PREGNATAL DEVELOPMENT

Pregnancy begins at conception with the union of a man’s sperm and a woman’s egg to form a single-cell embryo.1 This brand new embryo contains the original copy of a new individual’s complete genetic code. Gender,2 eye color, and other traits are determined at conception, also known as fertilization.

Most significant developmental milestones occur long before birth during the first eight weeks following conception when most body parts and all body systems appear and begin to function.3 The main divisions of the body, such as the head, chest, abdomen and pelvis, and arms and legs are established by about four weeks after conception.4 Eight weeks after conception, except for the small size, the developing human’s overall appearance and many internal structures closely resemble the newborn.5

Pregnancy is not just a time for growing all the parts of the body. It is also a time of preparation for survival after birth.6 Many common daily activities seen in children and adults begin in the womb—starting more than 30 weeks before birth. These activities include hiccups, touching the face, breathing motions, urination, right- or left-handedness, thumb sucking, swallowing, yawning, jaw movement, reflexes, REM sleep, hearing, taste, sensation, and so on.

Full-term pregnancy typically lasts 38 weeks from conception or 40 weeks from the first day of a woman’s last normal menstrual period.7

Unless otherwise noted, all prenatal ages on this web page are referenced from the start of the last normal menstrual period. This age is two weeks greater than the age from conception, also referred to as fertilization. (Please note that on the remainder of ehd.org, prenatal ages are referenced from the time of conception.)

The First Two Weeks

Shortly after a woman’s period begins, her body begins preparing for the possibility of pregnancy.

Approximately 2 weeks into her cycle, a woman releases an egg from one of her ovaries into her adjacent fallopian tube. Conception is now possible for the next 24 hours or so8 and signifies the beginning of pregnancy.9

The single-cell embryo has a diameter of approximately 4 thousandths of an inch.10

2 to 4 Weeks

The cells of the embryo repeatedly divide as the embryo moves through the Fallopian tube into the woman’s uterus or womb. Implantation, the process whereby the embryo embeds itself into the wall of the womb, begins by the end of the third week and is completed during the fourth week of pregnancy.11

The 4-week embryo is less than 1/100th of an inch long.
4 to 6 Weeks

By 5 weeks, development of the brain, spinal cord, and heart is well underway. The heart begins beating at 5 weeks and one day and is visible by ultrasound almost immediately.

By 6 weeks, the heart is pumping the embryo’s own blood to his or her brain and body. All four chambers of the heart are present and more than 1 million heartbeats have occurred. The head, as well as the chest and abdominal cavities have formed and the beginnings of the arms and legs are easily seen.

The 6-week embryo measures less than ¼ of an inch long from head to rump.

6 to 8 Weeks

Rapid brain development continues with the appearance of the cerebral hemispheres at 6½ weeks. The embryo reflexively turns away in response to light touch on the face at 7½ weeks. Fingers are beginning to form on the hand.

By 8 weeks the developing human measures about a ⅛ inch from head to rump.

8 to 10 Weeks

Brainwaves have been measured and recorded before 8½ weeks. Also by 8½ weeks, the bones of the jaw and collar bone begin to harden.

By 9 weeks the hands move, the neck turns, and hiccups begin. Girls now have ovaries and boys have testes. The embryo’s heart rate peaks at about 170 beats per minute and will gradually slow down until birth.

Electrical recordings of the heart at 9½ weeks are very similar to the EKG tracing of a newborn. The heart is nearly fully formed.

By 10 weeks kidneys begin to produce and release urine, and intermittent breathing motions begin. All fingers and toes are free and fully formed, and several hundred muscles are present. The hands and feet move frequently and most embryos show the first signs of right- or left-handedness.

Experts estimate the 10-week embryo possesses approximately 90% of the 4,500 body parts found in adults. This means that approximately 4,000 permanent body parts are present just eight weeks after conception.

Incredibly, this highly complex 10-week embryo weighs about 1/10th of an ounce and measures slightly less than 1¼ inches from head to rump.
10 to 12 Weeks

After 10 weeks, the developing human is called a fetus, which means “little one” or “unborn offspring.”

The eyelids are temporarily fused together by 10½ weeks.

By 11 weeks the head moves forward and back, the jaw actively opens and closes, and the fetus periodically sighs and stretches. The face, palms of the hands, and soles of the feet are sensitive to light touch. Thumb sucking and swallowing amniotic fluid begin. Girls’ ovaries now contain reproductive cells which will give rise to eggs later in life. Also in girls, the uterus is now present.

Yawning begins at 11½ weeks.

The number of heartbeats now exceeds 10 million.

Fingerprints start forming at 12 weeks while fingernails and toenails begin to grow.

The bones are hardening in many locations.

The 12-week fetus weighs less than 1 ounce and measures about 3 inches from head to heel.

The Original Fetal Position Crossed Ankles Left Knee and Hip Flexion Hands on Cheeks Hand Near Mouth

12 to 14 Weeks

By 13 weeks the lips and nose are fully formed and the fetus can make complex facial expressions.

By 14 weeks taste buds are present all over the mouth and tongue.

The fetus now produces a wide variety of hormones.

Arms reach final proportion to body size.

The 14-week fetus weighs about 2 ounces and measures slightly less than 5 inches from head to heel.

Joints of the Fingers Sole of the Right Foot Touching Thumbs Fingertips of Right Hand Palmar Surface of Right Hand

14 to 16 Weeks

By 15 weeks the entire fetus (except for parts of the scalp) responds to light touch. Tooth development is underway.

Gender differences emerge at 16 weeks when girl fetuses move their jaws more often than boys.

A pregnant woman may begin to feel fetal movement at this time.

The 16-week fetus weighs about 4 ounces and measures slightly less than 7 inches from head to heel.
16 to 18 Weeks

Production of a variety of digestive enzymes is well underway.61

Around 17 weeks blood cell formation moves to its permanent location inside the bone marrow62 and the fetus begins storing energy in the form of body fat.63

By 18 weeks formation of the breathing passages, called the bronchial tree, is complete.64 The fetus releases stress hormones in response to being poked with a needle.65

The 18-week fetus weighs around 6 ounces and measures about 8 inches from head to heel.

18 to 20 Weeks

By 19 weeks, more than 20 million heartbeats have occurred.

By 20 weeks the larynx or voice box begins moving in a way similar to the movement seen during crying after birth.66 The skin has developed sweat glands67 and is covered by a greasy white substance called “vernix,”68 which provides protection from the amniotic fluid.69

The 20-week fetus weighs about 9 ounces and measures about 10 inches from head to heel.

The Mouth and NoseA SmileSlightly Open Right EyeNo WorriesYawning

20 to 22 Weeks

At 21 weeks breathing patterns, body movements, and heart rate begin to follow daily cycles called circadian rhythms.70

By 22 weeks the sense of hearing begins to function and the fetus starts responding to various sounds.71 The cochlea, the organ of hearing, reaches adult size.72 All skin layers and structures are complete.73

With specialized medical care some fetuses can survive outside the womb by 22 weeks with survival rates reported as high as 40%74 in some medical centers.

The 22-week fetus weighs slightly less than 1 pound and measures about 11 inches from head to heel.

22 to 24 Weeks

Between 20 and 23 weeks rapid eye movements begin. These eye movements are similar to those seen when children and adults have dreams.75

By 24 weeks more than 30 million heartbeats have occurred.
The 24-week fetus weighs about 1¼ pounds and measures about 12 inches from head to heel.

24 to 26 Weeks
By 25 weeks, breathing motions may occur up to 44 times per minute.76
By 26 weeks sudden, loud noises may trigger a blink-startle response,77 which may increase movement, heart rate, and swallowing.78
The lungs produce a substance necessary for breathing after birth.79
The 26-week fetus weighs almost 2 pounds and measures about 14 inches from head to heel.

26 to 28 Weeks
By 27 weeks the thigh bones and the foot bones are each about two inches long (about 5 cm).80
By 28 weeks the sense of smell is functioning81 and eyes produce tears.82
The 28-week fetus weighs more than 2½ pounds and measures about 15 inches from head to heel.

28 to 30 Weeks
By 29 weeks, pupils of the eyes react to light.83
The 30-week fetus weighs about 3¼ pounds and measures about 16 inches from head to heel.

30 to 32 Weeks
By 31 weeks more than 40 million heartbeats have occurred. Wrinkles in the skin are disappearing as more and more fat deposits are formed.84
By 32 weeks breathing movements occur up to 40 percent of the time.85
The 32-week fetus weighs about 4 pounds and measures about 17 inches from head to heel.

32 to 34 Weeks
By 34 weeks true alveoli, or "air pocket" cells, begin developing in the lungs.86
The 34-week fetus weighs about 5 pounds and measures about 18 inches from head to heel.
34 to 36 Weeks

The 36-week fetus weighs about 5¾ pounds and measures about 18½ inches from head to heel.

36 to 38 Weeks

By 37 weeks the fetus has a firm hand grip and the heart has beat more than 50 million times.

The 38-week fetus weighs about 6¾ pounds and measures about 19 inches from head to heel.

38 to 40 Weeks

At term, the umbilical cord is typically 20 to 24 inches long.

Labor is initiated by the fetus, ideally around 40 weeks, leading to childbirth.

At full-term birth, newborn babies typically weigh between 6 and 9 pounds and measure between 18 and 21 inches from head to heel.