As a public health nurse, she was disturbed by what she suspected were poor reproductive outcomes resulting from environmental exposures. Today she is part of multidisciplinary teams studying these effects and looking to prevent them from occurring.

Wendie Robbins: Reproductive Toxicology Under the Microscope

As a nurse practitioner working in rural public health clinics in Arizona and Texas in the 1980s, Dr. Wendie Robbins saw patterns in families with poor reproductive outcomes that led her to suspect links to environmental or occupational exposures.

"We would travel long distances through flat desert to get to one particular clinic, and as we approached you would see a plume of dense smoke coming from the main industry in town, a copper smelter," she recalls. "You couldn't help but wonder whether some of the clinical outcomes you were encountering were related to that plume drifting over the homes in the community surrounding the plant." Robbins was particularly troubled by the reality that the residents of that town – and of another she visited, where copper mines were polluting the water supply – had little recourse against the toxic exposures: These industries fueled the towns' economies and represented many families' livelihood.

Longing to help these communities in a more proactive way, Robbins concluded that she could do so by pursuing a career as a laboratory research scientist, learning more about the potentially toxic reproductive effects of certain environmental exposures and disseminating her findings to help prevent many of these tragic outcomes from occurring. She earned a Ph.D. in epidemiology at UC Berkeley and for more than a decade has been at UCLA, bringing her unique perspective to reproductive toxicology studies and teaming with epidemiologists, environmental scientists, nurses and other clinical experts to translate the findings into better health outcomes for parents and their children.

Robbins evaluates human sperm cells for chromosomal abnormalities resulting from environmental, occupational or lifestyle exposures, developing biomarkers that can be used in epidemiologic studies of male reproductive toxicology. "In almost any health outcome, environment and underlying genetics both play a role," she explains. "If we want to understand these outcomes, we need to try to understand the interplay between genes, the environment and reproductive health, and how we might promote health through that knowledge. By better comprehending people's reproductive risks from various exposures, we can take measures to reduce those risks."

Her group has published studies of the effects on sperm DNA from smoking, alcohol and caffeine; from chemotherapy; from the antiretroviral agents used to treat HIV infection; from organophosphate pesticides; from high levels of workplace exposure to boron; and from air pollution. Robbins has found that certain chemotherapy drugs increase aneuploidy – a condition characterized by an abnormal number of chromosomes – in sperm cells during and immediately after treatment, with the sperm returning to pre-treatment chromosome numbers by six months after conclusion of the therapy. Conceptions taking place during this period are at risk for spontaneous abortion, Klinefelter syndrome, Down syndrome, mental retardation and other developmental disabilities. Robbins further found that sperm aneuploidy can result from high levels of exposure to air pollution, smoking, and alcohol consumption. Her pesticide studies have detected an increase in nullisomy – a missing sex chromosome – in sperm cells that could increase risk for Turner syndrome in offspring.

She traveled abroad for a study of the reproductive effects of occupational exposure to boron among male workers who mine the element in Liaoning Province, China. Robbins and colleagues – including Drs. Curt Eckhert, Nola Kennedy and David Elashoff from the School of Public Health – found that high exposure levels changed the ratio of Y- to X-bearing sperm, potentially influencing the gender of the workers' offspring – and suggesting a need for further study.

The research tools Robbins can now draw on to answer questions such as these have become far more powerful since her bench career began. But Robbins points to another change as being equally significant in advancing her efforts. "Scientific inquiry is increasingly collaborative," she says. "The goal is to learn things from bench research that can be implemented in patient care and health, and to do that you need to work in multidisciplinary teams."

As much as anyone, Robbins embodies that collaborative spirit. She holds a joint faculty appointment in the School of Nursing (where she is the Audrienne H. Moseley Endowed Chair in Biologic Nursing Science) and the School of Public Health, and has served as a bridge for her students and colleagues to other parts of the UCLA campus.

Robbins originally came to the School of Public Health after being recruited to fill a position for a nursing faculty member in the school's Center for Occupational and Environmental Health (COEH), directed by Dr. John Froines. The position was funded as part of the mandate from the state legislature that established occupational and environmental health centers in California, following the discovery in the late 1970s of infertility among workers exposed to the pesticide DBCP. "What really appealed to me about UCLA was the fact that it has this COEH that is committed to education, training, and research involving nurses, chemists, toxicologists, and others in environmental health, all working together to protect workers from occupational hazards," Robbins says.

While she continues to serve as a COEH faculty member, Robbins now also heads the Occupational and Environmental Health Nursing Program, part of the School of Public Health-based Southern California Education and Research Center. That center, under the direction of Dr. William Hinds, trains students in industrial hygiene, occupational medicine and nursing. Graduate nursing students in Robbins' program take environmental health, occupational safety, ergonomics, industrial hygiene and epidemiology courses in the School of Public Health. Robbins also fosters cross-disciplinary ties as a faculty member in UCLA's Interdepartmental Program in Molecular Toxicology.

The industries responsible for the reproductive effects Robbins first saw as a public health nurse more than two decades ago have been forced to clean up their act by policies resulting from the research of Robbins and her colleagues across the country. But Robbins suspects there are still many preventable birth defects stemming from exposures that are not yet fully understood. The field is becoming even more challenging with the explosion of new chemicals being introduced and the realization by scientists that exposure windows may be much wider than previously believed: For example, a male fetus exposed in the womb to even low doses of certain chemicals can have affected sperm as an adult.

"The exposures are changing, and there is a lot we don't know," Robbins says. "We have to remain vigilant if we want to continue to protect the health of the next generation."

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