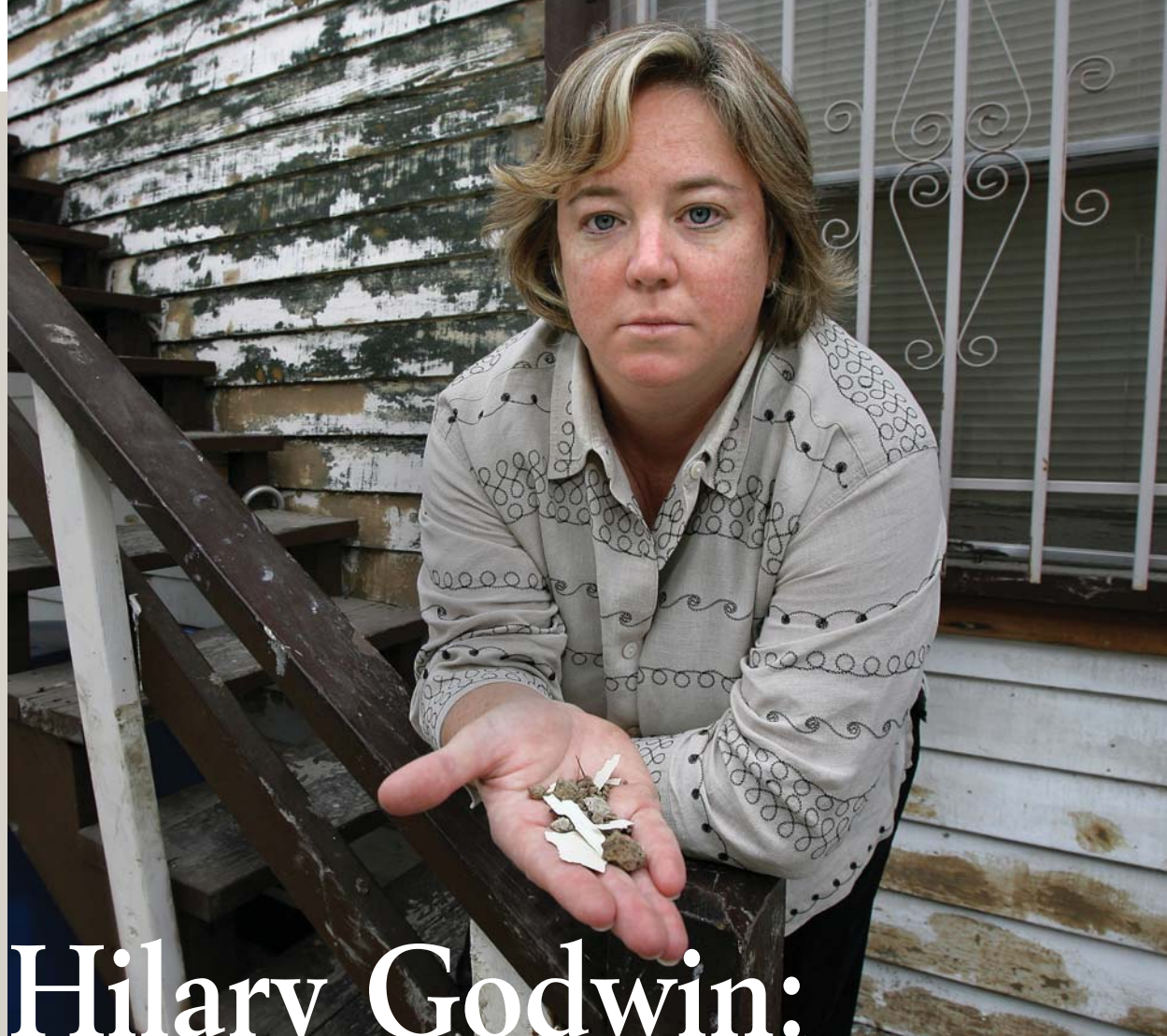


HER MOLECULAR STUDIES HAVE SHOWN HOW EXPOSURE TO THE METAL CAN PRODUCE COGNITIVE DEFICITS IN CHILDREN. AS A NEWLY RECRUITED PUBLIC HEALTH FACULTY MEMBER, SHE INTENDS TO WORK WITH COMMUNITIES TO PREVENT THESE TOXIC EFFECTS.



Hilary Godwin:

Preventing Children from Being Lead Astray

At the highest levels of academia, departments of physics, chemistry and engineering remain sparsely populated with women. For Hilary Godwin, there was never any doubt where she would end up. Raised in a family of scientists, her research career began in grade school, when she would spend her summers assisting her biologist father on his studies.

“In science you spend your life constantly learning and doing new things,” she says. “We’re on the steep part of the learning curve. That’s very rewarding.”

After earning her Ph.D. in chemistry at Stanford and completing a postdoctoral fellowship at Johns Hopkins University School of Medicine, Godwin in 1996 became the first female faculty member of the Chemistry Department at Northwestern University. She was serving as chair of the department when she was recruited last year to join the UCLA School of Public Health faculty as chair of the Environmental Health Sciences Department.

At Johns Hopkins, Godwin’s postdoctoral adviser had introduced her to researchers who were studying the effects of lead poisoning on children. For more than two decades, it had been known that elevated blood levels of lead were associated with a variety of pediatric health problems, particularly affecting the brain and nervous system. But little was known about what makes the metal toxic. Godwin set about to learn that and more.

Thirty years ago, the average child had what today would be considered an elevated lead blood level, though the guidelines were different at the time. Beginning in 1978, lead was eliminated as a component of house paint; around the same time, it was phased out of gasoline. While these public health policies substantially reduced the problem, it hasn’t gone away. “There is still residual lead in the soil, and residual contamination in older housing, for which mitigation is fairly expensive,” Godwin explains. Other sources of

exposure, particularly in Southern California, are imported candies and foodstuffs from Mexico that are contaminated with lead.

Unlike metals that are required for life, such as calcium, iron, zinc, copper and potassium, there is no evidence that lead does anything but harm, Godwin notes. Her laboratory has conducted key studies at the molecular level that have detailed how the damage occurs. Among her group's most significant findings: Even at relatively low levels, lead interacts with zinc proteins in the body, disrupting their function, which could account for the developmental problems associated with lead poisoning in children. If that conclusion is borne out in follow-up work – Godwin's group is currently testing its zinc hypothesis in model laboratory organisms – it might point to the need for at-risk children to take zinc supplements; indeed, Godwin notes, a reversal of lead-poisoning symptoms has already been shown in children who take zinc supplements in the form of vitamins.

Another focus of Godwin's lab carries similar implications: Her group is investigating whether there is a molecular basis for the association among children between iron-deficiency and lead poisoning. Some studies have shown that iron supplements can improve symptoms in children with elevated blood lead levels. "This underscores the importance of something the public health community has already been doing – emphasizing good nutrition in addition to good hygiene to prevent not just exposure to lead but also its effects," Godwin explains.

When Godwin began her lead studies, her focus was on the biophysical level – looking at how the interactions between lead and particular proteins affect the proteins' structure and dynamics. That work helped to elucidate the symptoms associated with lead poisoning and led to Godwin's hypothesis that lead interactions with zinc proteins affect developmental processes. Now, her group has shifted toward the broader view afforded by studying model systems such as budding yeast to address questions concerning the proteins involved in transporting lead and the effects of lead on gene expression, seeking to understand more comprehensively the activity occurring on the cellular level.

A second shift, which began when Godwin was at Northwestern, involved an increasing focus on working with the community groups most affected by lead exposure, both in terms of studying issues such as soil contamination in particular areas and in communicating risks and assisting in primary prevention efforts. "Now that lead has been taken out of gas and paint, the key strategy is educating parents about ways they can minimize environmental exposures for their kids," Godwin explains.

With her interests moving toward using basic-science knowledge to improve outcomes for children, the opportunity to join a renowned school of public health, particularly one with a strong program in molecular toxicology, proved irresistible. As chair of the school's Environmental Health Sciences Department, Godwin hopes to identify and help facilitate potentially fruitful new collaborations between the department's faculty and other units within the school and across the campus.

She is already feeling the impact of interdisciplinary collaborations in her own work. Godwin has taken an active role in the new UCLA High Speed, High Volume Laboratory Network for Infectious Diseases. The lab, established through state and federal funding to the School of Public Health and housed in UCLA's California NanoSystems Institute, will enable public health experts to track infectious disease outbreaks in near real time and dramatically shorten the period needed to produce effective vaccines (see page 9). In addition to drawing on her experience to assist in the setup of a laboratory with sophisticated technology, Godwin, at the request of Dean Linda Rosenstock, has served as a liaison within the school and to the larger UCLA community to ensure that the new facility's design is flexible enough to be able to expand to meet research needs that might emerge in the future.

"From an environmental health point of view, one of the exciting things about the lab is that in the course of collecting samples to analyze for infectious diseases, valuable environmental data will be obtained that would enable us to look, at a detailed level, at questions such as how global climate change might affect the spread of infectious diseases," Godwin says. She also sees substantial opportunity in the interactions with scientists working in the field of nanotechnology, where exciting new tools are being developed with the potential to be applied for public health purposes.

Learning from faculty in fields such as epidemiology and nanoscience has been an energizing experience for Godwin, with the potential to move her research into new areas. It fulfills the strong craving for lifelong learning that Godwin has felt since she was a child – and that she enjoys imparting to her students. "Traditionally, introductory science courses have been taught as a memorization of a bunch of facts," she says. "And yet, almost universally, scientists will tell you that the thrill of discovery is the reason they became a scientist. To draw new people into the field, we need to translate that excitement into a pedagogical style that stimulates students as they are first exposed."

"Now that lead has been taken out of gas and paint, the key strategy is educating parents about ways they can minimize environmental exposures for their kids."

—Dr. Hilary Godwin