

When A Human Being &  
Pregnancy Normally Begin

# A Basic Science Guide

Do you know the basic “facts of life”?

**Science knows!**



## ? DID YOU KNOW?

When a human being begins to exist is not a subjective, political or religious opinion. It is an objective scientific fact that has been globally known and universally accepted by human embryologists for over 100 years.



*“The immediate product of human sexual reproduction (fertilization; the fusion of sperm and oocyte) is a new, living, genetically unique, single-cell human being, human embryo, human organism, human individual, who immediately directs his/her own specifically human functions, activities, and development.”*

**- Dianne N. Irving, M.A., Ph.D.**

# A Note to Educators

---

One of the most extraordinary, objective, empirical scientific facts is that a whole, integrated, individual and living sexually reproduced human being begins to exist as a single-cell human being/human organism, and then continues to grow and develop as the same human being/human organism throughout the various stages of human development.

Where does this new single-cell human being come from?

What does this new single-cell human being have to do with sex and pregnancy?

This science guide is an introduction to the scientifically accurate basics about human sexual reproduction and can be used as a stand-alone resource or integrated into sex education curriculums as an essential foundational module.

Although this may be new information to you, the science behind human sexual reproduction has been long known and documented as scientific fact.

At Contend Projects we believe that these facts are more relevant than ever, especially considering the issues and consequences involved. Many people do not know the basic ‘facts of life’ and are still making BIG decisions based on BIG misconceptions. These decisions can have serious consequences, and we believe that individuals should be empowered to make fully informed choices in their lives.

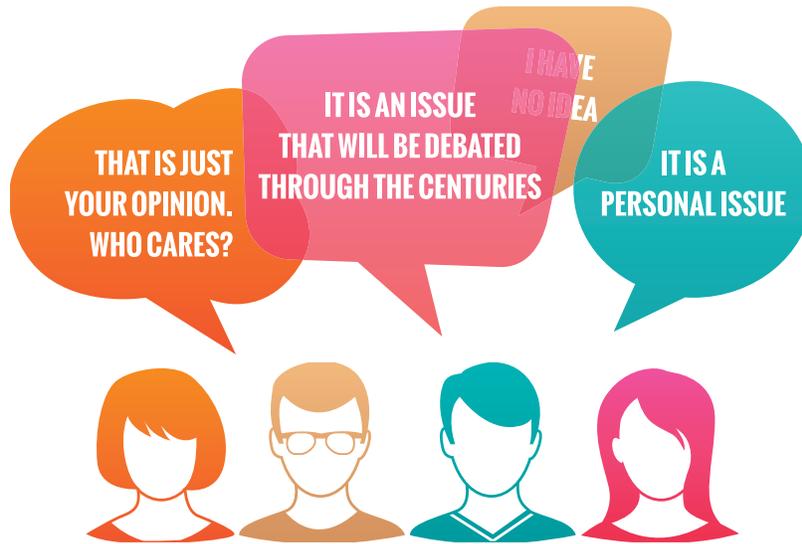
***Contend Projects, a registered 501(c)(3) education organization spreading the basic, accurate scientific facts about when a human life starts and the biological science of human embryology.***

# CONTENTS

---

The Problem (And Why It Matters for All of Us)	<b>5</b>
When Does a Human Being Begin to Exist?	<b>7</b>
Carnegie Stages of Human Embryonic Development	<b>9</b>
Carnegie Stage 1	<b>11</b>
The Continuum of Human Life	<b>14</b>
The Science & The Experts	<b>15</b>
Key Terms (Human Sexual Reproduction)	<b>16</b>
The Never List (False Terms)	<b>18</b>
Quiz: Human Sexual Reproduction Basics	<b>19</b>
References & Additional Resources	<b>21</b>

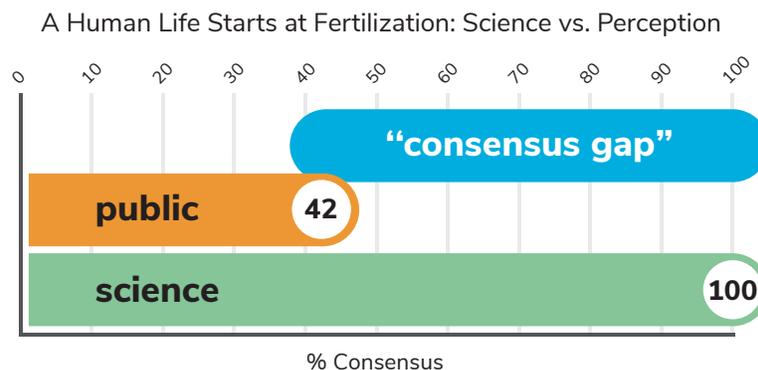
# The Problem (And Why It Matters for All of Us)



Science knows when a human life starts and has known for a very long time. However, most people don't know the basic facts about human reproduction.

A recent poll found that nearly of 60% Americans did not know when a human being begins to exist.<sup>1</sup>

## When a Human Being Begins to Exist: The "Consensus Gap" Between Public Perception and Science Reality



This is a massive problem. Science illiteracy regarding the basic, objective scientific embryological facts is precluding accurately informed decisions and consent and endangering human lives.

# Decisions about human sexual reproduction are serious and have serious consequences.

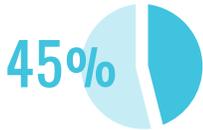
Consider the following facts:



By their 19th birthday, 7 in 10 teens have had sexual intercourse. <sup>2</sup>



The use of emergency contraception (EC) pills has increased from 4% (2.3 million) of women in 2002 to 20% (nearly 11 million) in the period ending 2015, and nearly 20% of women have used it three or more times. <sup>3</sup>



In the US, 45% of pregnancies were unintended in 2011, or about 3 million, and rates are highest among women ages 15 to 19. <sup>4</sup>



Approximately 40% of unintended pregnancies end in abortion. <sup>5</sup>

Many people are making big decisions that can have big impacts, based on misconceptions about human sexual reproduction and human development.

The good news is that human sexual reproduction is not a mystery and knowing matters! Scientifically accurate educational resources empower everyone to make better decisions and positively impact related harmful trends.

# When Does a Human Being Begin to Exist

## ! FAST FACT:

Biological sex is binary. In human sexual reproduction, there are only 2 types of sex cells/gametes: male (sperm) and female (oocyte/egg).

## ? DID YOU KNOW?

Using a fluorescent sensor, **scientists can see a flash of light** the moment the sperm cell and the oocyte/egg cell make contact! Scientists discovered that sparks of zinc explode at the beginning of the process of **fertilization**. This zinc spark is an extracellular marker of early human development.

When a new human life starts is an objective, empirical scientific fact of the biological science of **human embryology**.

*In **human sexual reproduction, a new human being begins to exist, and pregnancy begins**<sup>6</sup>, at the start of the biological process of **fertilization**, when the male reproductive cell (sperm) and the female reproductive cell (oocyte) make “first contact”.*

When these two mere cells, the sperm and the oocyte (commonly referred to as the “egg”), make first contact, a new, whole, individual, and living single-cell human being immediately begins to exist. He or she is not a “potential” human being, or a “part of” a human being, or “just a cell”, but an actual human being, who is one cell “big”.

The **scientific name for the new human being** during the first eight weeks of his or her biological existence is **human embryo**. Just as you and I were once toddlers, we were once embryos.

*“Embryonic life commences with fertilization, and hence the beginning of that process may be taken as the point of depart of stage 1. Despite the small size and weight of the organism at fertilization, the embryo is “schon ein individual-spezifischer Mensch” [definitely and specifically a human person] (Blechsmidt, 1972).”*  
- **Carnegie Stage 1**<sup>7</sup>

## ! FAST FACT:

Sperm and oocyte/egg possess “human life”, since they are PARTS of a living human being; but they are NOT each WHOLE, living human beings/organisms themselves.

**A human embryo or a human fetus is a whole, living, individual human being.**

## ? DID YOU KNOW?

All genuine **human embryology textbooks** are required to contain a complete chart of the Carnegie Stages.

The **Carnegie Stages of Human Embryonic Development** are the international gold standard of human embryological research. They document the objective scientific facts of the human embryonic period, beginning with human sexual reproduction/fertilization.

The Carnegie Stages were instituted in 1942 and continue to be documented, refined and advanced for scientific research and education purposes by:



The National Museum of Health and Medicine's Human Developmental Anatomy Center



Carnegie Institution for Science



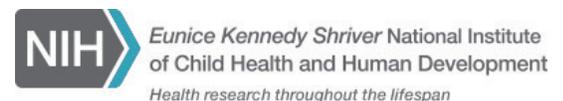
National Library of Medicine



Federative International Programme for Anatomical Terminology



International Federation of Associations of Anatomists



National Institute of Child Health and Human Development

\*among others

# The Carnegie Stages of Human Embryonic Development

## FAST FACT:

The **heart** of the new human being **beats** about **54 million times** before birth. <sup>8</sup>

## DID YOU KNOW?

Approximately **90%** of the more than 4500 structures of the adult human body become apparent during the embryonic period, the **first 56 days** of a human being's life.

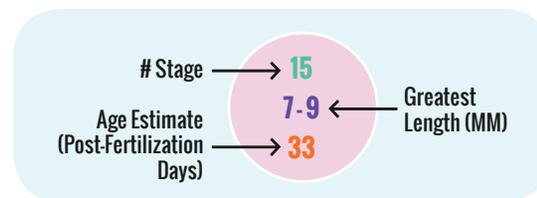
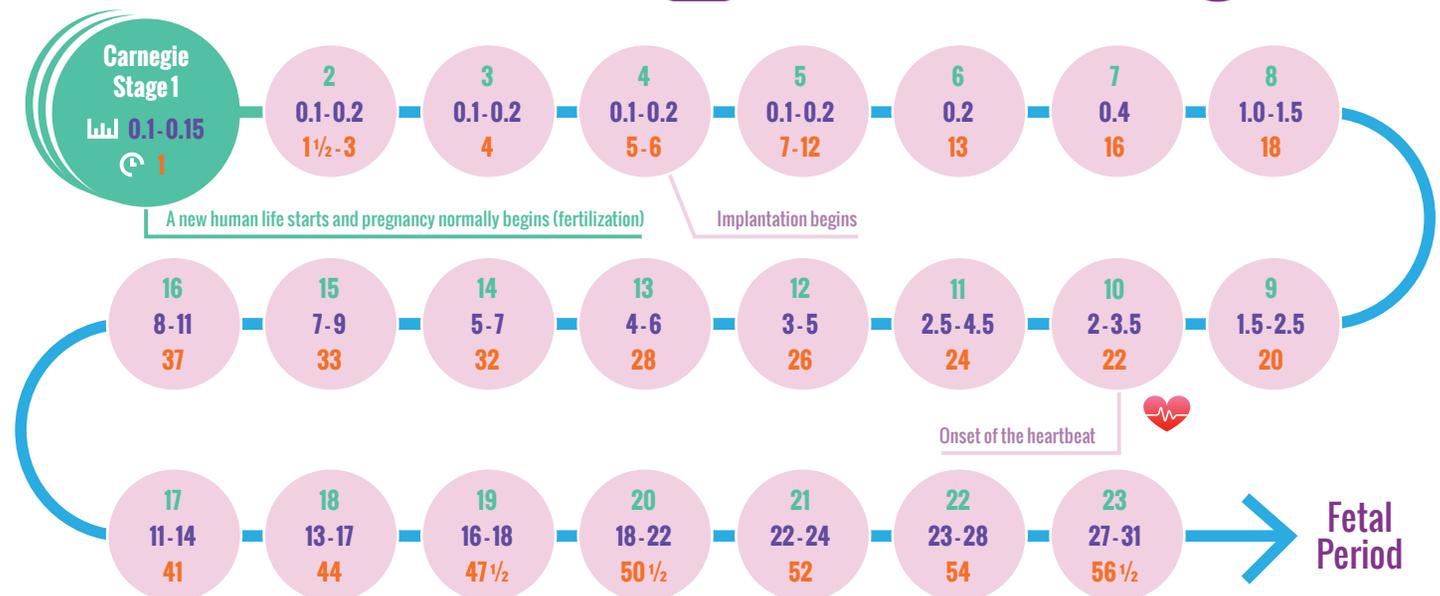
## Carnegie Chart

Carnegie Stage, Greatest Length (MM) & Age Estimate (Post-Fertilization Days)

Human development during the 8 week embryonic period is divided into 23 Stages.

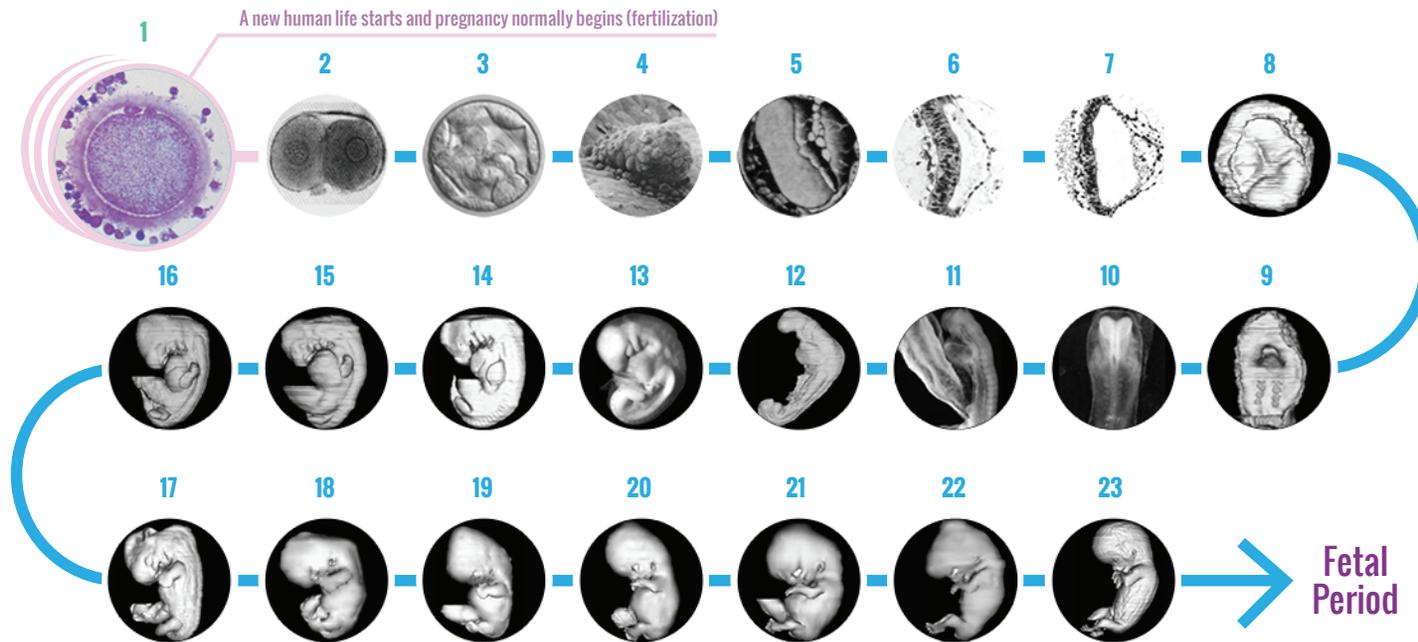


Carnegie Stage 1 is when a human being begins to exist.



# The Carnegie Stages of Human Embryonic Development

## Carnegie Stage & Human Embryo Image



*“There is considerable variation in normal human development during the postnatal period. The prenatal period is no different, with variations in the size, rate of growth, and order of appearance of some structures and functions.”*

**- The Endowment for Human Development**

# Carnegie Stage 1

## ! FAST FACT:

The new single-cell **human being** begins to exist at the beginning of the fertilization process, **Carnegie Stage 1a**, at “**first contact**” of the male and female human reproductive cells, the sperm and the oocyte/egg, respectively.

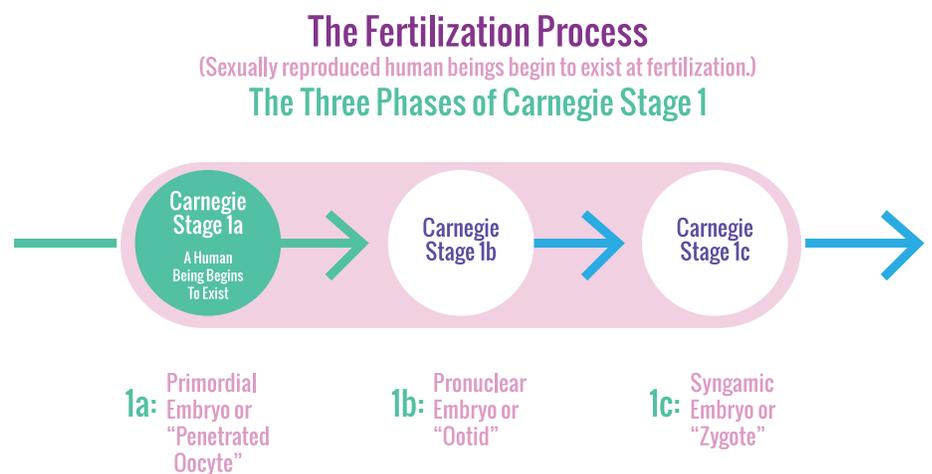
## ? DID YOU KNOW?

The earliest human being is known as the primordial embryo or the “penetrated oocyte” and is represented by Carnegie Stage 1a. The “zygote” is represented by Carnegie Stage 1c.

Carnegie Stage 1 is of special note as it documents when a human being begins to exist and describes the objective scientific facts about the development of the earliest single-cell human being.

**Stage 1** documents **HUMAN SEXUAL REPRODUCTION**. The scientifically accurate term for human sexual reproduction is **FERTILIZATION**.

## Carnegie Stage 1a, b and c



**Stage 1** is the unicellular human embryo, i.e., **a single-cell human being**, and is divided into three substages; a, b, and c. The new human being begins to exist at Stage 1a, i.e., at “first contact” of the sperm with the “egg”, when specifically human proteins and enzymes are produced.

Stage 1 is characterized by “unicellularity”, from “first contact” of the sperm cell with the oocyte/egg cell at the beginning of the process of fertilization through the formation of the zygote at the end of the process. **There is no such thing as the “fertilized egg Stage”**, and note that the zygote doesn’t even have a nucleus.

*The single-cell human embryo at this Stage is a new genetically unique living human being.*

## ? DID YOU KNOW?

Did you know that there are certain traits that are specifically substantially caused by the way the “23” maternal genes and the “23” paternal genes (DNA) are combined at “first contact” of the sperm with the egg?

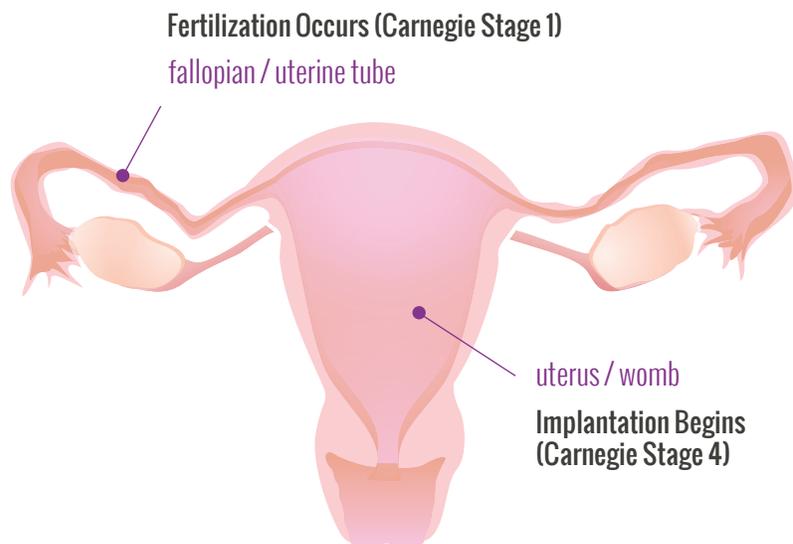
**Genetically determined traits include** the **biological sex** of the new human embryo, **blood type, eye/skin/hair color, height, and certain talents.**

*“In short, the biological facts demonstrate that at fertilization we have a real human being with a truly human nature. It is not that he or she will become a human being—he or she already is a human being. We know that empirically.”*

- Dianne N. Irving, M.A., Ph.D.

The biological process of **fertilization occurs** in a woman’s **fallopian tube**, NOT in a woman’s uterus. It takes the new human embryo about one week to reach the woman’s uterus to begin the **implantation** process.

### Female Reproductive System - Surface View (Basic)



**Implantation** is a developmental milestone of an already existing human being, and the beginning of the process is documented in Carnegie Stage 4.

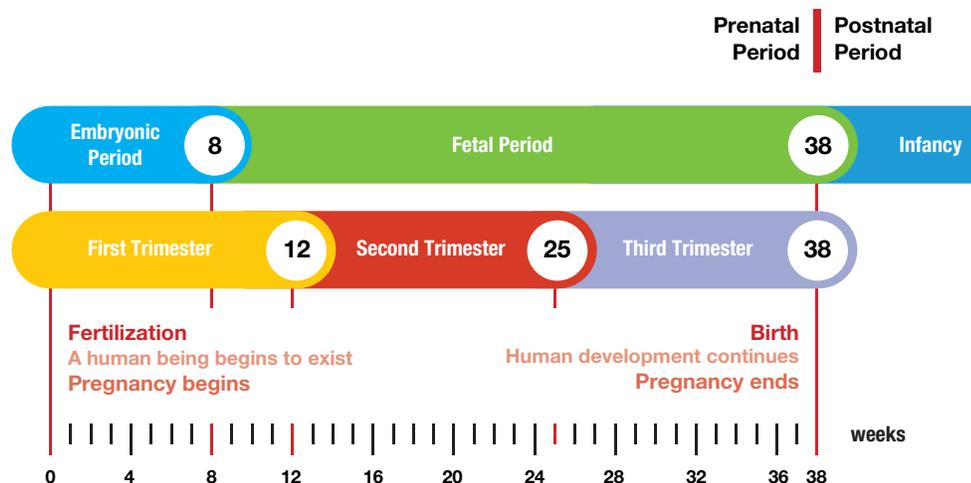
## ! FAST FACT:

Full-term pregnancy typically lasts **38 weeks from fertilization** or 40 weeks from the first day of a woman's last normal menstrual period.

*"Human pregnancy begins with the fusion of an egg and a sperm. (p.3); ... finally, the fertilized egg, now properly called an embryo, must make its way into the uterus (p.3); ... The sex of the future embryo is determined by the chromosomal complement of the spermatozoon ... Through the mingling of maternal and paternal chromosomes, the [embryo] is a genetically unique product of chromosomal re-assortment ... "* - **Bruce M. Carlson, Human Embryology and Developmental Biology**

- ✓ Shortly after a woman's period begins, her body begins preparing for the possibility of pregnancy.
- ✓ About 2 weeks into her cycle, a woman releases an egg from one of her ovaries into her adjacent fallopian tube.
- ✓ Human sexual reproduction/fertilization is possible for the next 24 hours or so.

## Human Development & Pregnancy Timeline



- Refers to human sexual reproduction in vivo and assumes a typical full-term pregnancy.
- Fertilization (Carnegie Stage 1), beginning with first contact of sperm and oocyte in the woman's fallopian tube, is when a human being begins to exist and pregnancy begins.
- The primary event of the 2nd week post-fertilization is implantation (Carnegie Stage 4, when the already-existing embryo makes it through the woman's fallopian tube and begins to implant into her uterus -- about 5-6 days).

# The Continuum of Human Life

## ? DID YOU KNOW?

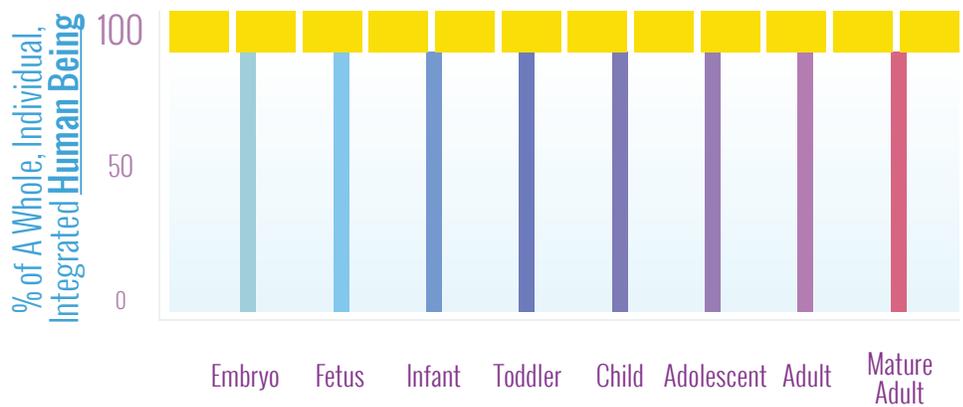
**Developmental milestones occur throughout a human's life** (e.g., implantation, onset of the heartbeat, birth, complete development of the tooth, complete physiological brain integration), however these “biomarkers” **do not imply any change in the nature or essence of an already existing human being.**

**After fertilization**, the new human being does not become a different kind of thing. The human embryo continues to grow and develop as the **same human being/organism throughout the rest of the embryonic period, the fetal period, and then, after birth, throughout the subsequent stages of human life.**

Human development is a **continuum**, and at any point along this continuum—including the very beginning of a human's biological existence—there exists the same human being.

## Continuum of Human Life

### Developmental Stages of Human Being



The single-celled human embryo is THE SAME human being as the 25-year old adult and the 100-year-old senior.

# The Science & The Experts

## ? DID YOU KNOW?

The International Federation of Associations of Anatomists (**IFAA**) represents about 36 countries and consists of **more than 7K scientists**.

## ! FAST FACT:

Human embryologists use **biochemical tests**, **DNA analysis**, and **powerful microscopes** to study the new human being (the human embryo).

*“The answer is there in the textbooks of Human Embryology, that a “human life” begins at fertilization ... It has always been there, at least for 100 years ... Every human embryologist, worldwide, states that the life of the new individual human being begins at fertilization ... We exist as a continuum of human life, which begins at fertilization and continues until death, whenever that may be.” - C.Ward Kischer, Ph.D.*

*\* Emeritus professor of Cell Biology and Anatomy, specialty in Human Embryology, University of Arizona, College of Medicine*



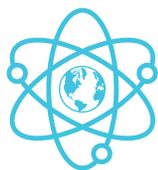
**Human embryology** is a branch of biology and is the **only science that specializes in when a human life starts** and its early development, particularly that of the human embryo and the human fetus.



The **scientific experts** in human embryology are those who are academically credentialed Ph.D. human embryologists and/or extensively professionally experienced in human embryology. “Cell biologists”, e.g., do not take the same courses and are not human embryologists.



These scientists use the **methods and tools of science** to research and document human sexual reproduction and early human development.



The Federative International Program for Anatomical Terminology (FIPAT), under the auspices of the **International Federation of Associations of Anatomists (IFAA)—the world body of Anatomy—**review, refine, and document the official lexicon of human anatomical terminology from Carnegie Stage 1a, the start of the process of fertilization, to birth.

# Key Terms

---

*The following are basic terms regarding human sexual reproduction:*

✓ **Continuum of Human Life**

The biological fact stating that the same whole, individual, integrated human being exists from the very beginning of the process of human sexual reproduction (Carnegie Stage 1a, “first contact”) until death.

✓ **Early Pregnancy Factor**

As early as 24 hours after fertilization, pregnancy can be confirmed by detecting a protein called “early pregnancy factor” or EPF in the mother’s blood. The detection of this protein indicates a viable (for that stage of development) human embryo exists. EPF is an immunosuppressive substance and is a pregnancy-specific protein. EPF is necessary for embryonic survival as it prevents rejection of the new, “foreign” human being by the mother (there are two bodies, each genetically distinct, and each “foreign” to the other). In this capacity, EPF acts as both an immunosuppressant and a growth factor.

✓ **Fertilization**

A biological process that creates a new human life. Fertilization is the scientific term for human sexual reproduction. It occurs *in vivo* in a woman’s fallopian tube, beginning when the sperm makes first contact with the oocyte and ending with the intermingling of maternal and paternal chromosomes at metaphase of the first mitotic division of the zygote. It can also occur *in vitro* in labs, “infertility clinics”, etc.

✓ **Human Being**

Any human organism, including the single-cell human embryo, who possesses a genome specific for and consistent with an individual member of the human species.

✓ **Human Chorionic Gonadotropin**

hCG is a hormone produced during pregnancy. It appears in the blood and urine of pregnant women after implantation begins. Levels of hCG increase quickly after implantation occurs. Home pregnancy tests/over-the counter pregnancy tests detect hCG levels, that is they detect if implantation has occurred.

✓ **Human Embryo**

A human being during the first 8 weeks of their biological development, beginning with the single-cell human embryo at the beginning of fertilization – not beginning at implantation.

## ✓ **Human Fetus**

A human being from the beginning of the fetal period of their biological development (the beginning of 9 weeks post-fertilization) through birth.

## ✓ **Human Sexual Reproduction**

The scientifically accurate term for human sexual reproduction is fertilization. Fertilization is a biological process that creates a new human life when a human sperm makes first contact and fuses with the protective covering of a human oocyte and a new, whole human being begins to exist. Human sexual reproduction can occur within 60 minutes of having vaginal sexual intercourse.

## ✓ **Implantation**

A process over time that involves attachment of the early human embryo to the uterus wall after it has already moved through the fallopian tube where fertilization has taken place.

## ✓ **Pregnancy**

In the case of sexual intercourse, pregnancy begins as soon as fertilization begins in the woman's fallopian tube; when the sperm makes first contact with the oocyte, and then continues through the rest of the embryonic period and the fetal period until birth. In assisted reproduction (e.g., IVF), the new human being begins to exist immediately at fertilization in the test tube, but the woman is not pregnant until the already existing human embryo is implanted into her uterus by a clinician.

# The NEVER List!

---

*The following commonly used terms are scientifically invalid and should be avoided.*

## ✘ Conception

The term is scientifically inaccurate and confusing (it may refer either to fertilization or to implantation) and has been formally rejected by the international nomenclature committee on human embryology. The scientifically accurate term for human sexual reproduction is fertilization.

## ✘ Fertilized Egg

There is no such thing as a “fertilized egg” stage of human development – once an egg has been fertilized, it is an embryo and therefore a human being. A “fertilized egg” is a pseudo-scientific term used to describe the single-cell human organism that results from fertilization.

## ✘ Individuation

A false “scientific” term referring to the development of the early human embryo, used to claim that until 14 days post-fertilization there is not a human being, just a “pre-embryo” (also a false term); but after this time the embryo has decided he or she will not “twin” and is suddenly a human “person.” The term has been formally rejected by the international committee on human embryology and is strictly arbitrary.

## ✘ Ovum

The term has been used for disparate structures as an oocyte and a 3-week embryo and has no scientific usefulness.

## ✘ Pre-embryo

Since the human embryo begins to exist at the beginning of the process of fertilization, there is no such thing as a “pre-embryo.” The term has been totally discredited by all human embryologists and by the nomenclature committee of the International Federation of Associations of Anatomists (IFAA).

# Human Sexual Reproduction Basics – Science Quiz

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

**True or False – Write “true” if the statement is correct and “false” if the statement is incorrect.**

- 1 When a human being begins to exist is still a mystery. \_\_\_\_\_
- 2 A human sperm is a human being. \_\_\_\_\_
- 3 A human embryo or a human fetus is the same as a human egg or a human sperm. \_\_\_\_\_
- 4 Pregnancy normally begins when a new human life begins within a woman’s body. \_\_\_\_\_
- 5 All birth control prevents human reproduction. \_\_\_\_\_

**Multiple Choice – Circle the letter of the correct choice.**

- 6 A positive over-the-counter pregnancy test means:
  - a you have already reproduced a new member of the human species
  - b a new, whole, individual, living human being is already growing and developing inside of your body
  - c you are already a parent
  - d all of the above
  - e none of the above
- 7 Considering human sexual reproduction, which milestone produces a new member of the human species?
  - a birth
  - b implantation
  - c onset of the heartbeat
  - d fertilization
  - e none of the above
- 8 If a method of birth control claims that it works by “preventing implantation”, it is:
  - a contraception
  - b abortifacient
  - c surgical abortion
  - d medical abortion
  - e none of the above

9 Pregnancy and a new human being can begin within 60 minutes of:

- a holding hands
- b texting
- c kissing
- d vaginal sexual intercourse
- e none of the above

10 Place the following events in the correct order, from 1 to 5:

- Fetal period of human development begins \_\_\_\_\_
- Sex \_\_\_\_\_
- Birth \_\_\_\_\_
- Pregnancy begins \_\_\_\_\_
- Implantation of new human being \_\_\_\_\_

11 Read the following birth control packaging to identify how the product works. Label the image “contraception”, “abortifacient”, or “both”.

How does Plan B One-Step® work?

Plan B One-Step® is one tablet with levonorgestrel, a hormone that has been used in many birth control pills for several decades. Plan B One-Step® contains a higher dose of levonorgestrel than birth control pills, but works in a similar way to prevent pregnancy. It works mainly by stopping the release of an egg from the ovary. It is possible that Plan B One-Step® may also work by preventing fertilization of an egg (the uniting of sperm with the egg) or by preventing attachment (implantation) to the uterus (womb).

\_\_\_\_\_

**Matching – Write the letter that corresponds to each definition next to the correct term.**

TERM	DEFINITION
12 Human sexual reproduction _____	<b>A</b> A protein that indicates fertilization has occurred and a woman is pregnant.
13 Birth _____	<b>B</b> When a woman is carrying a human being inside of her body, from fertilization until birth, normally lasting 38 weeks (or 40 weeks if measured from a woman’s last menstrual period).
14 Early Pregnancy Factor _____	<b>C</b> The process of the human fetus passing from the uterus into the outside world, when the fetus is called an infant.
15 Pregnancy _____	<b>D</b> A biological process that creates a new human life.

# References

---

- 1 “Americans’ Opinions on Abortion.” Marist Poll, January 2019.
- 2 Abma JC et al., Teenagers in the United States: sexual activity, contraceptive use, and childbearing, National Survey of Family Growth 2006–2008. Vital and Health statistics.
- 3 Special tabulation by the National Center for Health Statistics
- 4 Finer, Lawrence B., and Mia R. Zolna. (2016). “Declines in Unintended Pregnancy in the United States, 2008-2011.” *New England Journal of Medicine*, vol. 374, no. 9, 2016, pp. 843–852., doi:10.1056/nejmsa1506575.
- 5 Finer, Lawrence B., and Mia R. Zolna. (2016). “Declines in Unintended Pregnancy in the United States, 2008-2011.” *The New England Journal of Medicine*, vol. 374, no. 9, 2016, pp. 843–852., doi:10.1056/nejmsa1506575.
- 6 In vivo human sexual reproduction
- 7 Ronan O’Rahilly and Fabiola Müller. *Developmental Stages in Human Embryos*. Carnegie Institution of Washington, Publication 637. 1987.
- 8 Department of Maternal and Child Health, Johns Hopkins University, Baltimore, MD 21205, USA.

## Additional Resources

- **Contend Projects** - [contendprojects.org](https://contendprojects.org)
- **The Endowment for Human Development** - [ehd.org](https://ehd.org)
- **Virtual Human Embryo** - [ehd.org/virtual-human-embryo](https://ehd.org/virtual-human-embryo)
- **Carnegie Stages of Human Embryonic Development** - *Developmental Stages in Human Embryos by Ronan O’Rahilly and Fabiola Müller*. Published by Carnegie Institution of Washington
- **Carnegie Stage 1** - [medicalmuseum.mil/assets/documents/collections/hdac/stage01.pdf](https://medicalmuseum.mil/assets/documents/collections/hdac/stage01.pdf)
- **Human Developmental Anatomy Center** - [medicalmuseum.mil/index.cfm?p=collections.hdac.anatomy.index](https://medicalmuseum.mil/index.cfm?p=collections.hdac.anatomy.index)
- **International Federation of Associations of Anatomists** - [ifaa.net](https://ifaa.net)
- **Federative International Program for Anatomical Terminologies** - [fipat.library.dal.ca](https://fipat.library.dal.ca)

Please note all website references reflect links as of March 2020.

Do you know the basic “facts of life”?

**Science knows!**

learn more at  
[contendprojects.org](http://contendprojects.org)