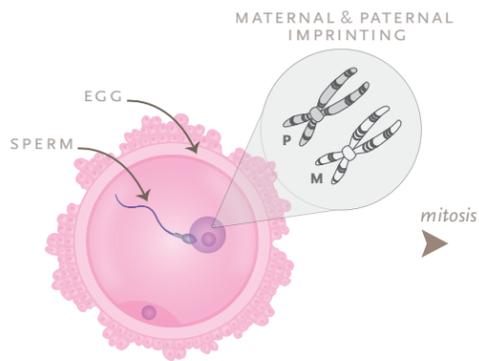


# Human Development

## in vivo

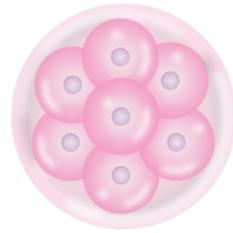
### FERTILIZATION



ZYGOTE  
day 0

**Nuclear Fusion:**  
Fusion of egg and sperm provides a complete human genome (two sets of nuclear DNA). Upon fertilization, calcium ions flood the egg cytoplasm and trigger fusion of egg and sperm nuclei.

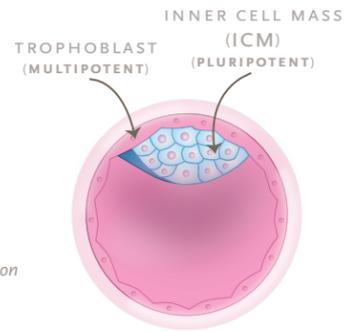
### TOTIPOTENT cells



BLASTOMERE  
day 3  
8 cells

**Clonal Cell Division:**  
Cells rapidly divide via mitosis producing a clonal population of 8 cells and at this stage identical twinning can occur.

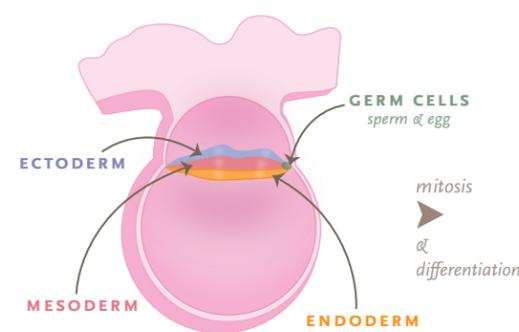
### PLURIPOTENT & MULTIPOTENT cells



BLASTOCYST  
day 5  
~150 cells

**Cell Differentiation:**  
As cells migrate in response to maternal signals in the uterus, they specialize, or differentiate. The cells on the outer layer of the blastocyst are referred to as the trophoblast and support placental development. The cells in the interior of the hollow ball, are referred to as the inner cell mass (ICM) and develop into the fetus. Each cell of the ICM has the potential to differentiate into any cell of the body.

### MULTIPOTENT cells



GASTRULA  
day 14

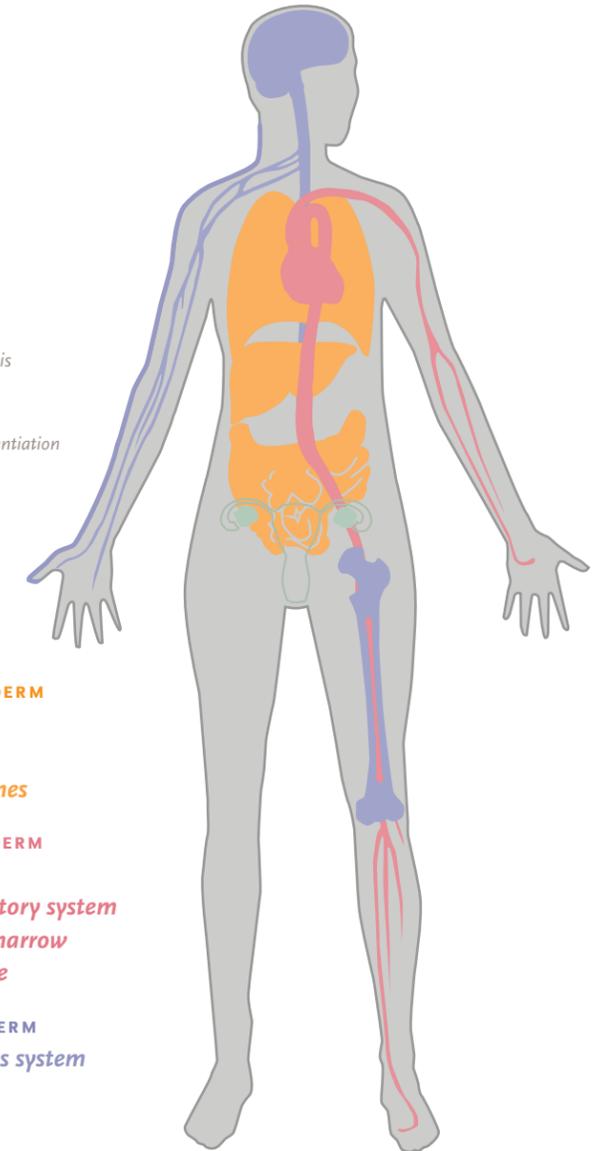
**Further differentiation into four germ layers:**

ENDODERM  
MESODERM  
ECTODERM  
GERM CELLS

Each germ layer gives rise to a different subset of cell populations in the body, giving rise to 200 different cell types in the adult body.



mitosis & differentiation



ENDODERM  
lungs  
liver  
intestines

MESODERM  
heart  
circulatory system  
bone marrow  
adipose

ECTODERM  
nervous system  
bone  
skin

GERM CELLS  
sperm & egg