

Lesson 1

Fertilization

IVF

Multiple births



Fertilization and Development

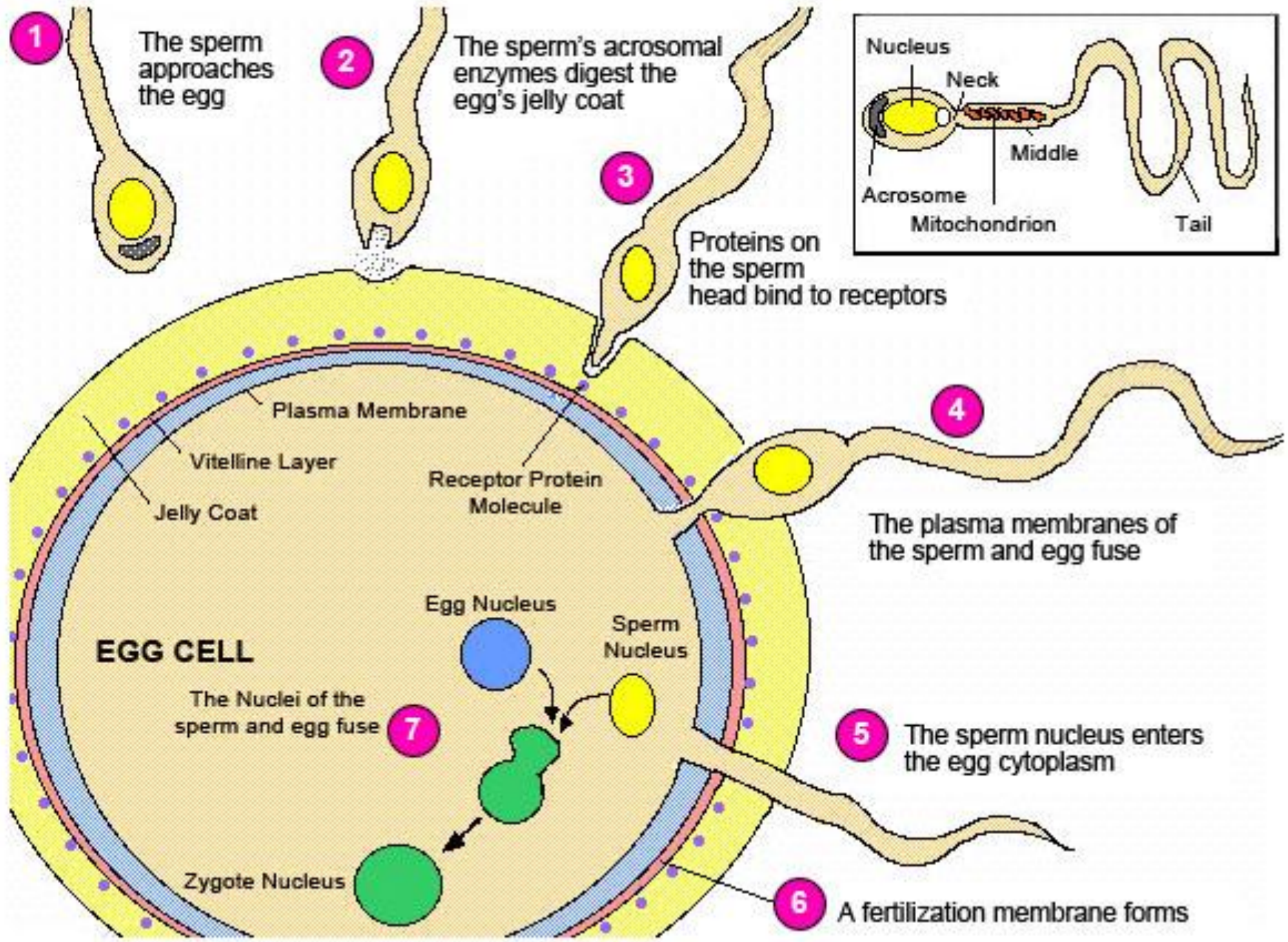
Fertilization

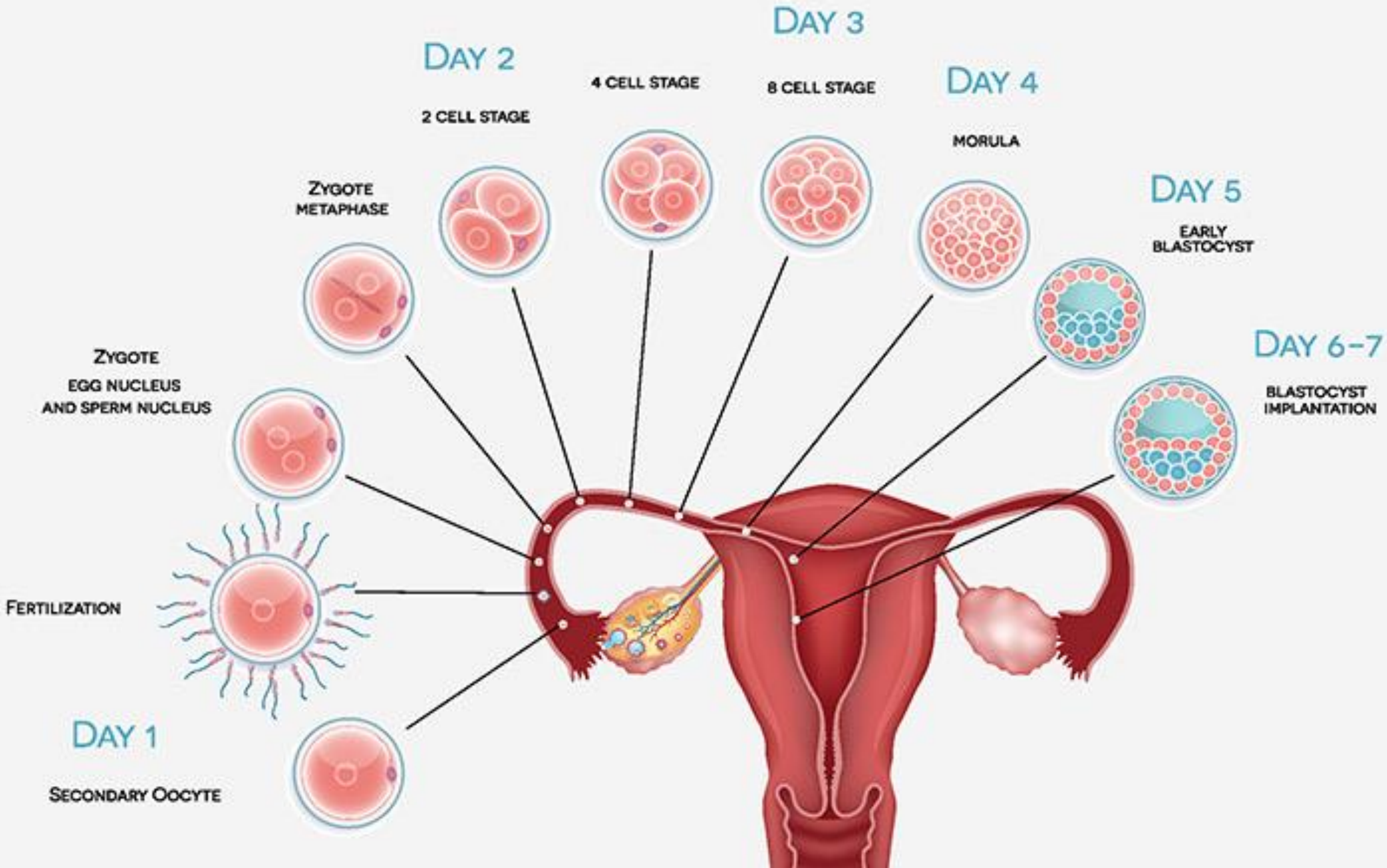
- ▶ Union of gametes (sperm and egg)
- ▶ Occurs in the upper portion of the fallopian tube of female.
- ▶ Fertilized egg is called a zygote.
- ▶ Zygote then divides by mitosis forming an embryo.

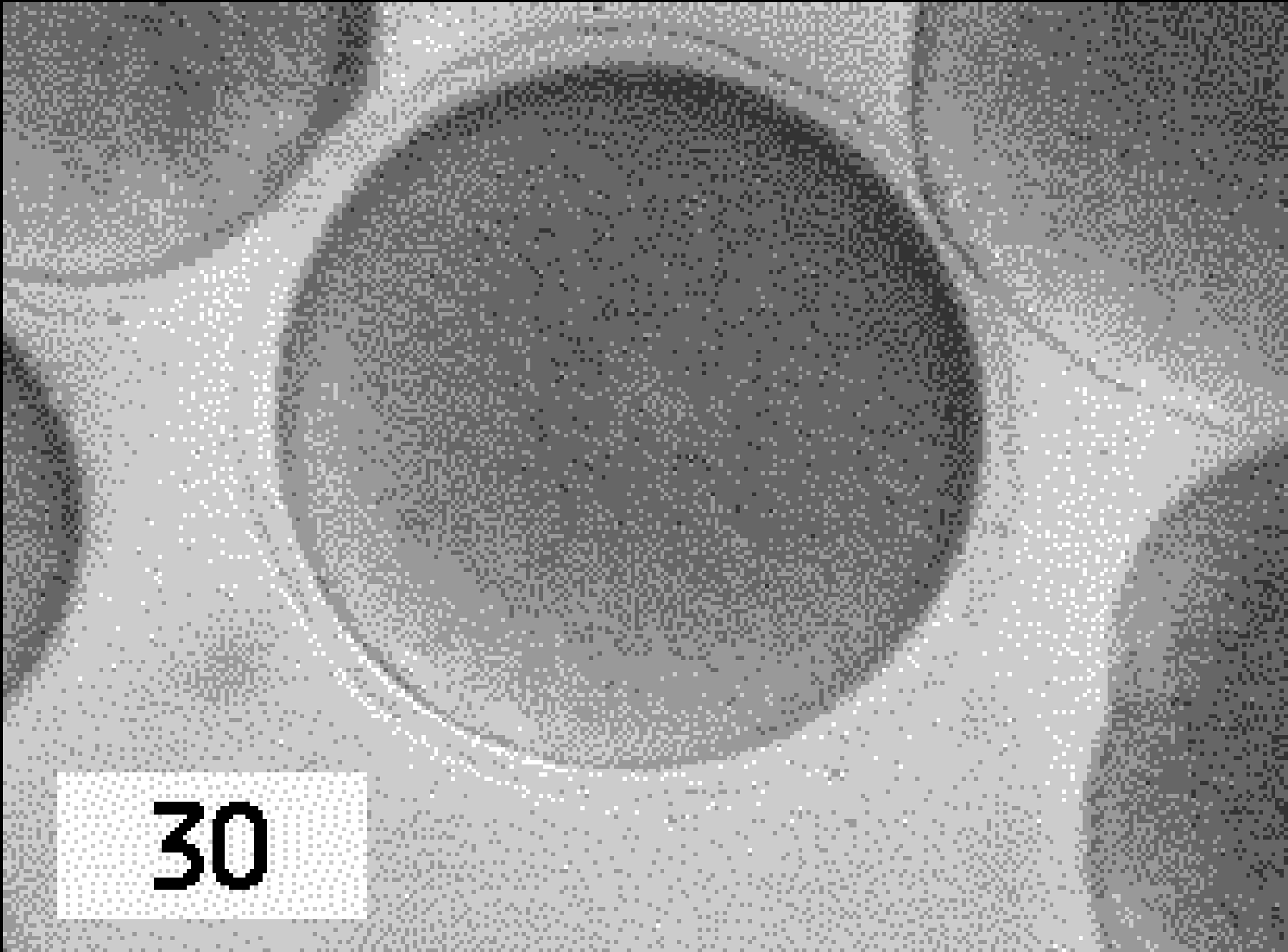


Fertilization Facts

- ▶ Approximately 300-500 million sperm cells are deposited in the vagina.
- ▶ Sperm can survive up to 5 days
- ▶ The egg can only be fertilized 12-24 hours after ovulation
- ▶ Fertilization completes when the 2 nuclei fuse, forming the genetic instructions for a new individual.







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In Vitro Fertilization (IVF)

- ▶ Egg and sperm are united outside of the body in a laboratory and the embryo is implanted into the uterus.



“Octomom” Nadya Suleman



- ▶ Birthed octuplets in January 2009
- ▶ Were conceived via IVF
- ▶ Ethical?





Multiple births

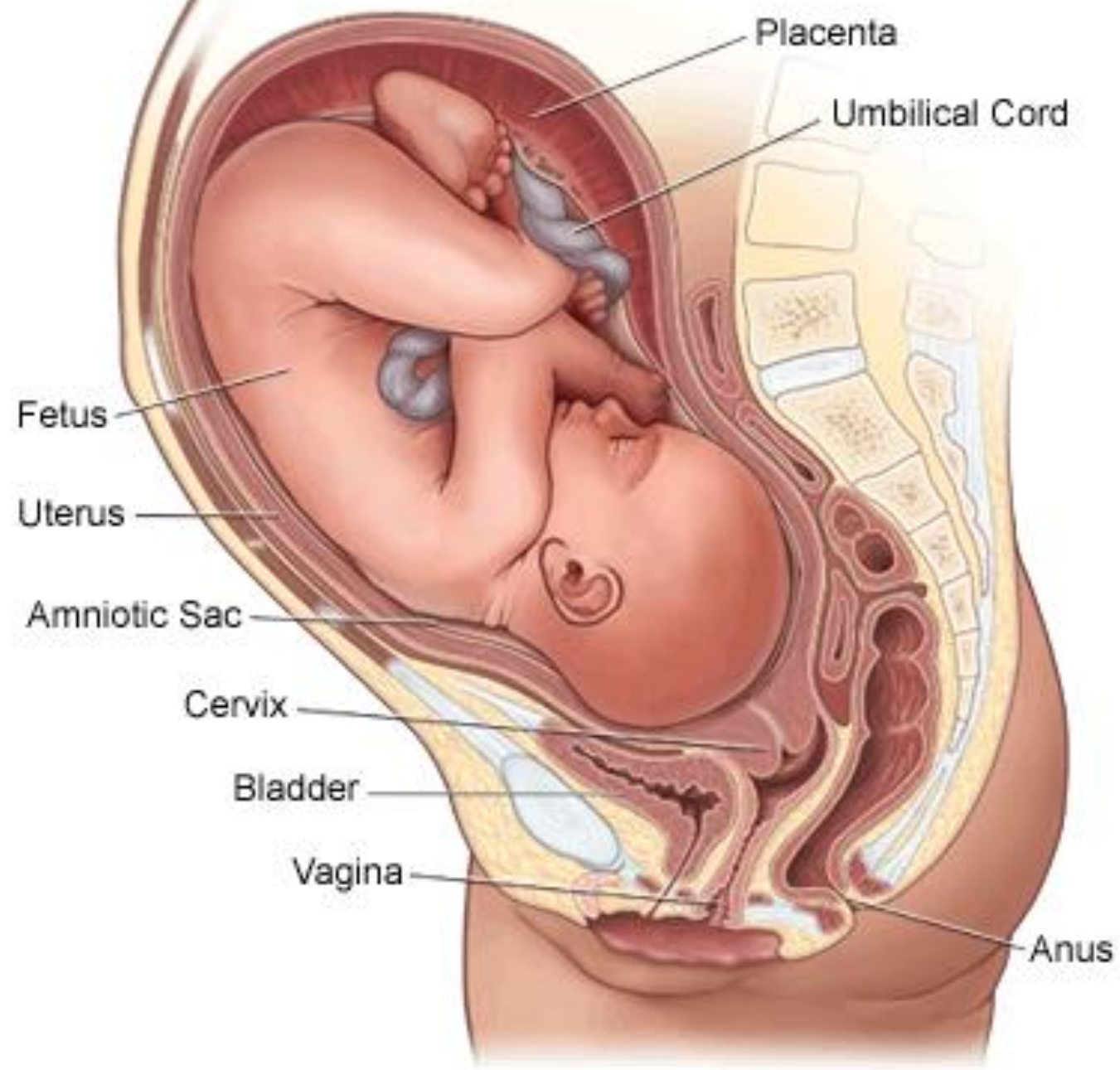
- ▶ Identical twins (monozygotic)
 - develop from one zygote, which separates completely during cell division. (one egg, one sperm)
- ▶ Fraternal twins (dizygotic)
 - develop from two eggs, each fertilized by separate sperm cells.
- ▶ Conjoined twins
 - identical twins which fail to completely divide & separate



Lesson 2

Internal Development & Structures

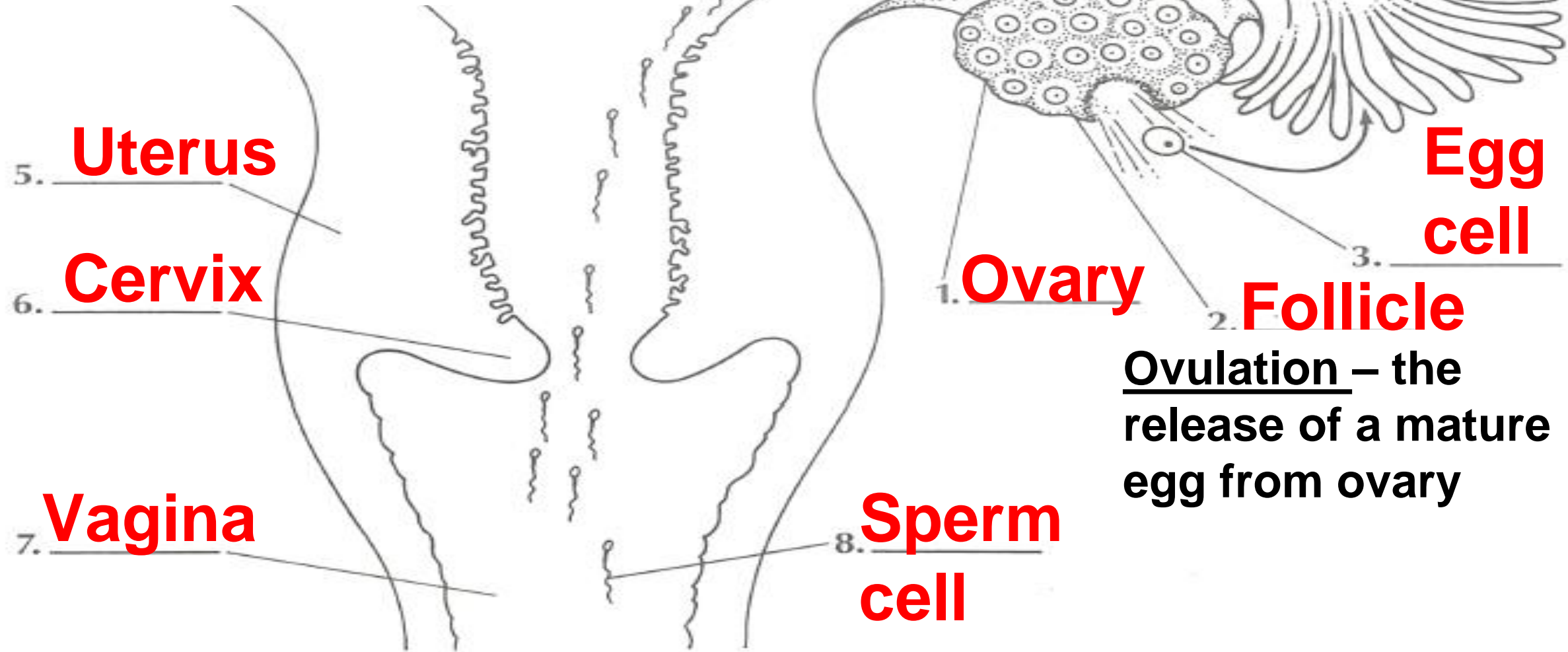
Fetus in Utero



Implantation – embryo burrows into thickened blood lining of uterus = pregnancy (not pictured here)

Fertilization – sperm & egg join to form a zygote

Fallopian tube



Ovulation – the release of a mature egg from ovary

A - embryo

D - uterine wall

I - uterus

E - umbilical cord

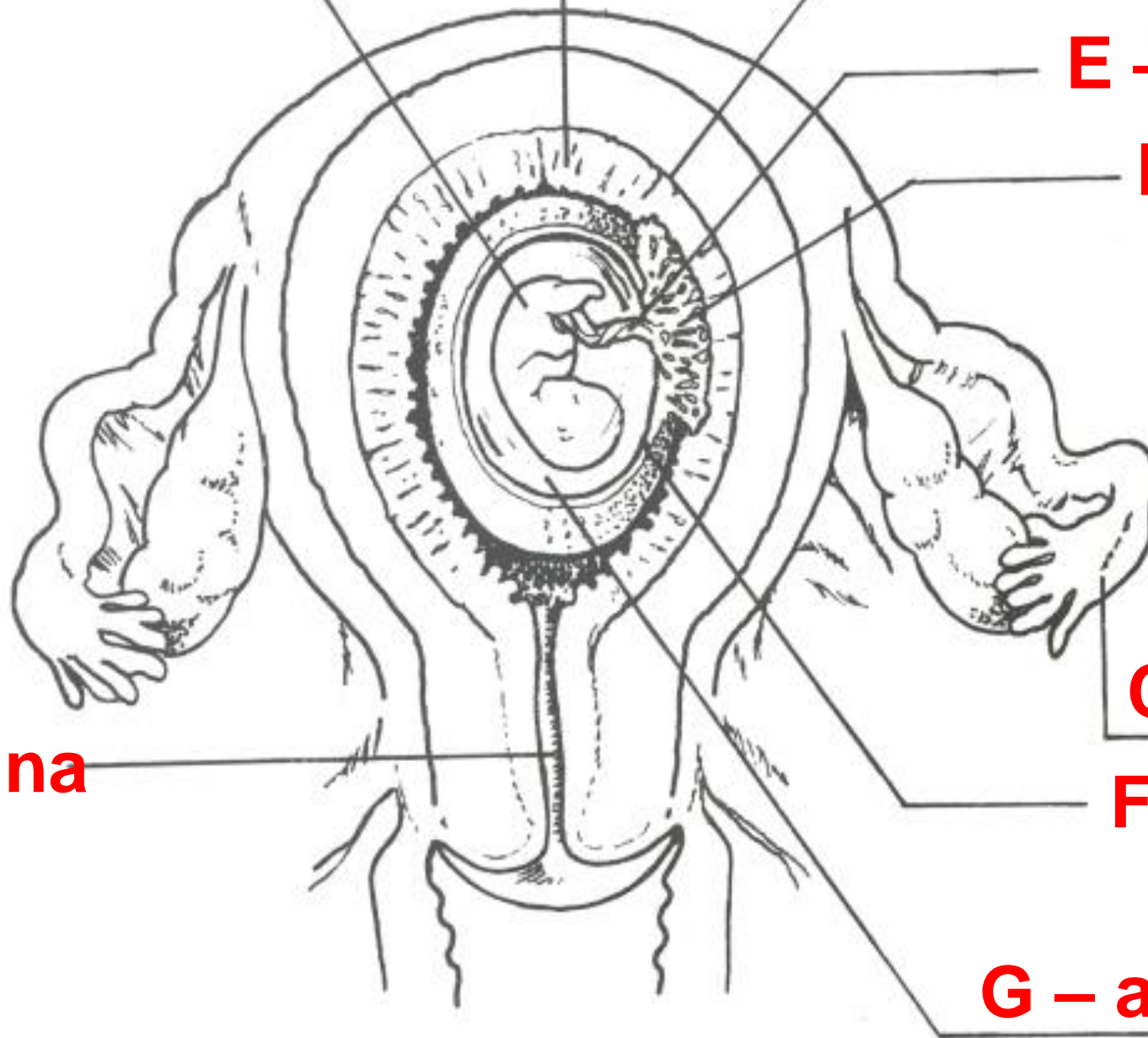
B - placenta

C - fallopian tube

H - vagina

F - amnion

G - amniotic fluid



A Mammal Embryo

- a. embryo – offspring during 1st 8 weeks of gestation
- b. placenta - organ for gas & nutrient/waste exchanges between mother and fetus;
NOTE: Their blood supplies do NOT mix!!!
- c. Fallopian tube – where fertilization occurs;
carries egg from ovary to uterus
- d. uterine wall – muscular part of uterus,
contracts during labor

- e. umbilical cord – attaches embryo/fetus to the placenta
- f. amnion – protective sac around fetus
- g. amniotic fluid – fluid in protective sac
- h. vagina – birth canal
- i. uterus – site of fetal development (40 weeks gestation in humans)

Fill in the blanks with the correct answers.

After two months of development, the embryo is called a (an) fetus. The

placenta is formed in part from the inner lining of the uterus and in part from

other membranes. It is through the placenta that the embryo/fetus is nourished while in

the uterus and wastes are carried away. The

umbilical cord connects the embryo/fetus with the placenta. It provides a transport

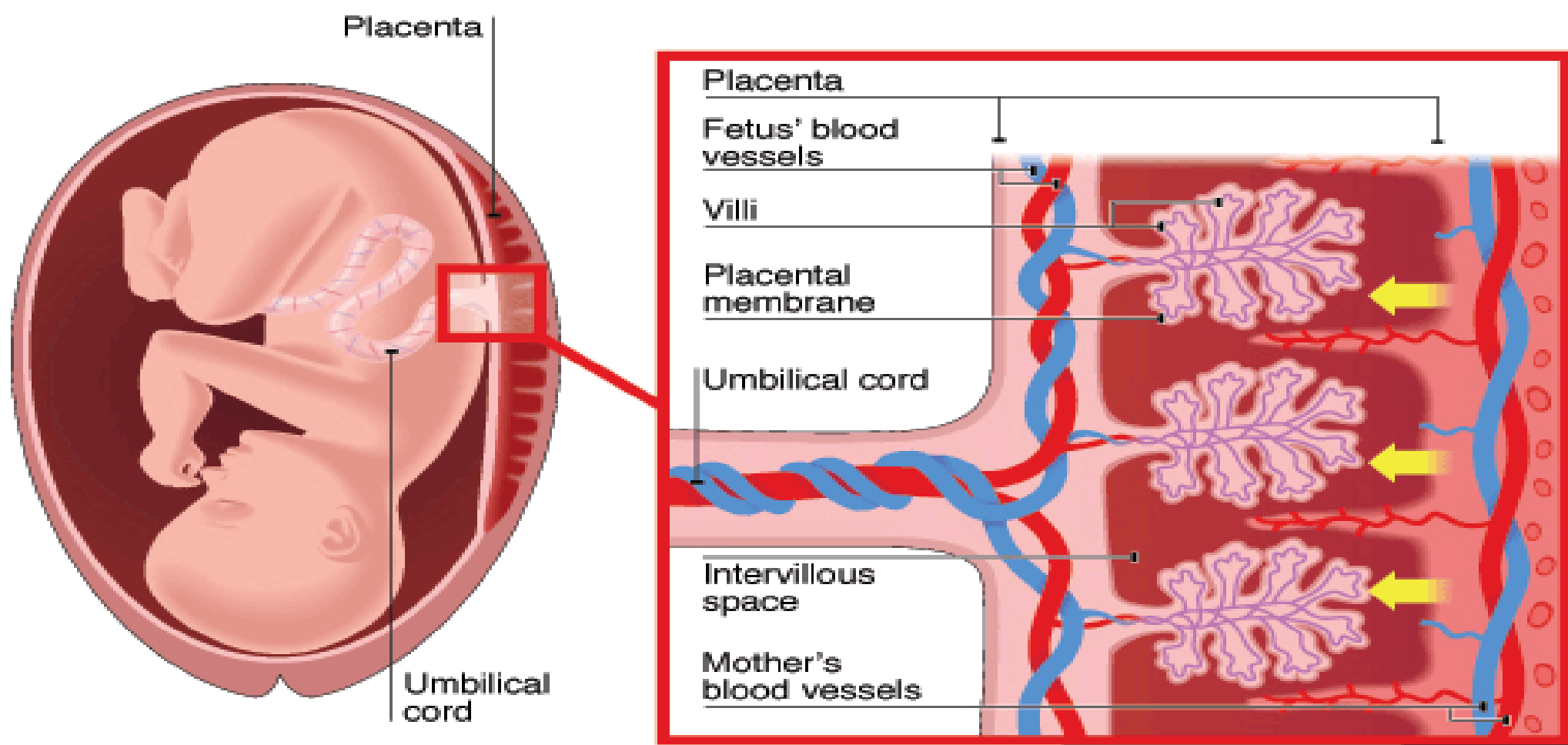
system for placental-fetal circulation. The amnion is the innermost of the

extra embryonic membranes, and it forms a fluid-filled sac, around the

embryo/fetus.

INTERNAL DEVELOPMENT

- ▶ growth of the embryo in the body of the female.
- ▶ Uterus – site of internal development
- ▶ Placenta (forms in uterus during pregnancy)
 - ▶ Allows diffusion of nutrients, wastes, & respiratory gases between the mother and embryo/fetus
 - ▶ Maternal and embryonic blood do NOT mix.



If maternal and fetal blood supplies do NOT mix then how are the nutrients, gases, and wastes exchanged?

Diffusion across the capillary membranes!

INTERNAL DEVELOPMENT

- ▶ An umbilical cord containing blood vessels attaches the embryo to the placenta.
- ▶ While in the uterus, the baby floats in the amniotic fluid.
 - ▶ Protects the baby from outside injury by cushioning sudden blows or movements.

Lesson 3

Review & Quiz

Birth Defects & Teratogens

Start Teratogen flyer research

Factors Affecting Fetal Development

- ▶ **Age-** chances of down syndrome increase significantly after the maternal age of 35.
- ▶ **Smoking, drugs and alcohol-** substances can cross the placenta and harm the baby
 - ▶ May lead to low birth weight (smoking), withdrawal at birth (drugs) or fetal alcohol syndrome (alcohol)

Birth Defects

Critical Period

- The time during development when a particular structure is sensitive to damage
- Birth defects can result from faulty gene(s) or environmental factors
- Most develop during the embryonic period (first 8 weeks) and are typically more severe than those that arise during the fetal period

Critical Periods of Development

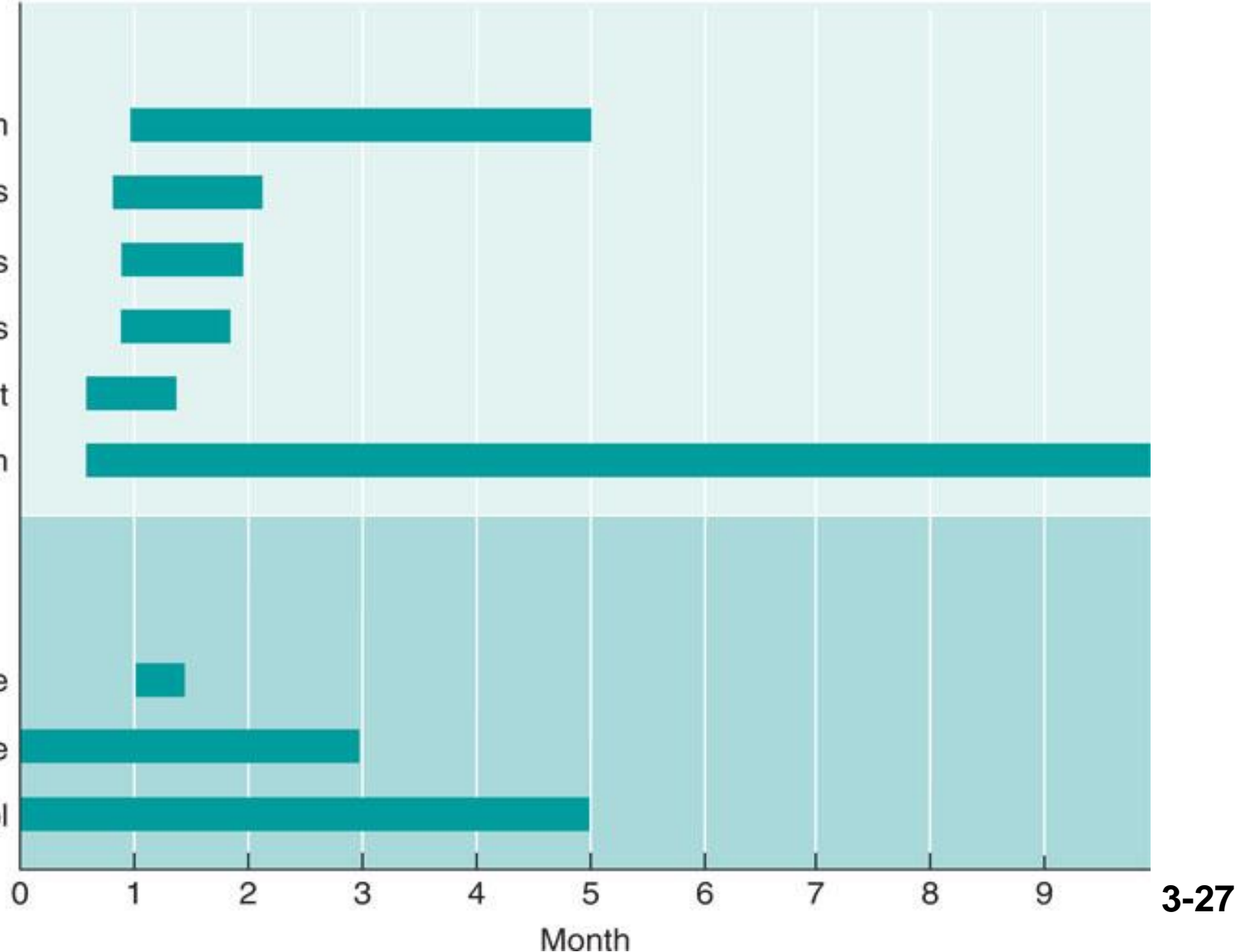
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When physical structures develop

Reproductive system
Ears
Eyes
Arms and legs
Heart
Central nervous system

Sensitivity to teratogens during pregnancy

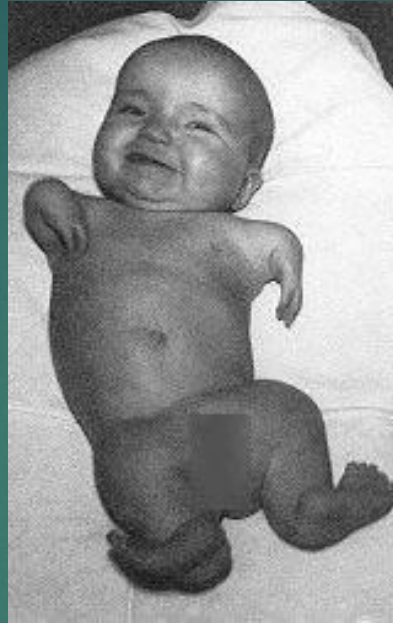
Thalidomide
Accutane
Diethylstilbestrol



Teratogens - Chemical or other agents that cause birth defects

Examples:

- Thalidomide
- Cocaine
- Cigarettes
- Alcohol
- Some viruses
(ex. Zika)



Baby with cleft lip

Range of Microcephaly Severity



Baby with Typical Head Size

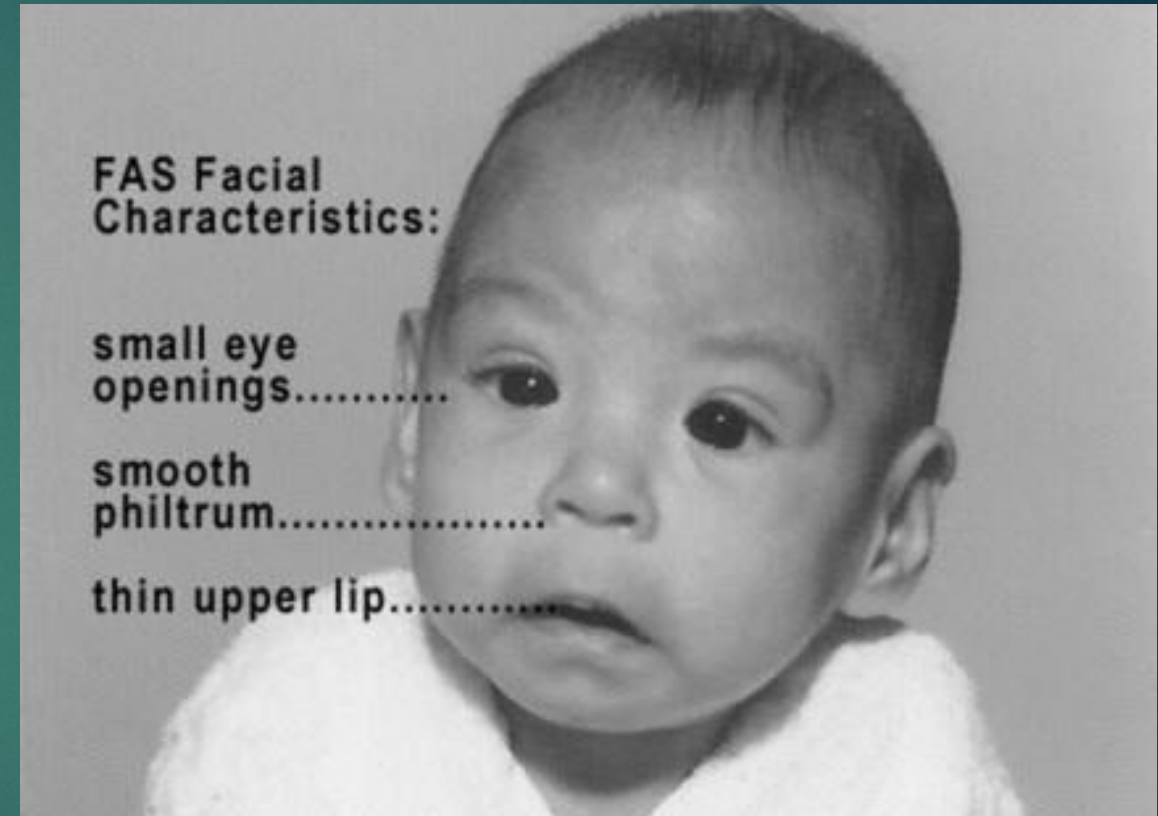
Baby with Microcephaly

Baby with Severe Microcephaly



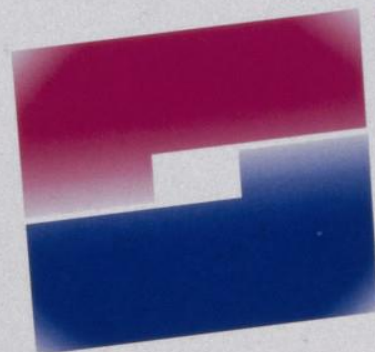
Fetal Alcohol Syndrome

- ▶ **Stunted Growth**
- ▶ **Lower than Normal Weight**
- ▶ **Small Head Circumference**
- ▶ **Slow Development**



50 mg **14 Capsules**

Each capsule contains 50 mg thalidomide.



THALOMID™

(thalidomide)

Rx only

WARNING: SEVERE, LIFE-THREATENING HUMAN BIRTH DEFECTS. IF THALIDOMIDE IS TAKEN DURING PREGNANCY, IT CAN CAUSE SEVERE BIRTH DEFECTS OR DEATH TO AN UNBORN BABY. THALIDOMIDE SHOULD NEVER BE USED BY WOMEN WHO ARE PREGNANT OR WHO COULD BECOME PREGNANT WHILE TAKING THE DRUG. EVEN A SINGLE DOSE [1 CAPSULE (50 mg)] TAKEN BY A PREGNANT WOMAN CAN CAUSE SEVERE BIRTH DEFECTS.

PHARMACIST: DISPENSE INTACT. THIS DRUG MUST NOT BE REPACKAGED. DO NOT DISPENSE UNLESS PATIENT HAS BEEN COUNSELED ON THE RISK OF BIRTH DEFECTS ASSOCIATED WITH THIS DRUG, AND A SIGNED INFORMED CONSENT FORM HAS BEEN PRESENTED.

THIS AREA FOR PRESCRIPTION LABEL



WARNING: THALOMID™ (THALIDOMIDE) CAN CAUSE SEVERE, LIFE-THREATENING HUMAN BIRTH DEFECTS.

[The Shadow of Thalidomide NY Times \(12 min\)](#)

Teratogen Flyer topic choices

1. Cigarettes
2. Heroin
3. Alcohol
4. Accutane
5. Mercury
6. X-rays
7. Lithium
8. Cocaine
9. Thalidomide
10. Zika virus
11. Diethylstilbestrol (DES)