Kentucky, like other states, has its share of hazardous waste sites, a legacy of decades of industrial development in the 20th century. The chemicals at these sites have been connected to contamination of soils and groundwater, and they represent a potential threat to human and environmental health.

**THE COMMONWEALTH** currently has 200 hazardous waste sites on an active list for control, cleanup, or monitoring under the federal Superfund program of the U.S. Environmental Protection Agency. Fourteen of them are earmarked as of national priority.

Two College faculty members, Bernhard Hennig in the Department of Animal and Food Sciences and Lisa Gaetke in the Department of Nutrition and Food Science, are helping find ways to curb the effects of the toxic chemicals at these sites through research and education.

**RESEARCH**

Hennig is looking at the effect of what we eat on disease development associated with exposure to toxic chemicals. Already, they have some preliminary answers. “The evidence exists that diets high in oils that are rich in omega-6 fatty acids, especially linoleic acid, promote inflammation and atherosclerosis,” Hennig said. “If PCBs initiate atherosclerosis, then high-fat diets may make the PCB effects even worse.”

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Bernhard Hennig (left) and Xabier Arzuaqa, post-doctoral fellow

**BERNARD HENNIG** is a professor of nutrition and toxicology. In addition to his appointment in the Department of Animal and Food Sciences, he also has appointments with three other academic centers on the larger UK campus and is a member of the Gill Heart Institute.

Hennig is looking at the effect of what we eat on disease development associated with exposure to toxic chemicals. His research is focusing on atherosclerosis, also known as hardening of the arteries. It causes coronary heart disease and is the number one killer in the United States.

**Research**

Atherosclerosis somehow unfolds in the human body at least in part because of inflammation and cell-damaging oxidative stress, both of which are seen in other diseases as well.

Hennig also is studying a family of toxins called PCBs (polychlorinated biphenyls). Toxic waste sites have a lot of PCBs (along with dioxins and other hazardous compounds). PCBs are now banned in the United States but were widely used from 1930 to 1970 to make everything from paints to cereal boxes. They’re still with us, because they don’t degrade easily. PCBs can cause the inflammation and oxidative stress that are factors in disease progression.

Hennig’s nutritional components for his research are different types of fatty acids, which are found in many foods. For example, omega-6 fatty acids, such as linoleic acid, are a lot more prevalent in the current American diet than in prehistoric times. They can be found, for example, in plant oils such as safflower and corn oils.

Hennig and those in his lab begin with a culture of cells that line the arteries. They’re called endothelial cells, and their function is a good indicator of the progress of atherosclerosis.

In simplest terms, the researchers add selected fatty acids in combination with PCBs to the cell culture to find out if dietary fat can change the cardiovascular toxicity of PCBs.
Genetics plays a part in how well the body deals with toxic chemicals and disease, and Hennig is studying that, too. The research is not yet complete, but Hennig can already say that "nutrition can modify the toxicity of these pollutants. It can make it worse or better, depending on what we eat. If an environmental pollutant can cause disease, our lifestyle can make us more (or less) susceptible to getting that disease."

"I believe this is very important," he said. "Taking a pill doesn't solve the problem, but eating the right foods may. Nutrition can make us more or less resistant to an environmental health threat."

A Lexington chef, J.C. Clark (left), assisted by chef-in-training Matt Clark (no relation) prepared a healthy gourmet meal for Harlan County residents who were learning about nutrition.

"If you are exposed to toxic chemicals and you eat right, you have a better chance of preventing disease."

–Lisa Gaetke

One night and prepared a buffet of healthy foods.

Lisa Gaetke tells the story of a woman in her classes who had diabetes and lost 50 pounds over about eight months. The woman attributed her weight loss to learning things like how to make fruit smoothies. She started having them for breakfast every morning and told Gaetke: "I just changed what I ate. I used what you showed us at that meeting."

While research about the exact relationship of toxic chemicals, nutrition, and disease may not yet be ready for prime time, what Gaetke could tell the community group in Harlan is that, as she said, "if you are exposed to toxic chemicals and you eat right, you have a better chance of preventing disease."

In her Harlan County meetings, Gaetke has been careful only to provide nutritional information, not gather data for research, since toxic waste sites and their effect on people are sensitive legal issues. We may not be able to get rid of toxic wastes, but it looks as if we may be able to control them, one bite at a time.

The original Superfund program was set up in 1980 under the U.S. Environmental Protection Agency to identify uncontrolled hazardous wastes, assess their effect, and put into place control measures. Sites where these wastes are found are called Superfund sites.

The research began in 1986. It is managed by the National Institute of Environmental Health Sciences, part of the National Institutes of Health (NIH).