Encouraging Healthy Lifestyle Practices to Protect Health from Environmental Pollution

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

Polychlorinated biphenyls (PCBs)

- Obesity
- Oxidative damage
- Dysfunction of reproductive and nervous systems
- Suppression of the immune system
- Cardiovascular diseases
- Diabetes
- Cancer

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.

# Kentucky Experiences Poor Health Outcomes

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

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)

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

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

Environmental pollutants in foods are concerning. Foods like tea and fish can be contaminated with mercury and polybrominated diphenyl ethers (PBDEs). Grains and meat can contain ammonia, high levels of mercury, and heavy metals. The foods we eat can also affect our health. Eating a variety of vegetables and fruits can help protect against environmental pollution. The following guidelines are designed to help you avoid eating foods that can affect your body. Avoid foods like these and try to choose fresh, low-pollutant foods, which can help benefit your overall health and reduce the risk of chronic disease.

What is Pollution?
Pollution can be divided into two main categories: industrial and natural. Industrial pollution includes oil spills, industrial waste, and air pollution. Natural pollution includes volcanic dust, pollen, and animal droppings. These pollutants can enter our bodies through the air, water, or food we eat.

Figuiring out Healthy Fish
Fish is a healthy protein choice. However, some types of fish can be hazardous to consume. These types of fish may contain pollutants such as mercury, dioxin, and arsenic. When choosing fish, it is important to select fish that are low in mercury and other pollutants. Examples of low-mercury fish include salmon, cod, and tilapia. Foods like these are healthier and safer for consumption.

What is a Phytonutrient?
Phytonutrients are compounds found in plants that are beneficial to our health. Phytonutrients are also known as antioxidants. They are compounds found in plants that help protect our bodies from damage caused by free radicals. Phytonutrients are found in a variety of fruits and vegetables, such as berries, carrots, and broccoli. Phytonutrients are essential for maintaining good health.

Flavanoids in Our Food
Flavanoids are a type of phytonutrient that is found in fruits, vegetables, and grains. They are known to have antioxidant properties and can help protect against heart disease. Flavanoids are also found in chocolate, red wine, and tea. Eating foods rich in flavonoids can benefit your health.

Flavorings in Our Food
Flavorings in our foods are often added to increase flavor. Many flavorings are artificial, which can be harmful to our health. Artificial flavorings can contain ingredients that are not safe for consumption. It is important to choose foods that are free of artificial flavorings.

Drink Storage Containers
Drink storage containers can be made of plastic, metal, or glass. These containers can contain harmful chemicals that can leach into the food. It is important to choose containers that are free of harmful chemicals.

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

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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# Lesson: Cut Down on Environmental Pollutants in Your Food

At the conclusion of this lesson, participants will be able to:

- 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.

### Assessment Questions

**A way we are exposed to environmental pollutants, such as polychlorinated biphenyls (PCBs) and mercury, is from** [eating contaminated foods].

Which of the following foods typically contains the highest concentration of arsenic? [brown rice]

Which of the following foods is most likely to have the highest concentrations of PCBs? [whole milk]
Country Ham and Broccoli Grits

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

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.


3. Remove from heat, stir in ham, broccoli mixture, cheese, egg, salt and pepper. Mix until well blended. Pour into prepared baking dish. Sprinkle with reserved cheese. Bake, uncovered for 30 minutes, or until top is set and lightly puffed. Yield: 16 to 18 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.

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.

CUT DOWN ON ENVIRONMENTAL POLLUTANTS IN YOUR FOOD

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

FAMILY AND CONSUMER SCIENCES

Superfund Research Center
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.
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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