

Article Last Updated: 3/18/2005 01:27 PM

What's in you?

Part one of a three part series

Douglas Fischer - STAFF WRITER
Inside Bay Area

In a pioneering study, we tested a Bay Area family for a suite of chemical pollutants. The results stunned even scientists.

A casual observer of Rowan Hammond Holland sees a little towhead, devilishly cute, who grins impishly while tossing food at the family dog.

A pediatrician sees a kid who's a bit small for his age: 30-odd inches tall, 22 pounds, about 10th percentile for 20-month-old boys.

But not even his mother could guess what's in his blood: flame retardants, at concentrations higher than measured almost anywhere in the world for someone not handling the stuff for a living.

He's a typical kid from a typical family, picked for an Oakland Tribune investigation of chemical pollutants in our bodies.

The surprising result, scientists say, suggests infants and toddlers have vastly higher levels of some chemical pollutants than health officials suspect — or even consider safe.

But no one can say. Rowan is the only toddler, at least in the United States, who's been tested for such things, despite evidence these compounds taint our blood, our food, our house dust, our kids.

This is our "body burden" our chemical legacy, picked up from our possessions, passed to our children and sown across the environment. It's the result, scientists say, of 50 years of increasing reliance on synthetic chemicals for every facet of our daily lives.

Only recently have regulators grasped its scope. Health officials have yet to fully comprehend its consequence.

We are all, in a sense, subjects of an experiment, with no way to buy your way out, eat your way out or exercise your way out. We are guinea pigs when it comes to the unknown long-term threat these chemicals pose in our bodies and, in particular, our children.

In the first study of its kind, Rowan and his family had their blood, hair and urine tested for a suite of chemical pollutants thought to be ubiquitous in our environment.

The tests showed PCBs, plasticizers, mercury, lead and cadmium in each family member. Chemicals used to make Teflon and GoreTex contaminated their blood. Mikaela, Rowan's 5-year-old sister, had more dibutyl phthalate — a plasticizer found in nail polish and cosmetics — in her urine than 90 percent of the 328 kids age 6-11 tested so far in the United States.

The shock was the family's level of a class of flame retardants — polybrominated diphenyl ethers, or PBDEs — used in everything from TV casings to rugs to foam cushions. In the United States, where levels are 10 to 100 times higher than the rest of the world, the average adult is thought to have 36 parts per billion in their blood.

A cocktail mixed at that concentration would have 36 drops of gin in a rail tank car of tonic. Rowan's mom, Michele Hammond, had 138 ppb. His dad, Jeremiah Holland, 102. His sister, 490. And Rowan: 838 ppb. Scientists start to see behavioral changes in lab rats at 300 ppb.

"This is a very serious warning of very small children being heavily exposed," said Aake Bergman, professor of environmental chemistry at Stockholm University in Sweden and one of the world's foremost experts on human exposure to fire retardants. "We may have many more people being exposed at similar levels." Proportions will vary, and indeed, a follow-up test of the Hammond Hollands found lower — but still alarming — PBDE levels in the children. A similar chemical stew can be found in every adult and child in the country, scientists say. The exposure comes courtesy of our lifestyle, in which synthetic chemistry imbues the modern world with convenience beyond that of any generation in history.

We make perfume from petroleum and preserve food in plastic. Our chances of dying in a building fire are almost nil. We clean bathrooms without scrubbing, spill coffee without worry of a stain.

Yet these modern wonders come with a price. As synthetic chemicals have saturated our lives, so too have they permeated our bodies.

We don't know the effect it has on our health. But scientists do have suspicions.

Autism, once an affliction of 1 in 10,000 children, today is the scourge of 1 in 166.

Childhood asthma rates have similarly exploded. And one in 12 couples of reproductive age in the United States is infertile.

One may not cause the other; to draw such links remains, for now, beyond the grasp of science. Industry and other scientists say exposure remains well below levels considered harmful — the Hammond Holland's numbers notwithstanding. Our ability to detect

these compounds, invisible even five years ago, has outstripped our ability to interpret the results.

Publishing body burden data, in other words, does little but make people worry.

But if it was your 2-year-old, would you want to know?

MONDAY NIGHT at the Hammond Holland's Berkeley home, and life is quiet.

Jeremiah, 35, a high school photography teacher and coach of the school's mountain biking team, is away leading a team cycling class at the Berkeley YMCA.

Mikaela started kindergarten last fall and has mastered the alphabet, which she proudly shows off: big A's and little c's, small d's and capital Z's, painstakingly written by small fingers with remnants of red polish on the nails. The alphabet is in random order but amazingly complete.

Rowan is finishing dinner — corn, carrots, pasta with tomato sauce, hard-boiled egg yolk and cheese. He has dispensed with bib and utensils in favor of a more direct hand-to-mouth approach, announcing he's done by shoveling a big handful of spaghetti off his high-chair tray onto the floor.

Michele, watching, doesn't mind. The dog will get it. And at least Rowan is eating.

In February 2004, Rowan fell off the growth charts, registering below the zero percentile for kids his age. He's since held steady at the 10th percentile, but Michele, 36, says it's never been easy to get him to eat — or sleep.

His location at the lower end of normal and the upper end of active could be a simple result of genetics. Or it could be his thyroid.

The danger of PBDEs, says Dr. Mark Miller, director of the Pediatric Environmental Health Specialty Unit at the University of California, San Francisco, is that they act as developmental neurotoxins and disrupt thyroid activity in rats and other lab animals. And they do so at levels one-third of Rowan's, say scientists at the state Environmental Protection Agency.

Michele, who figures her son is just a small, active kid, tries not to dwell on that thought.

Doctors such as Miller who specialize in environmental contaminants see no reason the family should have such high exposures. Researchers at Albemarle, a Louisiana-based manufacturer of brominated flame retardants, are equally mystified.

"It's hard to interpret the results, yet so important," said Dr. Gina Solomon, associate director of Miller's UCSF clinic and a senior scientist at the Natural Resources Defense Council. "The fact that (the family's) levels are on the high side is symptomatic of what's going on out there."

Swedish scientists such as Bergman first alerted @MDNM the world to growing levels of PBDEs in our bodies. Researchers monitoring Swedish breast milk samples for a slew of contaminants found PBDE concentrations doubling every five years over the 1980s and 1990s.

The United States recently launched a similar program but it tracks only a dozen of chemical families and won't release PBDE data until 2007. Efforts to create a similar program in California for a suite of environmental contaminants, including PBDEs, were shot down last year after the state Chamber of Commerce labeled it a job killer.

But tipped off by the Swedes, researchers here found concentrations in wildlife, human blood and breast milk doubling even faster — every 18 months.

That's just fire retardants. And one type, at that.

There are organochlorine pesticides such as DDT, the pesticide that launched the modern environmental movement. Banned in the 1970s, they can be found today in our house dust, food and bodies.

PCBs, banned in 1979, similarly plague us. Decades worth of evidence shows these chemicals —predecessors of and close chemical cousins to PBDEs — don't belong in the body. Numbers have declined over the years, but they're there in Rowan and Mikaela and all of us — a lifetime's supply, courtesy of Monsanto Chemical Co, once the only domestic manufacturer.

Also everywhere, but with little known of the health consequences, are phthalates — plasticizers that make lotions absorbable, nail polish pliable, cologne scented and plastic soft. Our kidneys filter them quickly from our body, but a daily replenishing shower from our material world keeps our bodies' phthalate levels steady.

Then there's Teflon, GoreTex, Scotchgard and other non-stick and stain-repellent wonders. In 2000, 3M, the sole U.S. manufacturer of the two crucial ingredients necessary to make such products, announced it had found traces of one — perfluorooctane sulfonate — in virtually every human blood sample it had tested in the United States and Europe.

Sure enough, the two compounds turned up in the Hammond Hollands, too.

MICHELE IS ANGRY , but not worried. Not yet. "If in the next year something goes wrong with Rowan, then I'm all of a sudden going to freak out about these numbers," she said.

Michele is a classic naturalist, most at home in the field, where she identifies birds from their songs and can name the grasses underfoot. At the University of California, Berkeley, she researches grassland ecology.

She finds most frustrating her inability to protect her kids from the pollutants. If she wanted to curb Rowan's and Mikaela's exposures, Michele wouldn't know where to start.

Sources are everywhere, yet impossible to track.

PBDEs show up in foam cushions and plastic casings. But which ones? One manufacturer might use a brominated flame retardant, another might use phosphorous. There's aluminum trihydrates and magnesium hydrates. The label never says.

"You can't make a universal judgment that just because it's a plastic, it has flame retardant," said Paul Ranken, senior research and development adviser for Albemarle, one of three domestic manufacturers of decaBDE, a brominated flame retardant.

"Your house may be different from my house. Your carpeting might be different. You might have a little bit of polypropylene ... I might have nylon." Phthalates (THAAL-ates) are similar. We need them to make plastics soft and flexible. Without them fragrances could not be dissolved into lotions and colognes. Ink would flake off bread bags. Your vinyl shower curtain would crack as you pulled it open.

But like PBDEs, some products have them. Some don't. Good luck trying to tell the difference.

"The fact of life is that phthalates are a remarkably useful product that ... allow people without a lot of money to have a first-world lifestyle," said Marian Stanley, manager of the Phthalate Esters Panel for the American Chemistry Council. "The risk is a theoretical risk. If you had the smallest baby with the most exposure for the longest time, you theoretically have a risk. Practically, do you have a risk? Nobody's seen it yet."

But is anybody looking?

The Centers for Disease Control and Prevention is conducting the only widespread biomonitoring program in the United States, looking at national exposure to pesticides, PCBs, dioxins and phthalates, among others. Its next report, cataloging some 148 compounds, is due later this spring. But there are gaps.

Its last report, released in 2003, summarized the results of 2,541 people tested for dibutyl phthalate, an additive found in nail polish, cosmetics, pill coatings, printing inks and, oddly, insecticides.

Of those, 328 were children under the age of 11. None were younger than 6. Yet exposure increases as the age group gets younger, with kids between 6 and 11 on average having twice the level as adults over 20.

That's true with the Hammond Hollands. Mikaela's levels are three times her mom's and almost nine times her dad's.

"There's not enough (information) to allow for big generalizations," said Solomon, the UCSF physician, who with Miller met with the family and helped interpret their results. "What it does do is show the huge need for this information, both to allow us to put these results in context and also give us information on what's going on out there over time and over age groups.

"We're blind to what's going on out there."

FORTY-SEVEN minutes in and Jeremiah's heart is churning at close to 180 beats per minute. His legs blur against his stationary cycle, thighs and calves straining, as he leads his high school bike team through a Monday night "spin" class.

A furious beat thumps from the room's loudspeakers. Sweat pours off Jeremiah's nose. Flywheels spin, pedals whirl. Then the pitch jumps a notch as Jeremiah goads the teens and the pace, incredibly, picks up.

Two years ago Jeremiah weighed 237 pounds. Today he's 180. He went from a size 40 waistband to a size 34, which he last wore in high school.

His wedding suit is too big for him.

He shed those pounds on the bike trails, trying to keep up with his students. He gave up alcohol and started eating better.

PCBs, dioxins, DDT, PBDEs, phthalates all love fat. Which is one reason many stick around so long, sequestered in our waistlines.

So as Jeremiah's fat burned off, so, too, did some of his body burden, doctors surmise. It could explain why his exposures, in many instances, are lower than his children's.

He also — unwittingly — played a dangerous game, Solomon and Miller said. As the fat broke apart, contaminants were freed. Some got trapped by the bile and were eliminated. Some landed in other fat cells. And some likely migrated to nerve cells or the brain.

Michele, meanwhile, shed her body burden as only a woman can.

Breast milk is 4 percent fat. As Michele nursed Mikaela and then Rowan, she drained a life's accumulation of pollutants into her children.

Her PCB results show that most dramatically: Mikaela has 207 ppb — slightly more than her dad.

Rowan has 355. But Michele has 69.

That's no reason to stop breast-feeding, cautioned Kim Hooper, the state PBDE expert with Cal EPA who has done extensive work with breast milk. Quite the opposite. Because in addition to fat, breast milk contains essential vitamins, minerals, growth hormones, enzymes, proteins and antibodies.

Plenty of evidence also suggests Rowan and other children get a far bigger dose from their environment. Several studies have found dust studded with these contaminants in the part-per-million range — 100 to 1,000 times what's found in humans. We all ingest a little dust daily, with children eating far more than adults due to higher hand-to-mouth contact.

The other big route to our bodies is food.

THREE YEARS AGO, Arnold Schechter, a professor at the University of Texas School of Public Health, set out to show how much our diets contribute to our body burden.

He pulled 30 everyday items off the shelves of three Dallas supermarkets. They got sliced, diced and mashed to a pulp, washed in hexane, vaporized and shot into a high-resolution gas chromatograph. He found PBDEs in eggs, milk, steak and fish. He also found them in soy infant formula, albeit at a minuscule 16 parts-per-trillion <cm-cq> concentration.

In Emeryville, Richard Wenning is doing the same thing with chickens, finding no difference in PBDE levels between free-range organic hens and factory-farmed roasters.

The compounds are spread far and wide, in air and dust. They're taken up by plants, eaten by animals. We eat the animals and spread our sewage sludge back on the fields.

In this respect, organically grown food is no different from conventional, said Wenning, a principle at Environ International Corp., an environmental consulting firm advising industry and regulators. "It's all recycled ... Until we can actually break the molecules apart, they're going to come around again."

As Michele and Jeremiah look around their house and wonder, industry — and to a certain extent regulators — see red herrings.

It would make little sense to toss the family's hand-me-down polystyrene carpet or their recently purchased foam-and-coil mattress and replace them with all-natural products, even if they could afford it. Nobody understands how PBDEs migrate from your living room couch. Or if they even do.

Come summer, mother and daughter will still polish their toenails together, as they always have. With phthalates everywhere, would doing otherwise make any difference?

;

Not if the Tribune's lab results are any indication. Michele uses no cosmetics beyond nail polish, yet her level of mono-butyl phthalate — the body's byproduct of a compound common in beauty products — sits above average for American women, based on CDC data.

The CDC cannot say whether that's good or bad for her health.

That, industry says, is the problem with trace analysis. We can see in the parts-per-trillion range, but we have little idea what it means. While consumers may be alarmed, industry looks at the numbers and sees the need for further study.

"The science doesn't say (exposure) is going to grow to any level where we see concern anytime soon," said Ron Zumstein, vice president for health, safety and environment at Albemarle, the decaBDE manufacturer.

"That's kind of how we look at it. You've got a huge margin of safety."

Others note we didn't see epidemics 30 years ago, when DDT and PCB use were at their height. Teflon has been applied to pots since 1962, with no apparent problems from the compound or its precursors.

Zumstein and a crew of Albemarle scientists analyzed the Hammond Holland's PBDE results at the Tribune's request. They were skeptical.

The samples could have been contaminated, they said. There's no easy explanation for why the children would be so much higher than their parents, and the results don't seem to match what little we know about PBDEs.

The EPA is assessing exposure risks and is expected to announce soon what it sees as the gaps in the research. Zumstein and his team say they're waiting for that before taking the next step.

"The (family's) results are outside the range of what we've seen," Zumstein said. "We don't want to jump to conclusions if the science has not been scrutinized yet."

That's exactly what industry has been saying for years, contend critics seeking to reform U.S. chemical oversight.

We don't know what these chemicals do in our body. The science is still being scrutinized. Yet we still put these compounds in our products, expose them to our children, eat them daily for dinner.

IN A COUNTRY OF 300 MILLION, we know the levels of fire retardant in fewer than 200 individuals. Meanwhile annual worldwide demand for PBDEs, according to industry groups, was almost 150 million pounds in 1999, up 67 percent from 1990. Half of that ends up in the U.S. market.

We have a legacy of reacting after the fact — lead, asbestos, mercury, ozone depletion.

Studies, notoriously difficult to construct, remain scarce. The federal government hasn't made funding such science a priority, declining, for example, to underwrite any studies of toxins in breast milk, Schecter said.

Would we curb our appetite — take more of a precautionary approach — if we all knew, like the Hammond Hollands, what lurks in our bodies?

"I'm not happy with a few data points. We cannot draw final conclusions from a family of four," said Bergman, the Swedish PBDE researcher. But "this is an indication of a very serious problem that society has to address."

To read more of **A Body's Burden**, visit www.insidebayarea.com/bodyburden/.