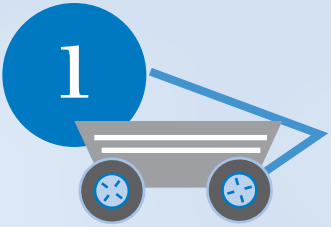
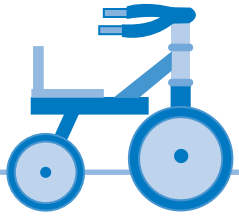


The Boy Inside You



Amber, a labor and delivery nurse, lay in the ultrasound suite, gazing at the monitor as her baby danced across the screen. Pregnant with her second child at thirty-eight, her records included the phrase "advanced maternal age." Thus, unlike her pregnancy four years earlier, she elected to have this amniocentesis to check for chromosomal abnormalities.

The sonographer moved the machine's wand over Amber's abdomen, looking at her baby's brain, heart, and other internal body parts.

Amber was gazing at the machine's monitor when an unmistakable image floated by. "Do you want to know what sex the baby is?" the sonographer asked.

"I think I already do!" Amber replied.

Together, the two women watched in amusement. Amber's baby lay, legs open, an undisputable appendage lying between them. Every time the sonographer moved her wand, the baby moved too, making sure his legs were spread open, giving the women yet another good view.

"He was determined to make sure we knew he was a BOY," Amber laughed two years later. "I think he was giving me fair warning for all those times he was going to laugh at me as he ran naked through the house tugging on his penis!"

Perhaps, like Amber, you have had an amnio and received the word you were having a healthy boy. Then again, you might already have had two girls and were secretly hoping for a boy this third time

● BABY BOY BRAIN FACT ●

Why Does a Doctor Suggest an Amniocentesis?

- You're thirty-five or older and the risk of Down syndrome and other, rarer, chromosomal abnormalities, increases with age. Down syndrome is the result of a baby having an extra chromosome.
- You had a blood test called a triple or quadruple screen at week sixteen of your pregnancy and the results were abnormal. With an abnormal result you are at increased risk for delivering a child with Down syndrome, a spinal defect (spina bifida), or a severe brain abnormality. REMEMBER! It is quite common to have a false positive result. Usually it comes from you or your doctor miscalculating your due date. An amnio and an ultrasound will give you a more accurate result.
- You had an ultrasound, and something abnormal was detected.
- You have a history of a chromosomal abnormality in your family.
- You have already delivered a child with a chromosomal abnormality.

around when you got a good peek at your sixteen-week ultrasound. You know it's a boy in there. You might have decided to wait until your baby was born to find out if you were carrying a boy or a girl. You responded to the curiosity of well-meaning coworkers "Do you want a boy or a girl?" with the response, "Either, as long as it's healthy."

Perhaps you're already holding that baby boy in your arms as you turn the pages of this chapter, trying to remember what it felt like to have your sleeping boy stretch or hiccup inside of you. Some couples might wonder if it's possible to choose the sex of their baby. They ask if there are any methods that increase the chances of having a boy. Science has come back with a resounding "NO!"

• BABY BOY BRAIN FACT •

Guaranteeing a Boy: Should We Make Love Standing Up?

Depending on the myth, you should

- Eat more salty foods, red meat, fish, eggs, chicken, pickles, olives, peas, corn, figs, apricots, raisins, prunes, beans, avocado, zucchini, mushrooms, and lots of beans of all kinds
- Eat less milk and dairy
- Have your (male) partner drink a strong cup of coffee one-half hour before retiring to the bedroom
- Make love standing up, at night, on the day of ovulation, or on odd days of the month
- Make sure the woman has her orgasm first
- Put your legs up in the air for an hour after making love
- Douche before making love

Remember:

- All of these suggestions are myths, not based in reality.
- None of these suggestions has held up to scientific scrutiny.
- But most statistics are on your side. Fifty-one boys are born for every fifty girls.

However you made your boy, you're about to find out about how genes, DNA, and chromosomes worked together to create him, how the powerful male hormone testosterone furthers his development, and what scientists are learning about what makes your baby boy so different from your best friend's daughter, starting from the moment of conception.

If you're curious to know why your friends and family are telling you that boys are so different from girls, read on!

Gene Talk

1. What is DNA? The body is made up of different kinds of cells: liver cells, skin cells, and blood cells to name a few. DNA is every cell's set of instructions or blueprint. It tells the cell whether it's going to help your little boy hear or help his heart beat.

2. What are genes, anyway? Genes are made up of the DNA. They are the instruction manual for your boy's body. They tell his body how to develop and function. Genes determine whether your boy will grow tall and slender like Aunt Debbie or short and squat like Uncle Harry. Your son's genes determine whether he'll have a cholesterol problem and a tendency toward heart disease. Your son has an estimated twenty-five thousand genes.

3. What's a chromosome and where can you find one? In the center of most of your body's cells, you'll find the nucleus, or the cell's command center. Within that nucleus are the chromosomes, the gene holders of your body. Chromosomes come in pairs, like shoes. We each have twenty-three pairs. When you and your partner created your son, you each gave him half of the set of twenty-three chromosomes.

4. What makes my boy a boy? Blame it on the chromosomes, specifically two called X and Y, and they couldn't be more different. Mom's egg always passes on an X chromosome and Dad's sperm can pass on either an X or Y chromosome. In your case, it was a Y! Human boys are XY.

• BABY BOY BRAIN FACT •

A Lot of Neural Mileage

Your son's forty-six chromosomes contain so much information that if you wrote it all down, the data would fill a stack of books two hundred feet high! If you pulled the entire twisted DNA from a single cell and stretched it out, it would be as long as a car. If you stretched out all the DNA in a human body, it would stretch to the sun and back six hundred times!

Although Mom's X chromosome is long and lean, containing up to fourteen hundred genes, Dad's stubby Y chromosome contains only about four hundred. It is the smallest chromosome in your boy's body. Unlike all the other chromosomes, it has no mate. Although the Y chromosome is kind of puny compared to the X chromosome, it has a very important gene called SRY. Think of it as the sex spot on the Y chromosome. Some researchers call this the testes-determining region, which gives you a hint of how important it is to the developing male embryo. It is also known as a *master gene,* because the work it does motivates other genes on other chromosomes to get involved in making your boy's boy parts.

Together, these genes direct the formation of a boy. Now his journey begins.

From Embryo to Baby Boy

Your boy's journey to being a male took place in three stages, starting with the development of his testicles. Next came his internal organs and finally the rest of his external genitals made their appearance.

Step 1: Formation of his testicles. About week eight of your pregnancy, the SRY gene kicked in and directed the formation of your son's testicles, which began to produce testosterone. By this time your boy, only a tiny embryo, was bathed in the male hormone. This was the first of three "hits" of testosterone. The first one lasts until the twenty-fourth week of your pregnancy.

Step 2: Formation of his internal male organs. Now testosterone takes over as director of the show. A pair of scene-stealing cords appear in your son's abdomen, called the Wolffian ducts. They turned into your son's internal genital structures. There was another set of cords, the Mullerian ducts, also auditioning for the role, and had they gotten the part, they would have become female internal anatomy. But no, a product of the Y chromosome performed a disappearing act on the Mullerian ducts, so that the boy structures took center stage.

Step 3: His external boy parts. Up until nine to ten weeks' gestation, the external genital area was rather nondescript. There was nothing to let you know that this was a boy or a girl. But testosterone steps up again and produces DHT, which begins to run the show. Up until this point, there was nothing more than a bump between your son's legs. Thanks to DHT, this bump became his penis and the area below this bump formed an empty scrotum. Eventually, the testicles, which are at this point up inside the abdomen, will assume their rightful place inside your son's scrotum.

Testosterone Hits, Hits, and Hits Again

Boys experience three series of "hits" of testosterone during their lives.

The first series, as we just described, came when the testicles began pouring out the testosterone that led to the formation of your baby's boy parts. The second occurs shortly after birth and the third hit occurs with puberty.

That first series of testosterone hits directed the development of the structures that will later be necessary for reproduction. We know less about the effects of the second series of hits. We think they help in getting the structures ready for your boy to make babies of his own. Right now this must seem like eons from now!

The final series of hits at puberty will set the processes in motion that will change your boy into an adult male. When puberty hits, you will hardly recognize your boy as he sprouts up, bulks out, and his voice lowers an octave or two. The androgens (testosterone and its buddies) are working on his muscles and bones, spurring on their growth. Although it's hard to imagine now, your boy child will begin to grow pubic, underarm, facial, and body hair, all directed by the same testosterone that made this embryo declare his boy status. Testosterone is not only responsible for the physical changes your son will experience, but also unleashes a stream of decidedly male behaviors.

Is Your Boy's Brain Different from His Sister's?

Yes. Absolutely.

Testosterone is responsible for the obvious physical differences we see in boys and girls, men and women. The latest research suggests that the Y chromosome and testosterone and its buddies

have profound effects on the formation of your boy's brain. These changes begin while your son's brain and nervous system are forming *in utero*.

Just as in the genital system, if you could peer in on early brain development, you couldn't tell the difference between a boy and girl brain. We all start out the same. But even before you missed your period, your son's nervous system was beginning on its male journey.

How Does Your Baby Boy's Brain Grow?

You have just taken an early pregnancy test and gotten the news. Already your son's brain had started to form. Your baby was little more than a tiny flat disk floating over a ball of cells. The transformation of this fertilized blob of chemically driven cells into a young man who will solve complex problems, build interesting structures, and read history textbooks is an amazing process.

A tiny groove developed along the length of this disk. The groove deepened and eventually sealed its edges over to form a long tube, the neural tube. By five weeks, the organ that looked like a lumpy inchworm had already embarked on the most spectacular feat of human development: the creation of the deeply creased cerebral cortex, the part of the brain that eventually allows your son to move, think, speak, plan, and create. The brain of your growing boy changes so much over the next thirty-four weeks that researchers are able to tell you how many weeks pregnant you are by looking at your son's brain.

What's Unique About a Baby Boy's Brain?

Your son's brain will perform millions of tasks in a uniquely male way.

Starting at eight weeks, his brain is flooded with multiple hits of male hormones. Traveling via the bloodstream from the testicles to the

brain, testosterone and its relatives modify brain function and shape how the brain processes, stores, and retrieves information. Testosterone actually affects how your boy's brain circuitry is laid down. Through a complicated interplay of genes and sex hormones, your baby's brain will take on the structure and function of a male brain.

His brain will

- Control his body temperature, blood pressure, heart rate, and breathing
- Translate a flood of information about the world around him from his eyes, ears, nose, and taste buds
- Regulate his physical motion when walking, talking, standing, or sitting
- Think, dream, reason, and experience emotions

And this is all done by an organ that is about the size of a small grapefruit!

A Quick Tour of the Baby Boy Brain

The key players in your son's brain are

1. The cerebrum. The biggest part of the brain is the cerebrum, also called the cerebral hemispheres. Most of the brain's weight, 85 percent, is devoted to the cerebrum. The cerebrum is the seat of higher brain functions—thinking, reasoning, speaking, and interpreting the environment. Memories are stored here, and emotions processed. When your son starts to crawl, his cerebrum will tell his arms and legs what to do.

2. Cerebellum. Next in the lineup is the cerebellum, which is at the back of the brain, below the cerebrum. Although a lot smaller than the cerebrum, about one-eighth of its size, the cerebellum is

a very important part of the brain. It controls balance, movement, and coordination (how the muscles work together). Because of the cerebellum, your son will be able to stand upright, keep his balance, walk, run, and jump.

3. Brain stem. Another small but mighty brain part is the brain stem, which sits beneath the cerebrum, in front of the cerebellum. The brain stem connects the brain to the spinal cord and is in charge of all the basic functions your boy's body needs to stay alive—breathing air, digesting food, and circulating blood.

4. Pituitary gland. The pea-sized, powerful pituitary gland is in charge of making your boy grow large by producing and releasing growth hormones into his body.

5. Hypothalamus. Last, but certainly not least, is the hypothalamus, the brain's regulator of emotions, body temperature, and food and water intake. At some point your son will tell you to stop putting a coat on him because YOU are cold—and you can thank his hypothalamus for that!

How Does a Tube Turn into a Brain?

The neural tube (the sealed-off set of early cells) starts to imitate a pretzel by swelling, folding, and contorting to form the various parts of the brain. It divides into the forebrain, midbrain, and hindbrain. Your little guy's eyes and nose will develop from the division of the neural tube that became the forebrain. This area also develops into the cerebrum and the hypothalamus. The midbrain is destined to become the brainstem. The hindbrain will become the cerebellum. You son's brain is growing rapidly at this point. If you were able to look in on him now, you would be struck by how odd he looks. He's almost all head!

Inside the tube, the cells divide rapidly and cause the tube to thicken. Some of these cells become neurons or nerve cells. Neurons are initially produced in the central canal of the neural tube. Although they are born there, they don't stay put, as they migrate to their final destination in the brain. These cells collect together to form the different centers of the brain and spinal cord, and they send out axons, long, threadlike extensions that connect with other nerves.

At nine weeks, the embryo's ballooning brain allows your boy to bend his body, hiccup, and react to loud sounds.

By week ten, your boy's brain is producing almost 250,000 new neurons every minute.

By your second trimester the grooves and furrows of your son's brain begin developing. Nature has taken advantage of these peaks and valleys to cram as many neurons as possible into a relatively small space.

By forty weeks, or term, his brain is an engineering masterpiece designed by genes and hormones.

Is Your "Boy Pregnancy" Different from a "Girl Pregnancy"?

Yes, but you're not likely to notice. Here's what researchers have found:

- Boy fetuses are in general more active than girl fetuses.
- Feeling hungry? Women pregnant with boys eat about ten percent more calories that those carrying girls. The good news is that you won't be gaining any more weight with a boy pregnancy! This research explains why those baby boys weigh more. A signal from your male fetus tells you he has higher energy needs than a girl.

• At each week of pregnancy, boys weigh more than girls, so that when they're born, boys weigh on average a half pound more than girls. Their heads are larger, and they're longer than the girls.

● BABY BOY BRAIN FACT ●

The Old Wives Weigh In

Here's some wisdom from a time-honored source—"The Old Wives"—and they say you're carrying a boy if

- Your baby's heart rate is less than 140 beats per minute.
- You're carrying the baby out front.
- You're carrying the baby low.
- The hair on your legs is growing faster.
- Your hands are rough.
- You crave salt.
- Your complexion improves.

We're still learning what makes boy pregnancies different from girl pregnancies. It's an active area of research, so stay tuned!

Will My Boy Be Okay? Ten Simple Things to Do

Now that you're pregnant, you're probably paying closer attention to your diet. Getting the right nutrients is not only important for your little one's health—it can affect his intelligence too. Certain foods positively affect your boy's memory and capacity to learn, and others can hinder proper brain development. These smart moves will help you maximize your future Einstein's learning.

1. First of all, strive to gain the right amount of weight. Obstetricians recommend that women of normal weight gain between twenty-five and thirty-five pounds during their pregnancy. A study from the National Institutes of Health found that women who follow that prescription have children with higher IQs than kids born to moms who gained more or less weight during their pregnancy. This is sort of a domino effect, as your prenatal weight gain affects your baby's birth weight, which, in turn, affects his brain size and IQ. Gaining too much or too little weight during pregnancy can lead to birth complications that can affect your baby. Women who are over- or underweight should check with their OB or midwife to find out their recommended weight gain.

2. Get those vitamins and minerals.

- Without enough **iron**, important areas of your baby's brain won't grow as they should, and this could lead to permanent damage. Red meat, beans, fortified cereals, and spinach are wonderful sources of iron.
- **Folic acid** is critical for the proper development of the neural tube. Eat some leafy green vegetables, such as kale and spinach. Dried beans and orange juice are also good sources. Fortunately, most breads, cereals, and grain products are fortified with extra folic acid.
- There's new evidence linking adequate **calcium** intake to a decreased risk of severe toxemia—a pregnancy complication that can result in preterm delivery and improper fetal growth.
- **Take your prenatal vitamins—even when you can't stomach the food!** It's often hard for a pregnant woman to take in all the nutrients she needs, especially during the first trimester of pregnancy, when the smell or taste

of any food might send her to the toilet bowl rather than the kitchen table.

The prenatal vitamins your doctor or midwife recommends are specially formulated for pregnancy. And before you ditch your vitamins because they make you sick, try taking them with food, or change brands.

Remember, prenatal vitamins are meant to supplement a well-balanced diet. They are not meant to replace the nutrients you need, merely add to them. Prenatal vitamins don't contain all the calcium and iron you need, for example.

3. Make sure you visit your dentist regularly. Women with gum disease are more likely than those with good gum health to deliver their babies prematurely. Some studies suggest that the risk may be up to nine times higher! And being premature is not good for your baby boy's brain. Your natural incubator, your uterus, is better for him than any high-tech machine in the neonatal intensive care unit.

4. Get your thyroid tested. Many women have an underactive thyroid gland that often goes undetected. A simple blood test can let you know whether you need to take a thyroid supplement, which can easily correct the problem. Children born to mothers with untreated thyroid disease during pregnancy score lower on IQ tests than children born to healthy moms.

5. Bump up your choline. The nutrient you never heard of is critical for your son's normal brain development. Studies in animals indicate that choline plays a crucial role in the construction of two major brain centers for learning and memory. A diet low in choline during pregnancy can permanently harm your baby boy's brain chemistry and development. Moms-to-be need 450 milligrams of

the nutrient each day. That's easy if your diet includes eggs, beef, and dairy products. Soybeans are also a good source.

6. Eat fish, an excellent food, but certain fish can have high concentrations of mercury and should be avoided. Don't eat shark, swordfish, or king mackerel. Mercury can affect your son's brain development, and not in a good way. But fish, rich in omega-3 fatty acids, may boost your baby's brainpower.

• BABY BOY BRAIN FACT •

You Really Are What You Eat

So is your little boy. In a study from Harvard Medical School, the more fish women ate during the second trimester, the higher their babies scored on a mental development test at six months of age.

7. Pump up the protein. Proteins are your boy's first set of building blocks. They help him grow from a single fertilized cell to a cuddly bundle. That's an awful lot of work for a little guy, and he needs your help.

8. Stay away from alcohol. Alcohol is not good for developing babies. Alcohol passes directly through the placenta to your baby, and your baby's blood alcohol level will be about the same as yours. So if you're feeling tipsy, so is he. Alcohol can not only lead to brain damage, it can also lower your son's testosterone levels. The most dangerous time seems to be during the mid second trimester, coinciding with the first series of testosterone hits, but no time is definitely safe.

9. Give up the cigarettes while you're at it, and avoid illegal drugs. We know that boys are already at higher risk for a preterm delivery, and babies whose mothers smoke are at even greater risk for being born prematurely. A smoking mother's placenta is smaller and doesn't work as well. Cigarette smoking actually raises testosterone levels in your fetus! Research indicates that the extra exposure to testosterone can result in an abnormally aggressive boy prone to attention-deficit/hyperactivity disorder (ADHD).

10. Get your body moving. It's good for you and may help boost your son's brainpower. There's evidence that at five years of age, children born to mothers who exercised while pregnant performed significantly better on general intelligence and oral language tests. The vibrations or sounds exercise causes *in utero* may have boosted neurological development. Not to mention exercise helps keep your weight gain under control!

• BABY BOY BRAIN FACT •

Mom's Stress

Maternal stress hormones may inhibit a fetus's brain growth by restricting blood flow to the uterus. Another theory is that certain brain chemicals are released in high levels during stressful moments. These chemicals can interfere with the production of brain neurons and synapses. We all have occasional bad days, but if you are continually feeling overwhelmed by responsibilities, depressed, or angry, give yourself permission to get help. It's OK to seek professional assistance for problems you can't resolve with the help of family or friends.

What Else Can I Do for My Baby's Brain?

Various authors and "experts" have suggested hyper-stimulating your baby at regular intervals to assist in his brain development. Suggestions include speaking to him through a paper tube, playing Mozart, reading to him in a foreign language, or shooting flashing lights at the mother's abdomen.

Does such stimulation work? There are numerous testimonials in advertisements supporting these methods. Users swear that their children are smarter, more physically coordinated and socially adept than average. Scientists, however, are skeptical. There is no way to really test how a baby would turn out with and without this stimulation.

No one can say for certain when a fetus is awake, so interfering with jabs to the abdomen may be interfering with his natural sleep patterns. It seems counterintuitive to wake a sleeping newborn baby. Why would you do such a thing *in utero*?

Gently talking to your baby, however, seems to pose little risk and in fact may help you as much as your baby. Thinking about your boy, talking to him, having your spouse talk to him, will all help to prepare you for this new boy who's going to jump into your life and turn it and himself upside down.

• BABY BOY BRAIN FACT •

The Role of Music

Listening to a soothing sonata is a great way to relax during pregnancy, but it won't make your baby any smarter. There is no evidence that playing classical CDs or foreign language tapes will boost your boy's brain power, either before birth or after.

By now we hope you have a pretty good idea how genetics and hormones have combined to shape the baby boy in your womb or in your arms. Next, we'll give you a preview of what to expect of that boy and his brain this coming year and what you and your partner can do to nurture the nature of this baby boy.