The Hazard Hunters

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By: Catherine Clabby

After 50 years, NIEHS stays focused on assessing environmental risks but in ways few could have predicted back in 1966.

When the United States Public Health Service launched the National Institute of Environmental Health Sciences in 1966, the marching orders were simple:

Track down environmental hazards, describe how exposure occurs, and pinpoint who gets hurt.

Fifty years on, insights into the complexity of both human biology and the range of risks make that detective work much harder.

Herbert Needleman, MD, NIEHS grantee, led pioneering studies providing first clear evidence that lead, even at very low levels, can affect the IQ of children. Photo courtesy: NIEHS

"Much of the work done 50,40, 30 years ago was really dealing with high levels of exposure, the kinds of studies we can still do today in places like Beijing or Delhi into high levels of pollution," said Linda Birnbaum, director of NIEHS.

Scientists now understand people are exposed to more potentially risky compounds than ever before. And variations in people's genes, life histories and habits make some of us more vulnerable than others.

"We now know that very low levels of exposure to a wide variety of compounds can affect our health," Birnbaum said, noting those include compounds that large numbers of people can encounter day after day.

It's in that context that NIEHS – for all of 2016 – has been celebrating a forward-looking 50th birthday, with leaders emphasizing the power of their newest tools to tackle high-stakes puzzles, despite scientific challenges and political uncertainty.

Local and international

NIEHS is the only one of 27 entities within the National Institutes of Health not located within a morning's commute to Washington, D.C. Gov. Terry Sanford, a pivotal Southern supporter of John F. Kennedy's presidential bid, and U.S. Sen. Sam Ervin in the 1960s lobbied hard to draw federal research-oriented jobs to a fledgling Research Triangle Park.

Sweetening the pot, The Research Triangle Foundation sold 509 acres of RTP land to the federal government for just $1.

It worked, said U.S. Rep. David Price.

Having NIEHS and an Environmental Protection Agency campus in RTP has made the Triangle region an international leader in environmental sciences. "It's also been a major job creator," said Price, one of multiple members of Congress who have advocated for continued federal support for both agencies.

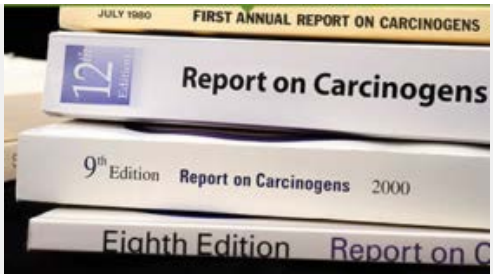
NIEHS' campus in Research Triangle Park. Photo courtesy: NIEHS

NIEHS does not make federal environmental policy, but it informs policies created by the EPA and other agencies. The institute employs some 650 people directly, including many scientists, but its impact on environmental research spreads far beyond this state. NIEHS spends more than 64 percent of its $681 million budget funding research, most of it elsewhere.

The National Toxicology Program, headquartered within NIEHS, coordinates assessments of health risks from industrial compounds and consumer products for federal agencies. It assesses everything from known carcinogens such as hexavalent chromium, to the cell phones millions of people use worldwide each day.

To be precise

Environmental scientists used to assume that "the dose makes the poison," meaning that the higher the exposure to a hazardous natural or human-made threat, the greater the health threat. In some cases, say with arsenic in drinking water, or soot particles in the air, that can still stand.



In 1978, Congress mandated that the Secretary of the US Dept. of Health and Human Services publish a science-based, public health report that identifies agents, substances, mixtures, or exposures in our environment that pose a hazard to people. Image courtesy: NIEHS

But it's now known that some materials can do harm in extremely low doses. Lead is an example, where now no level of exposure is considered completely safe.

In addition, the timing of exposure over a lifespan is important. Contact with some pesticides, can be more harmful to a developing fetus than to an adult.
Researchers given NIEHS grants are expected to help sort out what matters most.

"NIEHS is the NASA of RTP," said Heather Patisaul, a North Carolina State University biologist who has been an NIEHS grantee. "It is the premier incubator of scientific discovery within the realm of toxicology and environmental science not just nationally, but globally.

"Because of these discoveries we have, for example, cleaner air, safer plastics, and flame-retardant free furniture."

With NIEHS funding, Patisaul has been able to study the molecular effects of endocrine disruptors, compounds that, because they resemble human hormones, can short circuit normal hormone production. One of her areas of expertise is bisphenol a (BPA), the compound often found in plastic containers which can leak into food, including baby formula.

One U.S. survey estimated detectable levels of BPA could be found in 93 percent of Americans age six and older. Studies of lab animals have found subtle developmental effects in fetuses and newborns after low exposures to the compound.

New frontiers

Along with those emerging threats, NIEHS these days funds research exploring risks from nanomaterials, products constructed with engineered particles small enough to maybe slip through human skin, the lining of lungs or other protective tissue. Identifying environmental contributors to disorders such autism, heart disease and asthma are also on the NIEHS research agenda.

NIEHS and collaborators at the University of Utah pinpointed the BRCA1 gene that, when defective, is believed to be responsible for inheriting breast and ovarian cancer susceptibility. Image courtesy: NIEHS

In recent years, NIEHS has pushed researchers to depend less on lab animals, such as mice. It has helped develop study approaches using human cells and computer modeling to identify dangers.

UNC-Chapel Hill cell biologist Mark Zylka showed the value of that approach this year when he found that a commonly used agricultural fungicide produced genetic changes in human cells that resemble those seen in some people with autism.

"We have a better understanding of how animal data, cell culture data and computational data can help inform us," Birnbaum said.

Rocky roads

While widely respected in the field of environmental science, NIEHS has attracted criticism too. Industry groups have accused NIEHS-affiliated scientists of exaggerating risks posed by some chemicals and environmentalists have faulted NIEHS for working too closely with industry. In 2008, then-NIEHS director David Schwartz resigned after only two years at the helm. He is a pioneer in linking genetic activity and environmental exposure to greater vulnerability to lung diseases, such as asthma and pulmonary fibrosis.

A Congressional inquiry had turned up allegations Schwartz was consulting for law firms involved in asbestos lawsuits and spending NIEHS funds intended for other uses for his own lab. Schwartz apologized and said any errors he made were from ignorance, not ill intent.

Some scientists are concerned about how strongly federal leaders will support environmental research in coming months and years. The person appointed by President-elect Donald Trump to lead his transition at the EPA, for one, is a climate-change skeptic.

Unlike EPA, Price said, NIEHS has not been singled out for cuts in Congress in the past. The agency's position within the NIH, and the endurance of bi-partisan support of biomedical research, appears to have sheltered it.

That said, federal funding for all scientific research has been declining, Price said, a trend he said needs to be reversed.

"There's been a slow and steady lowering of resources available to research. That's a product of budget policy," Price said.

Since 2005, federal investments in research and development have declined by over 13 percent, Price said.

NIEHS leaders, at least publicly, are focusing on the positive. "NIH has a long history of bipartisan support and stands ready to work with the new Administration to improve people's health and reduce the burden of disease through biomedical research," Birnbaum said.

For one, there is that year-long birthday celebration to finish. Next month, for instance, NIEHS will be making the scientists it funds a lot more visible than usual in North Carolina.
Such researchers are expected to be the majority of people NIEHS expects at a multi-day science festival in downtown Durham the first week of December. NIEHS officials expect 1,200 people to join in.

Source: http://www.northcarolinahealthnews.org/2016/11/18/the-hazard-hunters/