

## Fetal growth

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## "FIRST SIGN"



## Two basics of fetal growth

- growth potential :
  - genetics
  - environmental factors (viruses, radiation, epigenetics)
- growth support:
  - transplacental nutrients transport
  - hormones (growth hormone, fetal insulin)

## The dynamics of fetal growth

- in the first half of pregnancy, placenta is growing significantly faster than fetus  
(20 weeks  $\Rightarrow$  3x heavier)
- in the second half of pregnancy, fetus is growing faster, and the term baby is 7x heavier than placenta

## The dynamics of fetal growth

- in the first half of pregnancy qualitative component of fetal growth dominates over quantitative
- potential to build (quantitative growth) is assigned to the placenta
- in the second half of pregnancy, the fetus "compensates" the quantity
- Physiological deceleration of fetal growth  $\Rightarrow$  after 38 weeks

## The dynamics of fetal growth

- first 16. weeks  $\Rightarrow$  hyperplastic fetal growth
- 16. – 24 weeks  $\Rightarrow$  combination of hyperplastic (decelerating) & hypertrophic type of growth (accelerating)
- after 24. weeks hypertrophic type of fetal growth dominates

## The dynamics of fetal growth

- ~ 26 weeks - fetus begins to secrete its own insulin  
(the active form - an inactive form is proven in the first quarter)
- until then, its growth is predominantly genetically determined
- since then, its growth mostly depends on the supply of glucose and insulin dependent metabolism

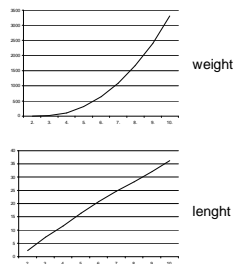
*Gararich V, Carmona F (1998) Macrosomia: Etiology and Pathogenesis. In: Kurjak A (ed) Textbook of Perinatal Medicine. The Parthenon Publishing Group, London New York, pp 1281-9*

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  - 22. weeks = 500g
  - 25. weeks = 800g
  - 28. weeks = 1200g
  - 30. weeks = 1500g
  - 32. weeks = 2000g

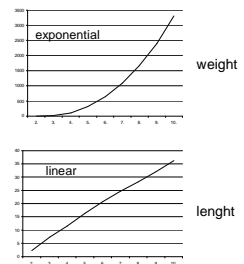
## Normal fetal growth

months	weight (g)	crown- rump (cm)
2.	1	2,3
3.	14	7,4
4.	105	11,6
5.	310	16,4
6.	640	20,8
7.	1080	24,7
8.	1670	28,3
9.	2400	32,1
10.	3300	36,2



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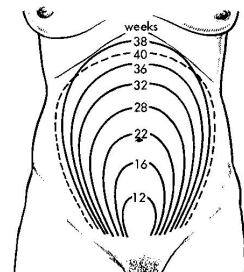
## Fetal growth

- clinics
  - fundus – symphyseal length
  - placement of fundus
- US



- clinics
  - fundus uteri

16tj. 2/S  
20tj. S/P  
24tj. P  
28tj. 2/P  
32tj. X/P  
36tj. X/2  
40tj. X/3



- fundus – symphyseal lenght



## Fetal growth - US

- to 12 tj: CRL
- >12 tj. BPD, AC, FL
- EFw= +/- 10%

## Normal fetal growth (physiological)

- estimated fetal weight, or measured birth weight compared with the population average
- **Percentile values** / tables / curves - distribution in the newborns population
- In regard to the three main factors determining fetal growth:
  - gestational age
  - infant's gender
  - mothers parity

## Percentile tables – population in Split

PROVOKTORIČE MUŠKO – PORODNE TEŽINE (g)										PROVOKTORIČE ŽENSKO – PORODNE TEŽINE (g)									
tpko	n	5	10	25	50	75	90	95		n	5	10	25	50	75	90	95		
22	3	338	338	338	338	338	338	338	338	3	338	338	338	338	338	338	338	338	338
23	15	338	338	338	338	338	338	338	338	15	338	338	338	338	338	338	338	338	338
24	15	338	338	338	338	338	338	338	338	15	338	338	338	338	338	338	338	338	338
25	15	338	338	338	338	338	338	338	338	15	338	338	338	338	338	338	338	338	338
26	15	338	338	338	338	338	338	338	338	15	338	338	338	338	338	338	338	338	338
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42	15	338	338	338	338	338	338	338	338	15	338	338	338	338	338	338	338	338	338

Roje D i sur. Porodne težine i duljine novorođenčadi u Splitu, Opravdnost razvijanja vlastitih referentnih vrijednosti za ocjenjivanje fetalnog rasta. Gynaecol Perinatol 2005;14:66-74.

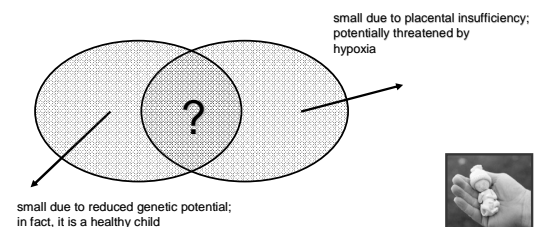
## Normal / altered fetal growth

- 10. – 90. centile - normal
- <10. centile = hypotrophy – Small for gestational age (SGA)
- >90. centile = hipertrophy – Large for gestational age (LGA)
- SGA – the smallest 10% of the population
- LGA – the biggest 10% of the population



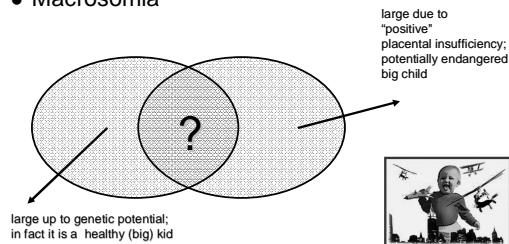
## SGA

- Intrauterine growth restriction / retardation (IUGR)
- IUGR : SGA



## LGA

- LGA – hypertrophy
- Macrosomia



## SGA - IUGR

- conditions associated with SGA / IUGR:
- chromosomopathy
- genetic syndromes
- viral infection of the first part of pregnancy
- preeclampsia
- disturbed placentation and inadequately developed placenta



## LGA

- conditions associated with LGA:
- DM
- hydrops fetus



## BIRTH WEIGHT (*per se*)

- extremely low birth weight (500-999 g)
- very low birth weight (1000-1499 g)
- low birth weight (1500-2499 g)
- normal birth weight (2500-3999 g)
- macrosomia (<4000 s. 4500g)



*small / BIG ?*

## OBESE / undernourished



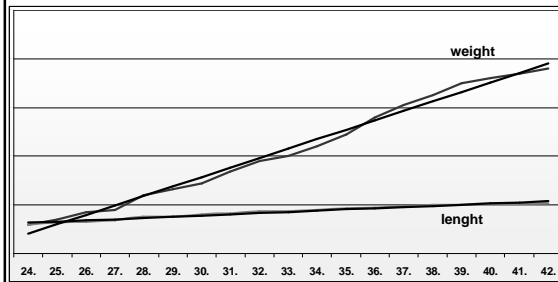
birth weight  
:  
birth length

symmetrically : asymmetrically

skinny

obese

### DYNAMICS OF FETAL WEIGHT AND LENGTH (through pregnancy)



### PONDERAL INDEKS ( g/cm<sup>3</sup> ) Rohrer's index

$$PI = 100 \times \frac{\text{birth weight (g)}}{\text{birth length}^3 (\text{cm})}$$

## FETAL MATURATION

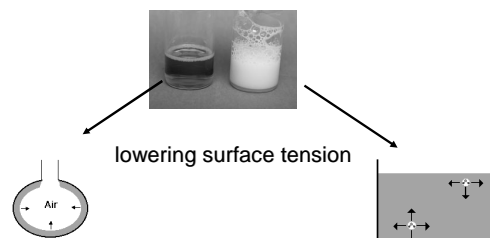
### Fetal maturity:

- depends primarily on the gestational age
- determinates outcome in preterm labor
- **accelerated maturation:** any kind of fetal distress (IUGR, preeclampsia, placental insufficiency)
- **slow(er) maturation:** DM, Rh immunization

### Fetal maturity:

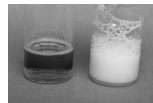
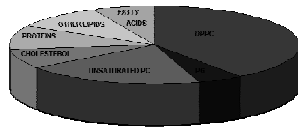
- when talking about fetal maturity, usually refers to fetal lung maturity
- degree of maturity / immaturity: CNS, digestive system, immune system, ..... (neonatologists)

### FETAL LUNG MATURITY



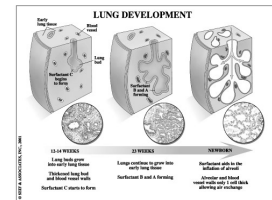
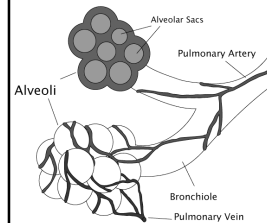
## SURFACTANT

- without it, every breath as if it were the first!

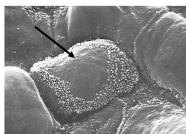


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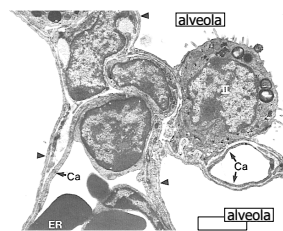
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## FETAL LUNG MATURITY pneumocyte ty. II (<2%)

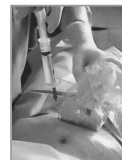


~27 weeks



## Amniocentesis

- invasive procedure
- fetal maturity in iatrogenic preterm birth
- the only way to prove fetal lung maturity



## ACZ – fetal lung maturation testing

### Biochemical tests:

- lecithin: sphingomyelin ratio
- phosphatidyl glycerol (+ or -)
- fluorescein polarization

### Biophysical tests

- Clementsov test foam
- Lamellar corpuscles



## Biophysical test

### Lamellar corpuscles number (conc.)

- lamellar bodies are surfactant storage packets in pneumocytes ty. II
- Fetal maturity: 30000-50000 / ml (amniotic fluid)
- 20000-30000 / ml lower limit
- simple, inexpensive, reproducible
- in the lab. counting - the equivalent of counting platelets because their size and shape is similar to lamellar bodies
- meta-analysis: the best test with predictive values better than L / S ratio

**Immaturity, and not size (weight) is the basic problem of prematurity**



## Corticosteroids

- 24 (25-26?) weeks
- stimulate fetal lungs maturation by "encouraging" pneumocytes ty. II in surfactant production
- different protocols:
- dexamethasone 2x6mg / 2 days

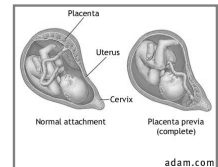
*"pseudostress / distress"*

## AMNIOSCOPY

## AMNIOSCOPY

- amniotic fluid colour
- Answering the following questions:
  - Is the fetus mature?
  - Is the fetus at risk / in distress?

- precondition: cervix chanell
- clinical examination by finger



## AMNIOSCOPY

- amniotic fluid colour
- Question: maturation degree
- After 38 weeks gradually vernix as a "patch" released into the amniotic fluid making the milky color effect
- Gradation of amniotic fluid colour around term:
  - clear
  - Indicated milk
  - Slightly milky
  - Porcelain like (white) colour



## AMNIOSCOPY

- **SECOND QUESTION IS:**  
*Is there any sign of fetal (possible) distress in the amniotic fluid (colour)?*

- - Is the child at risk?
- "Smeared" / meconium or green amniotic fluid



#ADAM

