



IN UTERO

Before They Are Even Breathing, Air Pollution Can Hurt Babies' Health

By Christina Elston

Victoria Niklas, M.D., takes care of some of the area's sickest newborns at Childrens Hospital Los Angeles. Grace was born early because her mother had preeclampsia.



About This Series

"In the Air" is being produced as a project for The California Endowment Health Journalism Fellowships, a program of USC's Annenberg School for Communication & Journalism.

- **January:** In Utero, how air pollution affects babies in the womb.
- **February:** The Kids Aren't Alright, rising asthma rates among children.
- **March:** Teenage Lungs, the long-term effects of breathing smog.
- **April:** Clearing the Air, efforts at change and what you can do.

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Back in the late 1980s, as an OB-GYN at L.A. County-USC Medical Center, Robin Johnson, M.D., says she first understood how important a mother's breathing can be to her unborn baby. One of her patients had asthma so bad it landed her in the hospital three to four times a month.

"She eventually delivered, and delivered early," Johnson says, though the baby was almost at term. What surprised the doctor was that, though the mother was of normal stature and not really sickly, "she ended up having this little four-pound baby."

Today, Johnson teaches at USC's Keck School of Medicine and is a fellow with the Reach the Decision Makers Training Program, created by the National Center of Excellence in Women's Health at UC San Francisco. Her project: To convince the U.S. Environmental Protection Agency (EPA) to look at birth outcomes when setting environmental policy. The agency confirms that it not take reproductive health into account in considering the costs and benefits of setting a new national air quality standard.

"Women and children are always the last variable that is thought about," she says. "It's up to us to say, Hey, wait a minute, we're where it starts! When you talk about the chicken and the egg, we're both."

Around 150,000 babies are born in L.A. County every year, and when they are born to mothers breathing polluted air they are more likely to be premature or underweight, UCLA research, backed by studies from across the U.S. and Europe, shows. Research out last month from USC, UC Davis and Childrens Hospital L.A. also found they could have double the risk of autism.

Victoria Niklas, M.D., cares for some of the county's sickest newborns. The neonatal intensive care unit at Childrens Hospital Los Angeles where Niklas is an attending neonatologist sees around 350 to 400 babies each year. Niklas points out that it is still impossible to peg air pollution as the cause of a given birth problem, but notes that smog and cigarette smoke share many ingredients. And the danger of cigarette smoke to unborn babies is clearly established.

Niklas also has years of experience with our local air. She first came to Childrens Hospital from the East Coast as an intern and resident in 1989. And her office wall sports a collage of photos she took of the L.A. skyline – showing a full palette of sky from bright blue to hazy brown – during 2007 when she commuted daily to the hospital from Newport. "We have to be open to understanding the impact of the environment on the patients we see," she says.

Niklas explains that whatever caused them to be born early, "pre-term babies are not just little infants." Born before 37 weeks' gestation (normal pregnancy is about 40 weeks), their internal organs haven't had time to mature. "The earlier you're born, the more likely you are to have complications of one of the major organ systems," explains Niklas.

• **The brain:** Delicate and underdeveloped blood vessels can break, causing bleeding into the fluid that bathes the brain. To keep pressure from building and damaging the brain itself, doctors often have to insert a stent to drain the fluid into the abdomen.

• **The lungs:** If the lungs are underdeveloped and weak, the baby will have to go on a breathing machine, which can cause permanent damage to the lung themselves.

• **The intestines:** If the intestines aren't ready to absorb and digest breast milk, the most gentle food a baby can be fed, it is difficult to nourish and help the baby grow.

Some children with these complications require breathing machines or feeding tubes for much of their childhood, and need care for the rest of their lives. "These problems are going to impact the way that family functions forever," says Niklas. And preemies spared these early complications can still develop problems – such as blindness of prematurity – later on.

Babies born too early or too small may also be more vulnerable to heart disease and diabetes as adults, says Beate Ritz, M.D., Ph.D., a UCLA environmental health researcher who has been looking at the impact of air pollution on birth outcomes in Los Angeles since 1990 and has published several major studies on the subject. As with the USC/Childrens Hospital autism team, she and her colleagues have recently focused on vehicle exhaust as the most important source of pollutants. They haven't yet pinpointed how a mother's exposure to this mix of gases and particles harms her unborn baby, but they are exploring three major possibilities.

The first is that the toxins piggybacking on ultrafine particles can enter the mother's bloodstream and disrupt the functioning of the placenta. This would starve the developing baby of both oxygen and nutrition.

These same toxins could also cross the placenta and act directly on the fetus, entering the cells and changing the way the baby's organs form. "We could be programming a pancreas to have diabetes later, or lungs to have lung disease," says Ritz.

Finally, the toxins could interfere with a pregnant woman's immune system. Early in pregnancy, the immune system is "turned down" so that the mother's body doesn't attack the developing baby as an invader. It returns to normal around the time the baby is due to be born. But exposure to air pollution could ramp a woman's immune system back up ahead of schedule. "If that's out of balance, you could easily see how a baby could be born too early," Ritz says.

Researchers speculate that oxidative stress and inflammation could also play a role in the link to autism.

Both Niklas and Johnson – who before she became an OB-GYN was a pediatric nurse in the Harbor Freeway corridor – say that air quality in the basin has gotten significantly better during their time in practice. But Johnson says she didn't notice any improvements in her patients.

Why? She was working in one of the most polluted parts of L.A. County, serving vulnerable low-income families. And as studies by Ritz and her colleagues have shown and the latest research on autism suggests, the closer you get to a freeway, the bigger the risk to your baby. Says Johnson, "Look at where the bad air is." ♦

Christina Elston is Managing Editor of *L.A. Parent*.

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