BI 358 Lecture 16

...Dr. Bradshaw, Pediatrics next session! Hooray!!

Today!

I. ***Announcements*** ***Quiz 5*** **first 15-20 min. Q? Presentations Group III next T immediately > Dr. Bradshaw's lecture. Reminder about *.ppt/.pptx* & guest lecturer feedback. Q?**

II. ***Dedication to Dr. Allen Harlor & Family***

III. ***Medical Physiol News*** **Dr. Cirullo connection: Drinking on pounds? + Volumetrics?** ***Nutrition Action Health*** **Mar 2012**

IV. ***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%x 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) +...

Dedicated to the Memory of Dr. Allen D. Harlor

March 23, 1936 to February 4, 2013

THE AMERICAN ACADEMY OF PEDIATRICS ®

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Pediatrician Extraordinaire, Loving Father, Avid Skier & BI 358 Medical Physiology Guest Lecturer!

http://www.musgroves.com/obituary.cfm?name=Dr.%20Allen%20Harlor%20Jr.

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Don't Be Dense

Trim calories per bite to trim pounds

Typical dinner

Volumetrics dinner

5 times per wk? ≡ 106,600 calories/yr ≡ ± 30.5 lb fat/yr

=

Starbucks Cinnamon Dolce Latte, whipped cream *Venti (20 oz.)*	410 calories

Jogging	50 min.

Neonate = “newly born,”

newborn infant

1st 4 wk > birth

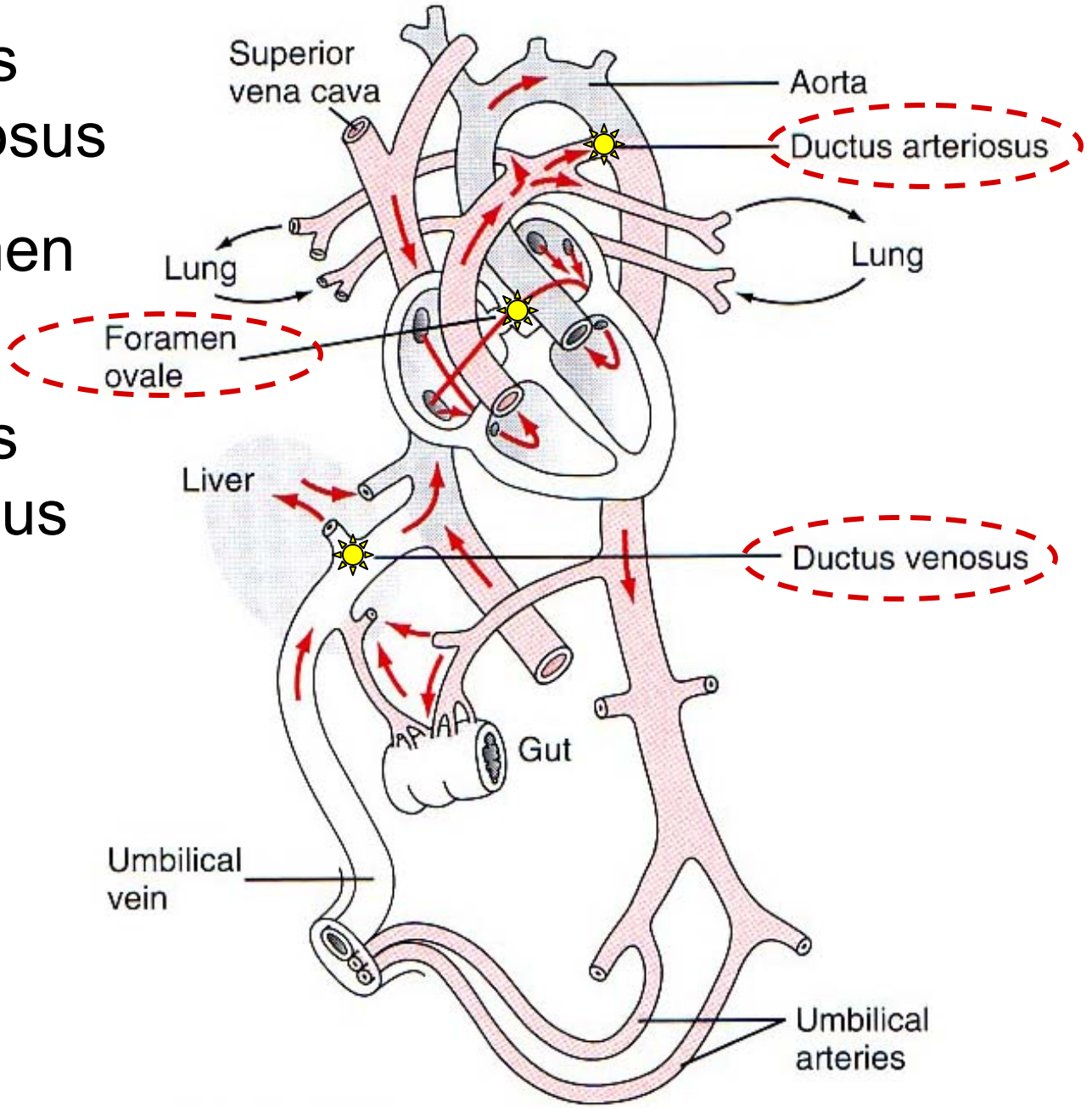
Pediatrics = Gr. paidos, “child”; branch of medicine which treats child; development, care, treatment of diseases

VARIABLE	*NEONATE*	*ADULT*
WT (lb)	7	♀ 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)	300 ←	$\frac{1}{17}$ x 5000
CO/$\dot{Q}$ (mL/min)	50 ←	$\frac{1}{100}$ x 5000
BP (mm Hg)	70/50	120/80
BMR (relative)	2x Adult	1
FLUID Δ(relative)	7x Adult	1

H_2O Homeostasis!

Fetal Circulation: Aqua Animal!

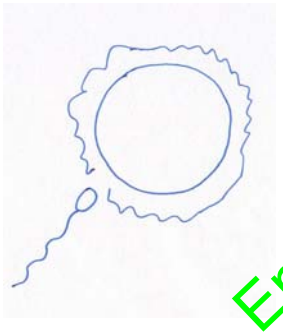
1. Ductus Arteriosus
2. Foramen Ovale
3. Ductus Venosus



G&H

RV Johnson (RVJ)
1994 Mayo Clinic p A2


6 wk
RVJ Mayo Clinic p A2



Embryoblast

t = 0 *3 wk* Embryo *8 wk* *≥ 9th wk*

Organogenesis

Fetus =

56 d

distinct human appearance

28 wk later

Baby

~38-40 wk

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

24 hr/d

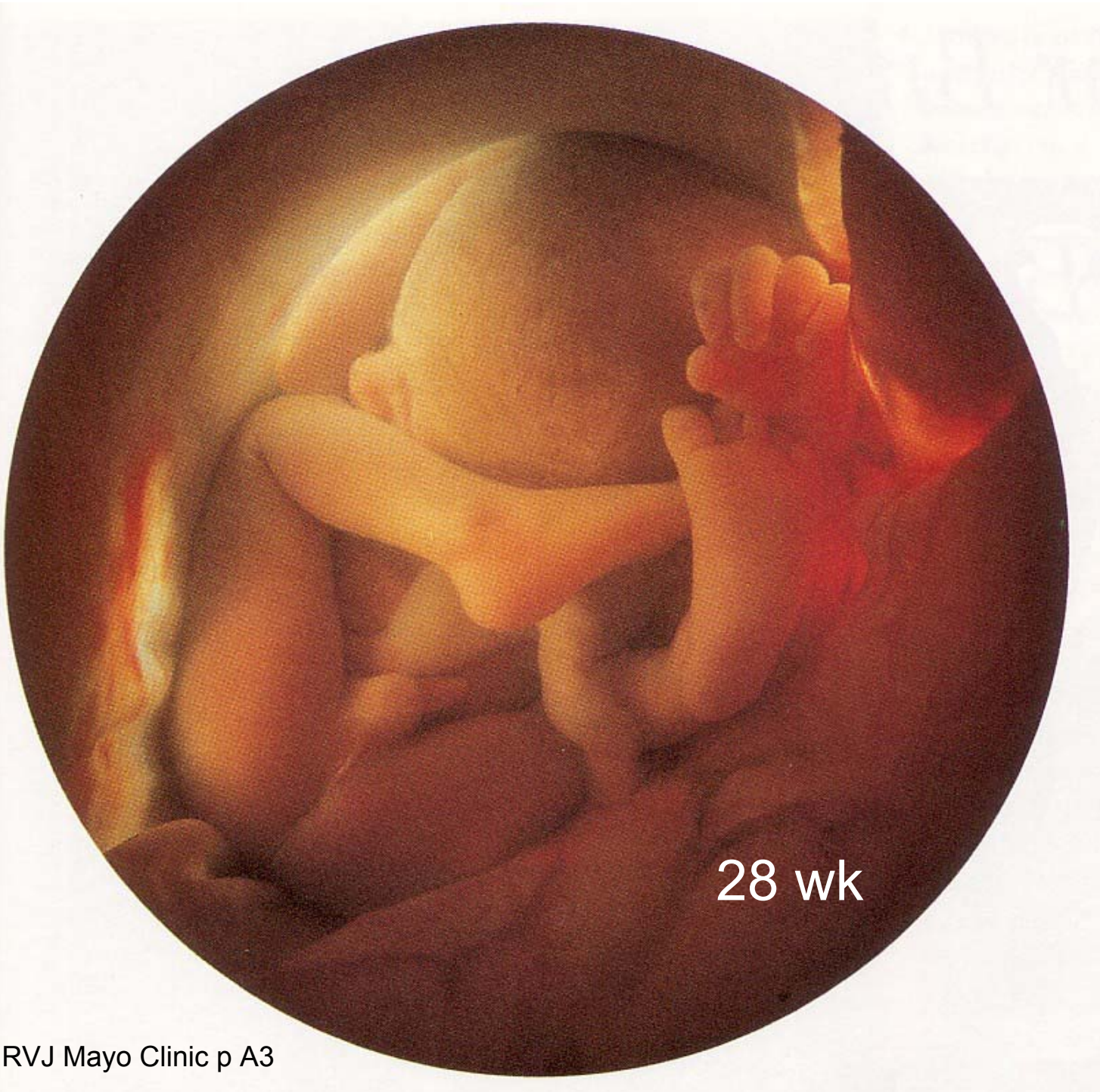
	0	4	8	12	16	20	24	
Cells	1	2	4	8	16	32	64	···100 trillion!
	2^0	2^1	2^2	2^3	2^4	2^5	2^6	

Embryo?
Fetus?
Baby?

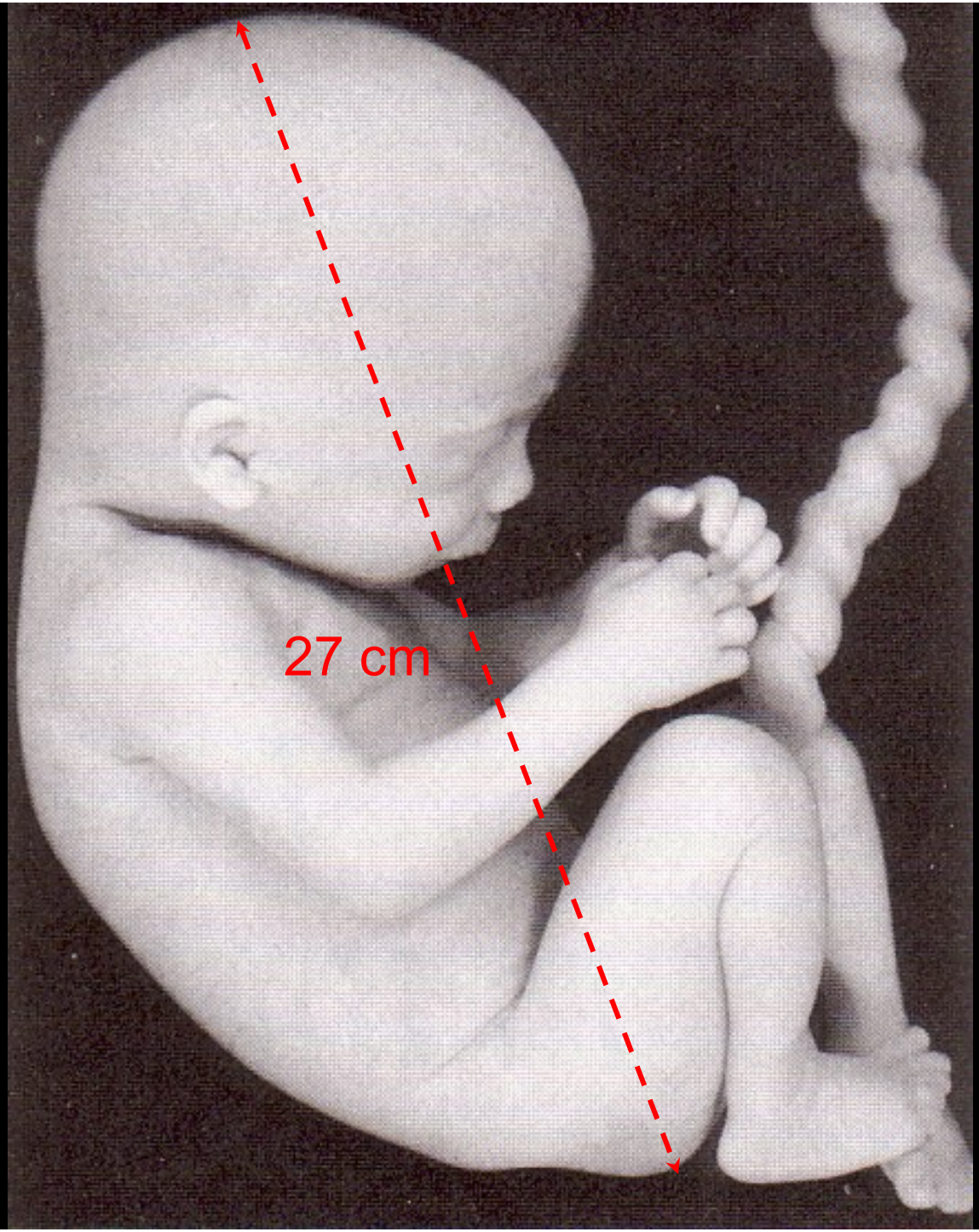
TW Sadler 2004
Langman's
Essential
Medical
Embryology


9 wk
RVJ Mayo Clinic p A2


17 wk
RVJ Mayo Clinic p A2



RVJ Mayo Clinic p A3



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

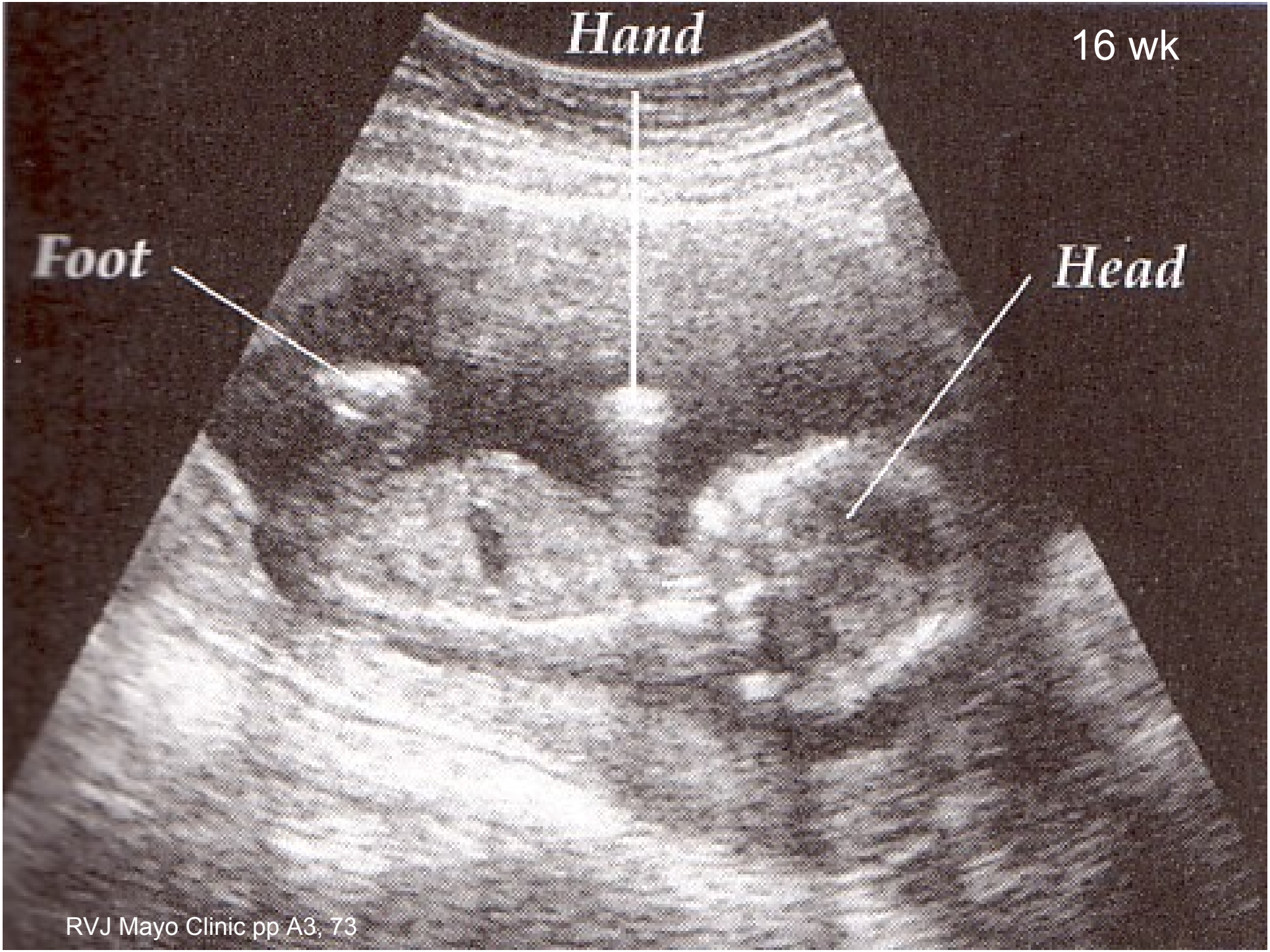
J Langman 1981 Medical Embryology p 80

As a Pregnant Female –

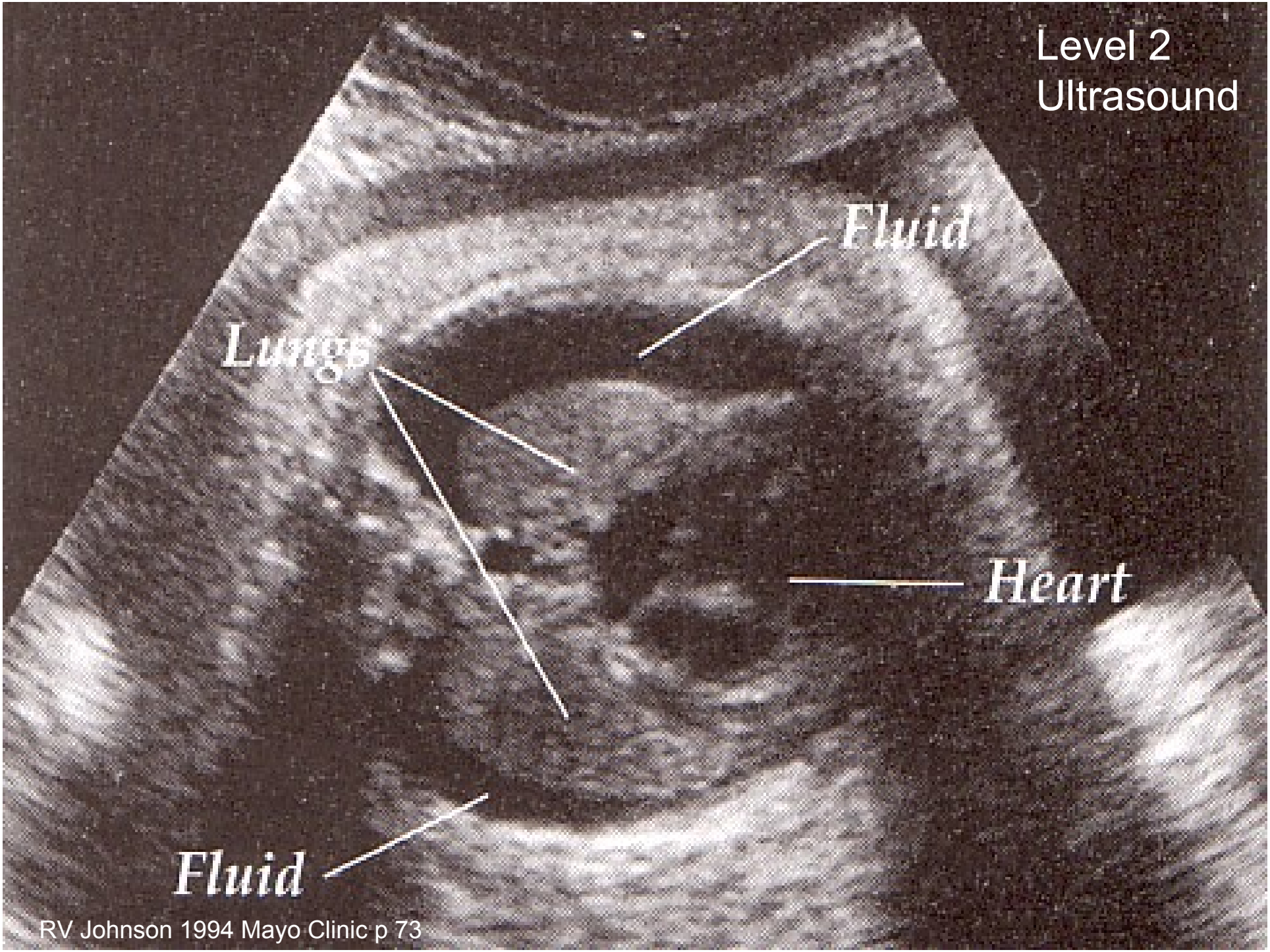
Where you'll gain the weight

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

RV Johnson, ed. *Mayo Clinic Complete Book of Pregnancy & Baby's First Year*, 1994, p 87.


Hand
16 wk
Foot
Head
RVJ Mayo Clinic pp A3, 73

- RVJ Mayo Clinic p 73



RV Johnson 1994 Mayo Clinic p 73

What are my chances of having a child with a birth defect? </= 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:

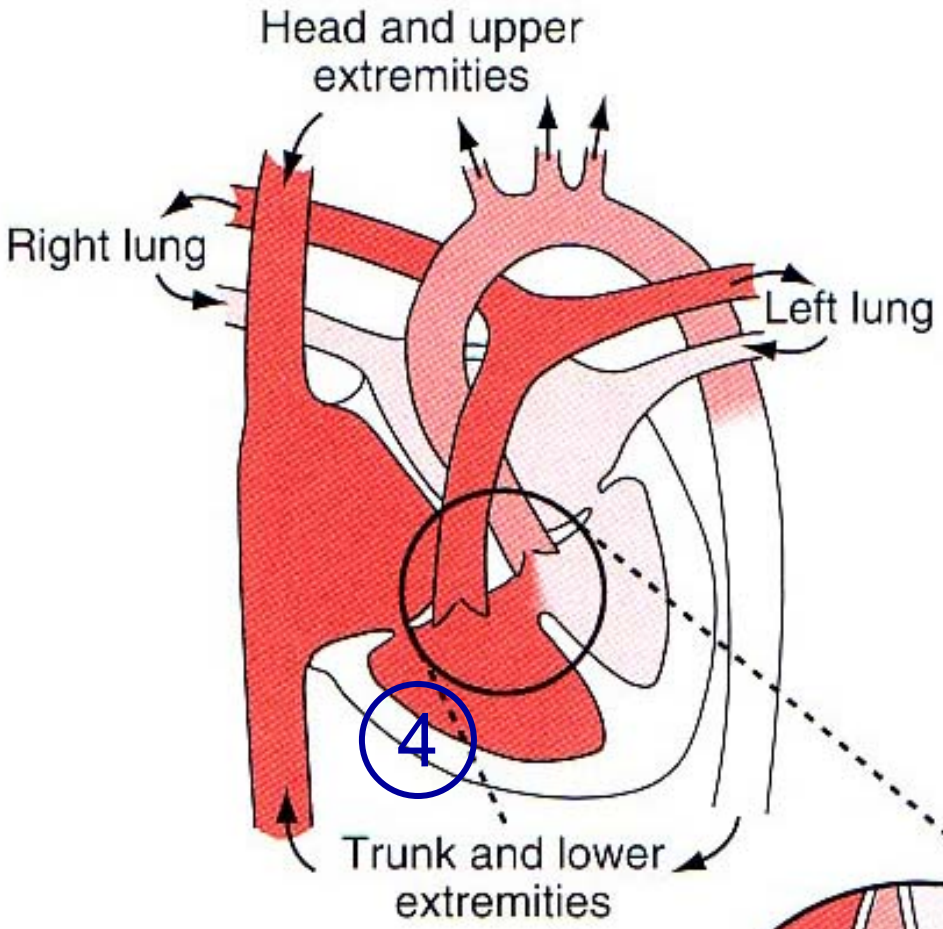
- One of every 175 is born with a congenital heart defect.
- One of every 400 is born with clubfoot.
- One of every 700 is born with cleft lip and palate.
- One of every 800 is born with Down syndrome.
- One of every 2,000 is born with spina bifida.

To put this list into perspective, consider the following:

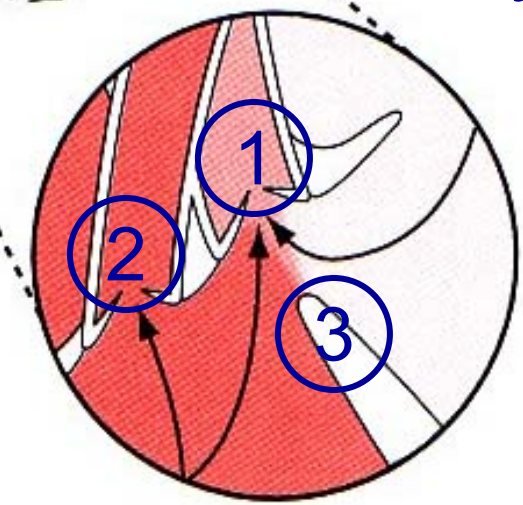
- The odds of having twins are about one in 100.
- The odds of having triplets are about one in 8,000.

RV Johnson Mayo Clinic 1994 p 56

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

G&H

Chromosome abnormalities: What are your risks?

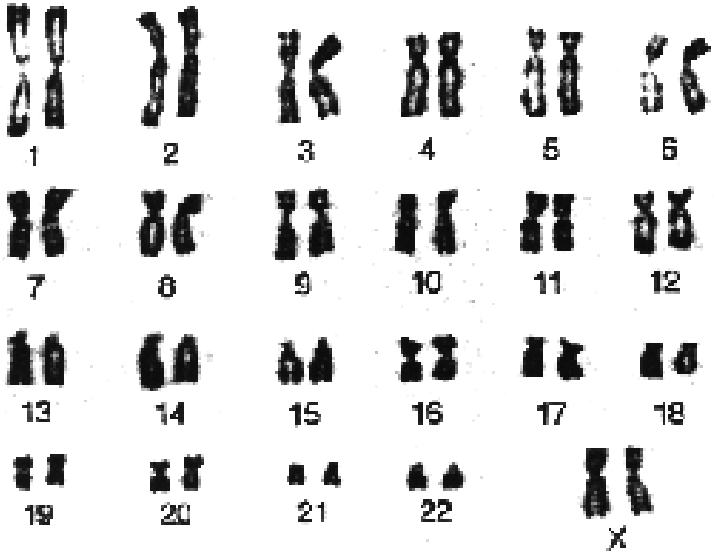
Age	Risk for Down syndrome	Total risk for clinically significant chromosome abnormalities
20	1/1,667	1/526
21	1/1,667	1/526
22	1/1,429	1/500
23	1/1,429	1/500
24	1/1,250	1/476
25	**1/1,250**	**1/476**
26	1/1,176	1/476
27	1/1,111	1/455
28	1/1,053	1/435
29	1/1,000	1/417
30	1/952	1/385
31	1/909	1/385
32	1/769	1/322
33	1/602	1/286
34	1/485	1/238
35	**1/378**	**1/192**
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
45	**1/30**	**1/21**

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

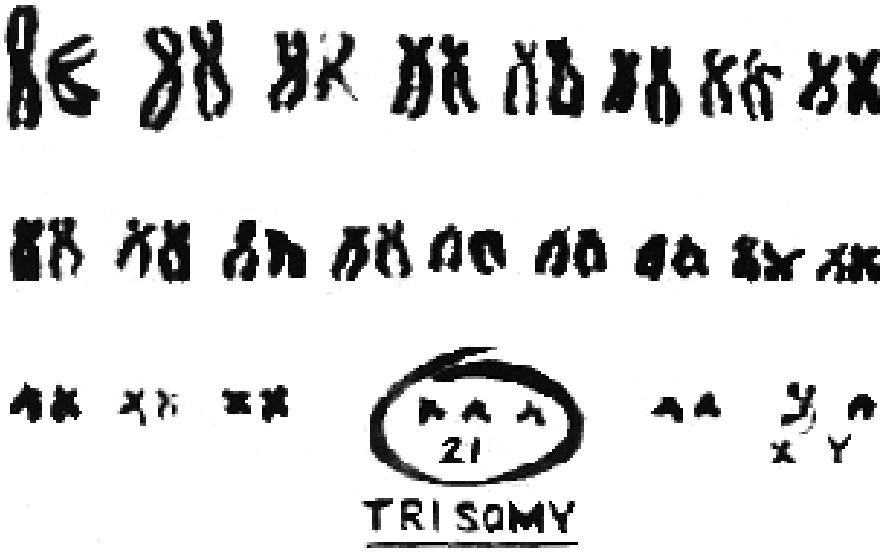
RVJ, Mayo Clinic p 59.

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

Normal ♀



Down Syndrome ♂



http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001992/

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

Quad Screen? 4 Blood Chemistry Tests

2nd 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)

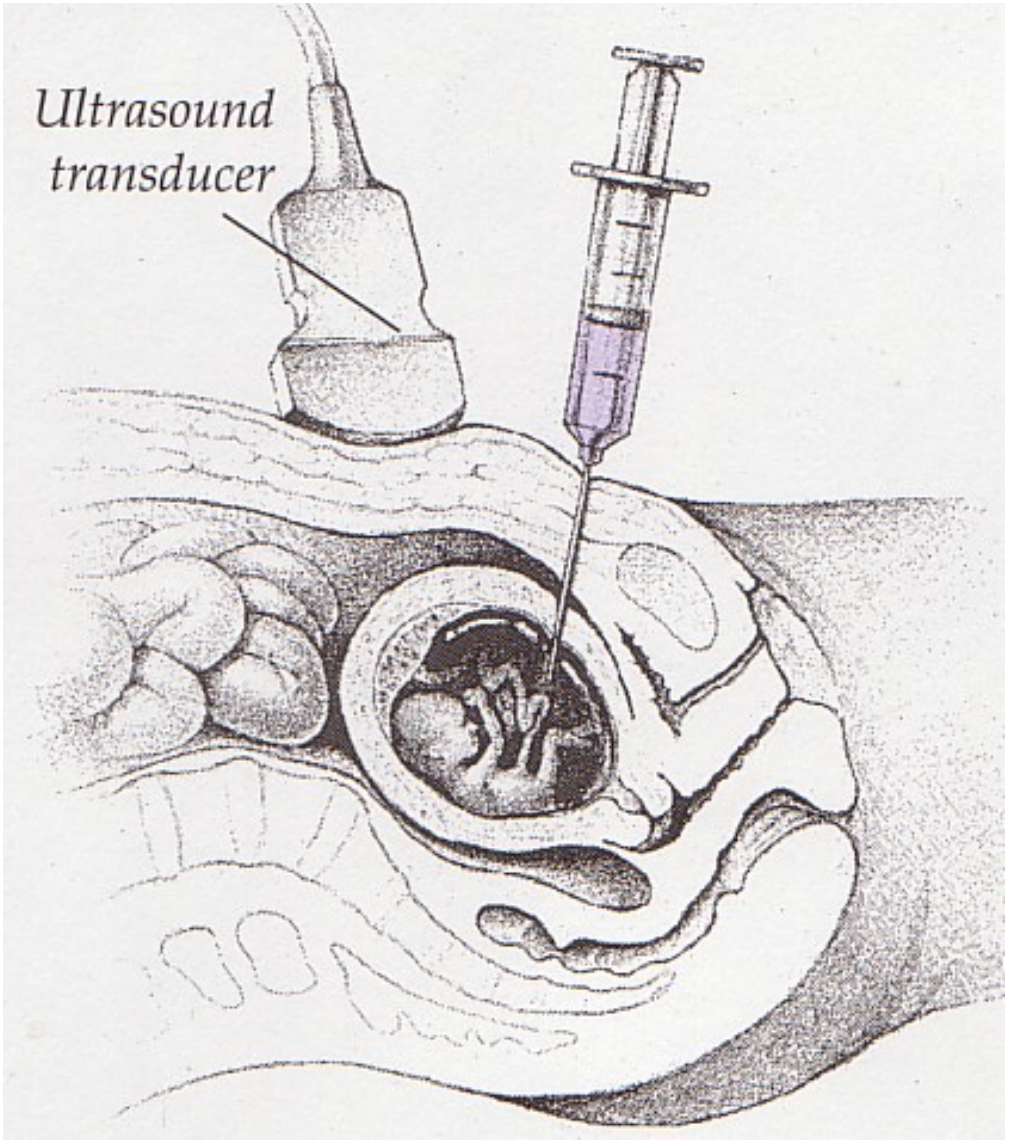
Estriol: placenta + fetal liver

Inhibin-A: placenta + ovaries

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

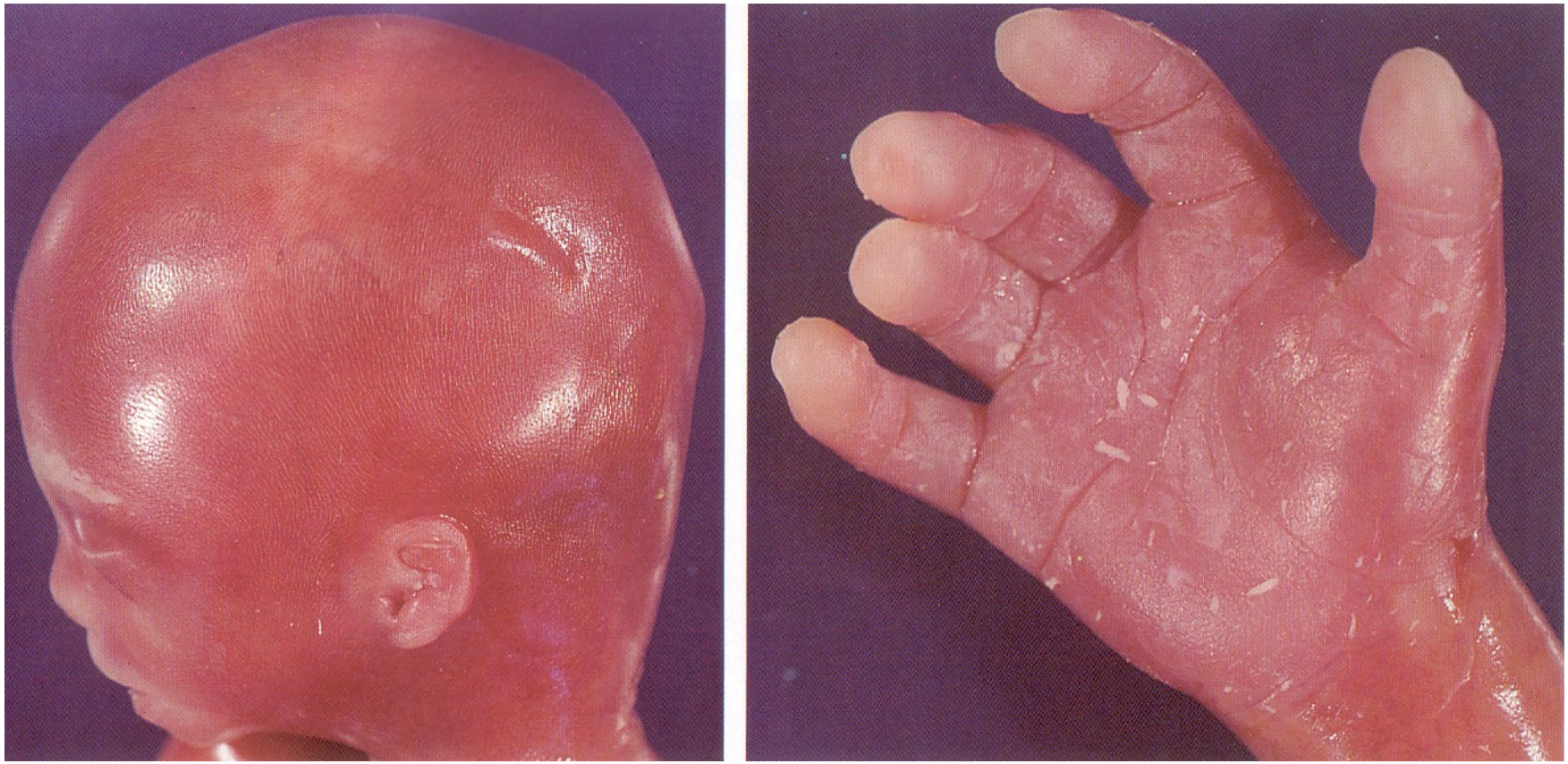
http://www.americanpregnancy.org/prenataltesting/quadscreen.html

Amniocentesis or Chorionic Villus Sampling?



RVJ Mayo Clinic p 77

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^{th} finger mid-phalynx dysplasia	60%
9.	Auricles anomalous	60%
10.	Simian crease	45%

Dizygotic Twins Discordant for Down Syndrome

MPS1994 p 109

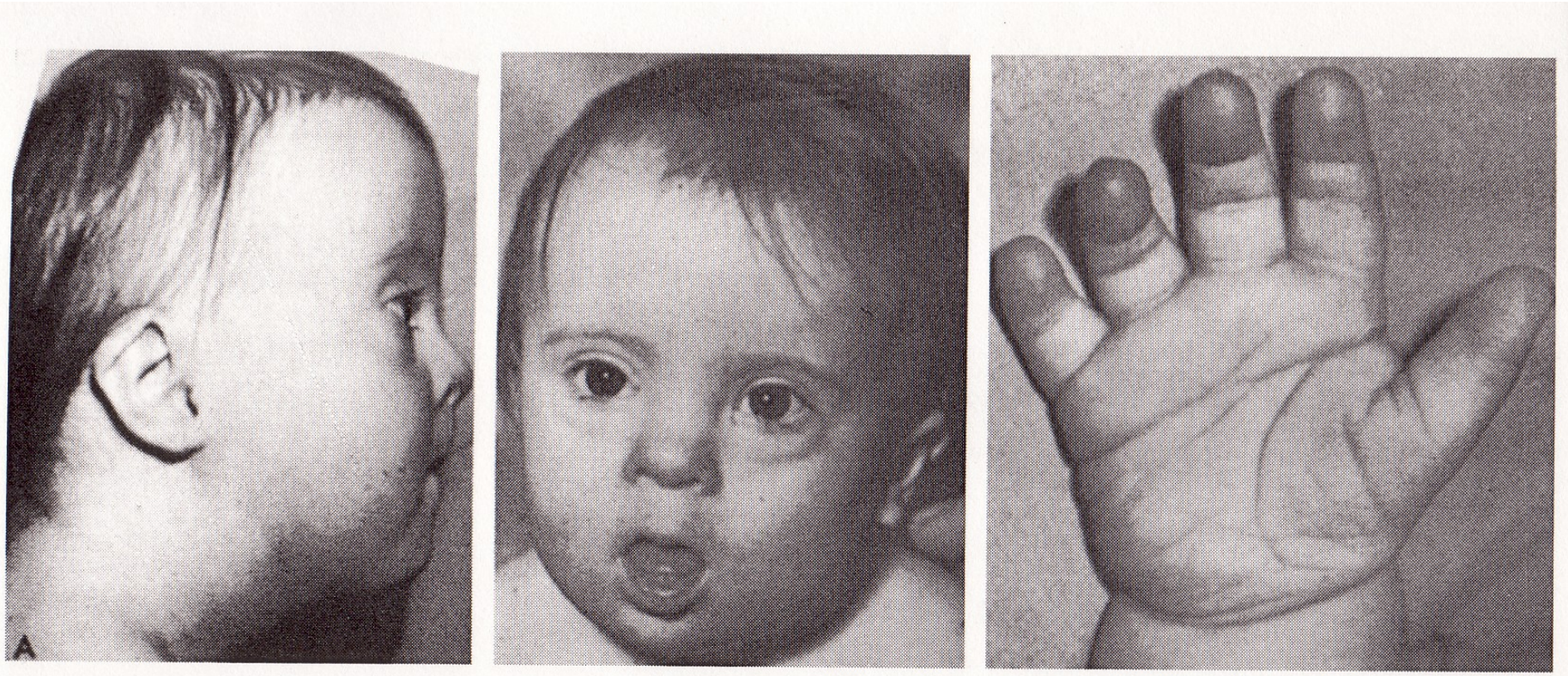
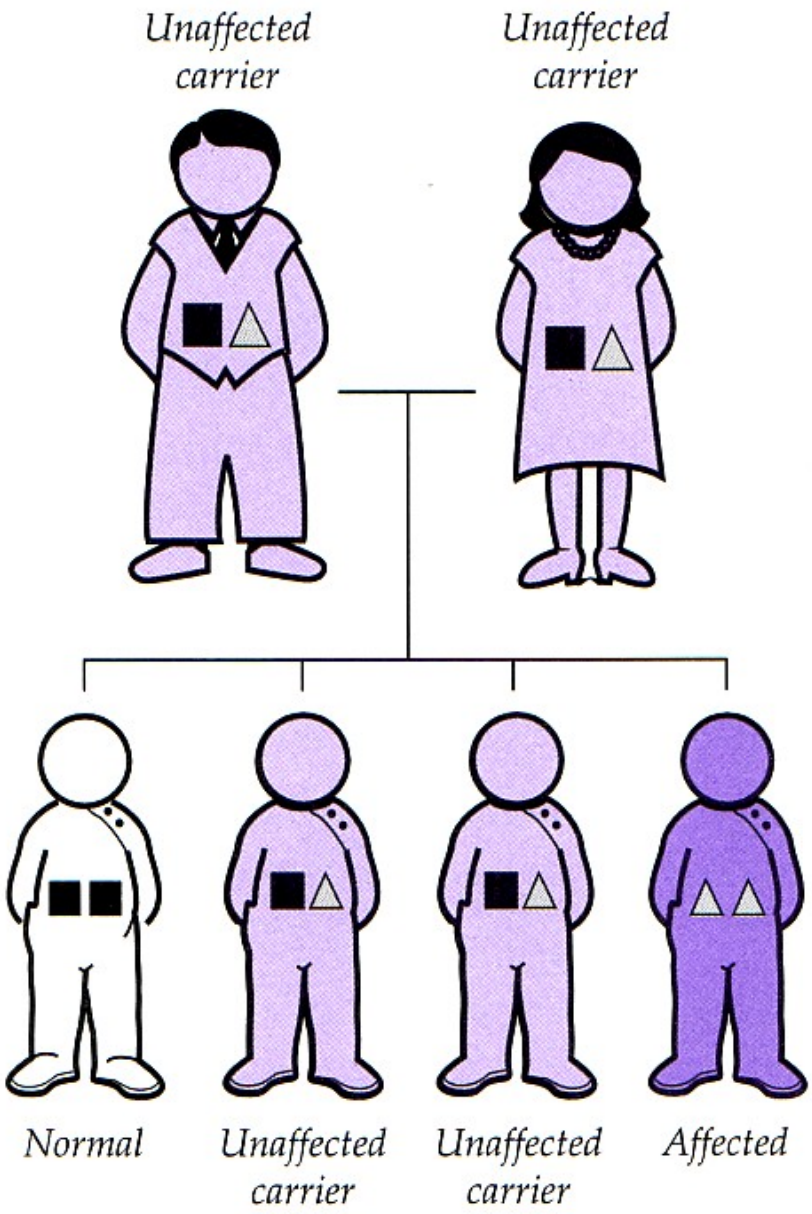
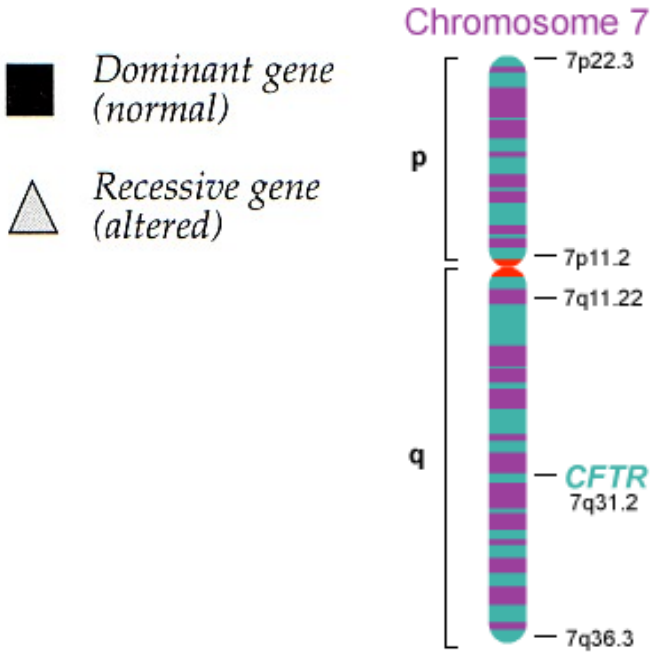


FIGURE 2. Down syndrome. *A*, Young infant. Flat facies, straight hair; protrusion of tongue; single crease on inturned fifth finger.

Recessive Disorders eg, Cystic Fibrosis



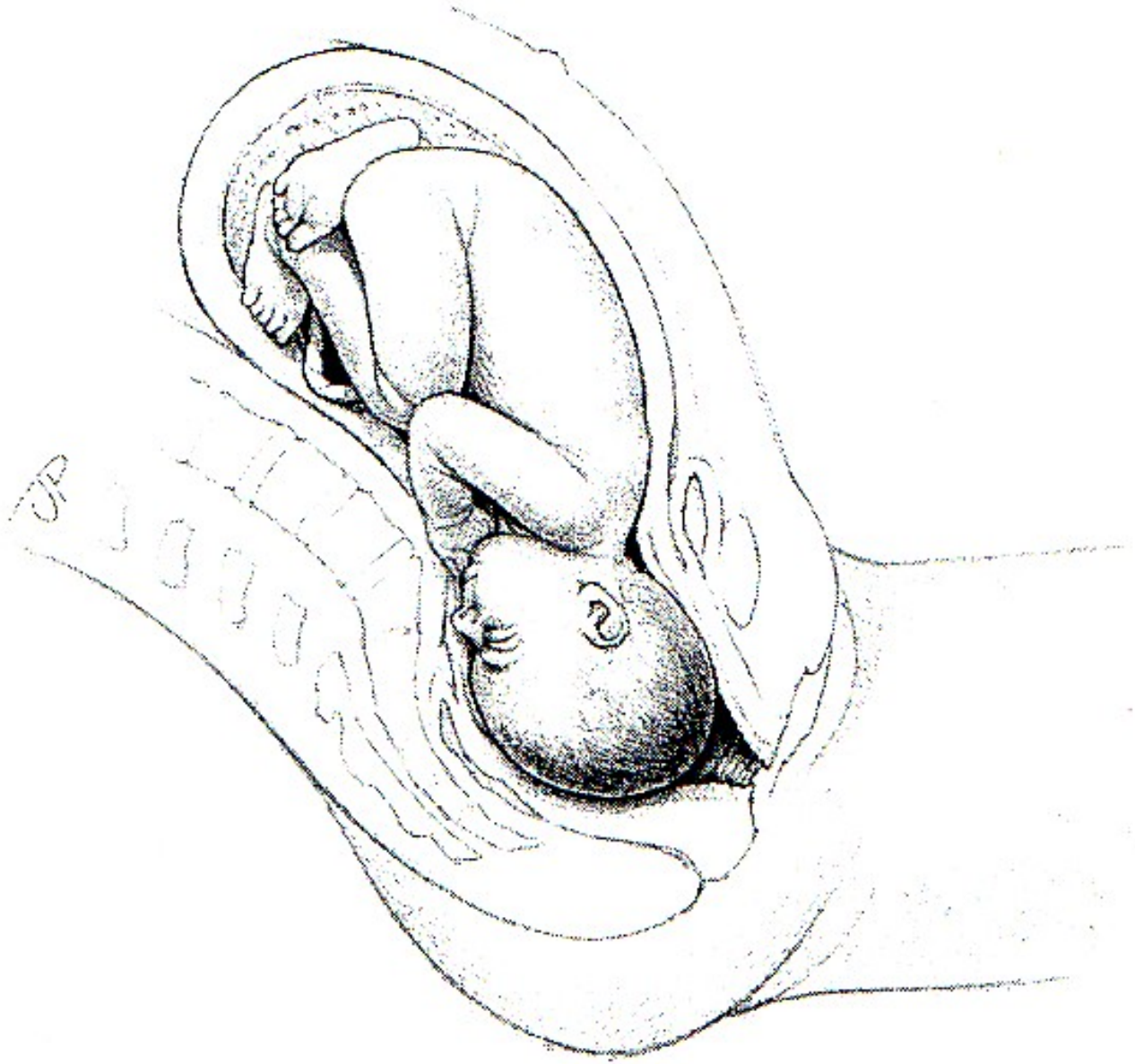
RVJ, Mayo Clinic p 61.



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

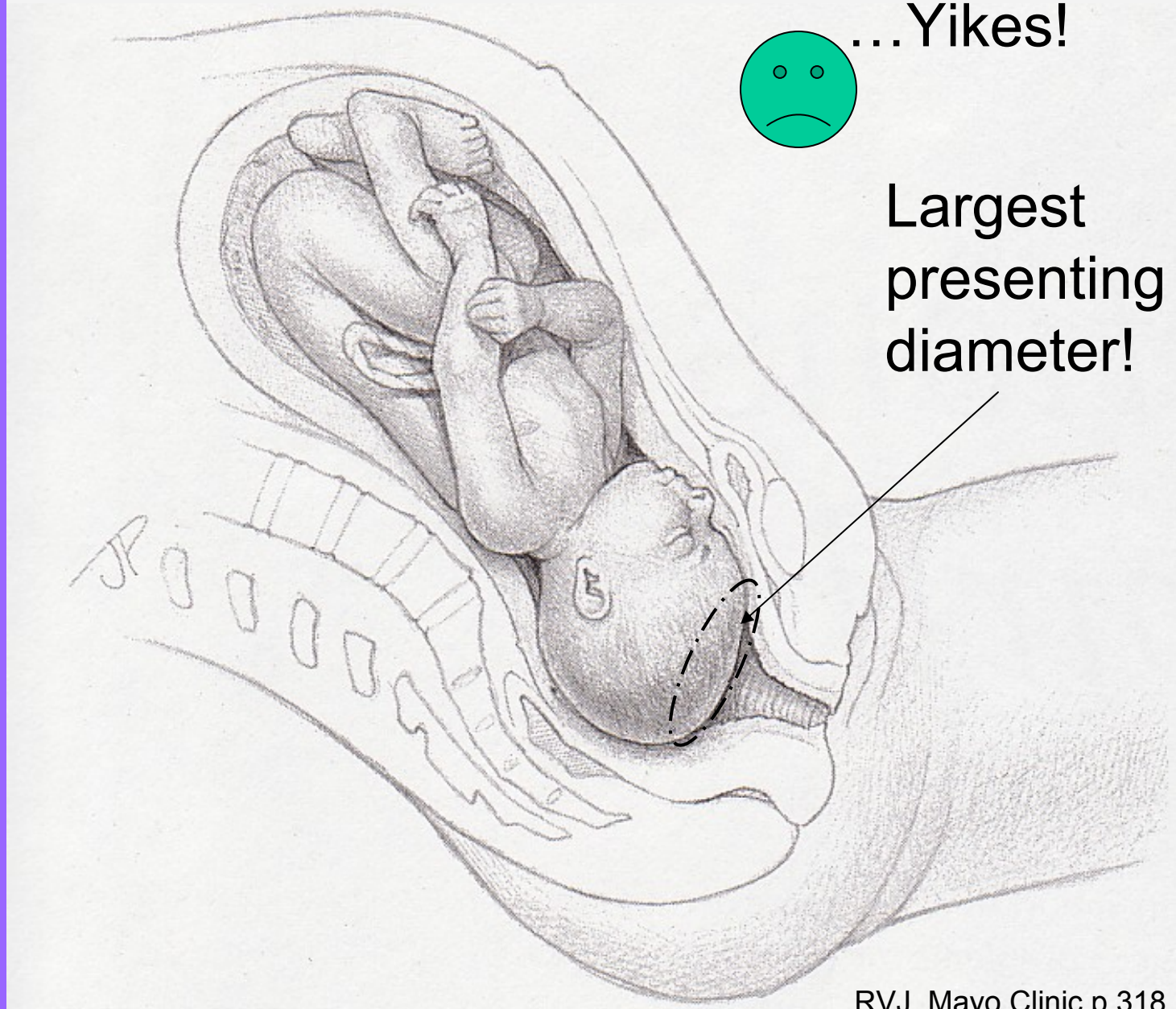
http://www.mja.com.au/public/issues/183_10_211105/mas10561_fm.html
http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0001167/

Most Common Position. Ideal!!



RVJ, Mayo Clinic p 317.

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



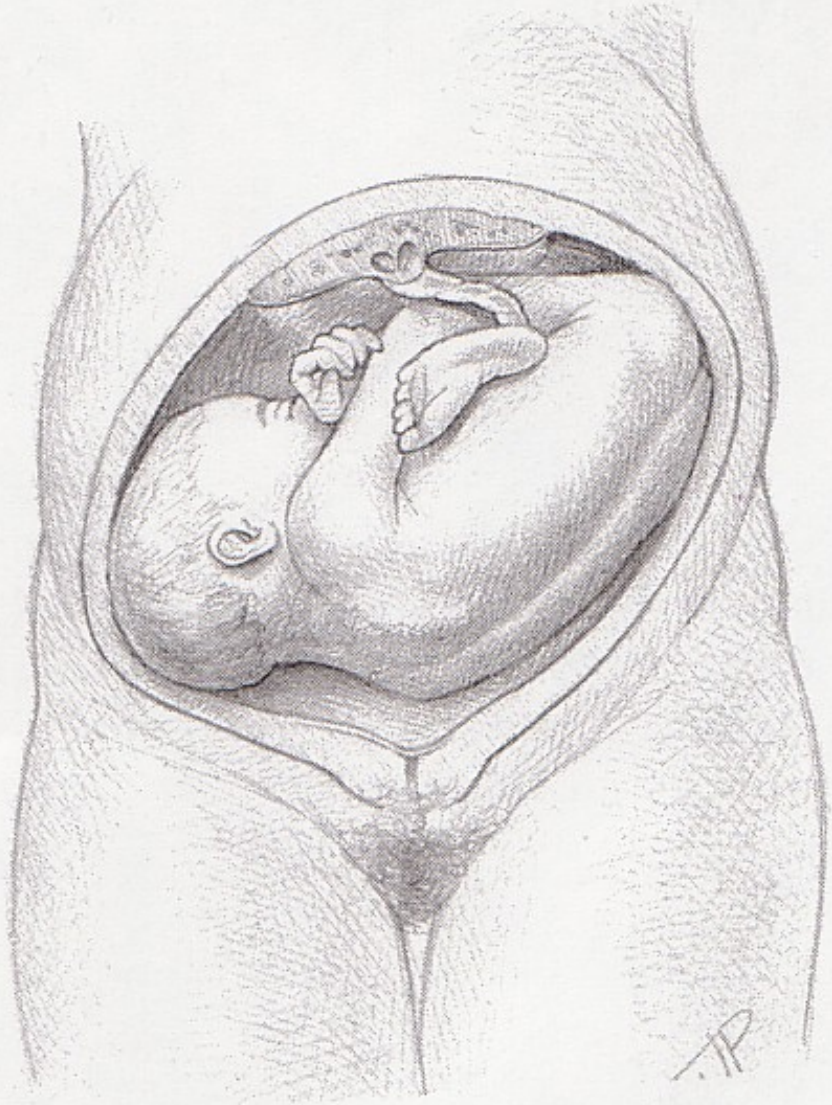
Largest presenting diameter!

RVJ, Mayo Clinic p 318.

Breech!
eg, Frank

RVJ, Mayo Clinic p 319.

Experienced Midwifes & 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.

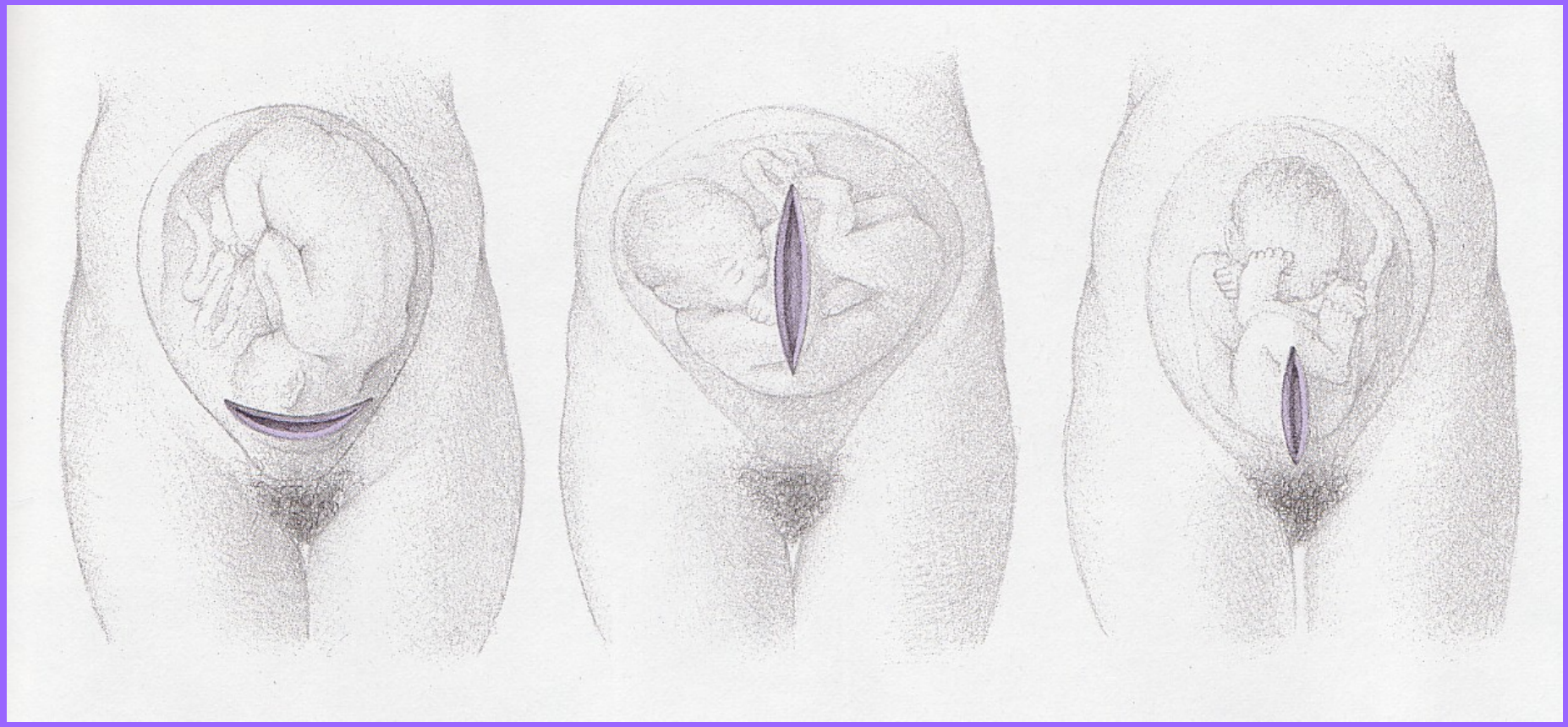
Transverse!

RVJ, Mayo Clinic p 319.

Low Transverse

Classic

Low Vertical



RVJ, Mayo Clinic p 337.

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

RVJ Mayo Clinic p A5

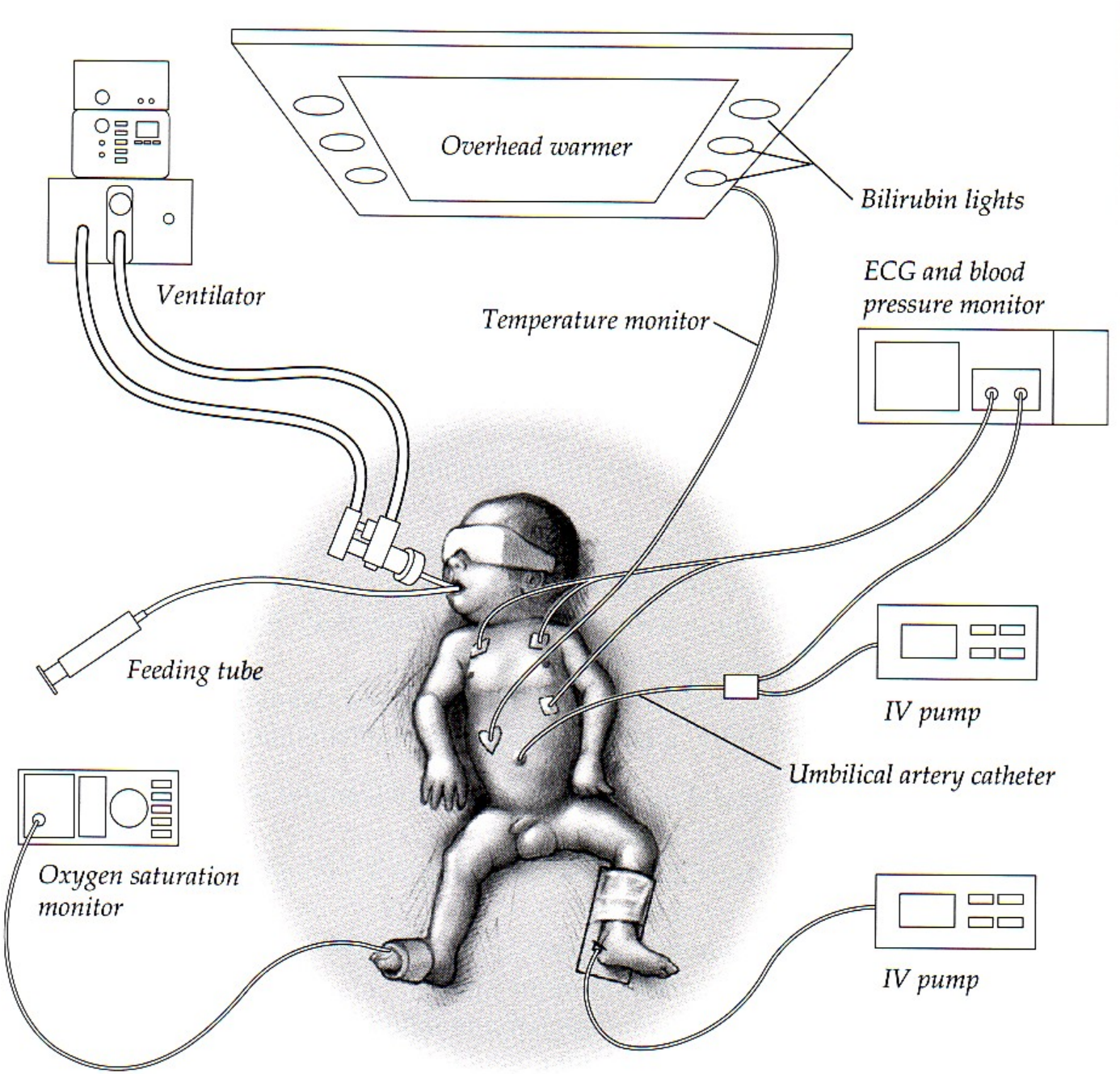
Apgar Scores: How Healthy Is Your Newborn?

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

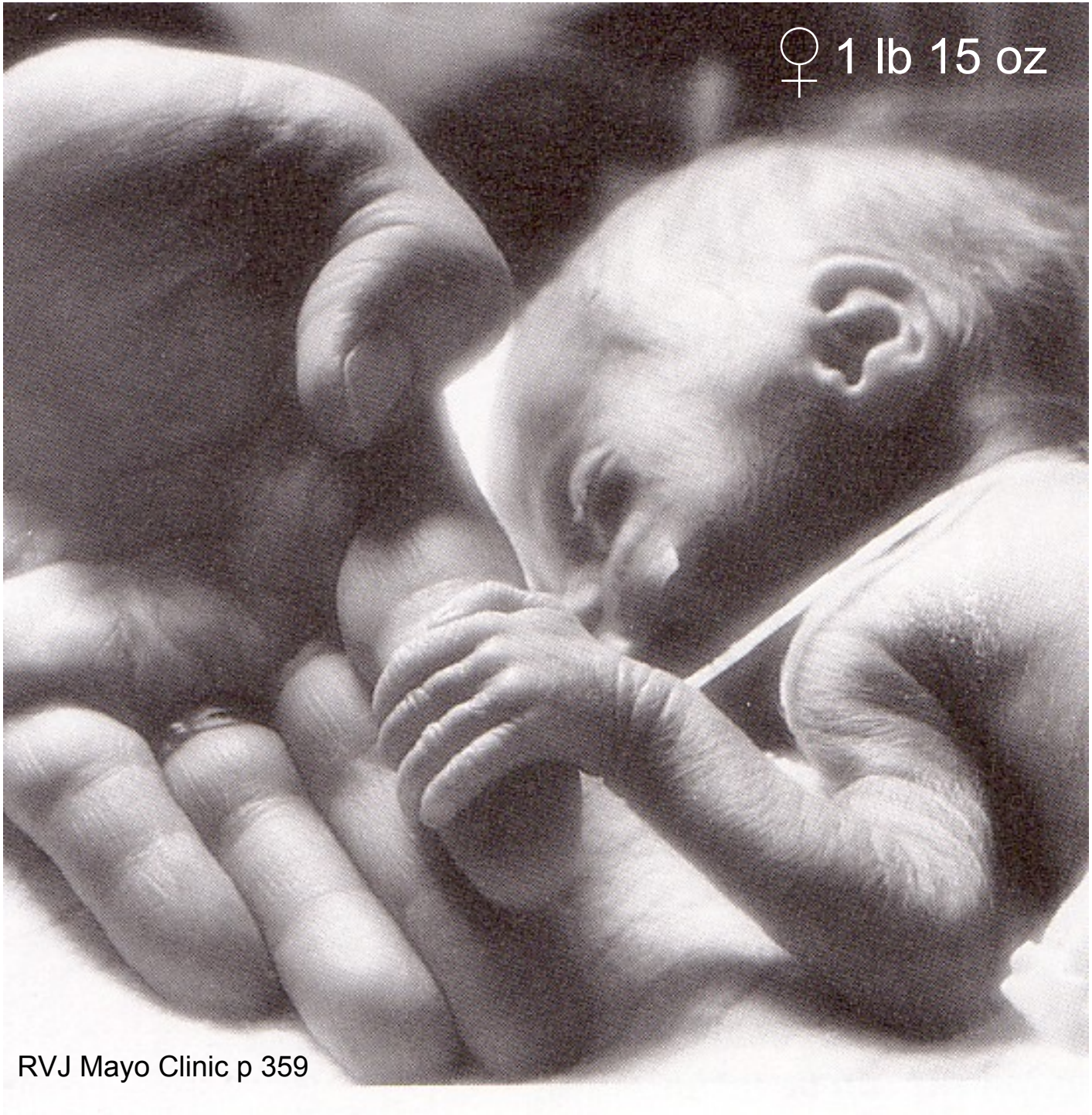
Scores determined for each sign are totaled. The highest possible score is 10. By 5 minutes of age, most healthy babies have scores of at least 7. A score less than that indicates that the baby warrants careful watching.

Virginia Apgar, MD, Anesthesiologist, 1953

RVJ Mayo Clinic p 349



RVJ Mayo Clinic p 360


♀ 1 lb 15 oz
RVJ Mayo Clinic p 359

RVJ Mayo Clinic p 361

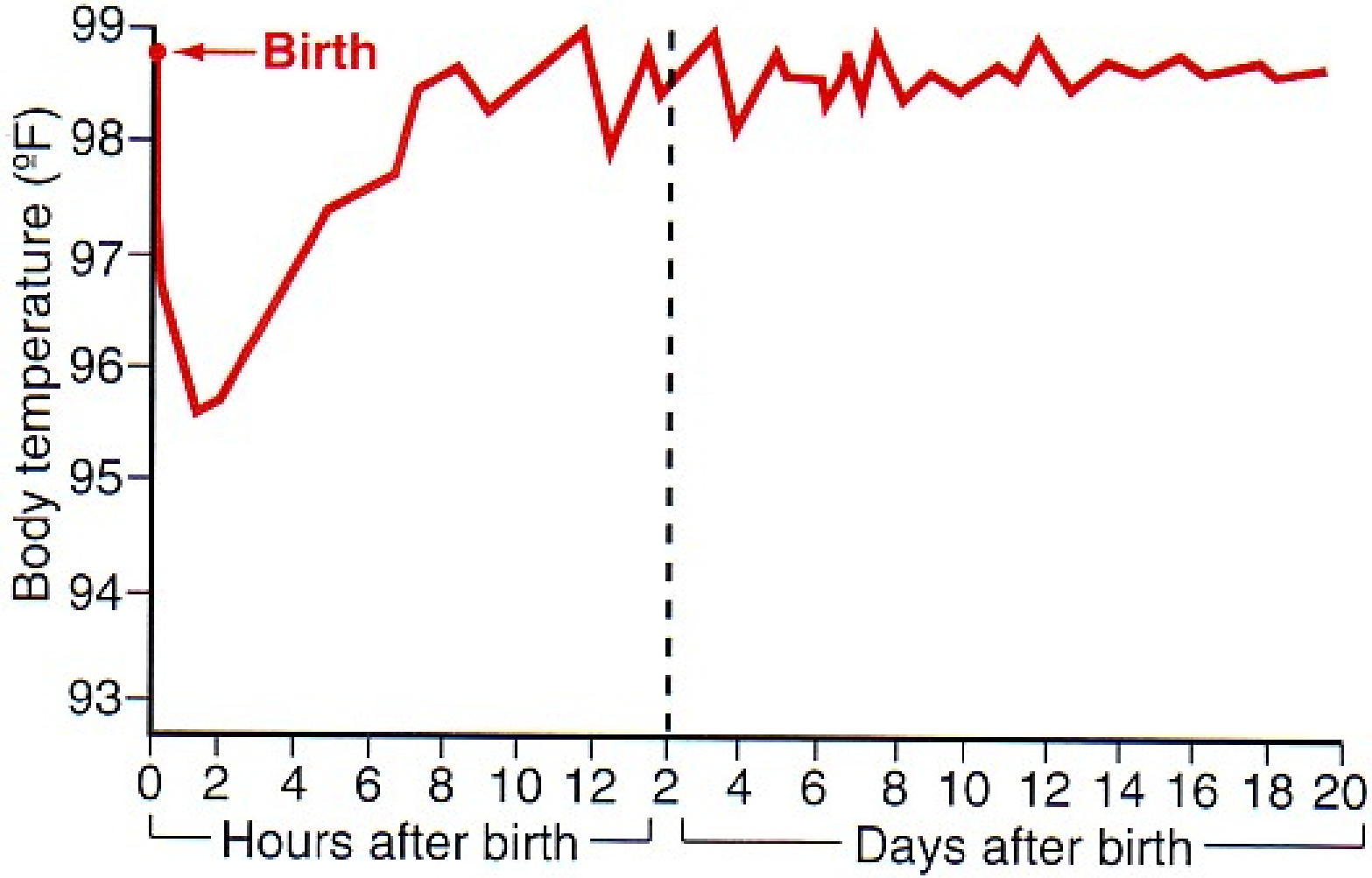


FIGURE 83–7

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

G&H


OSHKOSH
OSHKOSH
OSHKOSH

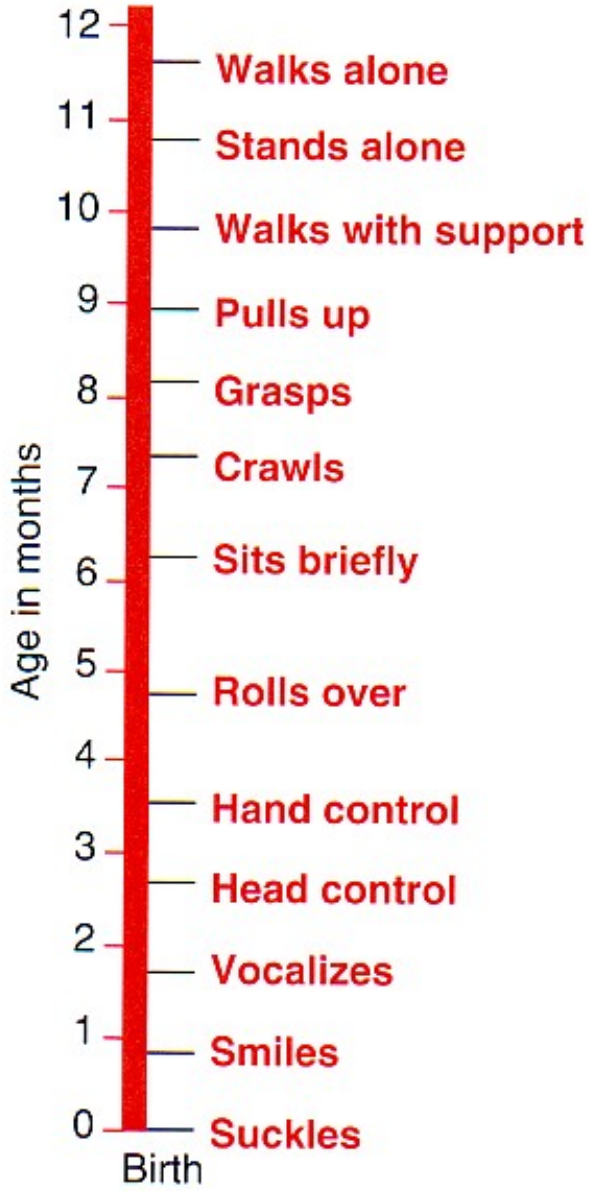
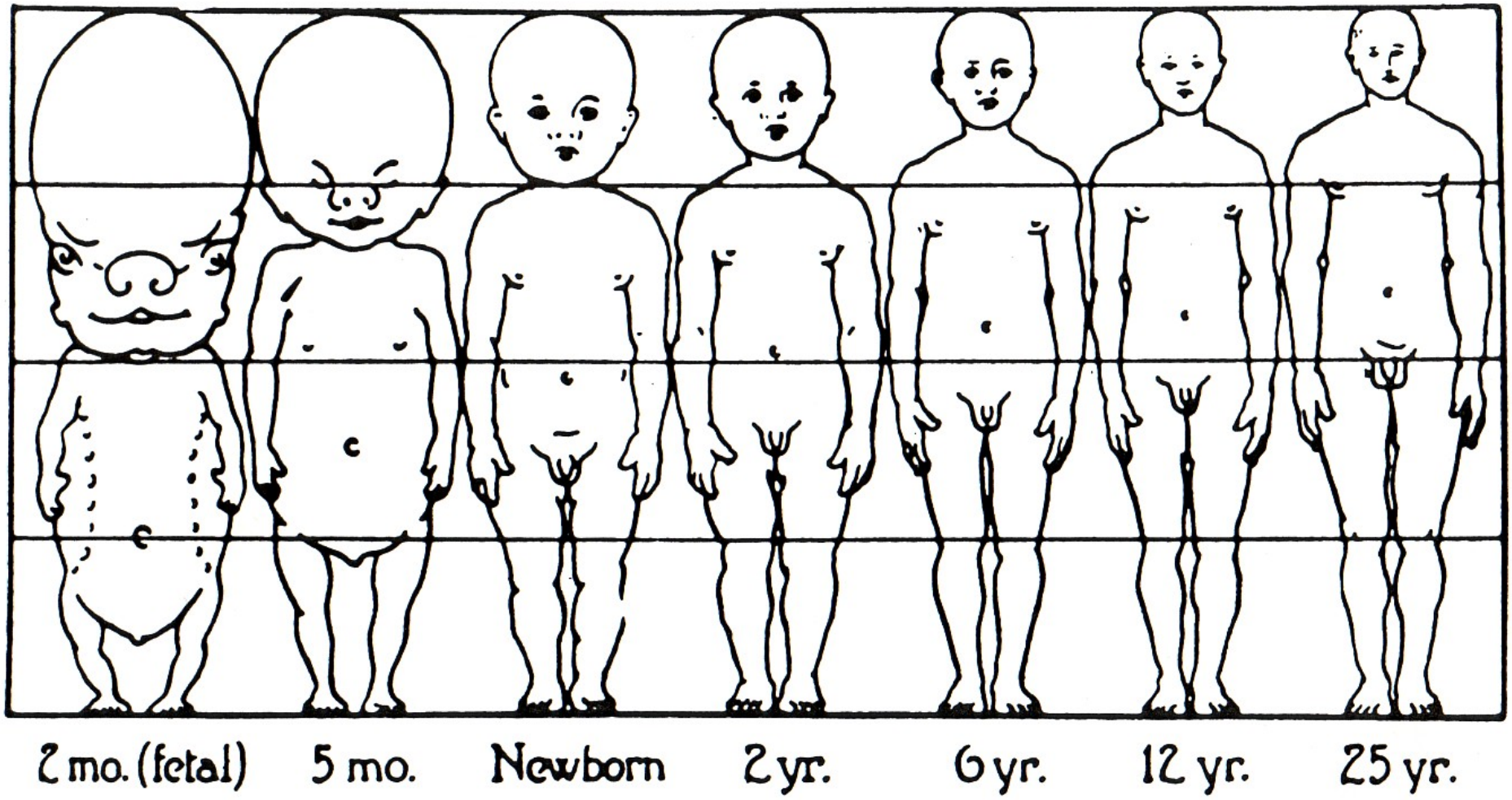


FIGURE 83–9

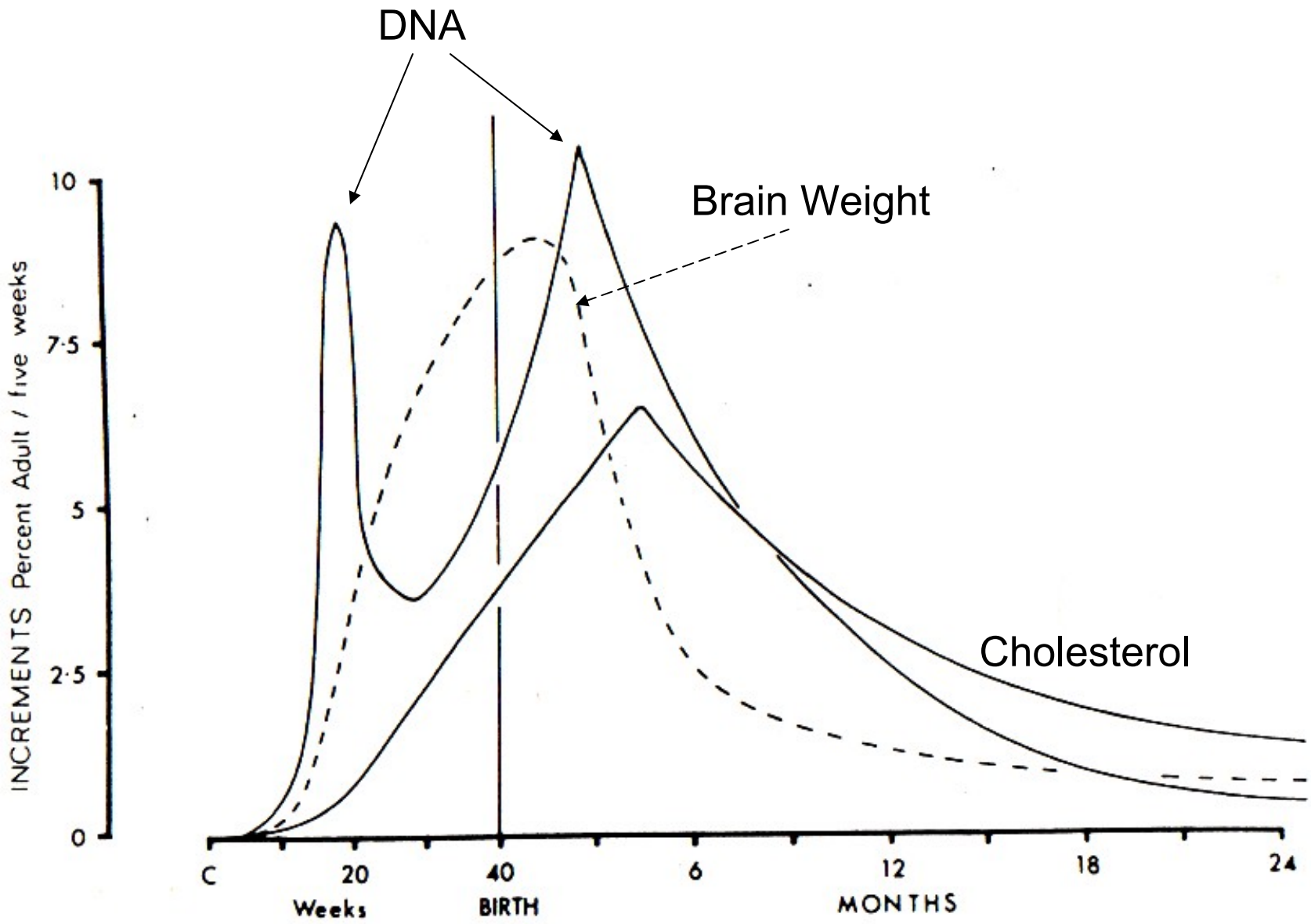
Behavioral development of the infant during the first year of life.

G&H

Cephalic to Caudal Development



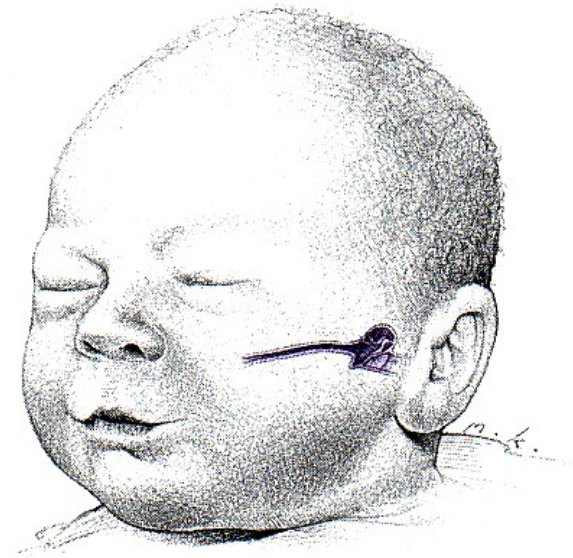
Courtesy Dr. Allen Harlor, PeaceHealth Medical

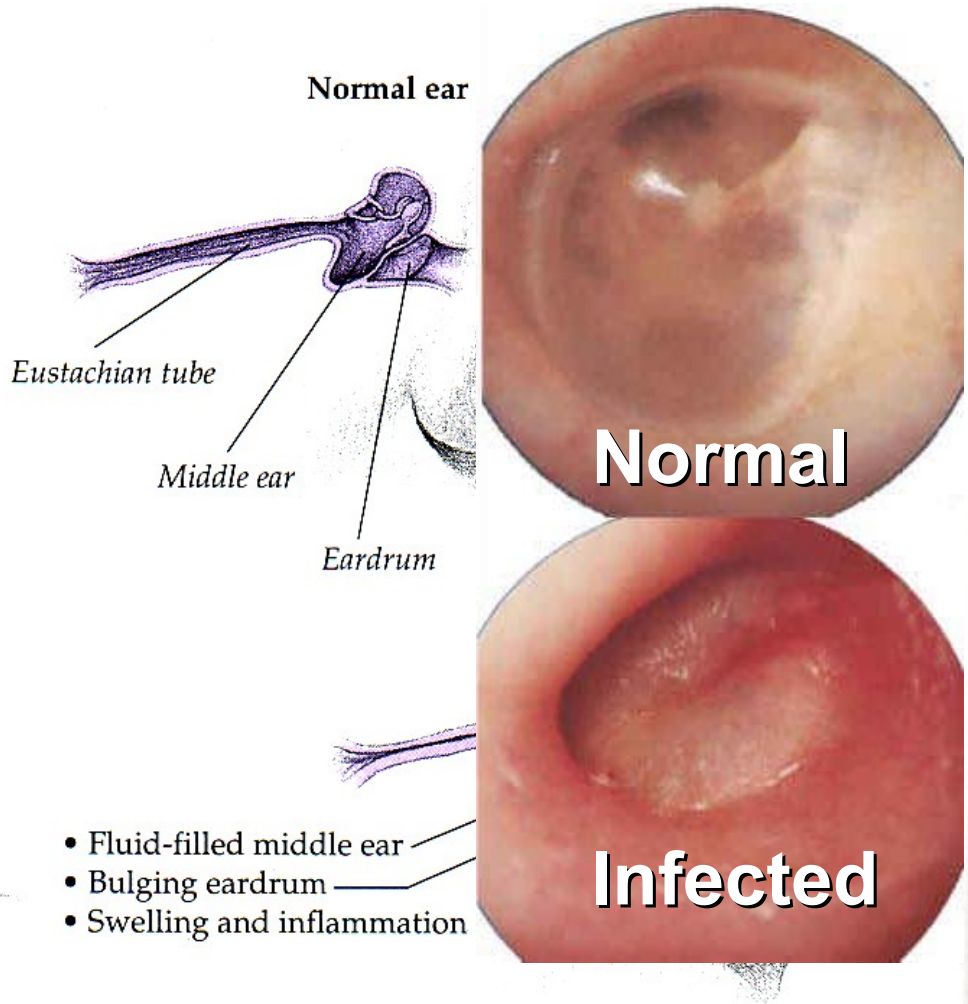


Courtesy Dr. Allen Harlor PeaceHealth Medical

Infant Eustachian tube smaller + more horizontal!

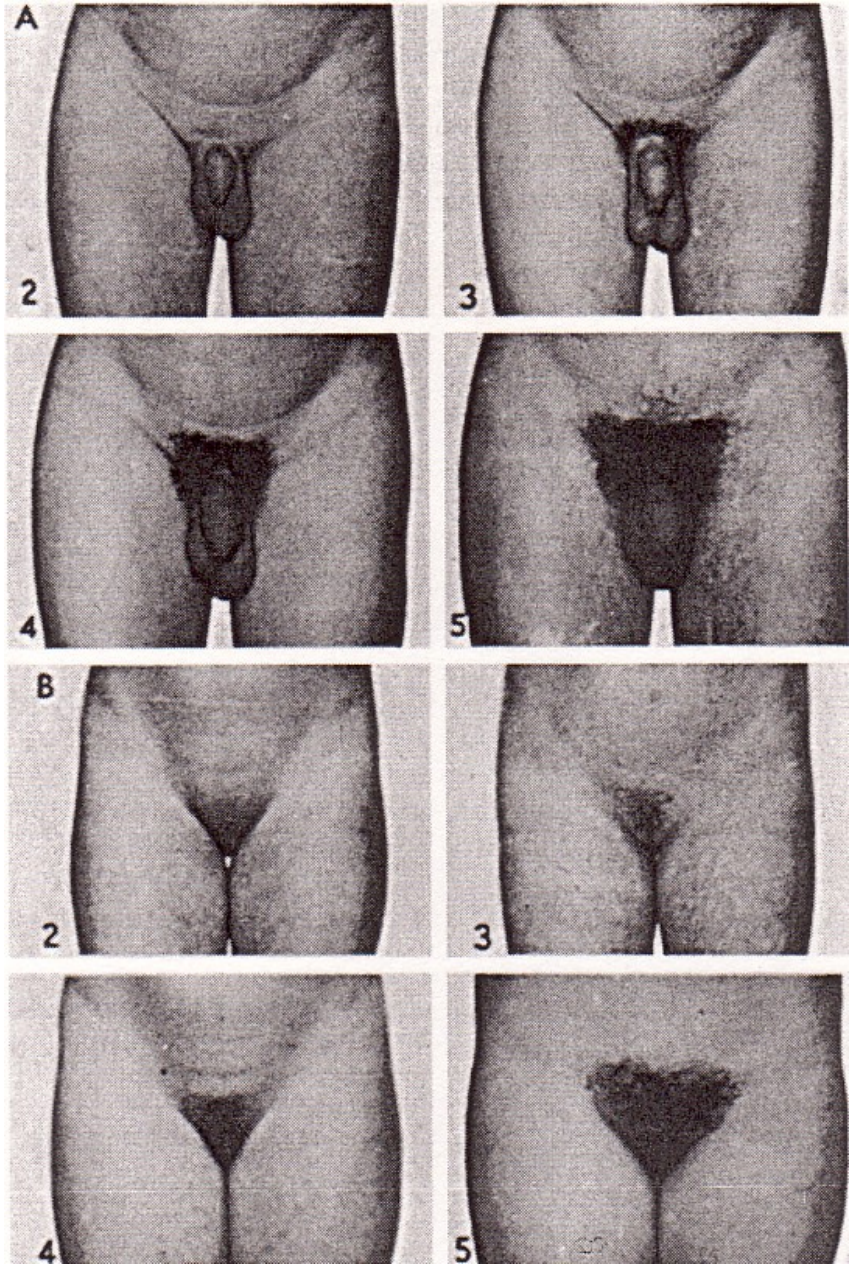
An infant's ear is different from an adult's ear because the eustachian tube is more horizontally positioned. Because of this, drainage from the middle ear occurs less easily, and your baby is at greater risk for an ear infection (otitis media). This condition occurs when the eustachian tube becomes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



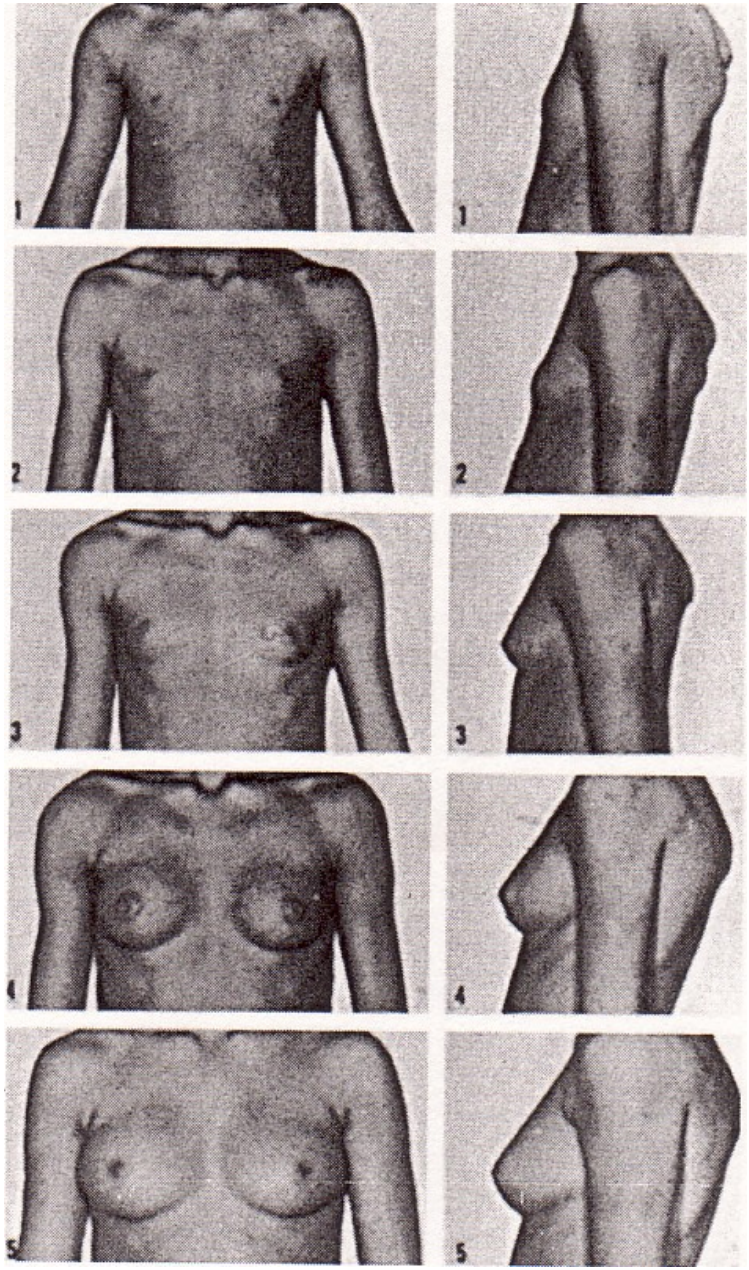


RVJ Mayo Clinic p 616

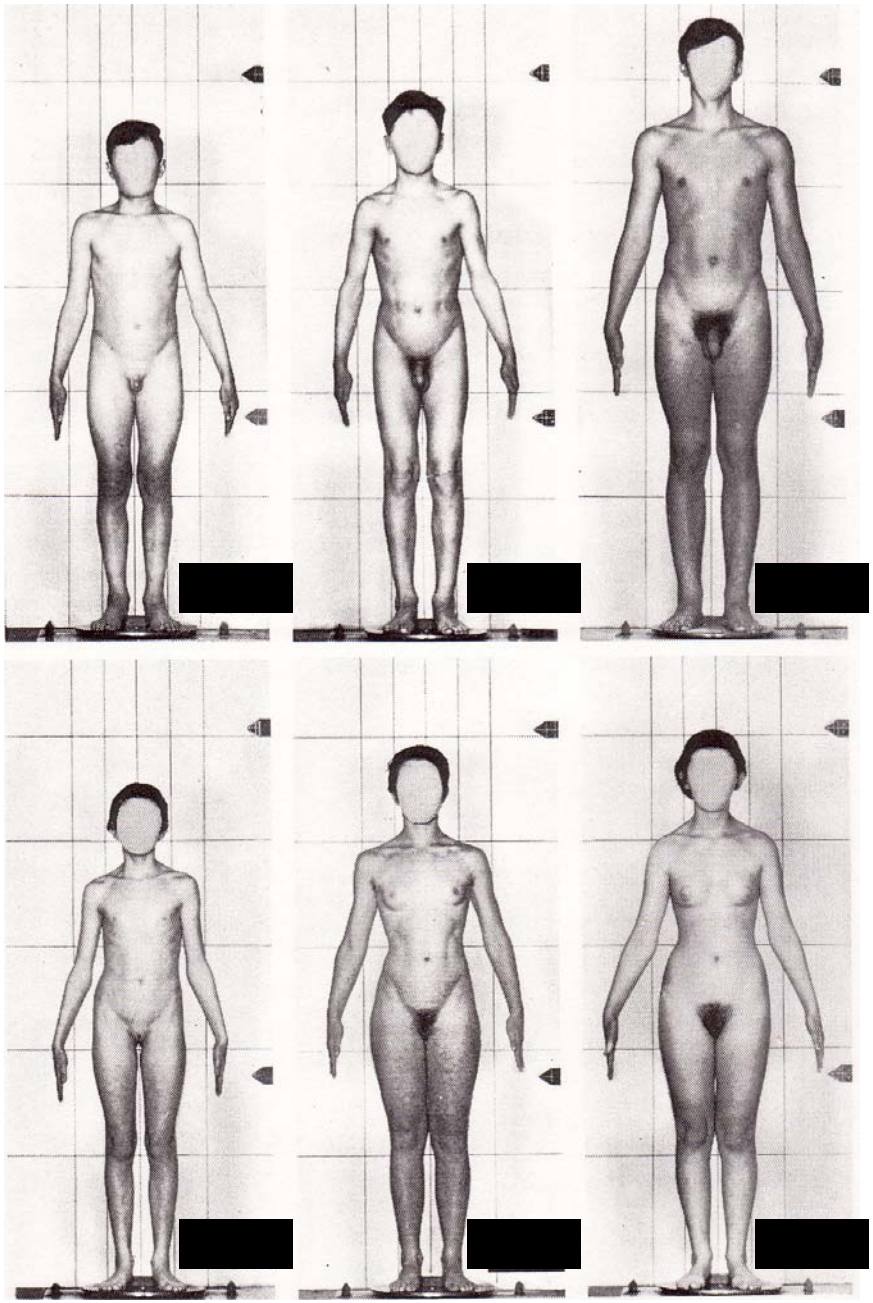
Tanner Stages of Development



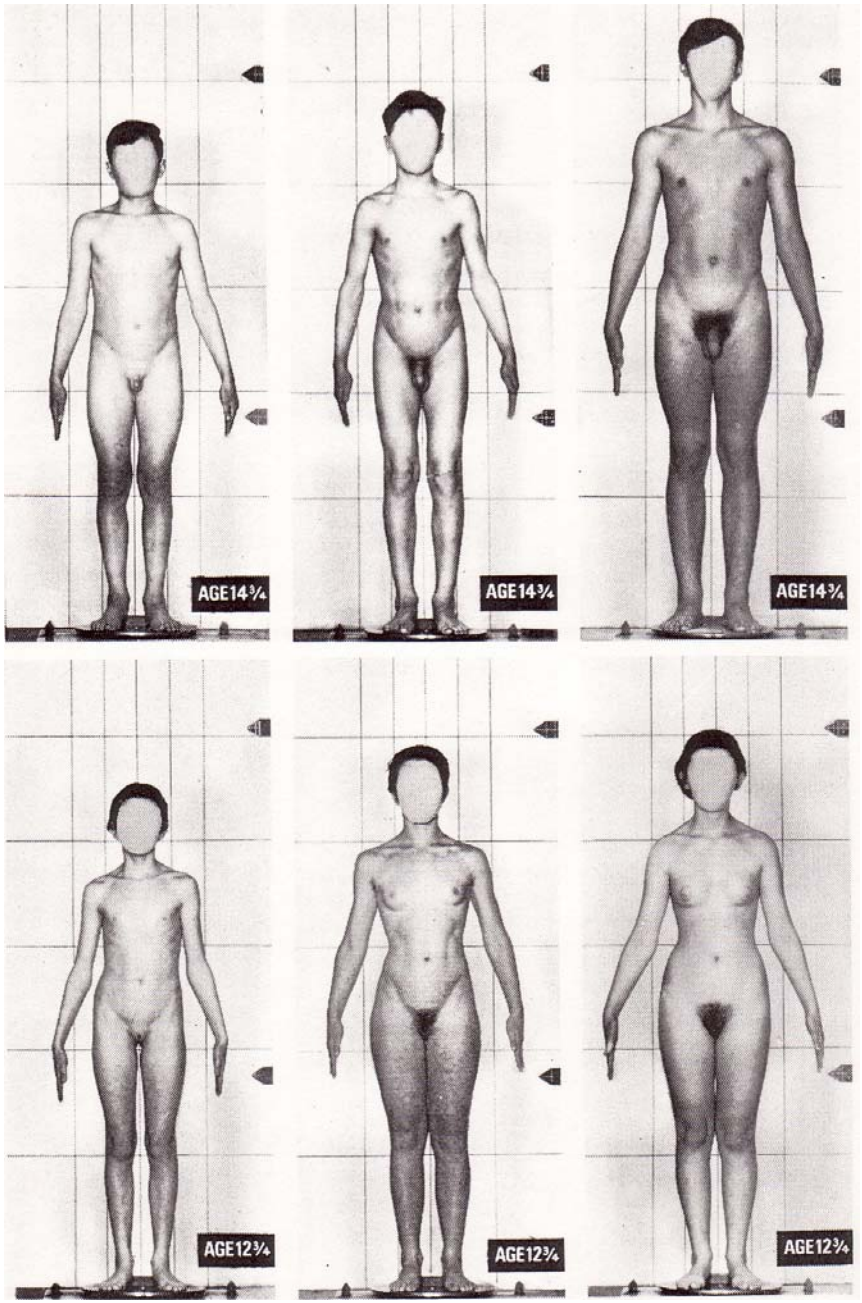
Tanner Stages for Breast Development



Tanner Stages? What are the Ages?



Tanner Stages? What are the Ages?



All 14 ¾ yr!!

All 12 ¾ yr!!