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## Puberty Before Age 10: A New ‘Normal’?

By ELIZABETH WEIL

One day last year when her daughter, Ainsley, was 9, Tracee Sioux pulled her out of her elementary school in Fort Collins, Colo., and drove her an hour south, to Longmont, in hopes of finding a satisfying reason that Ainsley began growing pubic hair at age 6. Ainsley was the tallest child in her third-grade class. She had a thick, enviable blond-streaked ponytail and big feet, like a puppy's. The curves of her Levi's matched her mother's.

"How was your day?" Tracee asked Ainsley as she climbed in the car.

"Pretty good."

"What did you do at a recess?"

"I played on the slide with my friends."

In the back seat, Ainsley wiggled out of her pink parka and looked in her backpack for her Harry Potter book. Over the past three years, Tracee — pretty and well-put-together, wearing a burnt orange blouse that matched her necklace and her bag — had taken Ainsley to see several doctors. They ordered blood tests and bone-age X-rays and turned up nothing unusual. "The doctors always come back with these blank looks on their faces, and then they start redefining what normal is," Tracee said as we drove down Interstate 25, a ribbon of asphalt that runs close to where the Great Plains bump up against the Rockies. "And I always just sit there thinking, What are you talking about, normal? Who gets pubic hair in first grade?"

Fed up with mainstream physicians, Tracee began pursuing less conventional options. She tried giving Ainsley diindolylmethane, or DIM, a supplement that may or may not help a body balance its hormones. She also started a blog, the [Girl Revolution](#), with a mission to "revolutionize the way we think about, treat and raise girls," and the accompanying T.G.R. Body line of sunscreens and lotions marketed to tweens and described by Tracee as "natural, organic, craptastic-free products" containing "no estrogens, phytoestrogens, endocrine disrupters."

None of this stopped Ainsley's body from maturing ahead of its time. That afternoon, Tracee and Ainsley visited the office of Jared Allomong, an applied kinesiologist. Applied kinesiology is a "healing art" sort of like chiropractic. Practitioners test muscle strength in order to diagnose

health problems; it's a refuge for those skeptical and weary of mainstream medicine.

"So, what brings you here today?" Allomong asked mother and daughter. Tracee stroked Ainsley's arm and said, wistfully, "Precocious puberty."

Allomong nodded. "What are the symptoms?"

"Pubic hair, armpit hair, a few pimples around the nose. Some budding." Tracee gestured with her hands, implying breasts. "The emotional stuff is getting worse, too. Ainsley's been getting super upset about little things, crying, and she doesn't know why. I think she's cycling with me."

Ainsley closed her eyes, as if to shut out the embarrassment. The ongoing quest to understand why her young body was turning into a woman's was not one of Ainsley's favorite pastimes. She preferred torturing her 6-year-old brother and playing school with the neighborhood kids. (Ainsley was always the teacher, and she was very strict.)

"Have you seen Western doctors for this?" Allomong asked.

Tracee laughed. "Yes, many," she said. "None suggested any course of action. They left us hanging." She repeated for Allomong what she told me in the car: "They seem to have changed the definition of 'normal.'"

For many parents of early-developing girls, "normal" is a crazy-making word, especially when uttered by a doctor; it implies that the patient, or patient's mother, should quit being neurotic and accept that not much can be done. Allomong listened intently. He nodded and took notes, asking Tracee detailed questions about her birth-control history and validating her worst fears by mentioning the "extremely high levels" of estrogen-mimicking chemicals in the food and water supply. After about 20 minutes he asked Ainsley to lie on a table. There he performed a lengthy physical exam that involved testing the strength in Ainsley's arms and legs while she held small glass vials filled with compounds like cortisol, estrogen and sugar. (Kinesiologists believe that weak muscles indicate illness, and that a patient's muscles will test as weaker when he or she is holding a substance that contributes to health problems.)

Finally, he asked Ainsley to sit up. "It doesn't test like it's her own estrogens," Allomong reported to Tracee, meaning he didn't think Ainsley's ovaries were producing too many hormones on their own. "I think it's xeno-estrogens, from the environment," he explained. "And I think it's stress and insulin and sugar."

"You can't be more specific?" Tracee asked, pleading. "Like tell me what crap in my house I can get rid of?" Allomong shook his head.

On the ride back to Fort Collins, Tracee tried to cheer herself up thinking about the teenage

suffering that Ainsley would avoid. “You know, I was one of those flat-chested girls at age 14, reading, ‘Are You There God? It’s Me, Margaret,’ just praying to get my period. Ainsley won’t have to go through that! When she gets her period, we’re going to have a big old party. And then I’m going to go in the bathroom and cry.”

**In the late 1980s**, Marcia Herman-Giddens, then a physician’s associate in the pediatric department of the Duke University Medical Center, started noticing that an awful lot of 8- and 9-year-olds in her clinic had sprouted pubic hair and breasts. The medical wisdom, at that time, based on a landmark 1960 study of institutionalized British children, was that puberty began, on average, for girls at age 11. But that was not what Herman-Giddens was seeing. So she started collecting data, eventually leading a study with the American Academy of Pediatrics that sampled 17,000 girls, finding that among white girls, the average age of breast budding was 9.96. Among black girls, it was 8.87.

When Herman-Giddens published these numbers, in 1997 in *Pediatrics*, she set off a social and endocrinological firestorm. “I had no idea it would be so huge,” Herman-Giddens told me recently. “The Lolita syndrome” — the prurient fascination with the sexuality of young girls — “created a lot of emotional interest. As a feminist, I wish it didn’t.” Along with medical professionals, mothers, worried about their daughters, flocked to Herman-Giddens’s slide shows, gasping as she flashed images of possible culprits: obesity, processed foods, plastics.

Meanwhile, doctors wrote letters to journals criticizing the sample in Herman-Giddens’s study. (She collected data from girls at physicians’ offices, leaving her open to the accusation that it wasn’t random.) Was the age of puberty really dropping? Parents said yes. Leading pediatric endocrinologists said no. The stalemate lasted a dozen years. Then in August 2010, the conflict seemed to resolve. Well-respected researchers at three big institutions — Cincinnati Children’s Hospital, Kaiser Permanente of Northern California and Mount Sinai School of Medicine in New York — published another study in *Pediatrics*, finding that by age 7, 10 percent of white girls, 23 percent of black girls, 15 percent of Hispanic girls and 2 percent of Asian girls had started developing breasts.

Now most researchers seem to agree on one thing: Breast budding in girls is starting earlier. The debate has shifted to what this means. Puberty, in girls, involves three events: the growth of breasts, the growth of pubic hair and a first period. Typically the changes unfold in that order, and the process takes about two years. But the data show a confounding pattern. While studies have shown that the average age of breast budding has fallen significantly since the 1970s, the average age of first period, or menarche, has remained fairly constant, dropping to only 12.5 from 12.8 years. Why would puberty be starting earlier yet ending more or less at the same time?

**To endocrinologists**, girls who go through puberty early fall into two camps: girls with diagnosable disorders like central precocious puberty, and girls who simply develop on the early side of the normal curve. But the line between the groups is blurring. “There used to be a discrete gap between normal and abnormal, and there isn’t anymore,” Louise Greenspan, a pediatric endocrinologist and co-author of the August 2010 Pediatrics paper, told me one morning in her office at Kaiser Permanente in San Francisco. Among the few tools available to help distinguish between so-called “normal” and “precocious” puberty are bone-age X-rays. To illustrate how they work, Greenspan pulled out a beautiful old book, Greulich and Pyle’s “Radiographic Atlas of Skeletal Development of the Hand and Wrist,” a standard text for pediatric endocrinologists. Each page showed an X-ray of a hand illustrating “bone age.” The smallest hand was from a newborn baby, the oldest from an adult female. “When a baby is born, there’s all this cartilage,” Greenspan said, pointing to large black gaps surrounding an array of delicate white bones. As the body grows, the pattern of black and white changes. The white bones lengthen, and the black interstices between them, some of which is cartilage, shrink. This process stops at the end of puberty, when the growth plates fuse.

One main risk for girls with true precocious puberty is advanced bone age. Puberty includes a final growth spurt, after which girls mostly stop growing. If that growth spurt starts too early in life, it ends at an early age too, meaning a child will have fewer growing years total. A girl who has her first period at age 10 will stop growing younger and end up shorter than a genetically identical girl who gets her first period at age 13.

That morning one of Greenspan’s patients was a 6½-year-old girl with a bone age of 9. She was the tallest girl in her class at school. She started growing pubic hair at age 4. No one thought her growth curve was normal, not even her doctors. (Eight used to be the age cutoff for normal pubic-hair growth in girls; now it’s as early as 7.) For this girl, Greenspan prescribed a once-a-month shot of the hormone Leuprolide, to halt puberty’s progress. The girl hated the shot. Yet nobody second-guessed the treatment plan. The mismatch between her sexual maturation and her age — and the discomfort that created, for everybody — was just too great.

By contrast, Ainsley was older, and her puberty was progressing more slowly, meaning she wasn’t at much of an increased risk for short stature or breast cancer. (Early periods are associated with breast cancer, though researchers don’t know if the risk stems from greater lifetime exposure to estrogen or a higher lifetime number of menstrual cycles, or perhaps something else, like the age at which a girl has her growth spurt.) In cases of girls Ainsley’s age, Greenspan has been asked by parents to prescribe Leuprolide. But Greenspan says this is a bad idea, because Leuprolide’s possible side effects — including an increased risk of osteoporosis — outweigh the benefits for girls that age. “If you have a normal girl, a girl who’s 8 or 9, there’s a big ethical issue of giving them medicine. Giving them medicine says, ‘Something is wrong with

your body,' as opposed to, 'This is your body, and let's all find a way to accept it.' ”

“I would have a long conversation with her family, show them all the data,” Greenspan continues. Once she has gone through what she calls “the process of normalizing” — a process intended to replace anxiety with statistics — she has rarely had a family continue to insist on puberty-arresting drugs. Indeed, most parents learn to cope with the changes and help their daughters adjust too. One mother described for me buying a drawer full of football shirts, at her third-grade daughter’s request, to hide her maturing body. Another reminded her daughter that it’s O.K. to act her age. “It’s like when you have a really big toddler and people expect the kid to talk in full sentences. People look at my daughter and say, ‘Look at those cheekbones!’ We have to remind her: ‘You may look 12, but you’re 9. It’s O.K. to lose your cool and stomp your feet.’ ”

“We still have a lot to learn about how early puberty affects girls psychologically,” says Paul Kaplowitz, chief of endocrinology at Children’s National Medical Center. “We do know that some girls who start maturing by age 8 progress rapidly and have their first period before age 10, and many parents prefer that we use medications to slow things down. However, many girls do fine if they are simply monitored and their parents are reassured that they will get through it without major problems.”

In some ways early puberty is most straightforward for families like those of the kindergartner on Leuprolide. She has a diagnosis, a treatment plan. In Greenspan’s office, I asked the girl’s father at what age he might choose to take his child off the drugs and let her puberty proceed. He laughed. Then he spoke for most parents when he said, “Would it be bad to say 22?”

**So why are** so many girls with no medical disorder growing breasts early? Doctors don’t know exactly why, but they have identified several contributing factors.

Girls who are overweight are more likely to enter puberty early than thinner girls, and the ties between obesity and puberty start at a very young age. As Emily Walvoord of the Indiana University School of Medicine points out in her paper “The Timing of Puberty: Is It Changing? Does It Matter?” body-mass index and pubertal timing are associated at age 5, age 3, even age 9 months. This fact has shifted pediatric endocrinologists away from what used to be known as the critical-weight theory of puberty — the idea that once a girl’s body reaches a certain mass, puberty inevitably starts — to a critical-fat theory of puberty. Researchers now believe that fat tissue, not poundage, sets off a feedback loop that can cause a body to mature. As Robert Lustig, a professor of clinical pediatrics at the University of California, San Francisco’s Benioff Children’s Hospital, explains, fatter girls have higher levels of the hormone leptin, which can lead to early puberty, which leads to higher estrogen levels, which leads to greater insulin resistance, causing girls to have yet more fat tissue, more leptin and more estrogen, the cycle feeding on itself, until their bodies physically mature.

In addition, animal studies show that the exposure to some environmental chemicals can cause bodies to mature early. Of particular concern are endocrine-disrupters, like “xeno-estrogens” or estrogen mimics. These compounds behave like steroid hormones and can alter puberty timing. For obvious ethical reasons, scientists cannot perform controlled studies proving the direct impact of these chemicals on children, so researchers instead look for so-called “natural experiments,” one of which occurred in 1973 in Michigan, when cattle were accidentally fed grain contaminated with an estrogen-mimicking chemical, the flame retardant PBB. The daughters born to the pregnant women who ate the PBB-laced meat and drank the PBB-laced milk started menstruating significantly earlier than their peers.

One concern, among parents and researchers, is the effect of simultaneous exposures to many estrogen-mimics, including the compound BPA, which is ubiquitous. Ninety-three percent of Americans have traces of BPA in their bodies. BPA was first made in 1891 and used as a synthetic estrogen in the 1930s. In the 1950s commercial manufacturers started putting BPA in hard plastics. Since then BPA has been found in many common products, including dental sealants and cash-register receipts. More than a million pounds of the substance are released into the environment each year.

Family stress can disrupt puberty timing as well. Girls who from an early age grow up in homes without their biological fathers are twice as likely to go into puberty younger as girls who grow up with both parents. Some studies show that the presence of a stepfather in the house also correlates with early puberty. Evidence links maternal depression with developing early. Children adopted from poorer countries who have experienced significant early-childhood stress are also at greater risk for early puberty once they’re ensconced in Western families.

Bruce Ellis, a professor of Family Studies and Human Development at the University of Arizona, discovered along with his colleagues a pattern of early puberty in girls whose parents divorced when those girls were between 3 and 8 years old and whose fathers were considered socially deviant (meaning they abused drugs or alcohol, were violent, attempted suicide or did prison time). In another study, published in 2011, Ellis and his colleagues showed that first graders who are most reactive to stress — kids whose pulse, respiratory rate and cortisol levels fluctuate most in response to environmental challenges — entered puberty earliest when raised in difficult homes. Evolutionary psychology offers a theory: A stressful childhood inclines a body toward early reproduction; if life is hard, best to mature young. But such theories are tough to prove.

Social problems don’t just increase the risk for early puberty; early puberty increases the risk for social problems as well. We know that girls who develop ahead of their peers tend to have lower self-esteem, more depression and more eating disorders. They start drinking and lose their virginity sooner. They have more sexual partners and more sexually transmitted diseases.

“You can almost predict it” — that early maturing teenagers will take part in more high-risk behaviors, says Tonya Chaffee, associate clinical professor of pediatrics at University of California, San Francisco, who oversees the Teen and Young Adult Health Center at San Francisco General Hospital. Half of the patients in her clinic are or have been in the foster system. She sees in the outlines of their early-developing bodies the stresses of their lives — single parent or no parent, little or no money, too much exposure to violence.

Some of this may stem from the same social stresses that contribute to early puberty in the first place, and some of it may stem from other factors, including the common nightmare of adolescence: being different. As Julia Graber, associate chairwoman of psychology at the University of Florida, has shown, all “off-time” developers — early as well as late — have more depression during puberty than typically-developing girls. But for the late bloomers, the negative effect wears off once puberty ends. For early bloomers, the effect persists, causing higher levels of depression and anxiety through at least age 30, perhaps all through life. “Some early-maturing girls have very serious problems,” Graber told me. “More than I expected when I started looking for clinical significance. I was surprised that it was so severe.”

Researchers know there’s a relationship between pubertal timing and depression, but they don’t know exactly how that relationship works. One theory is that going through puberty early, relative to other kinds of cognitive development, causes changes in the brain that make it more susceptible to depression. As Elizabeth Sowell, director of the Developmental Cognitive Neuroimaging Laboratory at Children’s Hospital Los Angeles, points out, girls in general tend to go through puberty earlier than boys, and starting around puberty, girls, as a group, also experience more anxiety and depression than boys do. Graber offers a broader hypothesis, perhaps the best understanding of the puberty-depression connection we have for now. “It may be that early maturers do not have as much time as other girls to accomplish the developmental tasks of childhood. They face new challenges while everybody else is still dealing with the usual development of childhood. This might be causing them to make less successful transitions into adolescence and beyond.”

**Over the past year**, I talked to mothers who tried to forestall their daughters’ puberty in many different ways. Some trained with them for 5K runs (exercise is one of the few interventions known to help prevent early puberty); others trimmed milk and meat containing hormones from their daughters’ diets; some purged from their homes plastics, pesticides and soy. Yet sooner rather than later, most threw up their hands. “I’m empathetic with parents in despair and wanting a sense of agency,” says Sandra Steingraber, an ecologist and the author of “Raising Elijah: Protecting Our Children in an Age of Environmental Crisis.” “But this idea that we, as parents, should be scrutinizing labels and vetting birthday party goody bags — the idea that all of us in our homes should be acting as our own Environmental Protection Agencies and

Departments of Interior — is just nuts. Even if we could read every label and scrutinize every product, our kids are in schools and running in and out of other people's homes where there are brominated flame retardants on the furniture and pesticides used in the backyard.”

Adding to the anxiety is the fact that we know so little about how early puberty works. A few researchers, including Robert Lustig, of Benioff Children's Hospital, are beginning to wonder if many of those girls with early breast growth are in puberty at all. Lustig is a man prone to big, inflammatory ideas. (He believes that sugar is a poison, as he has argued in this magazine.) To make the case that some girls with early breast growth may not be in puberty, he starts with basic science. True puberty starts in the brain, he explains, with the production of gonadotropin-releasing hormone, or GnRH. “There is no puberty without GnRH,” Lustig told me. GnRH is like the ball that rolls down the ramp that knocks over the book that flips the stereo switch. Specifically, GnRH trips the pituitary, which signals the ovaries. The ovaries then produce estrogen, and the estrogen causes the breasts to grow. But as Lustig points out, the estrogen that is causing that growth in young girls may have a different origin. It may come from the girls' fat tissue (postmenopausal women produce estrogen in their fat tissue) or from an environmental source. “And if that estrogen didn't start with GnRH, it's not puberty, end of story,” Lustig says. “Breast development doesn't automatically mean early puberty. It might, but it doesn't have to.” Don't even get him started on the relationship between pubic-hair growth and puberty. “Any paper linking pubic hair with early puberty is garbage. Gar-bage. Pubic hair just means androgens, or male hormones. The first sign of puberty in girls is estrogen. Androgen is not even on the menu.”

Frank Biro, lead author of the August 2010 Pediatrics paper and director of adolescent medicine at Cincinnati Children's Hospital, began having similar suspicions last spring after he flew to Denmark to give a lecture. Following his talk, Biro looked over the published data on puberty of his colleague Anders Juul. In Juul's study, some of the girls with early breast development had unexpectedly low levels of estradiol, the predominant form of estrogen in women's bodies from the onset of puberty through menopause. Biro had seen a pattern like this in his data, suggesting to him that the early breast growth might be coming from nonovarian estrogens. That is to say, the headwaters for the pubertal changes might not be in the girls' brains. He is now running models on his own data to see if he can determine where the nonovarian estrogens are coming from.

The possibility that these early “normal” girls are reacting to estrogens that are not coming from their ovaries is compelling. Part of the comfort is that a girl who is not yet in puberty may not have developed an adolescent brain. This means she would not yet feel the acute tug of her own sexual urges. She would not seek thrills and risk. Still, the idea that there are enough toxins or fat cells in a child's body to cause breast development is hardly consoling. Besides, some of

the psychosocial problems of early puberty derive from what's happening inside a girl's body; others, from how people react to her. "If a girl is 10 and she looks 15, it doesn't make any difference if her pituitary is turned on or if something else caused her breast growth," Biro says. "She looks like a middle adolescent. People are going to treat her that way. Maybe she's not interested in reciprocal sex, but she might be pressured into sex nonetheless, and her social skills will be those of a 10-year-old."

So what are families of early bloomers to do? Doctors urge parents to focus on their daughters' emotional and physical health rather than on stopping or slowing development. In this way, the concept of a new normal is not just a brushoff but an encouragement to support a girl who is vulnerable.

"I know they can't change the fact that their daughter started developing early, but they can change what happens downstream," Louise Greenspan, the pediatric endocrinologist at Kaiser Permanente, told me. Parents can keep their daughters active and at healthy body weights. They can treat them the age they are, not the age they look. They can defend against a culture that sells push-up bikinis for 7-year-olds and otherwise sexualizes young girls. "Most of the psychological issues associated with early puberty are related to risk-taking behaviors," Greenspan continued, and parents can mitigate those. "I know it sounds corny and old-fashioned, but if you're in a supportive family environment, where you are eating family meals and reading books together, you actually do have control." Early breast growth may be just that — early breast growth: disconcerting, poorly understood, but not a guarantee of our worst fears. "You don't go directly from the first signs of early puberty to anorexia, depression, drinking and early sexual debut."

**In Fort Collins**, Tracee, Ainsley's mother, tried to stay focused on the positive. At one point during my visit, she disappeared into her basement, the headquarters for her company, T.G.R. Body, and returned with a pink hat box filled with chemical-free samples of Peppermint Pimple Popper and Bad Hair Day Miracle Powder. "I just want to be part of the solution," Tracee said, rubbing a sample of silver hair-streaking gel on my wrist. "I'm so tired of running away. I need to have something Ainsley is moving toward."

Mothers who have been through it urge candor. "Be honest with her, and by honest I mean brutally honest" — about what's going to happen to her body — "while still being kind," says the mother of a girl who recently turned 10 but who first showed signs of developing what she calls "a shape" at age 3. "You don't want your daughter experiencing something for which she's unprepared."

Patience and perspective may be the greatest palliatives. "The thing with puberty is that everybody is going to go through it at some point," another mother told me. Three years ago

this woman was installing small trash cans in her third-grade girl's school bathroom stalls so that her daughter could discreetly throw away menstrual pads. But now that daughter is 12, in the sixth grade; her body seems less strange. "I feel so much better, and so does she. By another two or three years down the road, all the other girls will have caught up."

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Puberty Before Age 10: A New "Normal"? - The New York Times 2012 Bone age: using the amount of cartilage in the body to see the progression of development through puberty Xeno-estrogens: estrogen mimics; can alter the timing of puberty (ex: BPA). The Medicalization of Women's Moods: Premenstrual Syndrome and Premenstrual Dysphoric Disorder - Chrisler & Gorman 2015 PMS: cyclic recurrence of certain changes in behavior, mood, and body beginning in the week leading to menstruation Premenstrual dysphoric disorder (PMDD): depressive disorder requiring 5 or more symptoms that disappear with I started puberty at only age 8, and was always tall for my age as a child, but stopped growing at only 12 and I'm 5'3" (Most of the women in my family are 5'5"+). I've read that when you hit puberty earlier your bones fuse early, and you don't reach full growth potential. Anyone else start out as tall for their age, but ended up short in adolescence/adulthood? Update: Lol, I also love being short! But when I was growing up everyone was always saying "Irene you're going to be like 6 feet tall when you get older"- That didn't happen. haha.