NARRATOR: You're watching NOW with Bill Moyers. With contributions from NPR news. This week on NOW...

NARRATOR: This week on NOW. Are we poisoning our children?

DR. SANDRA STEINGRABER: Children very often serve as the kind of canaries in the coal mine.

NARRATOR: A report on the search for everyday chemicals that may be harming our kids.

DR. PHILIP LANDRIGAN: To me as a medical detective, the first clue is the increase in the incidence of childhood cancer. That signals that something is going wrong.

DR. STEINGRABER: Children have home and garden pesticides in their urine and they're peeing out wood preservatives. Women have termite poisons and toilet deodorizers and flame-retardants in their breast milk.

AYAISHA HAMILTON-ODOM: Just about everybody in my family has asthma. There's nothing scarier to a parent than their kid not being able to breathe.

DR. MARY GUINAN: What if you could have protected your child from something—and you didn't?

DR. RICHARD JACKSON: We are bringing new laboratory technology to this that we've never been used before.

DR. FREDERICA PERERA: It's like fingerprints at the scene of a crime.

NARRATOR: From our studios in New York, Bill Moyers.

MOYERS: We are devoting our entire broadcast tonight to one important question: Are everyday chemicals harming our kids? In my lifetime, more than 75,000 synthetic chemicals and metals have been put to use in America. Chemicals, that in many cases, make our lives easier and better. They kill insects and weeds, clean our clothes and carpets, unclog our drains, create produce and lawns, pretty as a picture.

But most of these chemicals have never been tested for their toxic effects on children. And scientists are concerned that recent increases in childhood illnesses like asthma and cancer, as well as, learning disabilities, may be related to the environment — to what kids eat, drink
and breathe.

With four grandchildren, I’m grateful for the scientists who are trying to answer these questions. You’ll meet some of them in this report. All of us have a stake in their scientific exploration of kids and chemicals.

MOYERS: There’s a mystery unfolding in Fallon, Nevada.

INVESTIGATOR: "Are you Carinsa?"

MOYERS: A medical mystery.

Investigators are searching homes for traces of a potential killer. No one knows what it looks like. It left no visible tracks.

But, somehow, it crossed the path of five-year-old Sareynah Rivers. She is in remission now ... but two years ago she was the fourth child in town to be diagnosed with Acute Lymphocytic Leukemia.

CARINSA RIVERS: Not long after that another child was diagnosed and at the time I just thought how awful for that family to be going through what we were going through. And then I found out that another child had leukemia. It was just one after the other and I just, I thought what's going on here?

MOYERS: When the fifth child fell ill — Nevada’s top health officials decided to investigate. Dr. Randy Todd and Dr. Mary Guinan.

DR. MARY GUINAN: The cases kept coming in an alarming manner. Almost like a communicable disease. Dr. Todd and I would look at each other and say, it can't be true — we have another case.

MOYERS: In 20 years this county of 24,000 people — had recorded only one case of childhood leukemia. Now, in five years, they've had 15. What experts call a cancer cluster.

DR. GUINAN: I think it’s human nature to ask and human nature to think, there are so many cases there must be something to this.

MOYERS: Is there something in this high desert valley making children sick? Could it be pesticides from the fields? High levels of naturally occurring arsenic in the water? Atomic testing from the 1960s? Or is it benzene from the jet fuel used at the nearby airbase?

No one could say ... so everything in the environment was suspect.

RIVERS: I’d drive around town. I’d drive on the outskirts of town. I looked at every building wondering what kind of chemicals they were using, wondering if they were spilling when they weren't supposed to be.

INVESTIGATOR: When you clean your home do you have a cleaning service that comes in?

(Carinsa nods)

INVESTIGATOR: Do you know what products they might use?

(Carinsa shakes her head.)

INVESTIGATOR: Do you see them doing any aerial spraying? Or...

SCOTT HUTNER: I've never... I've seen aerial spraying, but I haven't seen it in this field here.

DR. GUINAN: You could have a list of hundreds of environmental toxins, but the question is
how did it affect our community and how did it affect it uniquely? If there is a toxin, if there is
something in the environment, how did it specifically select these children?

MOYERS: It's rare to uncover the cause of a cancer cluster. Dr. Guinan did in the 1980s when
she worked for the Centers for Disease Control in Atlanta, Georgia. She helped link a cluster
of cancers in Gay men to the virus we now know as HIV.

Dr. Guinan knew that Fallon's mystery required help from the best medical detectives in the
country.

DR. RICHARD JACKSON: Clusters are the bane of the existence of health officers. And given
the dramatic nature of this cluster we felt this was an important one to respond to.

MOYERS: Dr. Richard Jackson runs the CDC's environmental health division. His team hadn't
taken on a cancer cluster in 20 years.

DR. JACKSON: Environmental epidemiology, doing epidemic investigations of things in the
environment, has been held back by the lack of good measures about what's in people. It's
much more difficult than infectious disease epidemiology. Environmental exposures are often
much lower, much more long term, it's a different kind of investigation.

MOYERS: Investigators know they will find the most important clues hiding in the kid's bodies
— if their tools can detect them.

BARBARA DEBRAGA (NURSE): "I got to do this one, huh?"

MOYERS: Dustin Gross has successfully fought his leukemia with chemotherapy.

DR. GUINAN: We will look for environmental toxins in the body. Not have you been exposed
to them? But how much of these toxins have been absorbed into the human body. In fact,
into these human bodies. And nobody's ever done that in a cancer cluster before.

MOYERS: Blood and urine samples from the families in Fallon were brought to the CDC labs
in Atlanta. They are being analyzed here for minute traces of chemical suspects: pesticides,
metals, solvents, and PCBs — a class of persistent chemicals, banned years ago.

DR. JACKSON: I don't think there's ever been a cluster investigation before that looked at
125, 130 different chemicals in blood and urine. Many labs measure what's in the air. Many
labs look at what's in water. Some look at what's in food. But the ability to actually look at
something in a human being is much more difficult.

MOYERS: Scientists have learned a lot about curing childhood leukemia with chemicals ...
now they are undertaking the painstaking process of learning how — or whether — certain
chemicals can cause the disease.

DR. GUINAN: What we will find is clues. And how to look at the next step. That's how science
works. Science works in small steps. And then there's maybe an aha moment. But prior to
that "aha" moment there are years and years of systematic study and that's what's so very
difficult for people to understand about science.

MOYERS: Since the investigation began in Fallon, two children have died.

Scientists might not find a link between their deaths and the community's environment. But
the questions they are asking in this small town in Nevada are part of a bigger search
unfolding across the country.

DR. LANDRIGAN: I see the cluster of cases of childhood leukemia in Fallon as part of the
broad increase in the incidence of various forms of childhood cancer in the United States,
leukemia among them — an increase that has been going on for the past 25 or 30 years.

DR. LANDRIGAN TO STUDENT: So let's talk for a minute about leukemia rates in this country
and what's going on.
MOYERS: Dr. Philip Landrigan is a pioneer in the emerging field of children's environmental health.

From New York's Mount Sinai School of Medicine he works with scientists around the country to understand how kids are affected by exposure to chemicals.

DR. LANDRIGAN: Fifty or 60 years ago in this country the major diseases in children were the infectious diseases.

DR. LANDRIGAN TO PATIENT: Hi. Good morning, how are you? I'm Dr. Landrigan.

DR. LANDRIGAN: Today the major causes of illness in kids are chronic diseases.

DR. LANDRIGAN TO MOTHER: She's not having too much trouble breathing now?

MOTHER: Much better than before.

DR. LANDRIGAN: Asthma is the leading cause of admission of children to hospital; it's the leading cause of school absenteeism. Cancer, after injuries, is the leading killer of children in the United States. Developmental disabilities are common. They affect anywhere from five to ten percent of all children. Things like attention deficit disorder, dyslexia, autism.

MOYERS: Do you think these changes in the patterns of illness have anything to do with the food we eat the air we breathe, the water we drink?

DR. LANDRIGAN: We know that chemicals in the environment are responsible for some of these effects. We know, for example, that some cases of development disability in children are caused by exposures to lead, to pesticides, to mercury, to PCBs. We suspect that children who are exposed to pesticides are at greater risk of childhood cancer than other children. But mostly we don't know.

MOYERS: Of the 3000 or so high production volume chemicals in use in this country today only 43% have been even minimally tested. Only about 10 percent have been thoroughly tested to examine their potential effects on children's health and development.

So little testing has left scientists and policy makers in the dark about the toxicity of thousands of chemicals. This is changing — slowly.

In 1996, the Food Quality Protection Act directed regulators to re-evaluate more than 500 pesticides and set stricter standards for the protection children.

DR. LANDRIGAN: Prior to 1996, all environmental regulation in this country was based on the notion that the entire population consisted of healthy young adults.

MOYERS: No one said children are different?

DR. LANDRIGAN: No. no.

MOYERS: To comply with the new law, scientists at the Environmental Protection Agency had to learn how kids and chemicals come into contact.

They are gathering data from hundreds of children where traces of chemicals are routinely present — homes, classrooms, playgrounds.

DR. LINDA SHELDON: Now do we know where the kids are spending their time. Not just on the tables, but around there. Are they actually going to be sitting or rolling in that area?

MOYERS: Dr. Linda Sheldon is the lead investigator.

DR. SHELDON: What we're trying to understand is what chemicals they're exposed to, how much they are exposed to and how that exposure occurs. Maybe just for some chemicals food is the most important pathway. For other chemicals just the air you breathe is the most
important pathway.

**DR. LANDRIGAN:** Children are very different from adults.

First of all they're more heavily exposed pound for pound. They eat more food, they drink more water, they breathe more air. Then of course kids play on the ground. They live low, they put their hands in their mouths and so they transfer more of any toxic chemicals into their body than we do.

**SCIENTIST:** Before we do this, does anyone have to go potty?

**MOYERS:** The scientists use special suits to gather chemicals that children pick up from surfaces in the room. They also measure what's on the surfaces.

They're looking for tiny traces of 40 different persistent organic chemicals that may harm children — from PCBs and chemicals produced by burning fuels, and chemicals used in plastics, to a range of pesticides.

**DR. SHELDON:** With pesticides it appeared that the highest exposures for children would be both through pesticides getting on their skin and also what happens with this hand to mouth activity. Do pesticides go onto their hand and into their mouth? Or as they are sucking objects, sucking pacifiers sucking anything in sight are they bringing in pesticides to their body.

**SCIENTIST:** See, I wipe the fish down for you.

**MOYERS:** Many indoor pesticides were originally designed to be used outdoors.

**DR. SHELDON:** Once you bring them indoors, there's no sunlight, there's no rain, they tend to degrade more slowly, so in fact, it's more important for us to understand them in that environment.

**MOYERS** Pesticides can linger indoors for weeks ...sometimes years. Particularly in carpets they can reach concentrations 10 to 100 higher than those found outside.

**DR. LANDRIGAN:** Many of the pesticides in common use, particularly members of the organophosphate family, were deliberately designed to be toxic to the nervous system. They kill insects by poisoning the nervous systems of the insects and they have the same capability in humans.

**MOYERS:** Animal studies have lead some scientists to believe that even minute exposures to certain pesticides can harm the developing brain, alter behavior and diminish intelligence.

Dr. Sheldon’s team continues the search for traces of chemicals where children live and play. Comparing what children are exposed to in their environment to what shows up in their urine will help researchers to know what precautions to recommend.

But exposure is only one piece of the puzzle. A critical question remains: What do combinations of these chemicals, at low levels, actually do to children?

Here in New York City, the effort to answer that question begins in the womb.

More than 500 expectant mothers will pull on back packs like these in their third trimester. Inside are devices that trap the chemicals in the air they breathe.

Children in New York City are exposed to an urban soup of airborne chemicals. Some neighborhoods in upper Manhattan suffer more than others.

**PEGGY SHEPARD:** We are inundated with diesel trucks and buses. Out of the 7 depots here in Manhattan, 6 are in Harlem and Washington heights. We have never been in compliance with clean air standards.
MOYERS: Peggy Shepard has campaigned for fifteen years to clean up the sources of air pollution in these neighborhoods — from sewage treatment plants to diesel engines. She thinks research will help.

SHEPARD: New York City is rated number two in air toxics by the EPA just after Baltimore. And we'd like to know what is the cumulative impact of all of these sources?

MOYERS: What's already known is that these neighborhoods have some of the highest rates of asthma in the country.

Ayaisha Hamilton-Odom, eight months pregnant, is taking part in this groundbreaking study at Columbia's Center for Children's Environmental Health.

AYAISHA HAMILTON-ODOM: Just about everybody in my family has asthma. One of my aunts was hospitalized twice this summer, y'know, for her asthma. My mother has asthma, I have asthma, little Leon has asthma. And hopefully my baby won't have it. But the odds...

MOYERS: A child's genes do increase the odds, but they are not the whole story.

DR. PERERA: We have basically dropped the ball as a research community, maybe as a country. We have a very serious lack of understanding of how to go about preventing these diseases because we haven't had enough information.

MOYERS: Dr. Frederica Perera is the study's director.

She and her team are looking for links between chemicals in the air and the risk of asthma, cancer, or learning disabilities.

Jessica Dietrich's assignment is to find out how the expectant mothers, none of whom smoke, are exposed to chemicals throughout their pregnancy.

JESSICA DIETRICH: Tiffany?

TIFFANY CRAFTON: How you doing?

DIETRICH: Good, how are you?

CRAFTON: Fine.

MOYERS: Tiffany Crafton, has no history of asthma in her family. She is expecting her third child.

DR. PERERA: We can't wait until individuals are born to know that there's been some damage.

DIETRICH: Let me just write down your due date. While I have it here.

DR. PERERA: We know the developing fetus and young child are particularly sensitive to a variety of toxic chemicals. So it's very important for us to learn about the effects of low level, combined, real life exposures.

DIETRICH: I want you to think about your entire pregnancy from the very beginning. Have you ever been exposed to any paint or paint products.

CRAFTON: No

DIETRICH: Have you ever been exposed to carbon black from copying or printing machines?

CRAFTON: Yes

DIETRICH: You have?
CRAFTON: I have. I made copies for two weeks.

DIETRICH: During your pregnancy?

CRAFTON: Yeah.

MOYERS: You're doing this in a very urban area, would a study like this have relevance to mothers in the suburbs or rural America?

DR. PERERA: Yes, absolutely. Because the exposures we are studying are not unique to these communities. They're not unique at all. They're very widespread, in fact pervasive.

DIETRICH: So every day when you would go into work, you'd walk through a bunch of people smoking...

DR. PERERA: We are focusing on those so-called involuntary exposures, things that we don't have control over. Because we haven't had enough information about their early effects. And yet we know from experimental studies and from some human data — albeit generally limited — that these exposures do have the potential to harm the health of the developing child.

DIETRICH: Alright. So basically it's sucking in air through here. This is what we'll analyze later on.

CRAFTON: So, it's like everything I'm breathing.

DIETRICH: Everything that is in the air that you breathe will be trapped in here. So this will give us an idea of what types of pollution you are exposed to in your daily life during your pregnancy. And also that the baby is exposed to.

DIETRICH: Does it feel all right? Do you want me to tighten it? It's comfortable?

CRAFTON: Yea, how do I look?

DIETRICH: All right, it looks great, very stylish.

CRAFTON: It makes me more aware because now I'm noticing different smells. Like I've noticed when we were in the building the lady was smoking and I walked by and I was like, "that's going to take in the smoke." And, it's like, outside now I can smell you know, stuff on the bus...that I really never noticed before.

DIETRICH: Hi Ayaisha, how are you?

HAMILTON-ODOM: I'm fine.

DIETRICH: You've got the backpack on.

MOYERS: Each woman returns the backpack after 48 hours.

DIETRICH: Thank you very much.

HAMILTON-ODOM: It got to suck up some of the fumes from the trucks coming from the armory.

MOYERS: The air samples are full of clues. So far they reveal every woman has been exposed to carcinogens that come from burning fuels.

They are also searching for passive cigarette smoke and neurotoxic pesticides.

Other culprits may be clinging to the dust in Ayaisha's home, like allergens from mice or roach droppings.
DR. PERERA: We don't know much about how common pollutants may interact with allergens to cause asthma and this study gives the investigators a unique opportunity to do that.

MOYERS: If all goes well, their diligence will pay off with an understanding of which pollutants are getting through to the baby.

DIETRICH: I'm just going to put these stickers here so that when you go to the hospital they'll know that you are part of the study

MOYERS: What have we learned about the fetus? Is it truly susceptible to these invaders?

DR. PERERA: Yes. The fetus does not have the same mature defense mechanisms that adults have and their systems and organs are developing very rapidly. So they're more vulnerable.

MOYERS: Scientists already know certain chemicals can cross the placenta and reach the developing fetus.

They believe these exposures might be having an impact.

MOYERS: Exposure alone doesn't mean a child will get sick, does it?

DR. LANDRIGAN: Oh, no. Exposure alone is just exposure. What matters is how intense is the exposure and when it occurs in the course of a child's development.

MOYERS: The amount and the timing?

DR. LANDRIGAN: That's right. If the child's exposure occurs at a critical window in early development, even a relatively small exposure can have devastating long-term consequences.

MOYERS: Such devastating consequences hit the world like a bomb forty years ago.

In Europe, a prescription drug called thalidomide was being given to expectant mothers to fight morning sickness.

What the doctors didn't know was that a mother's nausea coincided with a crucial period in limb formation.

SANDRA STEINGRABER: Children were born without arms and legs, children were born with problems with their ears and their eyes, all kinds of things that were obvious right in the delivery room when these children were born.

DR. STEINGRABER: There may be no safe threshold levels at certain key windows of vulnerability.

MOYERS: Dr. Sandra Steingraber, a biologist, has written and lectured widely about the effects of chemicals on the developing fetus.

DR. STEINGRABER: What we realized was it wasn't so much how many pills you took that determined the extent of the damage in the child, it's on which day you took the pills. So if you took a pill on day 35 or 36 of your pregnancy, you had one kind of damage. If you took the same dose on day 40 or 45, you had a whole — another set of physical malformations in the child. It all depended on what body part was getting set up on that day of development.

DR. LANDRIGAN: We've learned that if a child is exposed to a chemical like lead or a pesticide during one of those critical early windows, that there can result toxic affects which are absolutely unique and absolutely devastating effects that have no counterpart if an older child or an adult is exposed to the same chemical.

DR. STEINGRABER: Very early on in pregnancy for example a toxic exposure that occurs during that point where the fertilized egg is just getting itself implanted and setting up its life support system inside the uterus, that's a window of vulnerability for miscarriage.
MOYERS: Between weeks 5 and 10, organs and limbs are forming.

DR. STEINGRABER: So a chemical that earlier on might have created a miscarriage if it’s introduced during that period of time might create a risk for a birth defect. Cleft pallet, hole in the heart, fingers or toes are shortened or missing.

MOYERS: In the fifth month, the brain undergoes a period of rapid growth.

DR. STEINGRABER: If a toxic chemical, especially a neurotoxin, is introduced during that point in the second trimester you can actually paralyze migrating brain cells and extinguish human intelligence. And maybe, and here’s where the science is really just beginning to emerge, maybe certain problems that we — understand in the school systems as attention deficit disorders, hyperactivity, the inability to pay attention, aggressive and violent behaviors might have their origins during those windows of vulnerability during pregnancy. And these are questions just being asked. Data just beginning to come in.

DOCTOR: Baby’s almost out. Come on push Ayaisha.

Give it a good push.

MOYERS: It’s been a month since Ayaisha Hamilton-Odom took off her backpack air monitor.

MRS. HAMILTON-ODOM: Six, seven, eight

DOCTOR: Push, come on...what a beautiful baby, Ayaisha. It’s a girl!

HAMILTON-ODOM: Oh my god, that’s my baby!

Oh my god! Hi baby.

MOYERS: Already there’s evidence none of these babies enter the world untouched by chemicals. .. The clues show up in the umbilical cord blood .. it’s difficult to collect even a small amount. The blood is both light sensitive and time sensitive. It must be carried off immediately for processing in a darkened lab.

MOYERS: So you are looking here in this blood for the evidence that a child has been exposed to chemicals.

DR. PERERA: That’s right the blood samples are processed and analyzed here. And this is Dr. Deliang Tang.

DR. DELIANG TANG: I cannot shake hands with you...

MOYERS: The blood is spun into separate components in a centrifuge.

DR. TANG: See, here on the top is the plasma, the bottom, red, is the red blood cells. In between there is a very thin layer.

MOYERS: I see it.

DR. TANG: That’s white blood cells.

MOYERS: A very, very tiny layer of white blood cells.

DR. TANG: That’s where the DNA is.

MOYERS: In the white blood cells.

DR. TANG: In the white blood cells. Then we are going to take the white blood cells and extract the DNA. I’ll show you DNA.
MOYERS: Okay, good. I have never seen DNA before. That's it? Oh yes.

DR. PERERA: That white milky substance?

MOYERS: That's what they call the stuff of life.

DR. PERERA: That's the stuff of life.

DR. TANG: All the information is in there.

MOYERS: But it is in this milky looking fluid there, this DNA, that you will hope to find the fingerprints of the chemicals that you are looking for?

DR. PERERA: That's right. There's a lot of monitoring of exposure. But that's not enough we really need to know how much that individual has actually absorbed of a particular chemical and whether there has been damage to key targets like DNA or the immune system. It's like fingerprints, almost, at the scene of a crime.

MOYERS: This machine detects chemicals in DNA. The chemical fingerprint will show up as a peak in the DNA analysis.

DR. TANG: We're only interested in this peak.

MOYERS: This one right here.

DR. PERERA: That's the benzopyrene.

DR. TANG: This peak is representing the amount of adducts the baby has.

MOYERS: Adduct is A D D U C T? It's not a word I was familiar with.

DR. PERERA: No, an adduct is where the chemical is actually hooked on to DNA.

MOYERS: This is a model of benzopyrene ... a chemical formed by burning fuels. When benzopyrene crosses the placenta it makes its way into the fetus, into the cell, and can bind itself to the DNA ... forming the Adduct.

This is undeniable proof that the chemical has been there and damaged the baby's DNA.

MOYERS: That's the fingerprint you're talking about.

DR. PERERA: That's the fingerprint and if this adduct is not repaired properly, a mutation, a change in the coding sequence can result. And if other things happen down the road that cell can become a cancer cell.

MOYERS: Six out of 10 of these babies have measurable adducts.

Earlier work by Dr. Perera determined that the greater the number of adducts, the greater the risk for cancer.

DR. STEINGRABER: And that's the missing link in all this. We know the exposures are happening, often. We know the cancers are happening, but being able to then trace the cause and effect link between the exposure and the biological damage that exposure does inside the body and then being able to say that that's the kind of damage that we know contributes to tumor formation, that's the link we're beginning to fill in and that's what's so exciting I think about the new science.

MOYERS: Dr. Perera's team, at Columbia, is half way through the study.

DR. PERERA: The advisors kept saying to me was what a rich body of data we have accumulated on this cohort.
MOYERS: The researchers have already observed that up to half of the babies are sensitized to mice or roach allergens in the womb. And one of four babies is at high risk for asthma by age one.

Unfortunately, the chemicals that control these pests are also a problem. Dr. Robin Whyatt studies the mothers’ exposure to pesticides.

DR. ROBIN WHYATT: There was a study done in 1997 that indicated, in fact, the major use of pesticides in New York State is not occurring in the agricultural communities but is occurring in the boroughs of Manhattan and Brooklyn. So we have been monitoring for eight different pesticides and we’ve so-far completed that for 166 women and all of those women are exposed to at least 3 pesticides and 30 percent of the women have been exposed to all eight.

MOYERS: And the cord blood samples reveal the babies have absorbed the same pesticide compounds as their mothers.

DR. WHYATT: There is some data from laboratory animals that have shown that if you give these exposures while the mother is pregnant it causes a lot of learning disabilities in the offspring. So the question is: Are these effects happening in humans and that’s what we’re trying to find out.

DIETRICH: So let’s get started with the questionnaire.

DR. PERERA: At six months a child comes in for testing, again at 12 months, and again at 2 and 3 years and we hope to repeat that on into the successive years.

RESEARCHER: Y que es eso?

BOY: Un caballo.

RESEARCHER: Un caballo.

DR. PERERA: And we measure the child’s cognitive development ...

RESEARCHER: Where’s the other one? Y l’altra donde esta? Okay!

BOY:

DR. PERERA: and also motor function.

MOYERS: And what are you seeing?

DR. PERERA: Well so far I can’t give the actual results at this time. But many of the children do seem to have some either mild or severe developmental delay.

DIETRICH: We’re going to hide the bunny under this cup...

MOYERS: It is still too early to draw conclusions. Dr. Perera and her team will not yet declare a link between certain pesticides and a child’s ability to learn.

But a great deal rides on tests like these.

RESEARCHER: Great! Thank you very much.

MOYERS: The team is not waiting to educate the participants in their study. They’ve called on community activist Peggy Shepard to help them reduce exposure to chemicals in the neighborhood.

MOYERS: What can research in a community like this do that science alone in a lab can’t do?

SHEPHERD: Well, you know, scientists are good at producing data and coming out with some
results. It's organizations and community residents who, if working with them, can take that data and advocate and take action — change policy, change conditions.

MOYERS: Are we making progress... Are we going to have ten years from now, 20 years from now a healthier cleaner environment in which children are safer?

DR. PERERA: You know, I think it can happen. There are many committed people. But it's not going to be easy. It's going to take a tremendous amount of hard work and stamina and some real struggles.

MOYERS: Scientists know from experience just how long and hard the struggle can be. They learned that lesson in the battle to protect children from exposure to a single chemical — lead.

Lead paint’s capacity to harm children has been documented for more than 100 years. No toxic chemical has been studied as thoroughly.

But even today lead remains the number one environmental threat to children's health.

RANDY PAIGE: Out of the 50 schools we examined, 17 of them tested positive for lead.

MOYERS: Just last year a news investigation in Los Angeles showed children were being exposed to lead contamination in their local elementary schools.

PAIGE: Watch as this little boy puts both of his hands on the contaminated windowsill. He brushes off what appears to be a paint chip. Seconds later his right hand goes into his mouth.

MOYERS: Lead can leave its mark on a child’s brain even before there are obvious symptoms.

DR. HERBERT NEEDLEMAN: Lead is an unusual metal in that has no function in the body. It's never been shown to have any use at all in the body.

MOYERS: Dr. Herbert Needleman, is a psychiatrist at the University of Pittsburgh. Twenty-three years ago, working at Children's Hospital in Boston, he revolutionized the way scientists think about exposure to low levels of toxic chemicals.

DR. NEEDLEMAN: It was acknowledged that a lot of lead can make you retarded and my question was would a little lead make you dumb. It just reduces to that.

MOYERS: In the late 1970s, Dr. Needleman studied the baby teeth of healthy school children in two Boston suburbs.

DR. NEEDLEMAN: Instead of blood we used the tooth, because the tooth is a long-term storage measure. We collected 3,000 teeth from 2500 children and we brought the children with the highest tooth lead levels and the lowest tooth lead levels into our laboratory. Measured a lot of other things, I gave the mother an IQ test. And when we looked at the data we found that the children who had high lead in their teeth — by the way had never been identified as having any problems with lead — had lower IQ scores, poorer language function, and poorer attention.

MOYERS: It was a stunning discovery, and no one knew it better than the lead industry.

Leaded gasoline was the single greatest source of lead exposure, and as a result of Needleman’s work the Environmental Protection Agency sped up efforts to ban it.

The lead industry fought back, denying Needleman's science.

JEROME COLE: Lead has been used in gasoline for over 60 years. There's simply no evidence that anyone in the general public has ever been harmed by this usage.

MOYERS: Lead producers had long downplayed the dangers of lead.
In the nineteen twenties, even as European countries were banning the use of lead paint indoors, the industry in America was promoting it as a healthy product ... in household paints ... plumbing ... children's toys.

At the same time the industry started adding tetraethyl lead to gasoline, financing their own research to override the concerns of public health officials.

The propaganda worked. For almost 50 years, many people believed that children, like adults, could only be harmed by large doses of lead.

That belief was shattered by Dr. Needleman's work.

In 1991 the lead industry took aim at his landmark study.

DR. NEEDLEMAN: The lead industry decided that they were losing the battle, the number of studies was growing rapidly from around the world. Lead was being taken out of gasoline. And I think, they didn't invite me into their private quarters to discuss this, but I think that they said we'll attack like the keystone, the center the one that began all this, and if we can impeach that then the whole thing will crumble.

DR. LANDRIGAN: The lead industry attacked viciously and they attacked Dr. Needleman himself. They accused him of scientific misconduct and they actually filed charges against him at his university and at the National Institutes of Health.

DR. NEEDLEMAN: It's like a death sentence. If you're found guilty of scientific misconduct you're out of business; your reputation is ruined; you're through.

MOYERS: While his scientific peers dissected Dr. Needleman's work, the industry's ideological allies tried to ruin him.

DR. NEEDLEMAN: The lead industry used two public relations groups Hill and Knowlton and Adelman Associates and they sent it around the world.

MOYERS: The assault went on for three years. For three years, Dr. Needleman stood his ground.

DR. LANDRIGAN: Those were tough years in Dr. Needleman's life. Eventually those charges were shown to be baseless and the people that brought them forward who had portrayed themselves as neutral scientists were, in fact, revealed as consultants to the lead industry. It took several years for the truth to out. But he triumphed.

DR. NEEDLEMAN: I knew I was right. I mean, I knew that the work was good. I knew that my colleagues who worked with me on it were honest people. But I realized that science is not always the polite intellectual activity that it appears to be; that environmental science sometimes becomes something closer to warfare.

MOYERS: Today scientists believe that, as a result of taking lead out of gasoline, children average three IQ points higher than their parents.

DR. NEEDLEMAN: I don't think there are many public health triumphs as substantial as removing lead from gasoline. In the '70s the mean blood lead, the average blood lead for children was 16. Now it's two or below just because lead was taken out of gasoline.

RESEARCHER: The computer is getting a reading of the lead level in your leg bone.

MOYERS: Dr. Needleman is still at work.

RESEARCHER: How many times in the last six month have you skipped classes or school without an excuse?

SUBJECT: Zero.
MOYERS: He continues to find links between levels of lead in children's bones and a variety of behavioral problems: including Attention Deficit Hyperactivity Disorder, ADHD, aggression, violence and failure in school.

DR. NEEDLEMAN: As we do better and better studies — larger numbers of subjects, better measurements of outcomes and exposure, better statistics. We find effects at lower and lower doses. So I can't say there's a safe level.

MOYERS: This is the largest lead smelter in the United States — the Doe Run plant in the small town of Herculaneum, Missouri.

WOMAN AT MEETING: You need to get your children to doctors, you need to get that lead out of their system and you need to get them children out of Herculaneum. I lost my home, I lost my job, I lost everything. No job is as important as your child!

MOYERS: Despite all the studies that confirm the dangers of lead to young children. ... it took years for the residents here to discover the truth about the plant's threatening presence in their backyard.

RESIDENT: I remember when we were in high school on a daily basis we could taste that in our throat, in our mouth.

LESLIE WARDEN: It was such a company town that you just didn't talk about it.

MOYERS: Leslie Warden, a town alderwoman, was one of the first to break the silence.

LESLIE WARDEN: People knew it was there, especially the people that worked there. They had a lot of health concerns. But, you just didn't speak out against your neighbor.

ROBYN WARDEN: When we moved in, I didn't hear one word about lead poisoning, lead contamination. My daughter was getting stomach cramping and vomiting. The doctors were no help at all, they didn't even ask is there a possibility that there might be lead poisoning.

LESLIE WARDEN: I think it was always in the back of our minds. And the more we talked to people the more concerned we became because my niece and nephew were smaller and I had been learning the smaller they were the more it affected them.

MOYERS: In 1999 Leslie insisted that Robin get her children tested.

Aaron Warden's blood lead level was 26.

Grace's level was 44 — more than four times the level the government claims is safe.

ROBYN WARDEN: We had the whole house tested and we had very high concentrations of lead in our carpeting. When the carpet was removed, their lead levels dropped off by half.

My children are no longer allowed to go outside. We keep our doors and windows shut. We just basically, encase them in the house. And they don't breathe the outside air around here as much as possible.

WOMAN: Sitting here listening to about how important it is to clean your floors and everything — what good does that do if you're breathing it?

DR. KEN ORLOFF, ATSDR: You're right.

RESIDENT: The air's going into your lungs.

DR. ORLOFF: There's no way to...exactly.

MOYERS: At town meetings the community demanded help from the government.
DR. ORLOFF: Keep the windows closed ... keep the particulates...

RESIDENT: You have to go outside.

DR. ORLOFF: Yes, I know. You're right. You can't stop it because you have to breathe. You're absolutely right.

DANIEL VORNBERG, VP ENVIRONMENTAL AFFAIRS THE DOE RUN COMPANY: I'm not certain why the concern has reached this level. Maybe it's because the government had a lot of public meetings and invited the media and they became — people became more aware or more concerned or maybe people tolerate less risk than they did ten and 15 years ago.

LESLE WARDEN: We thought there were laws to protect us. We thought that's what the Department of Natural Resources and the Environmental Protection Agency was for. But what we've been told by these agencies is that they don't have any authority to do anything to the company if they're out of compliance.

MOYERS: Leslie Warden was astonished to learn that Doe Run had never complied with Federal standards set 24 years ago. The plant had made some progress — but then failed to meet three deadlines set by the EPA. Nonetheless, as long as the company volunteered to try again the government wouldn't penalize it.

Doe Run kept on pouring lead into the air.

JACK WARDEN: It was a shiny silver color. Almost looked like glitter laying beside the streets.

MOYERS: Leslie's husband Jack began to collect his own evidence.

JACK WARDEN: I took samples myself. Finally, I coaxed one of the DNR people to take samples. And once he did the numbers were alarming.

LESLE WARDEN: Astronomical.

MOYERS: The contamination Jack Warden found ... was 300,000 parts per million, or 30 percent pure lead.

At last the state had to admit there was an emergency — lead ore was falling from passing trucks and blowing into people's yards.

State officials stopped pedestrian traffic on the truck route from the smelter.

The EPA found lead contamination wherever they looked: inside peoples homes .. in the school yards, and inside the school buildings.

Hundreds of people had their blood tested.

One in four of the children under seven had blood lead levels higher than ten.

RESIDENT: I have read any type of overexposure could cause problems no matter what your levels are — like learning disabilities is a big one. My daughter suffers with that. I don't want to see my son suffer with that.

DR. ORLOFF: All I can do is to repeat that the Centers for Disease Control has suggested that levels below ten micrograms per deciliter are considered to be safe for children.

GALE CARLSON, MISSOURI STATE DEPARTMENT OF HEALTH: From what I understand when they find levels below there, they have not found what we call developmental deficits.

WOMAN IN MEETING: That's incorrect. It's a neurotoxin and they found it down to levels of 3 micrograms per deciliter. You have not done your homework, sir.
MOYERS: In fact, recent studies indicate it may be the first 10 micrograms that does the most to diminish intelligence.

ROBYN WARDEN: There's been a lot of talk about how it causes attention deficit problems and all that. I get very, very angry when I think about what they did to my children's future.

MOYERS: Robyn Warden and her family had had enough. Last summer they convinced Doe Run to buy their home and they moved out of town.

Two months after the move, Grace's blood lead levels fell to 17. Aaron's fell to 15.

Doe Run has a new agreement with the EPA. They clean the streets daily. They plan to reduce truck traffic.

They've offered to clean people's homes and replace their yards.

But many families in Herculaneum want their town bought out or the smelter closed permanently.

REP. RICHARD GEPHARDT: That white house right there?

MOYERS: Then, in January 2002, Missouri Congressman Richard Gephardt came to listen to residents. He demanded that Herculaneum be put on the Superfund priority list.

GEPHARDT: I think it's unconscionable that young children should be in harms way, should have elevated lead levels and not be on the priority list.

MOYERS: It's not yet on the list. But under pressure, Doe Run agreed to buy 160 homes. The company has until August to make its emissions legal.

ROBYN WARDEN: Doe Run played a really good game they told people that everything was under control and we were safe. And people weren't educated enough to know any different. It took people actually investigating lead to figure out that we were being lied to.

DR. STEINGRABER: There's a Web site called scorecard.org, enter whatever zip code you want, and it will give you a list of all of the toxic releases and you might be surprised. Because I felt like I knew my hometown and yet, learning about where the toxic waste sites were was like learning a brand new landscape.

FAITH DE CASTRO (DR. STEINGRABER'S DAUGHTER): And you can pop them like poppy seeds.

DR. STEINGRABER: I think I saw them up there last time

MOYERS: As both biologist and mother, Dr. Steingraber looks at even her pristine landscape in Ithaca, New York with a wary eye.

DR. STEINGRABER: Just because there are no smoke stacks visible around us just because you live a long way away from the source of these chemicals doesn't mean that nature won't bring them to you in some way. When we look inside the body, when we take a look at what's in people's blood, what's in breast milk, what's in their urine, we're seeing, we're seeing the results.

MOYERS: One result is that Dr. Steingraber, like all nursing mothers, is feeding industrial chemicals to her infant.

DR. STEINGRABER: No woman has uncontaminated breast milk on this planet. By the time I eat food it contains trace amounts of PCBs, pesticides, dioxins, methylmercury. and my breast milk, which is distilled from all of that, will contain levels of toxic chemicals several-fold higher than that.

MOYERS: These are chemicals that accumulate in all of us, from a lifetime of exposure.
Stored in fat cells .. they can not be separated from the nutrition a mother feeds her baby.

**DR. LANDRIGAN:** Breast-feeding is still absolutely, unequivocally the best source of nutrition for a human infant. It has factors that can't possibly be replicated by cow's milk or formula. But we have to reduce the use in American society of toxic chemicals that have the potential to accumulate in breast milk.

**FAITH:** But I already washed my hands.

**MOYERS:** Dr. Steingraber does the best she can to reduce her children’s exposures at home. The simplest thing any parent can do is wash a child’s hands, thoroughly, with soap and water and scrub fruits and vegetables well.

Steingraber doesn't use chemical cleaning products or bug sprays and she buys organic as a way to support farmers who don't use pesticides.

**DR. STEINGRABER:** But we can't shop our way out of our current situation. We still need to take action. All of us have a need to know what kind of pest control practices are being used in day care centers and nursery schools. We need to know what the playground equipment is made out of.

**MOYERS:** In February, this year, the nursery school did test the play structure. They learned arsenic was leaching from the treated wood, contaminating the soil at high levels where the children play.

The more investigators look the more they're finding traces of chemicals everywhere.

They are in our homes. They are in our children. But there's still a lot we don't know.

**DR. JACKSON:** What are the chemicals in the mom and dad? What are the genes in the mom and dad? And what combination of genes with what combination of chemicals would be a risk.

**MOYERS:** For answers to pressing questions like these, scientists are pinning their hopes on an unprecedented project called the National Children's Study.

One hundred thousand children will be tracked from the womb to age 18, providing scientists with a vast new store of data.

**DR. JACKSON:** And hopefully this will bring science to very big policy decisions about what chemicals are being permitted in our environment. We now have the science and technology to do this. The question would be whether we have the political and economic will to do it.

**MOYERS:** When it's in full-gear, the National Children's Study will cost $50 million dollars a year — if Congress approves it.

Without conclusive science, it's a constant fight to protect children's health.

A new law to slash diesel pollution from trucks and buses by 95% could decrease asthma and cancer risk ... it's being challenged by the petroleum industry.

Congress is considering legislation to require schools to use safer pest controls. The law was killed in committee last Fall, and again this Spring.

And while the Food Quality Protection Act has strictly limited the use of three toxic pesticides... there's no law that requires testing of thousands of new chemicals for effects on the developing brain.

**DR. LANDRIGAN:** We're never told that last one. We're never told that that the chemical that they're about to consume has never been examined for it's affects on children's health.

**MOYERS:** We've learned from the people of Herculaneum that even when the science is sound and the laws are in place it's up to the community to get results.
DR. STEINGRABER: It's time that our public policy takes action to get our kids out of harms way. Let the science go on, let the proof-making and the research happen, but let's keep our kids safe while the research goes on.

DR. STEINGRABER: Here you go, sailing like a bird.

FAITH: I forgot to bring my rain boots.

MOYERS: Since we finished that report, officials at the Doe Run Plant in Herculaneum, Missouri announced that over the first quarter of this year, for the first time ever, they met the federal air quality requirements. And results of the investigation in Fallon, Nevada, are expected this summer; we'll bring those to you as soon as they're released. In the meantime, for more on KIDS AND CHEMICALS... and for more on what you can do... go to PBS.ORG. That's our report for NOW, I'm Bill Moyers. See you on the web.