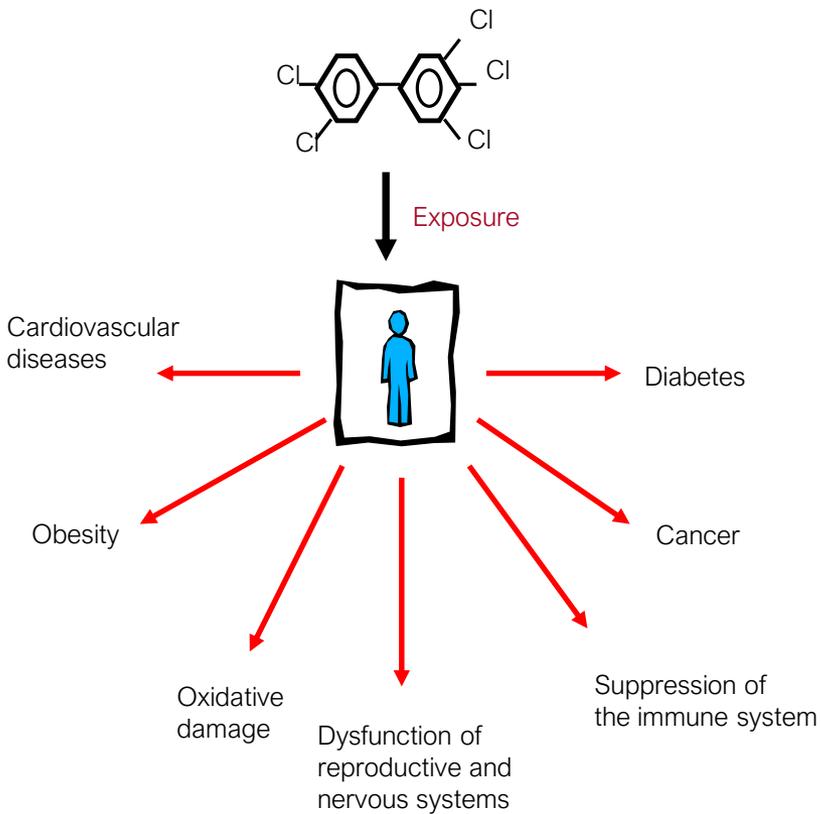
The NIEHS SRP supports research that provides practical, scientific solutions to protect health, the environment and communities.



Source: <https://tools.niehs.nih.gov/srp/sites/www.cfm>

University of Kentucky Superfund Research Center (UK-SRC): Nutrition and Superfund Chemical Toxicity

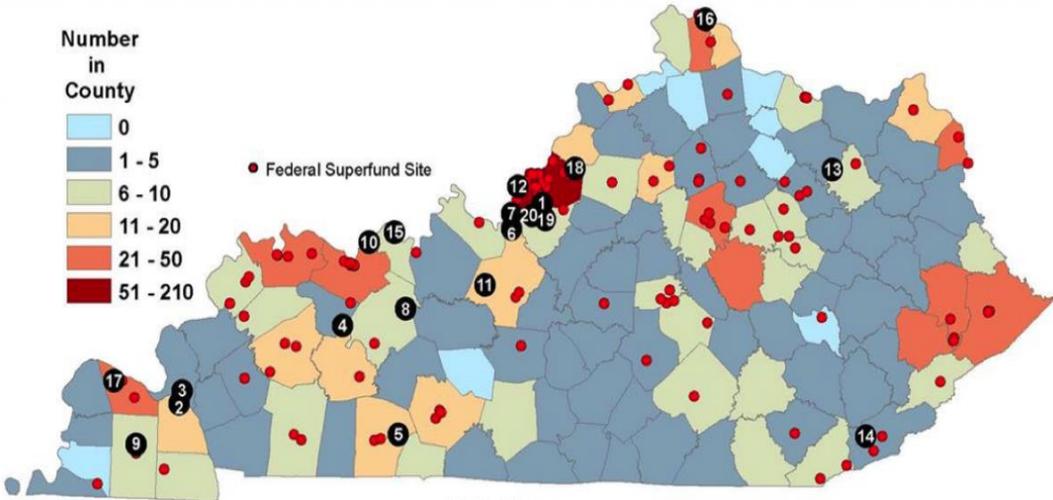
Polychlorinated biphenyls (PCBs)



Source: Sci Total Environ. 2009 Dec 1; 407(24): 6109-6119

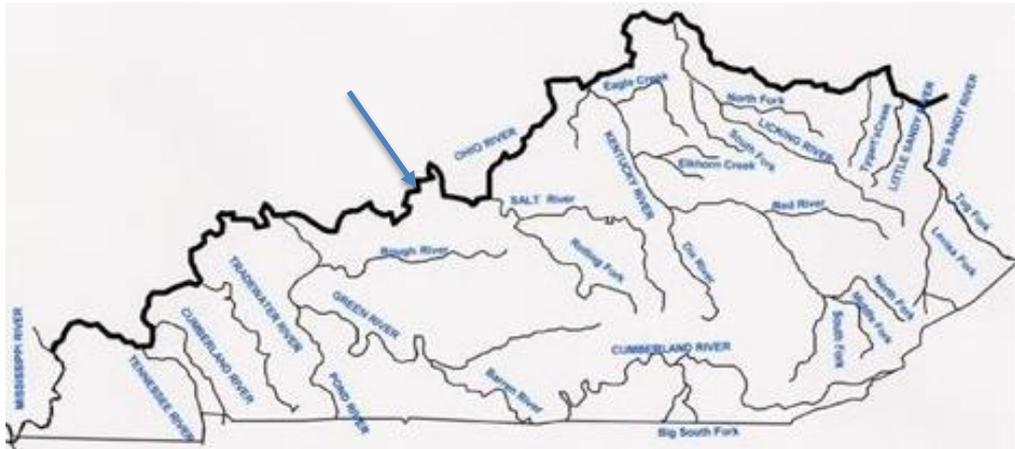
Source: <http://www.epa.gov/opptintr/pcb/>

Kentucky Contains Hundreds of Hazardous Waste Sites and Contaminated Waterways



- 13 National Priority List sites
- 248 state superfund sites
- 465 sites pending review

- Fish consumption advisories for PCBs exist for Kentucky streams and the entire Ohio River that forms the northern border



Source: <https://www.kyforward.com/wp-content/uploads/2018/11/Kentucky-Waterways-map.jpg>

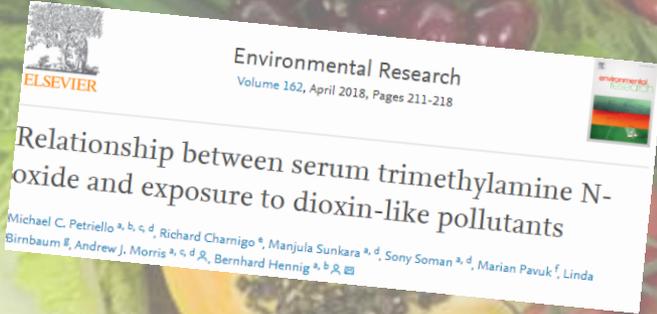
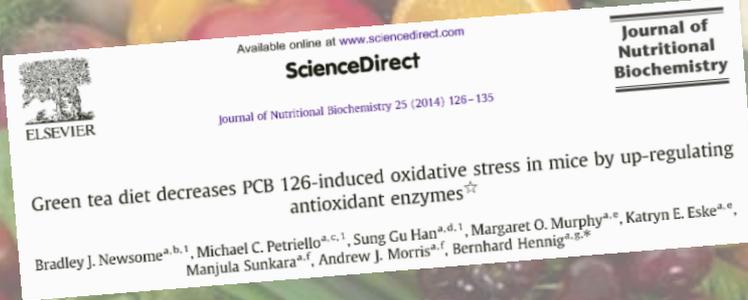
Kentucky Experiences Poor Health Outcomes

Health Indicator	Kentucky	United States	Ranking
Diabetes (%)	12.9	10.5	44
Heart disease (%)	6.2	3.9	49
Cancer deaths (per 100,000 population)	234.9	189.8	50
High blood pressure (%)	39.4	32.2	46
Obesity (%)	34.3	31.3	43

Source: America's Health Rankings analysis of CDC WONDER Online Database, Underlying Cause of Death, Multiple Cause of Death files, United Health Foundation, AmericasHealthRankings.org, Accessed 2019.

Kentuckians Face Increased Vulnerability to Environmental Pollution

- A growing and convincing body of research (including results from UK-SRC) indicates that nutrition may function as a modulator of vulnerability to environmental insults with nutrition serving to both better or worsen the health impacts associated with exposure to environmental toxins.
- Eating diets high in antioxidant and anti-inflammatory bioactive nutrients such as those found in fruits and vegetables may buffer the body against toxic insult.



Current Research Projects

Project #1: Superfund Chemicals, Nutrition and Endothelial Cell Dysfunction

Project Leader: Bernhard Hennig

Project #2: Postnatal Complications of Perinatal PCB Exposure

Project Leader: Kevin Pearson

Project #3: Polychlorinated Biphenyls, Nutrition, and Diabetes

Project Leader: Lisa Cassis

Project #4: Biomimetic Magnetic Nanocomposites as a Platform Technology for the Capture and Sensing of PCBs

Project Leader: J. Zach Hilt

Project #5: Chloro-Organic Degradation by Polymer Membrane Immobilized Iron-Based Particle Systems

Project Leader: Dibakar Bhattacharyya



Current Research Cores

Core A: Administrative

Core Leader: Bernhard Hennig

Core B: Research Support

Core Leader: Andrew Morris

Core C: Research Translation

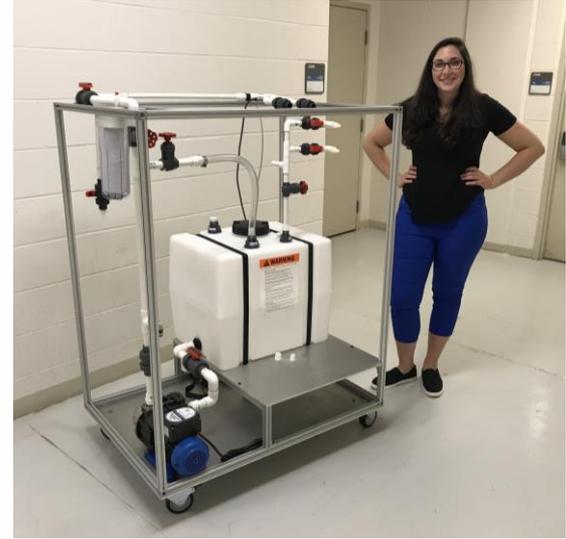
Core Leader: Lindell Ormsbee

Core D: Community Engagement

Core Leader: Dawn Brewer

Core E: Superfund Interdisciplinary Training

Core Leader: Zach Hilt



Community Engagement Core (CEC)



Dawn Brewer
(Leader)



Annie Koempel
(Project Manager)



Kelly Pennell
(Co-Leader)



Lindell Ormsbee
(Co-Leader)

The CEC translates the science of the UK-SRC to communities.

The purpose of the UK-SRC's CEC is to **encourage exchange of information** and **meet the needs of individuals and communities** by providing educational support about nutrition, environmental issues, and other perceived areas of concern.

Community Engagement Core's Approach

Nutrition

- Core leader (Dawn Brewer) and project manager (Annie Koempel) are Registered and Licensed Dietitians.

Environmental Science

- Core Co-leaders (Lindell Ormsbee and Kelly Pennell) facilitate interaction between Research Translation Core and assist with environmental science/health related concerns identified by community members.

Evaluation

- Each program or activity is evaluated to assess progress towards meeting Specific Aims.
- Primary outcomes of CEC activities are changes in knowledge/awareness and health behaviors (and in some cases changes in health outcomes).
- Focus groups or semi-structured interviews are conducted to assess program operation and partnership.

Forming Partnerships and Communicating our Message



Forming Partnerships and Communicating our Message

Social Ecological Model for Behavior Change



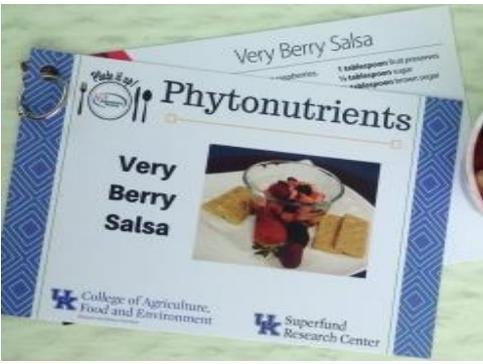
Source: <https://www.ihs.gov/healthyweight/hwmodel/>

Examples Superfund Community Action through Nutrition (SCAN) Programs

Tanglewood Trail Walking Program:
This program is a community-initiated fresh foods walking program. Participants received \$10 to spend on fruits and vegetables at their local farmer's market every Saturday (June - September) that they walked the Tanglewood Trail (approximately 1 mile round trip) to the market.



BerryCare: A Blackberry Club to Facilitate Community Engagement and Phytonutrient Intake Extension Curriculum and Evaluation
Sustainable source of phytonutrient-rich blackberries to vulnerable older adults and to a fixed budget meal provider (e.g. Senior Centers).



Family and Consumer Sciences Cooperative Extension System (FCS Extension)

- Smith Lever Act of 1914 created a Cooperative Extension Service associated with each land-grant institution.
- Kentucky has 120 FCS county extension agent positions.



Body Balance: Protect Your Body from Pollutants with a Healthy Lifestyle

FC33-007

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Body Balance: Protect Your Body from Pollution with a Healthy Lifestyle

Cut Down on Environmental Pollutants in Your Food

Environmental pollutants in food are concerning. Foods like fish may be contaminated with mercury and polychlorinated biphenyls (PCBs). Fruits and rice may contain arsenic. High fat meat and dairy products may also contain chemicals from pollution that aren't healthy for your body. Read on to learn how to choose foods with fewer pollutants, which can help keep the body healthier and lessen the risk of chronic diseases.



What is Pollution?
Hazardous chemicals, such as heavy metals and persistent organic compounds, pollute our natural environment and are found in air, water, soil, and sediments, as well as our food. Certain foods collect pollutants more easily than others. Exposure to these substances can contribute to increased health risks, if they occur for long enough at high enough levels. Research has shown some

hazardous chemicals may cause the body to be more vulnerable to medical conditions such as cardiovascular disease, diabetes, and cancer.

Why eat fish?

- Provides high-quality protein and contains many essential nutrients
- Good source of several B vitamins, including thiamin, riboflavin, niacin, B6, B12, as well as vitamins D and E
- An alternative to meat and poultry

Figuring out Healthy Fish
Fish is a healthy protein choice, but some types are more susceptible to having more pollution than others. Choosing types of fish low in pollution is the best way to receive the health benefits of fish while keeping exposure to pollution low.

What is a Phytonutrient?
A phytonutrient comes from plant-based foods. Think of a phytonutrient like a vitamin or mineral in that it can benefit health. Research shows they are good, but scientists have not determined them to be essential

like vitamins or minerals, or determined how much needs to be consumed each day. In the future, there may be recommended levels of phytonutrients to consume, just like vitamins and minerals today. There are thousands of phytonutrients. They naturally occur in fruits, veg-

etables, legumes, whole grains, and other plant foods. Like vitamins and minerals, there are diverse types of phytonutrients, and they have various positive health effects. Certain foods are higher in some types of phytonutrients than others, just like how vitamin C is high

for vitamins. Incorporating a variety of herbs and spices into meals is flavorful and may have health benefits.

Flavorings in Our Food
Herbs, spices, and natural and artificial flavorings all add taste to the foods we eat. They each bring a unique flavor to foods.

On packaged foods, the front of the box often says "naturally flavored" or "artificially flavored." This means the flavor is added, just like how vanilla flavoring is added to many baked goods. But these flavors include more than just vanilla. Food manufacturers may add blueberry flavoring to blueberry muffins, chocolate flavoring to cereals or cookies, or any other

How food and drink is stored plays a big part in how long it stays fresh. Some types of packaging can keep food fresher longer. There are many types of packaging and beverage containers, and some are safer than others, which may have negative health effects. People are exposed to pollution every day, in ways that cannot always be avoided. Even storage containers may contain potentially harmful chemicals. For example, heating plastic that is not microwave safe can cause chemical residue to come in contact with food. Certain plastics may have negative effects on health. Read on to find out more about the safest ways to store food and drinks.

Drink Storage Containers
Cups and water bottles can be plastic, metal, or glass. There are many ways to store a drink. Some options may be safer than others. Bophenol A (BPA) is a

common plastic used to make cups and bottles. BPA is concerning because of its association with negatively impacting brain development in infants and toddlers and potentially affecting hormones of people. Research is ongoing to determine if regulations should be made. If you are concerned about BPA exposure, choose plastics labeled "BPA free," metal, or glass. Most disposable plastic water bottles contain BPA. A reusable BPA-free plastic, metal, or glass bottle limits your risk of potential health effects, and is better for the environment than disposable plastic bottles.

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Body Balance: Protect Your Body from Pollution with a Healthy Lifestyle

Make Your Plate a Rainbow

Every day we choose foods to eat that we enjoy. Did you know that your food choices can impact your health? Choosing healthy foods such as fruits, vegetables, legumes, and whole grains may help prevent certain diseases. Eating a variety of colorful plant foods has the potential to protect or improve health. Research has shown that the vitamins, minerals, and phytonutrients found in plant foods may protect the body from the negative effects of pollution. The benefits may include lower blood pressure, decreased cell damage, and reduced risk of type II diabetes, heart disease, and cancer.



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Healthy Ways to Flavor Your Food

Using herbs and spices are a healthy way to add flavor to food and they may protect against the harmful effects of environmental pollution. We are exposed to pollution every day in our air, water, soil, and even our food. This exposure to pollution may have negative effects on health. Herbs and spices help protect the body by decreasing cell damage caused by the pollution that we are exposed to everyday. Reducing cell damage helps protect against the development or progression of various chronic diseases. Some herbs and spices are also anti-bacterial and antimicrobial, which helps keep the immune system strong to protect against diseases and research. Even though research shows that herbs and spices are beneficial to health, scientists have not determined exactly how much of each herb and spice should be consumed each day in the future, there may be official recommendations, like

for vitamins. Incorporating a variety of herbs and spices into meals is flavorful and may have health benefits.

Flavorings in Our Food
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Safe Storage for Food and Drink

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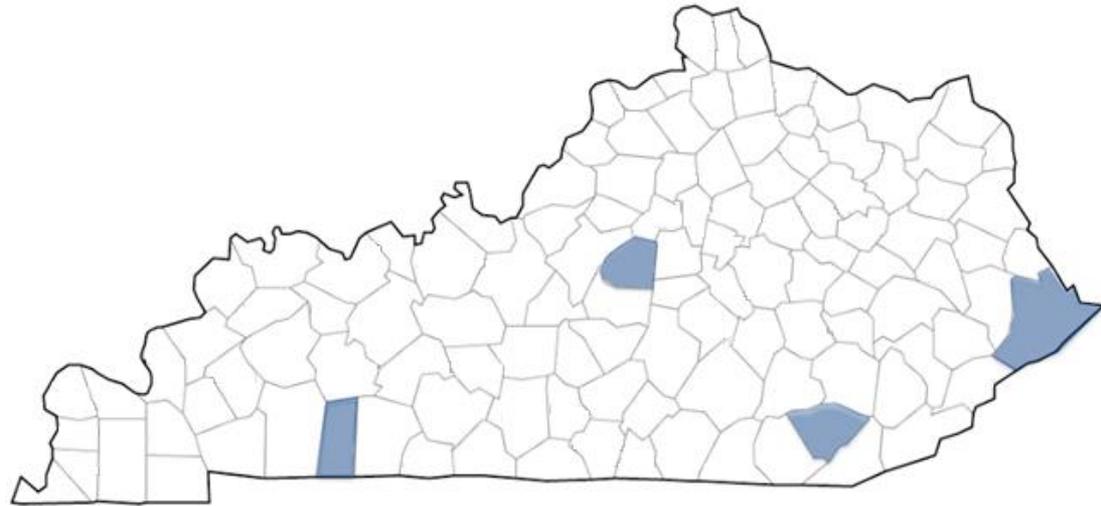
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Source: http://dept.ca.uky.edu/agc/pub_author.asp?author=Brewer%2C+Dawn

Dunn K, Gaetke L, Stephenson T, Brewer D (2017) Older Adults' Perceptions of Nutrition as Protective Against Detrimental Effects of Environmental Pollution. *Journal of Extension*: Vol 55 (4); 4R1B7.

Body Balance Pilot Study

- Piloted in 4 counties by FCS Extension Agents
- 9-lesson curriculum
- Pre- and post-lesson evaluation
- Focus groups



Nutrition and Environmental Pollution Extension Curriculum Improved Diet-Related Behaviors and Environmental Health Literacy

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Body Balance Pilot Study

Learning Objectives	Assessment Questions [correct answer]
Lesson: Cut Down on Environmental Pollutants in Your Food	
<p>At the conclusion of this lesson, participants will be able to:</p> <ul style="list-style-type: none">• Learn why certain foods contain pollutants.• Learn ways to consume healthy fish.• Learn what arsenic is and where it is found.• Choose and cook healthy meat and dairy products.	<p>A way we are exposed to environmental pollutants, such as polychlorinated biphenyls (PCBs) and mercury, is from <i>[eating contaminated foods]</i></p> <p>Which of the following foods typically contains the highest concentration of arsenic? <i>[brown rice]</i></p> <p>Which of the following foods is most likely to have the highest concentrations of PCBs? <i>[whole milk]</i></p>

Body Balance Pilot Study



Country Ham and Broccoli Grits

- | | | |
|---|--|---|
| 1 tablespoon olive oil | 2 cloves minced garlic | 6 ounces country ham, cut into ½ inch pieces |
| 1 pound fresh broccoli florets | 4 cups 1% milk | 1 large egg, beaten |
| ½ cup minced onion | 1 cup uncooked quick grits | Salt and pepper to taste |
| ¾ teaspoon crushed red pepper flakes | 1 cup 2%, shredded cheddar cheese | |

1. Preheat oven to 375°F. **Coat** 13x9x2 inch baking dish with cooking spray. **Heat** olive oil in a frying pan. **Sauté** broccoli, onion, garlic and red pepper flakes until vegetables are tender. About 5 minutes. **Set aside.**

2. Heat milk to a boil in a large saucepan. Slowly, **whisk** in grits. **Reduce heat** and stir continuously until thickened. **Reserve** 2 tablespoons of the cheese.

3. Remove from heat, stir in ham, broccoli mixture, cheese, egg, salt and pepper. **Mix** until well blended. **Pour** into prepared baking dish.

4. Sprinkle with reserved cheese. **Bake**, uncovered for 30 minutes, or until top is set and lightly puffed.

Yield: 16, ½ cup servings.

Nutritional Analysis: 120 calories, 3.5 g fat, 1 g saturated fat, 25 mg cholesterol, 370 mg sodium, 13 g carbohydrate, 1 g fiber, 4 g sugar, 9 g protein.

Buying Kentucky Proud is easy. Look for the label at your grocery store, farmers' market, or roadside stand.



CUT DOWN ON ENVIRONMENTAL POLLUTANTS IN YOUR FOOD

BODY BALANCE: PROTECT YOUR BODY FROM POLLUTION WITH A HEALTHY LIFESTYLE

FAMILY AND CONSUMER SCIENCES

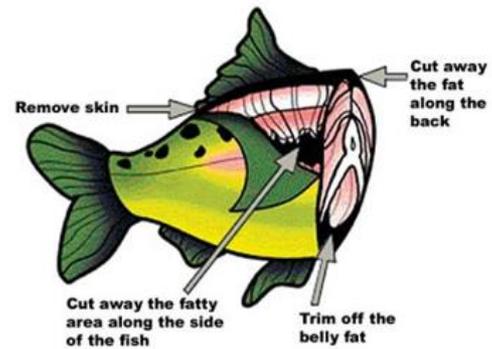
University of Kentucky College of Agriculture, Food and Environment Cooperative Extension Service
Building strong families. Building Kentucky. It starts with us.

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT, LEXINGTON, KY 40546



Body Balance: Protect Your Body from Pollution with a Healthy Lifestyle Cut Down on Environmental Pollutants in Your Food Supporting Document: Cleaning Fish

Mercury cannot be removed through cooking or cleaning – it is in the flesh of the fish. However, you can reduce the amount of other contaminants like PCBs by removing fat when you clean and cook fish.



Body Balance Pilot Study - Results

- Increase in both nutrition and environmental pollution knowledge.
 - Significant increase in knowledge for 63% of questions.
- Focus group participants highlighted several specific behavior changes they made as a result of their participation.
- The FCS extension agent was reported to be an important component in why participants attempted to make healthier lifestyle choices.

Body Balance Final Curriculum

- **Revisions to the Body Balance curriculum was incorporated using feedback from the agents, participants, and program reviewers.**

- 1. The Connection between Pollution and Nutrition (publication only)**
- 2. Cut Down on Environmental Pollutants in Your Food**
- 3. Make Your Plate a Rainbow**
- 4. Healthy Ways to Flavor Your Food**
- 5. Fundamentals of Fermented Foods**
- 6. Picking Out Produce: All About Organic and Conventional Foods**
- 7. Safe Storage for Food and Drink**
- 8. Nutritious Nuts and Seeds**

Reach of Body Balance

- Body Balance curriculum is available for Kentucky FCS Agents to use.
- Presented curriculum at FCS Extension statewide training.
- Potential to reach 500 – 1,000 people annually across Kentucky.

Thank You

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NIEHS

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