



## BI 358 Lecture 12

- I. Announcements Presentations Group I next Tuesday!  
Sign-in, attendance, guest feedback, .pptx vs Prezi...  
submit < 4 pm M. Q? Today's lecture prep for Dr. Godfrey's  
& Dr. Bradshaw's guest lectures, Feb 25<sup>th</sup> + Mar 3<sup>rd</sup>.
- II. Congenital Hand Differences Prep for Dr. Godfrey
- III. Neonatal & Pediatric Physiology Prep for Dr. Bradshaw
  - A. What's a *neonate*? Age range for pediatric patients?
  - B. Some differences?
    1. Markers to predict problems (NB: rare ~95% OK!)
    2. cf: Neonate vs. adult human values (selected)
    3. Body fluid composition? Intake & excretion
    4. Heart differences?
    5. More frequent, yet still uncommon problems:  
congenital genetic defects, Tetralogy of Fallot,  
Down syndrome, Edward's syndrome, Cystic  
fibrosis
  - C. Development & Pediatrics tour, Tanner scale. Ref:  
Moore, Persaud, Shiota (MPS); Johnson (RVJ) +...



slocum

center for orthopedics  
& sports medicine

Live in motion.

20 in 10,000 or 0.002

More common in ♂ than ♀

***Congenital Hand  
Differences in  
the Media!***

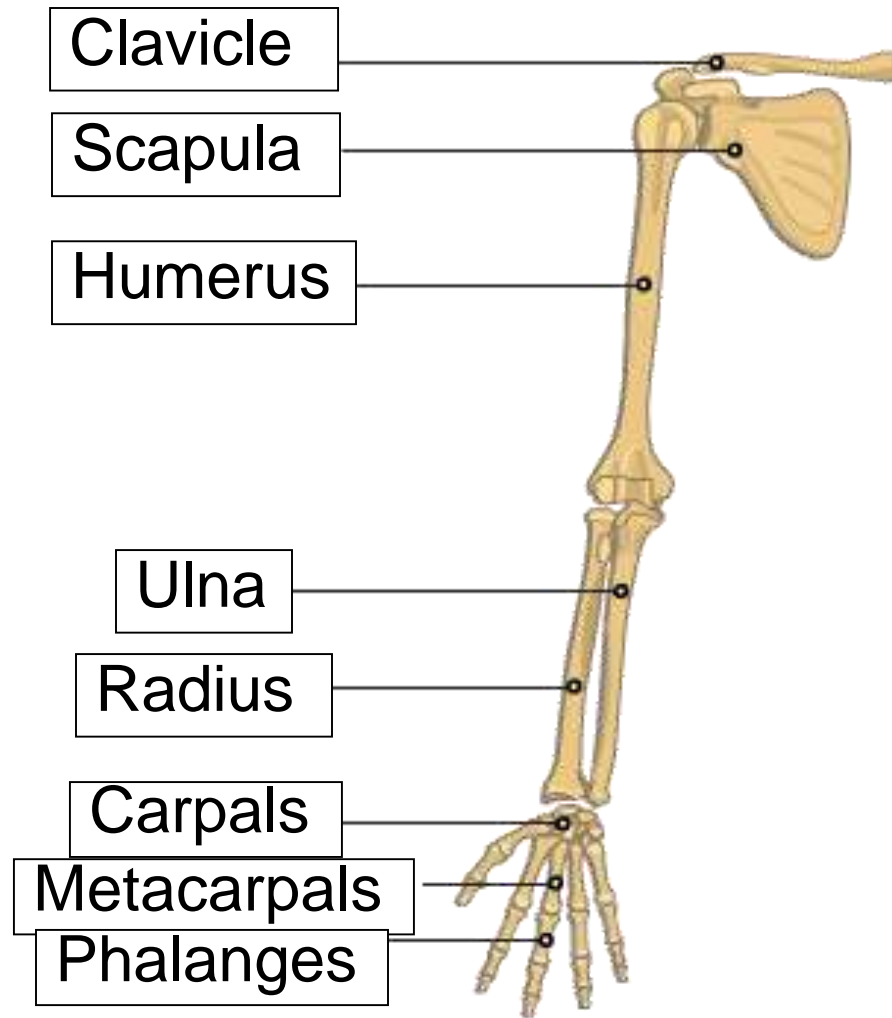
**Jenna Godfrey, MD, MSPH**

Pediatric Upper Extremity

Adult Hand & Wrist

<https://orthoinfo.aaos.org/en/diseases--conditions/congenital-hand-differences>

# Upper Extremity Bones



# Hand

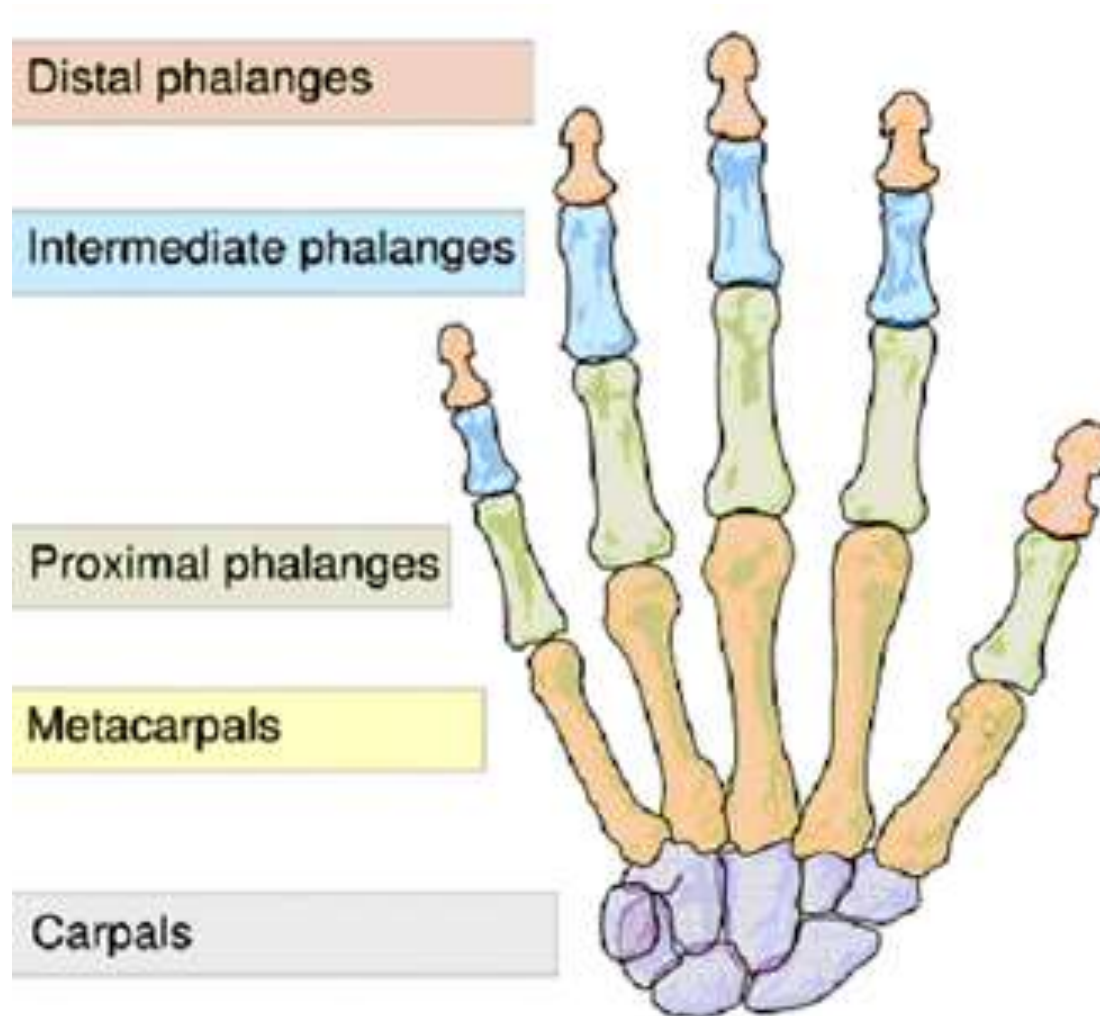


Image Source: <http://en.wikipedia.org/wiki/Hand>



<https://www.yoganatomy.com/wrist-pain-in-yoga/>





Neonate  
*Gr. neos/new*  
*L. -nat/born*

infant  
1<sup>st</sup> 4wk > birth



Charles A. Hoffmeister, MD  
Neonatal/Perinatal Specialist

# Examination of the Newborn

An Evidence-Based Guide  
Second Edition



EDITED BY ANNE LOMAX



WILEY-Blackwell



Life-long  
education...

Safety,  
prevention...



Pediatrics = Gr. παιδιά/paidiá/children  
Γιατρός/Giatrós/physician

medical branch that treats child:  
development, care, disease treatment



In the USA:  
13.4 million readers  
57,695 pediatricians  
2,100 nominated  
7 chosen  
1 is our Dr. B

You're one of our  
favorite pediatricians and  
*Parents* magazine's, too!

Pilar Bradshaw, M.D., F.A.A.P.



Dr. Deanna St. Germain, DO  
Medical Director  
Kids' **FIRST**



**Change Their World and it Will Change Yours!**










PROVIDING INTERVENTION AND ADVOCACY FOR CHILDREN  
WHO ARE VICTIMS OF OR WITNESSES TO CRIME

<https://kidsfirstcenter.net/>

# VARIABLE

# NEONATE

# ADULT

WT (lb)	7 <i>&lt; 6.0 premature</i>	♀ 110 ♂ 150
WT (lb, range)	4.5  11	wide variation
HR (b/min)	130 	~2 x 70
RR (breaths/min)	40 	3 x 12-15
BV (mL)	! 16.7 x 300 	$\frac{1}{17}$ x 5000
CO/ $\dot{Q}$ (mL/min)	100 x 50 	$\frac{1}{100}$ x 5000
BP (mm Hg)	70/50 	?? x 120/80
BMR (relative)	2x Adult	 1
FLUID $\Delta$ (relative)	 7x Adult	 1

**H<sub>2</sub>O Homeostasis!**

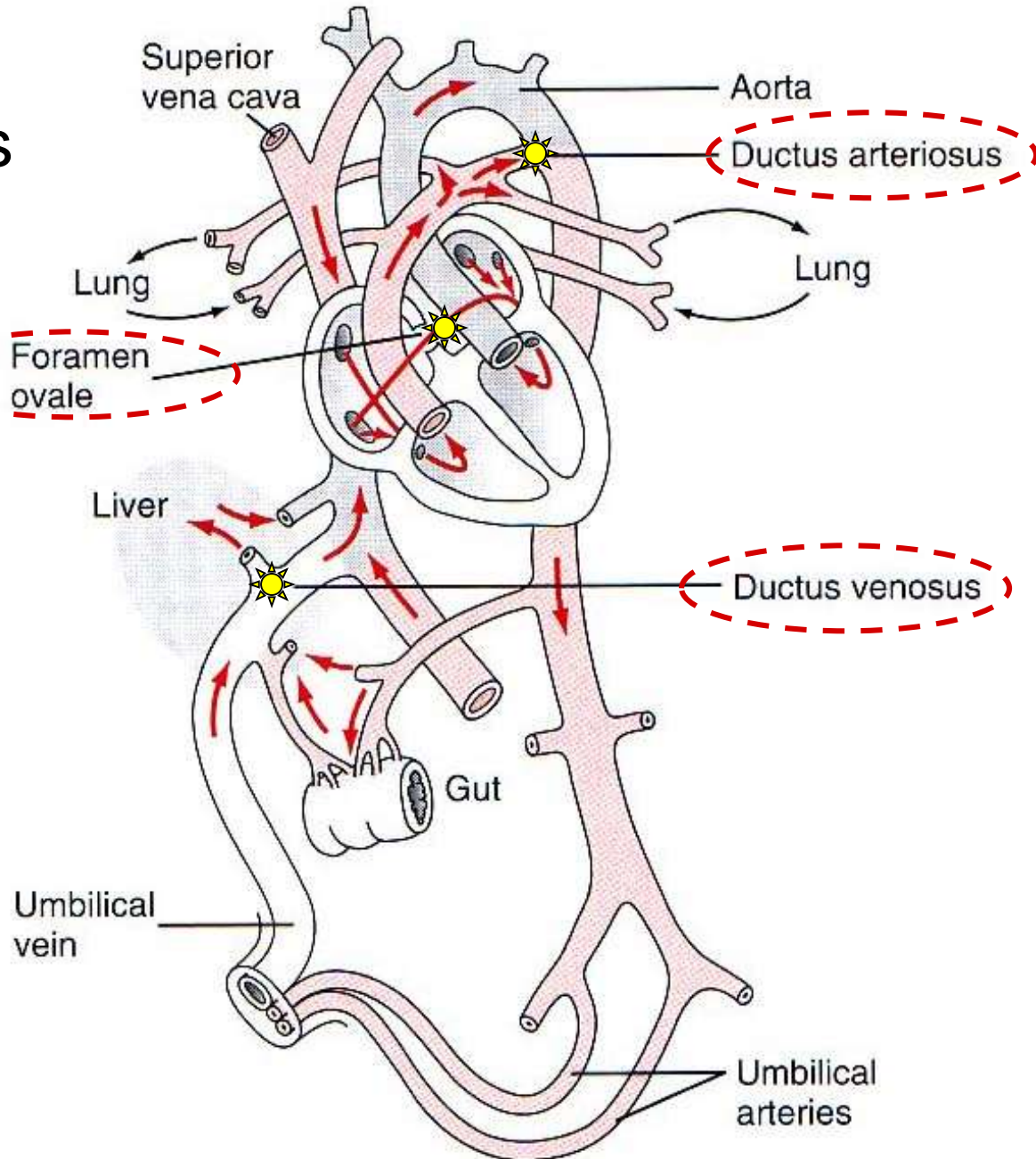


# *Fetal Circulation: Aqua Animal!*

① Ductus Arteriosus

② Foramen Ovale

③ Ductus Venosus





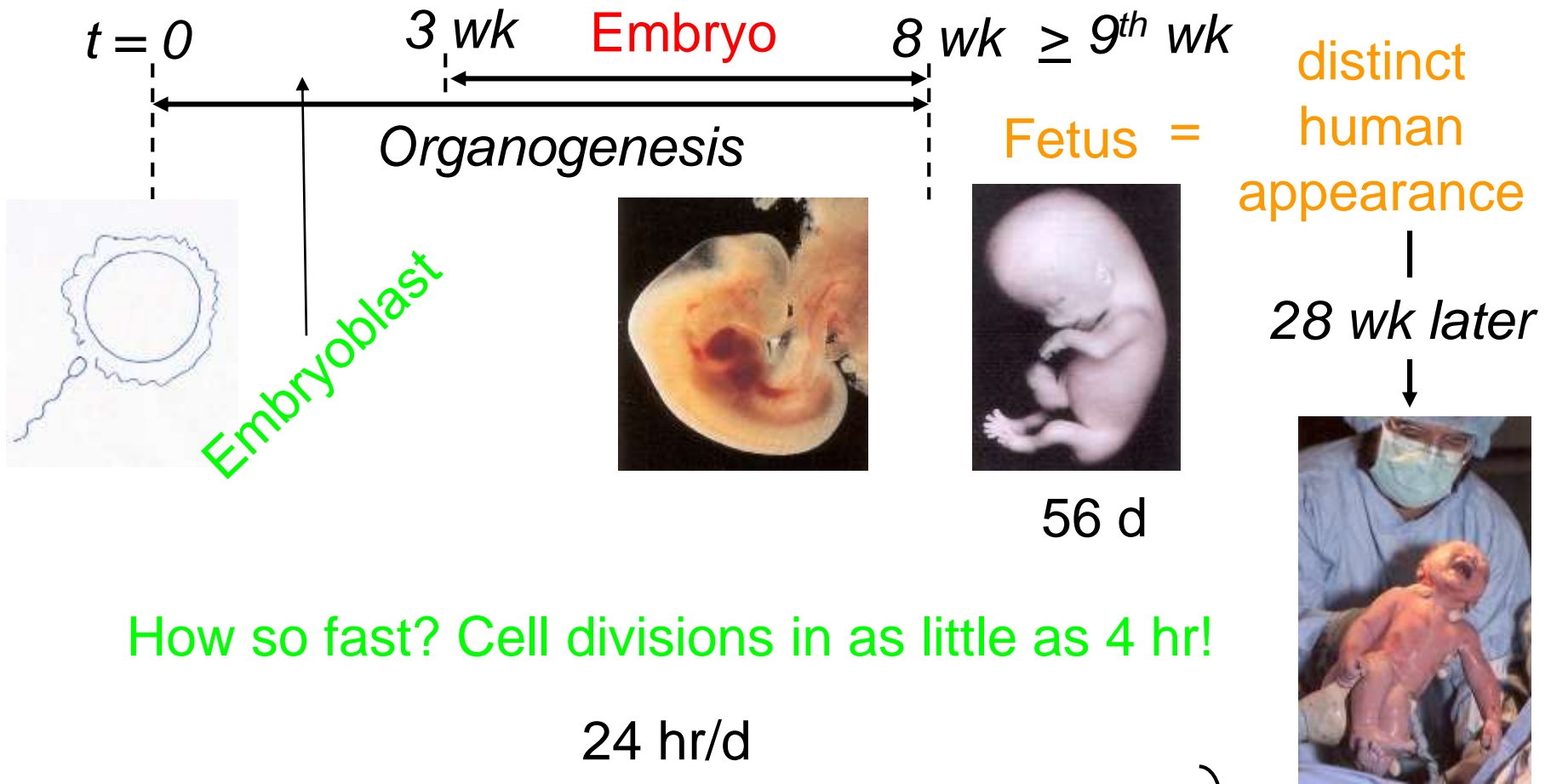
5 wk

RV Johnson (RVJ)  
1994 Mayo Clinic p A2





6 wk



How so fast? Cell divisions in as little as 4 hr!

	24 hr/d						
	0	4	8	12	16	20	24
Cells	1	2	4	8	16	32	64
	$2^0$	$2^1$	$2^2$	$2^3$	$2^4$	$2^5$	$2^6$

} ...100 trillion!  
 Baby  
 ~38-40 wk



Embryo?  
Fetus?  
Baby?



TW Sadler 2004  
Langman's  
Essential  
Medical  
Embryology

9 wk

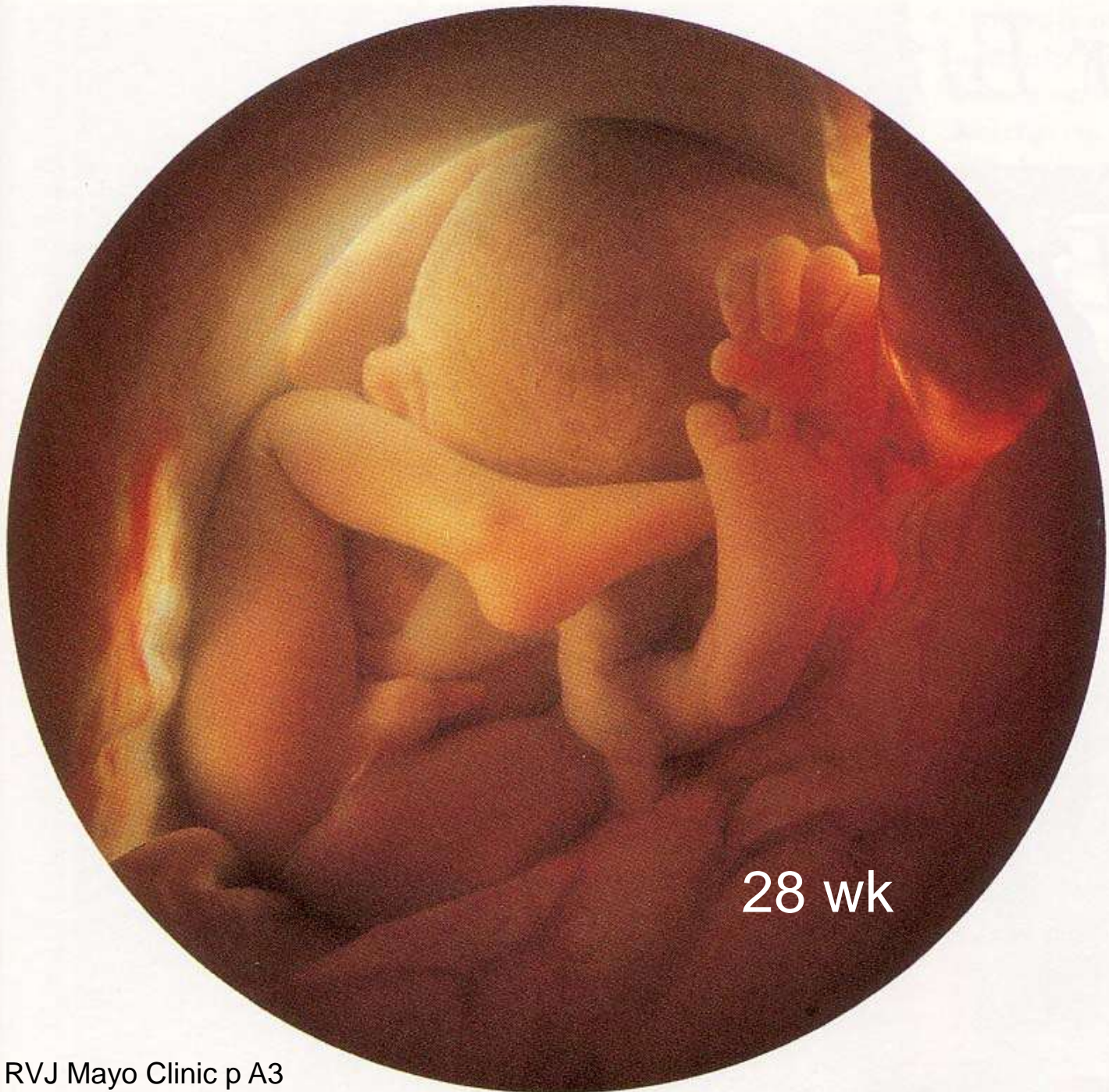




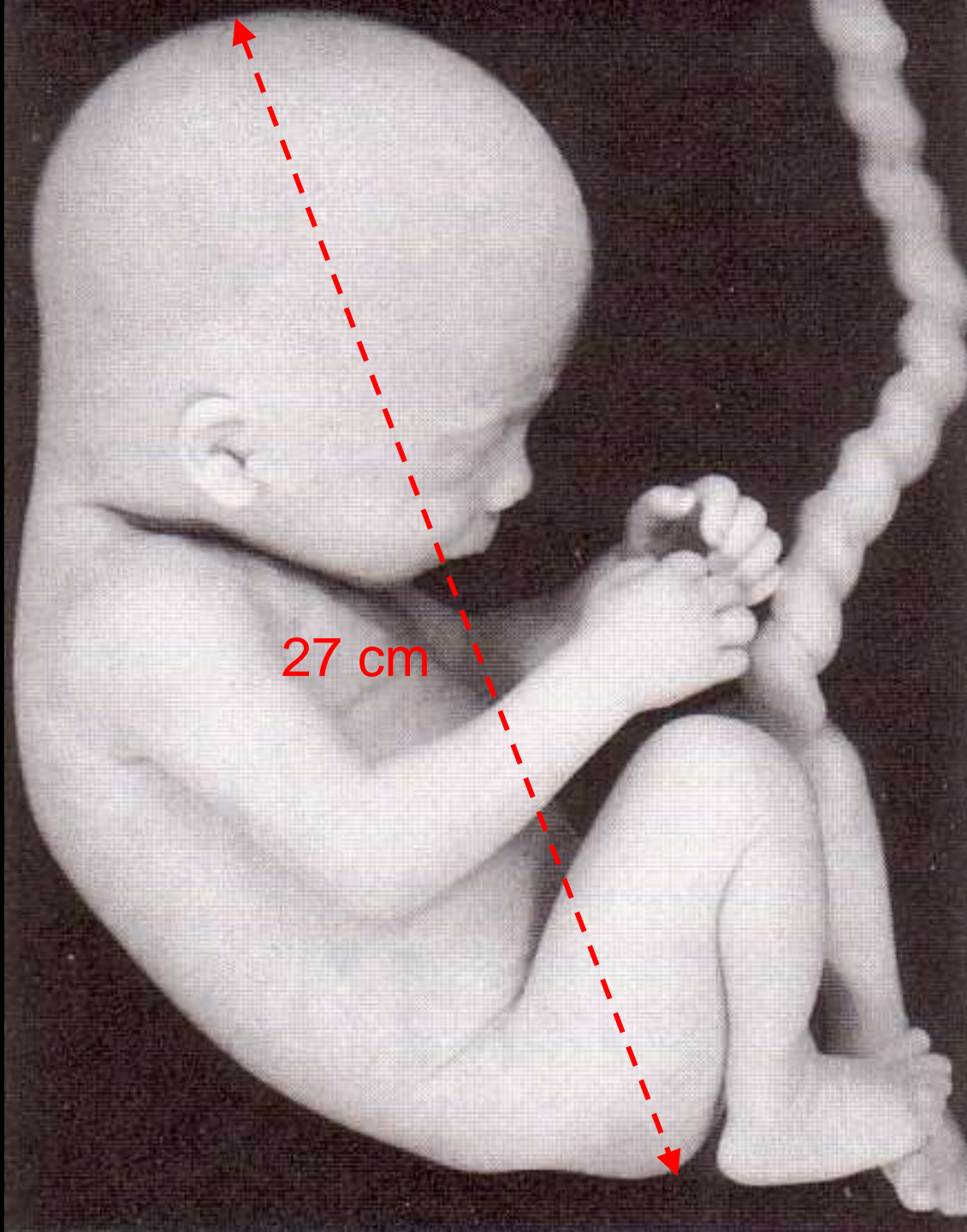
17 wk







28 wk



Fetus @ 28 wk  
or 7 mo  
1100 g (1.1 kg)  
≈ 2.5 lb

27 cm



# *As a Pregnant Female –*

## *Where you'll gain the weight*

Your baby	6½ to 9 pounds
Placenta	1½ pounds
Amniotic fluid	2 pounds
Breast enlargement	1 to 3 pounds
Uterus enlargement	2 pounds
Fat stores and muscle development	4 to 8 pounds
Increased blood volume	3 to 4 pounds
Increased fluid volume	2 to 3 pounds

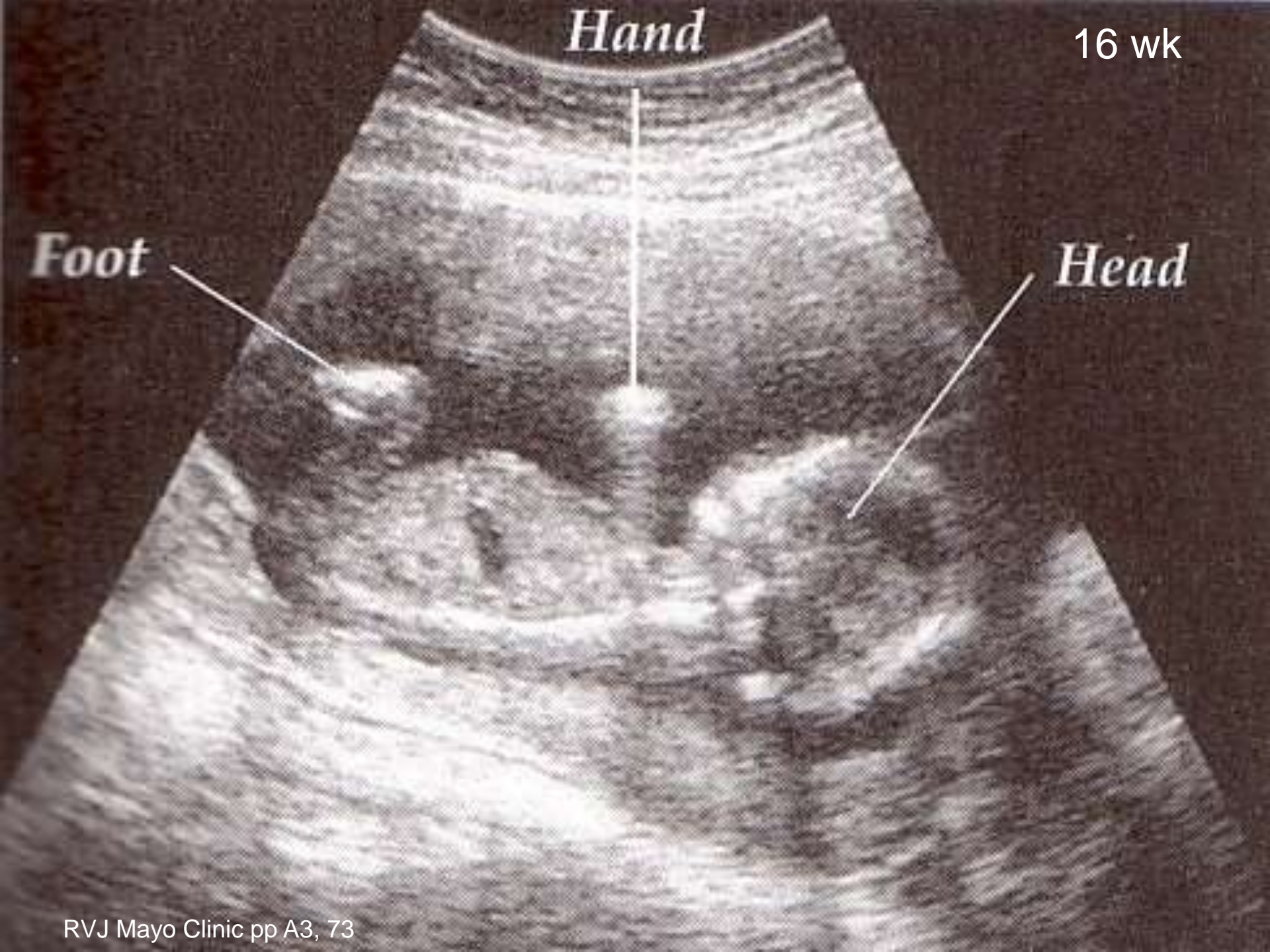
**Total** 22 to 32½ pounds

*Hand*

16 wk

*Foot*

*Head*





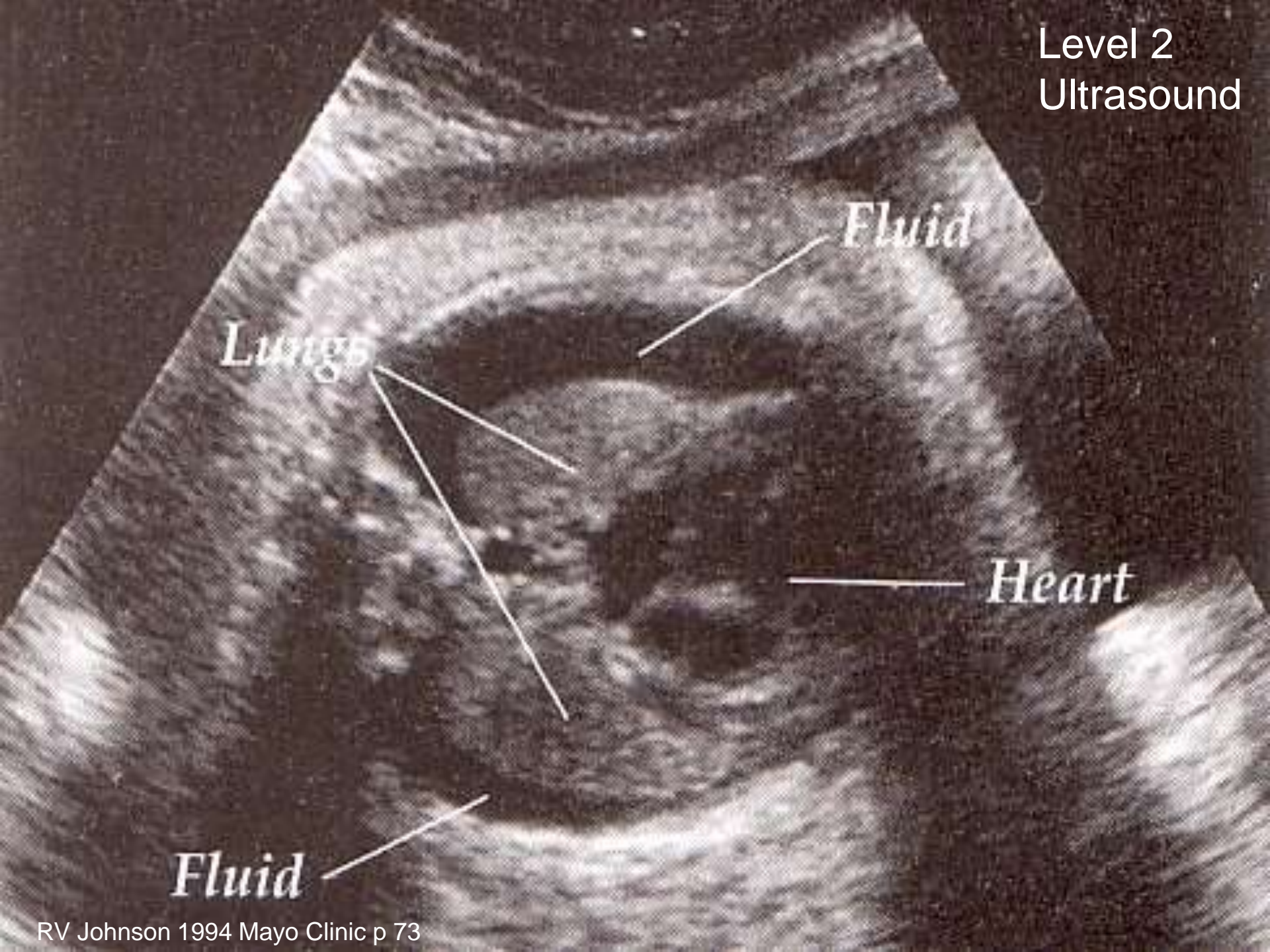
Surprise!

*Head*

*Head*



Level 2  
Ultrasound



Lungs

Fluid

Heart

Fluid

## *What are my chances of having a child with a birth defect?     $\leq 5\%$*

Of every 100 babies born in the United States, 95 to 97 are born healthy (no major medical or surgical intervention is necessary). According to the March of Dimes Birth Defects Foundation:

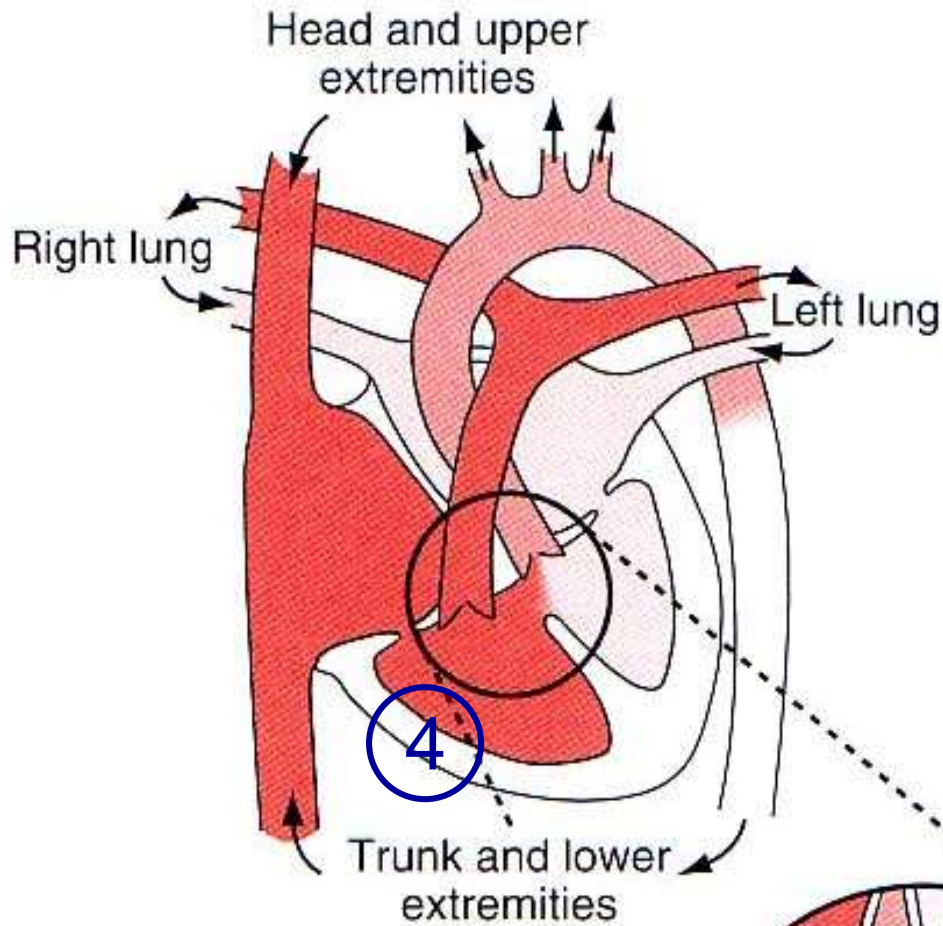
- One of every 175 is born with a congenital heart defect.
- One of every 400 is born with clubfoot.
- One of every 700 is born with cleft lip and palate.
- One of every 800 is born with Down syndrome.
- One of every 2,000 is born with spina bifida.

To put this list into perspective, consider the following:

- The odds of having twins are about one in 100.
- The odds of having triplets are about one in 8,000.

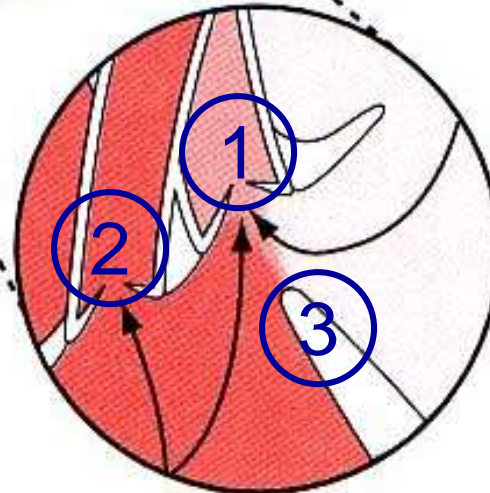


# Tetralogy of Fallot



- ① Aorta Displacement
- ② Pulmonary Stenosis
- ③ Ventricular Septal Defect
- ④ R Ventricular Hypertrophy

f = 3.3 per 10,000 live births  
15% TOF 22q11 deletion  
7% TOF trisomy 21  
≥ 4% TOF NKX2.5 mutation





## *Chromosome abnormalities: What are your risks?*

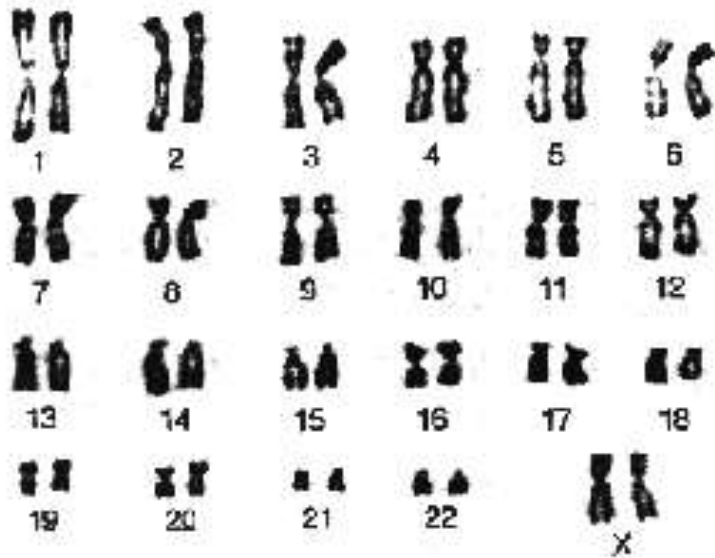
Age	Risk for Down syndrome	Total risk for clinically significant chromosome abnormalities
20	1/1,667	1/526
21	1/1,667	1/526
22	1/1,429	1/500
23	1/1,429	1/500
24	1/1,250	1/476
<b>25</b>	<b>1/1,250</b>	<b>1/476</b>
26	1/1,176	1/476
27	1/1,111	1/455
28	1/1,053	1/435
29	1/1,000	1/417
30	1/952	1/385
31	1/909	1/385
32	1/769	1/322
33	1/602	1/286
34	1/485	1/238
<b>35</b>	<b>1/378</b>	<b>1/192</b>
36	1/289	1/156
37	1/224	1/127
38	1/173	1/102
39	1/136	1/83
40	1/106	1/66
41	1/82	1/53
42	1/63	1/42
43	1/49	1/33
44	1/38	1/26
<b>45</b>	<b>1/30</b>	<b>1/21</b>

Implications relative to Dr. Kaplan's lecture & delaying pregnancy!

# 95% of Down Syndrome Trisomy 21 90% of Cases → Eggs Are Abnormal

Normal ♀

Down Syndrome ♂



<https://ghr.nlm.nih.gov/condition/down-syndrome>

<http://www.ds-health.com/trisomy.htm>

# Quad Screen? 4 Blood Chemistry Tests

2<sup>nd</sup> trimester, neural tube defects & chromosomal abnormalities, 81% sensitivity, 5% false +

*High, neural tube defects (spina bifida)*

**AFP:** *alpha-fetoprotein*, fetal liver

*High, Down syndrome (Trisomy 21)*

**hCG:** *human chorionic gonadotropin*, placenta

*Low, Edward's syndrome (Trisomy 18)*

**Estriol:** placenta + fetal liver

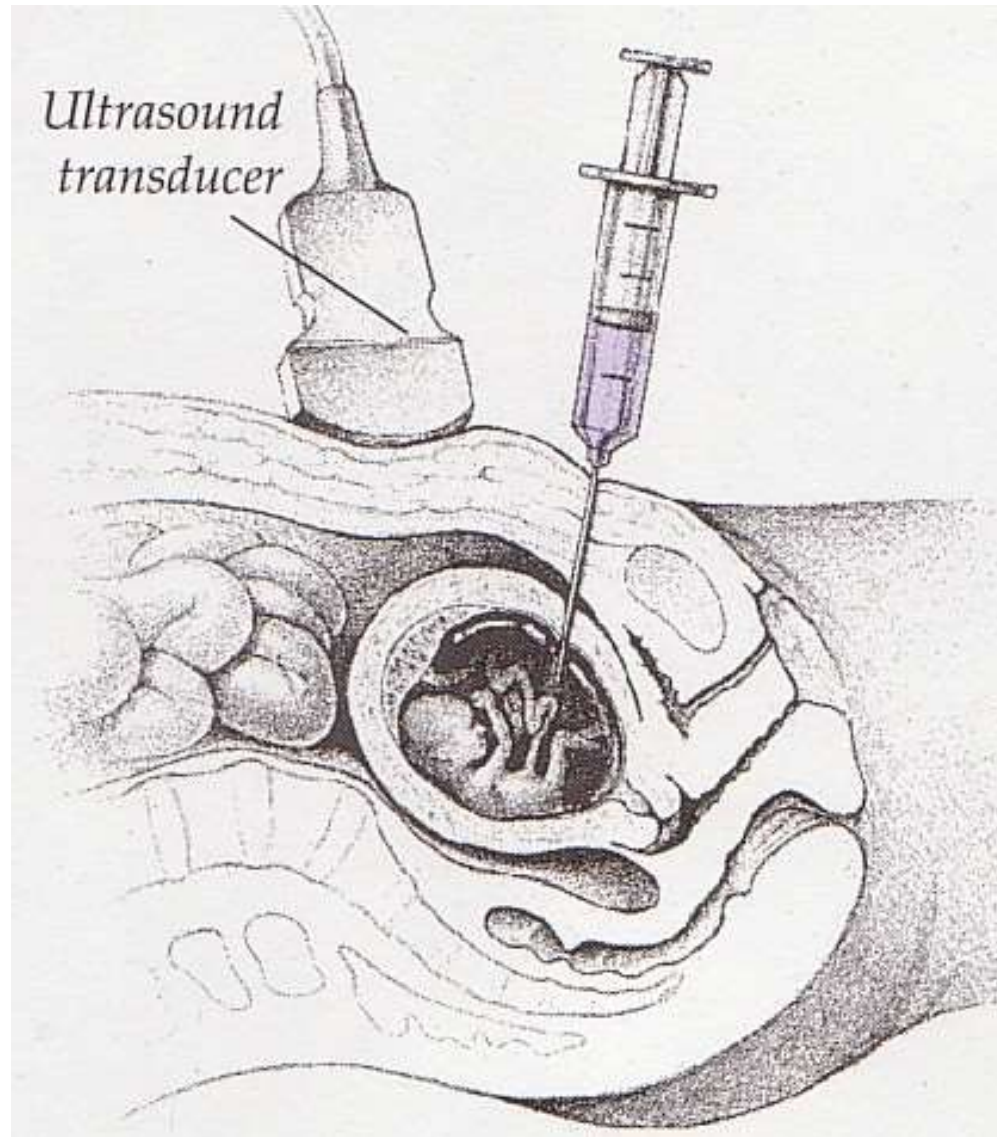
**Inhibin-A:** placenta + ovaries

<http://www.mayoclinic.com/health/quad-screen/MY00127>

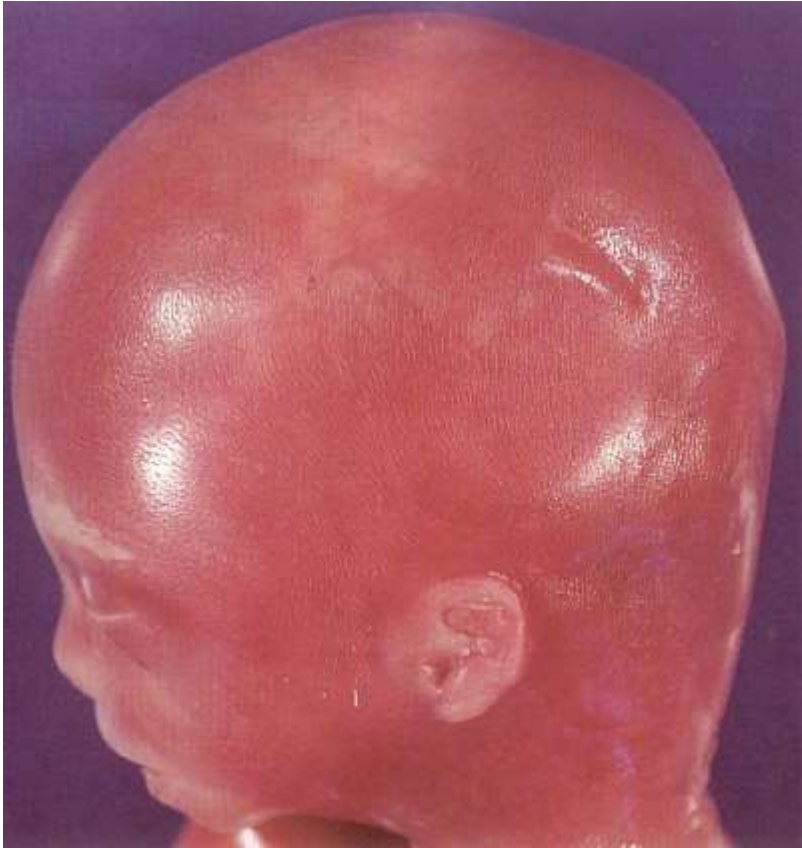
<http://www.americanpregnancy.org/prenataltesting/quadscreen.html>



# *Amniocentesis or Chorionic Villus Sampling?*



# ***Down Syndrome Fetus***



***NB:*** 1:1400 incidence for maternal age 20-24; 75% spontaneously aborted.  
Flat frontal facies, anomalous auricles, simian crease, clinodactyly.

***SOURCE:*** KL Moore, TVN Persaud & K Shiota (MPS)1994  
*Color Atlas of Clinical Embryology* p 109

# ***DOWN SYNDROME NEONATE***

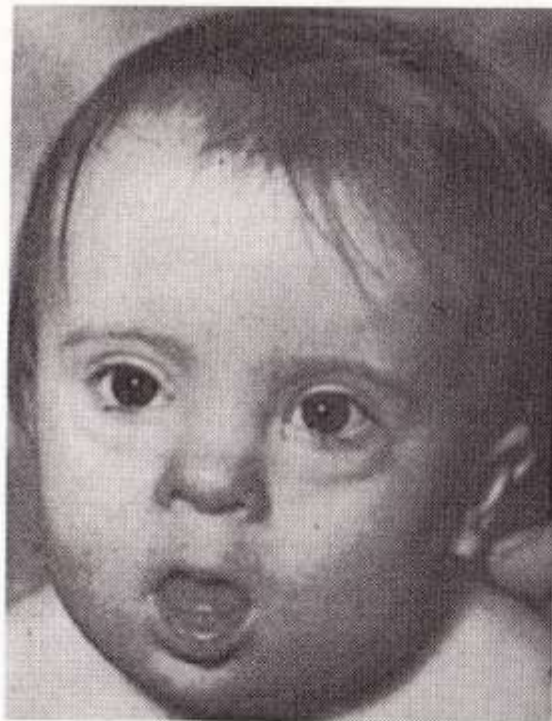
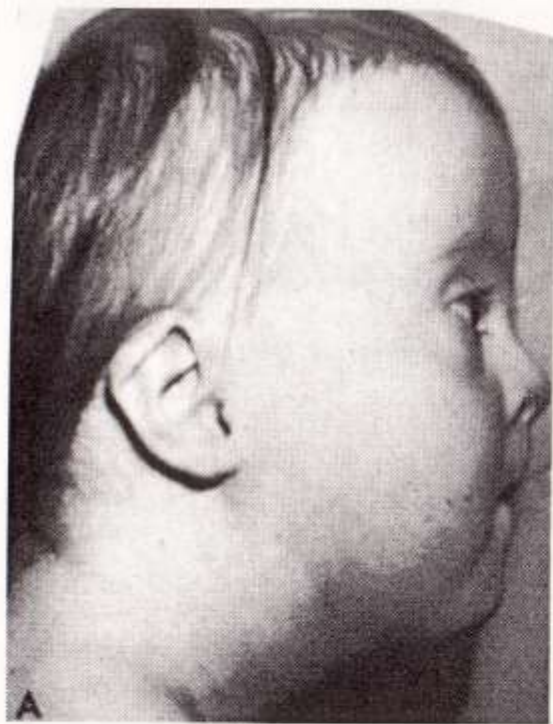
## ***10 KEY FEATURES (Hall)***

- |   |     |
|---|-----|
| 1. Facial profile flat                          | 90% |
| 2. Hypotonia                                    | 80% |
| 3. Poor Moro reflex                             | 85% |
| 4. Joint hyperflexibility                       | 80% |
| 5. Skin excess nape of neck                     | 80% |
| 6. Palpebral fissures slanted                   | 80% |
| 7. Pelvic dysplasia                             | 70% |
| 8. 5 <sup>th</sup> finger mid-phalynx dysplasia | 60% |
| 9. Auricles anomalous                           | 60% |
| 10. Simian crease                               | 45% |



# ***Dizygotic Twins Discordant for Down Syndrome***



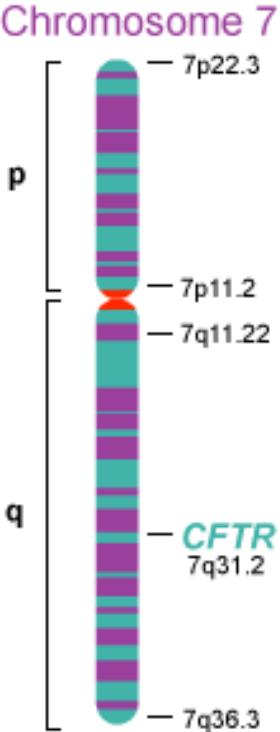
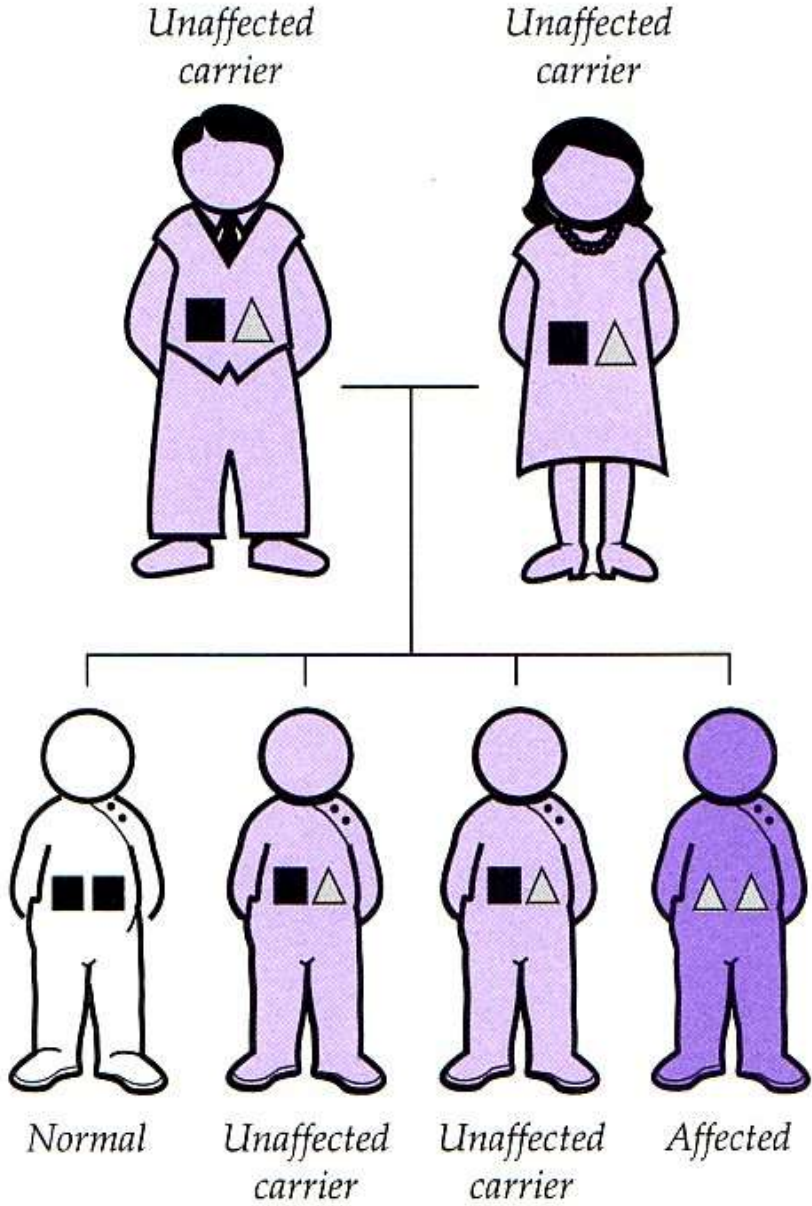


**FIGURE 2.** Down syndrome. *A*, Young infant. Flat facies, straight hair; protrusion of tongue; single crease on inturned fifth finger.



# Recessive Disorders eg, Cystic Fibrosis

RVJ, Mayo Clinic p 61.



f = 4 in 10,000 live births  
CFTR gene, 7q31.2  
long arm chromosome 7

<http://ghr.nlm.nih.gov/gene/CFTR>

[http://www.mja.com.au/public/issues/183\\_10\\_211105/mas10561\\_fm.html](http://www.mja.com.au/public/issues/183_10_211105/mas10561_fm.html)



# Most Common Position. Ideal!!



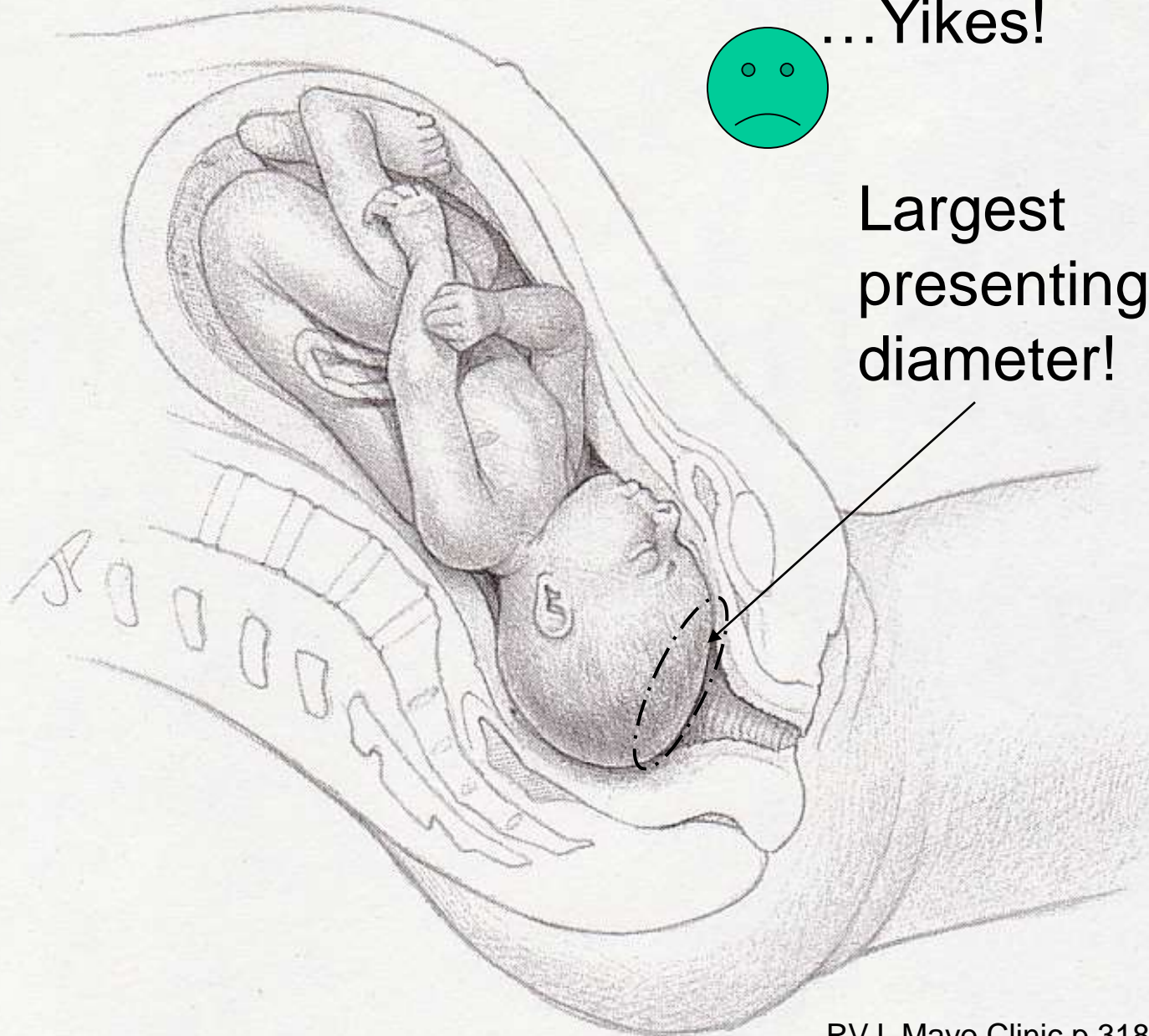
RVJ, Mayo Clinic p 317.

cf: G&H 2016 fig 83-9  
G&H 2011 fig 82-9

Occiput Posterior/Sunnyside up! Oh No!  
...Yikes!



Largest  
presenting  
diameter!



Breech!  
eg, Frank





Transverse!



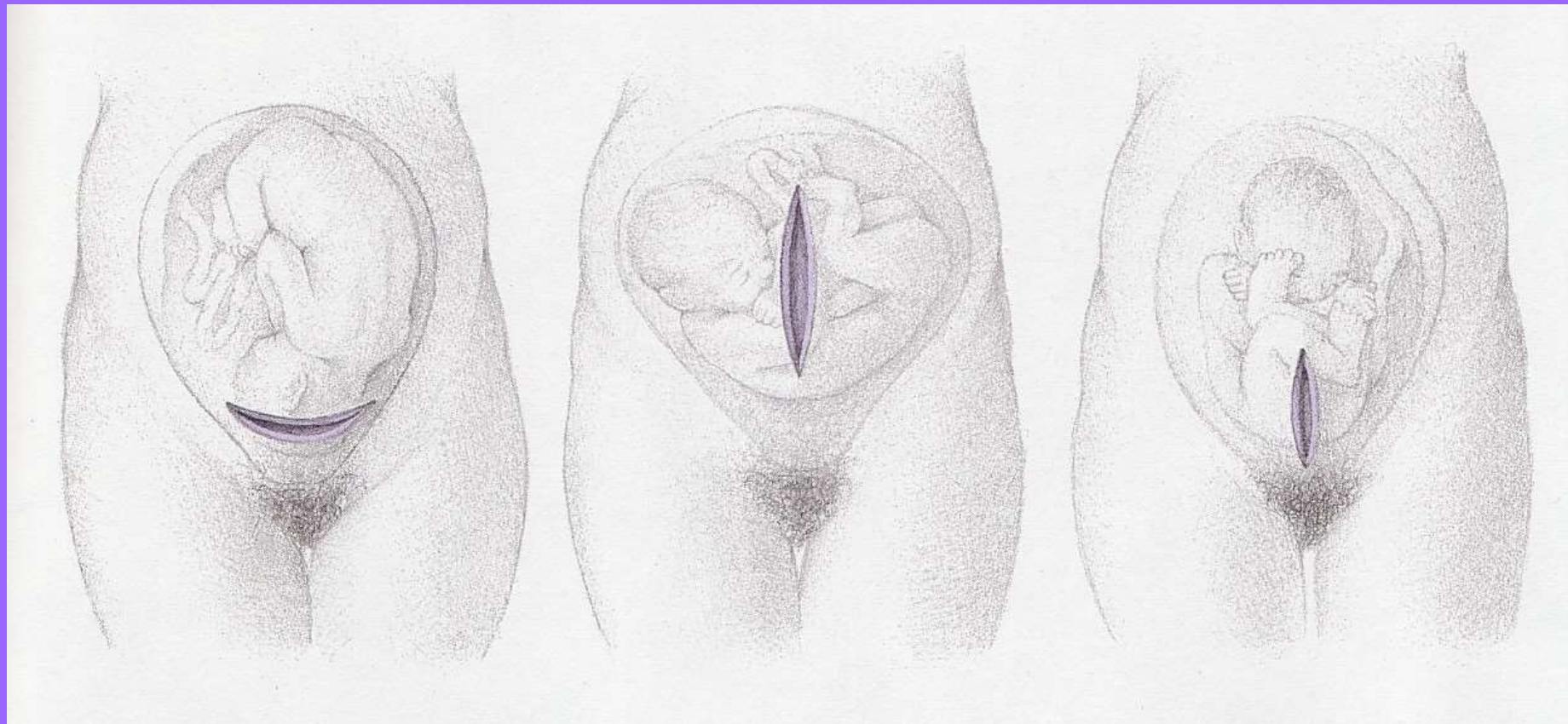
Experienced  
Midwives &  
OB-GYN MD  
may be able to  
massage into  
position?

*A baby who is positioned horizontally across the uterus, rather than vertically, is in a transverse lie position. Most babies in this position have a cesarean birth.*

Low Transverse

Classic

Low Vertical







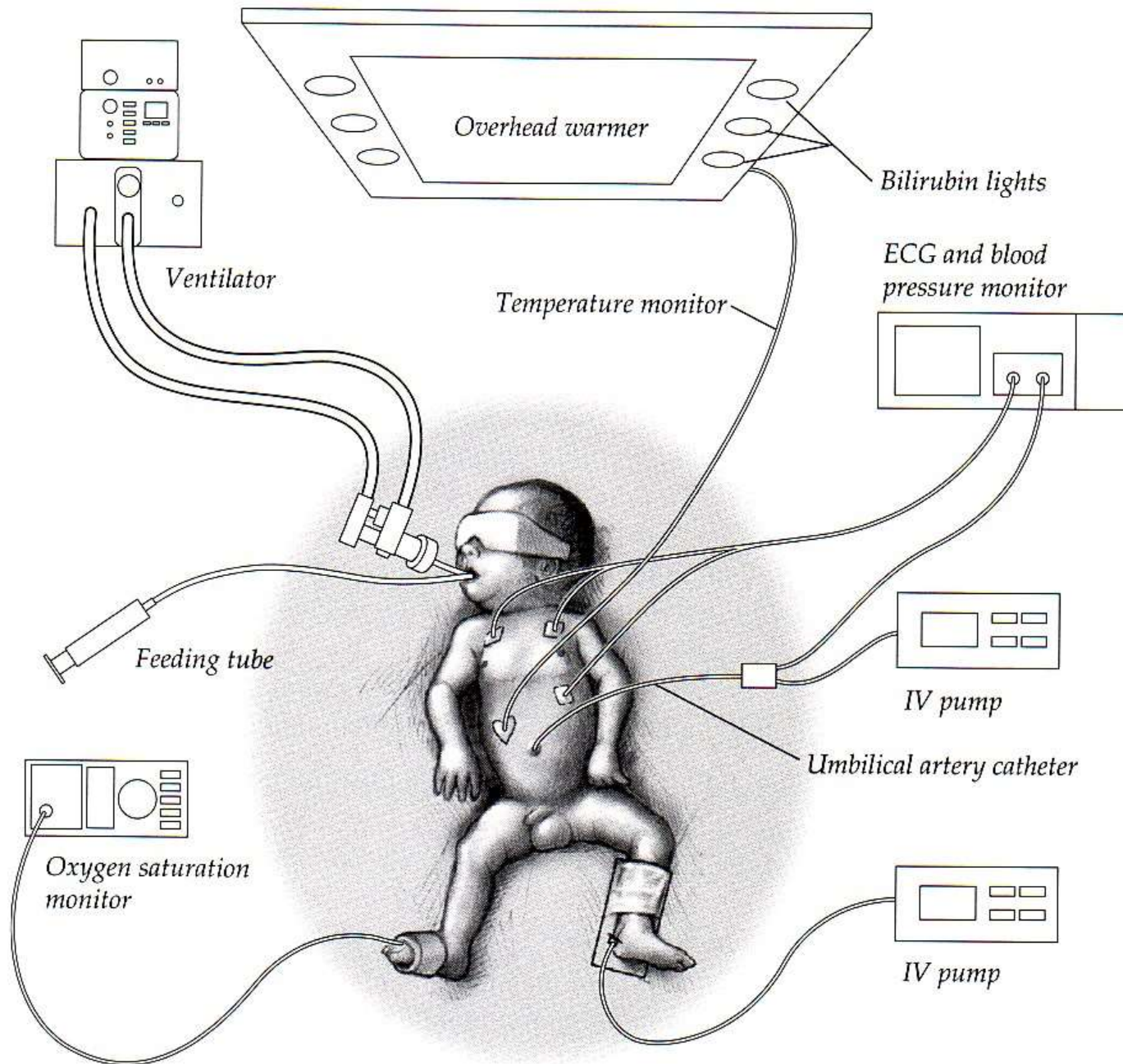
Baby @ birth  
38 wk or 266 d  
> conception!  
3200 g (3.2 kg)  
≈ 7 lb



## Apgar Scores: How Healthy Is Your Newborn?

Sign	Points		
	0	1	2
Appearance (color)	Pale or blue	Body pink, extremities blue	Pink
Pulse (heartbeat)	Not detectable	Below 100	Above 100
Grimace (reflex irritability)	No response to stimulation	Grimace	Lusty cry, cough or sneeze
Activity (muscle tone)	Flaccid (no or weak activity)	Some movement of extremities	Active motion
Respiration	None	Slow, irregular	Good, crying

Scores determined for each sign are totaled. The highest possible score is 10. By 5 minutes of age, most healthy babies have scores of at least 7. A score less than that indicates that the baby warrants careful watching.



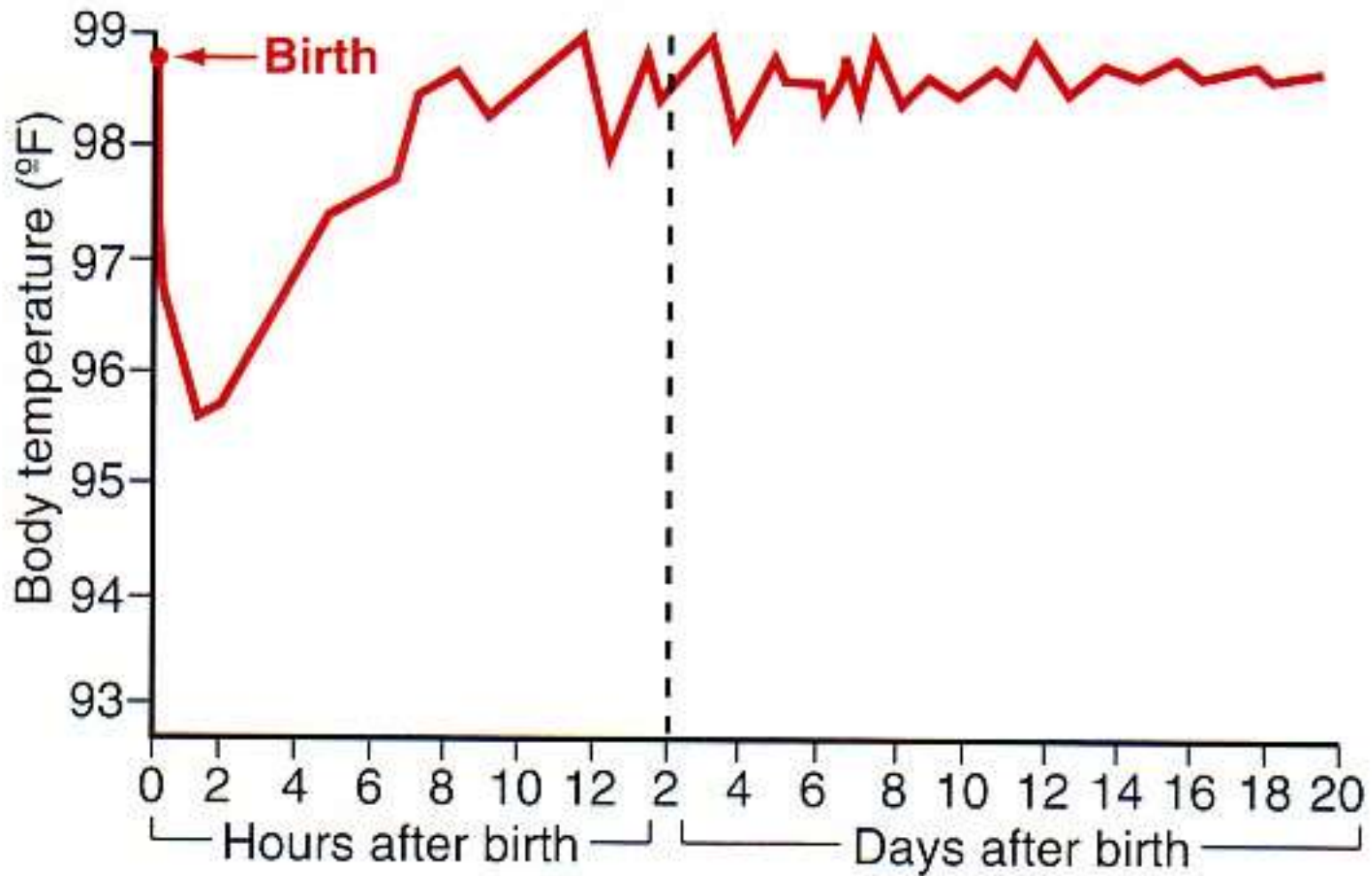


♀ 1 lb 15 oz







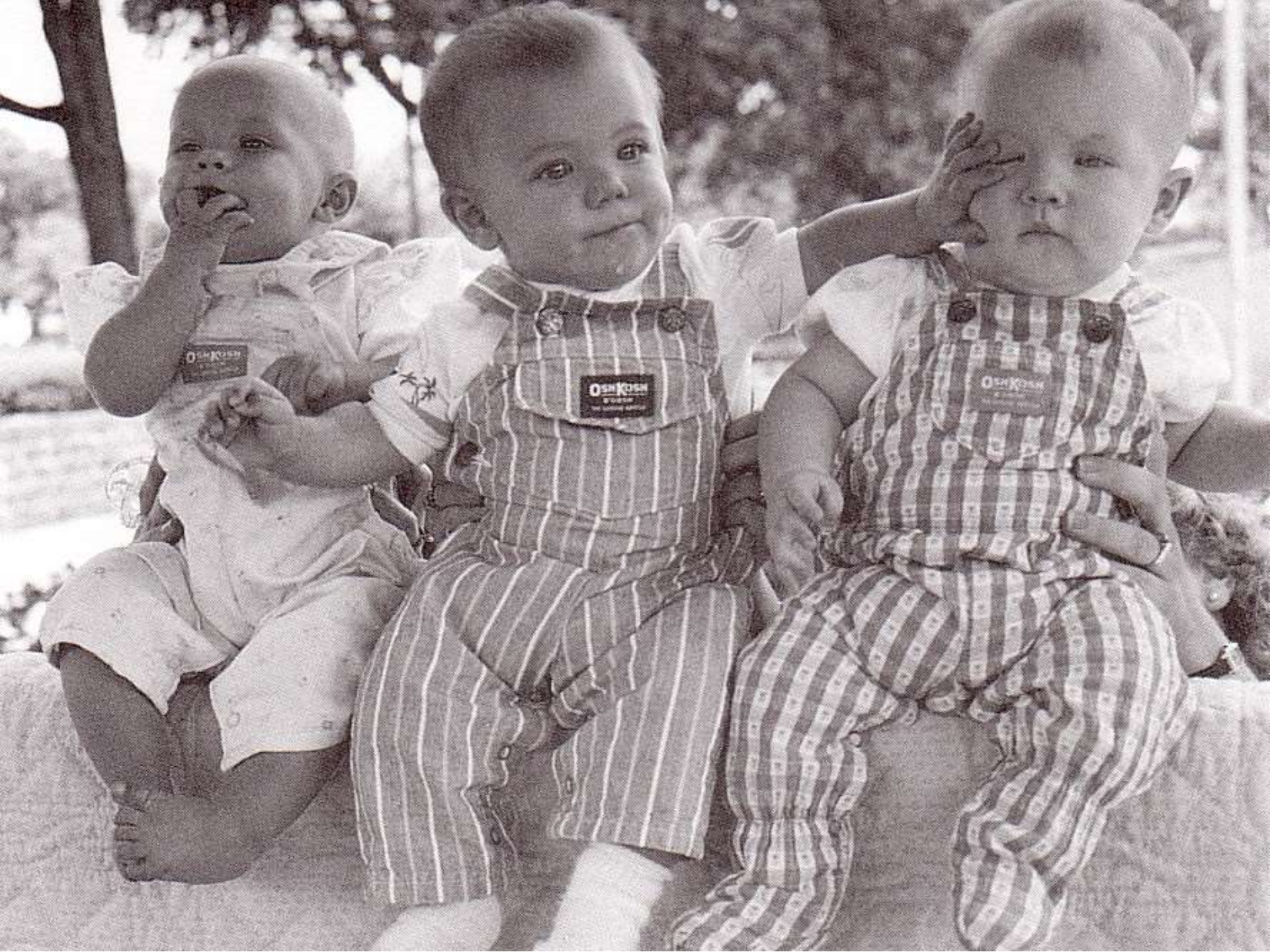


**FIGURE 83 - 7**

Fall in body temperature of the neonate immediately after birth, and instability of body temperature during the first few days of life.

G&H 2016 fig 84-7  
 G&H 2011 fig 83-7









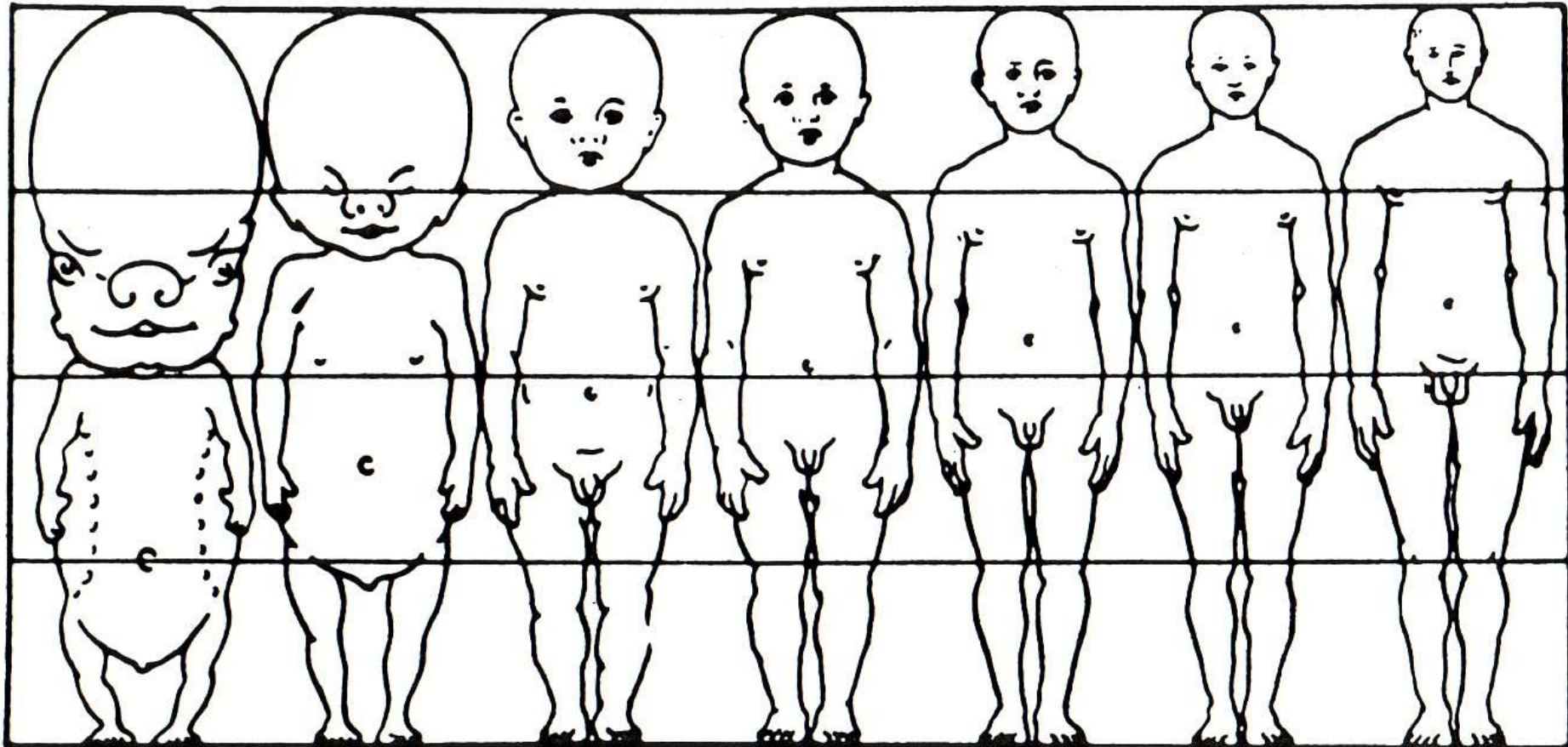
Behavioral development of the infant during the first year of life.







# *Cephalic to Caudal Development*



2 mo. (fetal)

5 mo.

Newborn

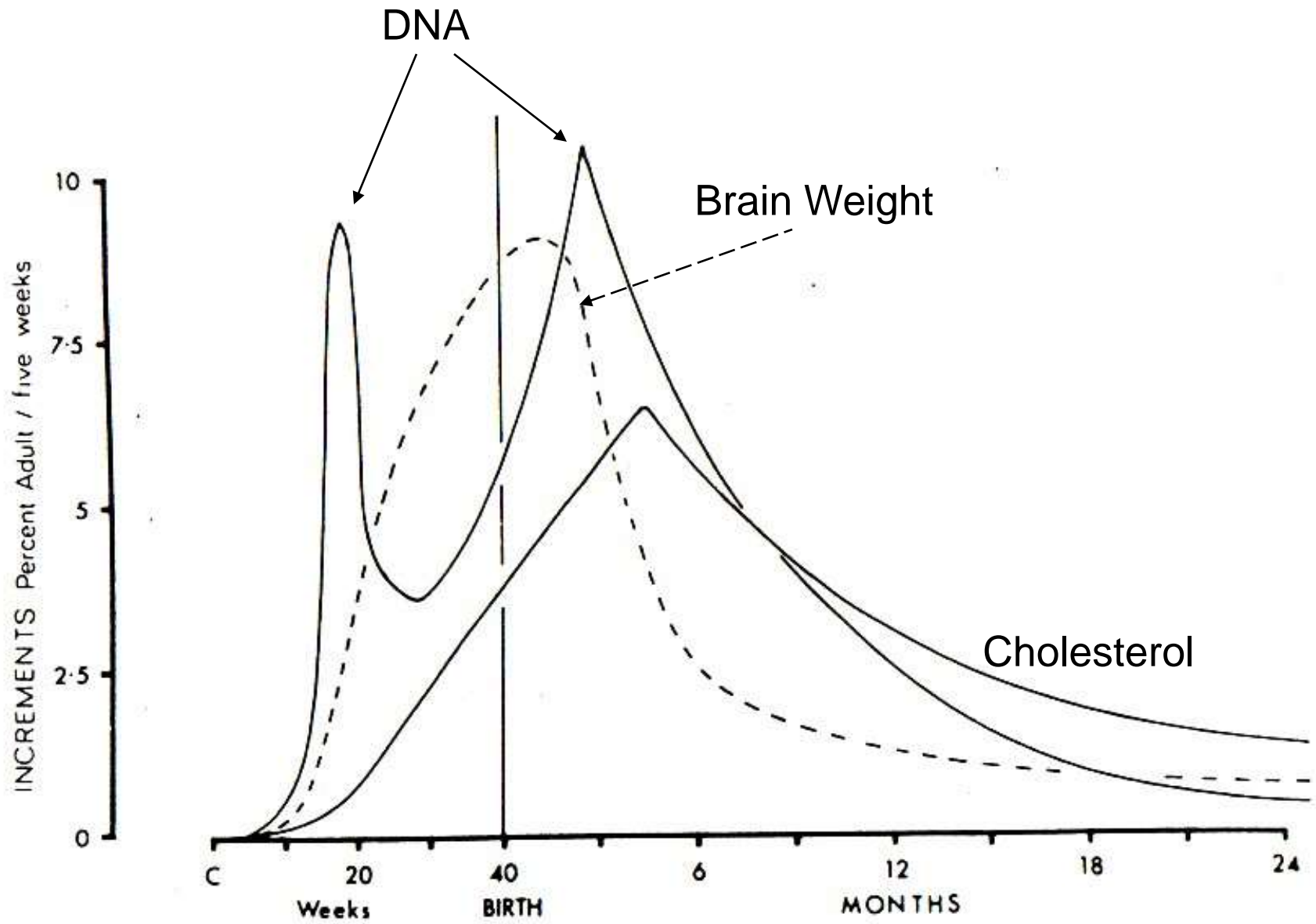
2 yr.

6 yr.

12 yr.

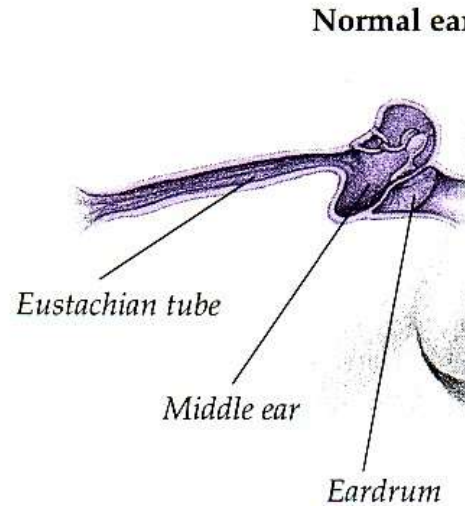
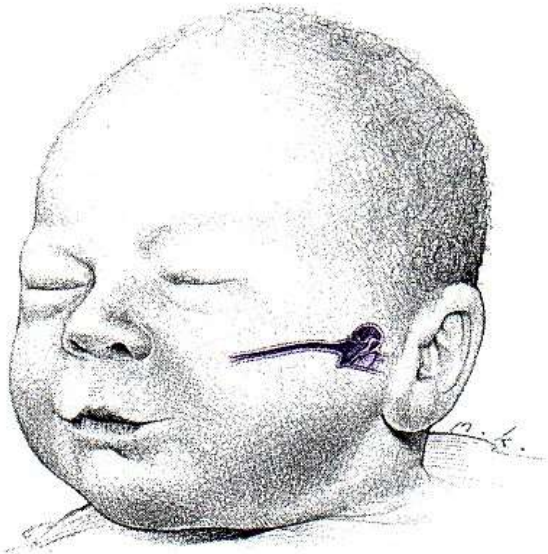
25 yr.





# Infant Eustachian tube smaller + more horizontal!

*An infant's ear is different from an adult's ear because the eustachian tube is more horizontally positioned. Because of this, drainage from the middle ear occurs less easily, and your baby is at greater risk for an ear infection (otitis media). This condition occurs when the eustachian tube becomes blocked and fluid is trapped. It is marked by swelling and discoloration of the eardrum.*



**Normal**

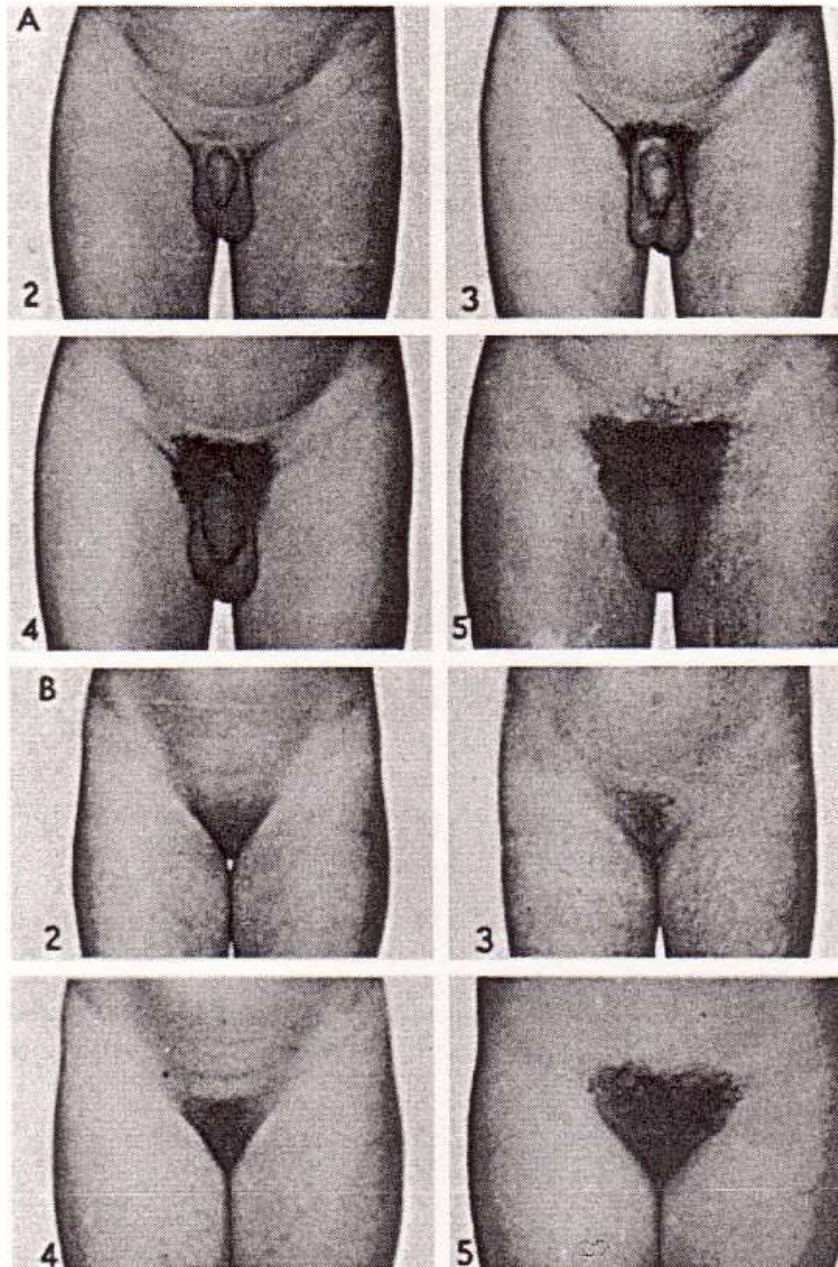
- Fluid-filled middle ear
- Bulging eardrum
- Swelling and inflammation



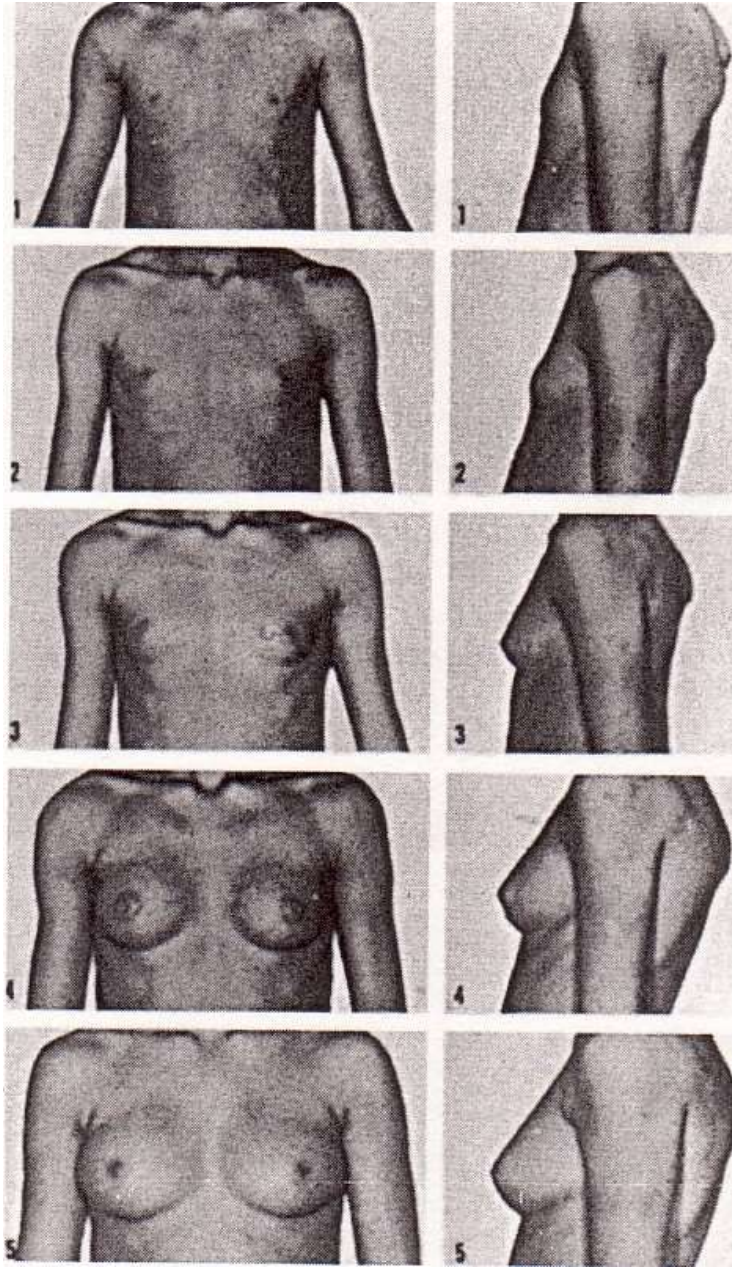
**Infected**



# Tanner Stages of Development



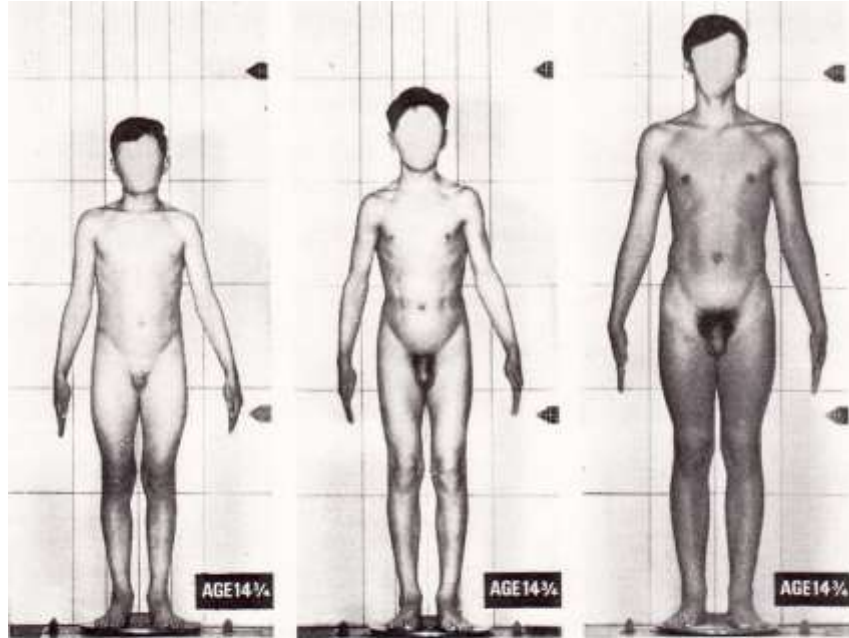
# Tanner Stages for Breast Development



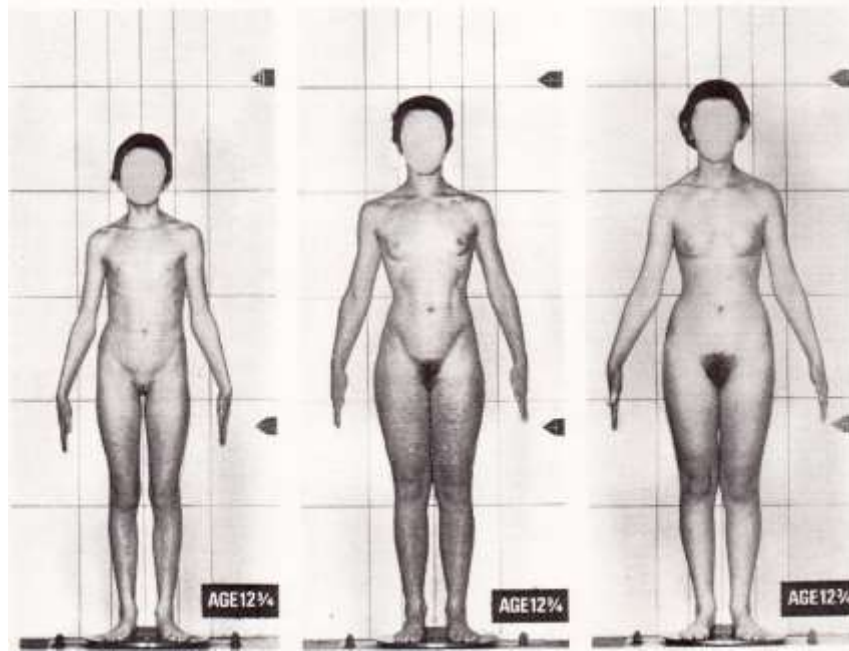




# Tanner Stages? What are the Ages?



All 14  $\frac{3}{4}$  yr!!



All 12  $\frac{3}{4}$  yr!!