Processes of adaptation to extrauterine life

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ADAPTATION

- 1.stabilisation and assurance an appropriate breathing and gas exchange
- 2. changes in blood circulation
- 3. thermoregulation
- 4. nutrition, digestion and absorption
- 5.elimination of metabolizm products

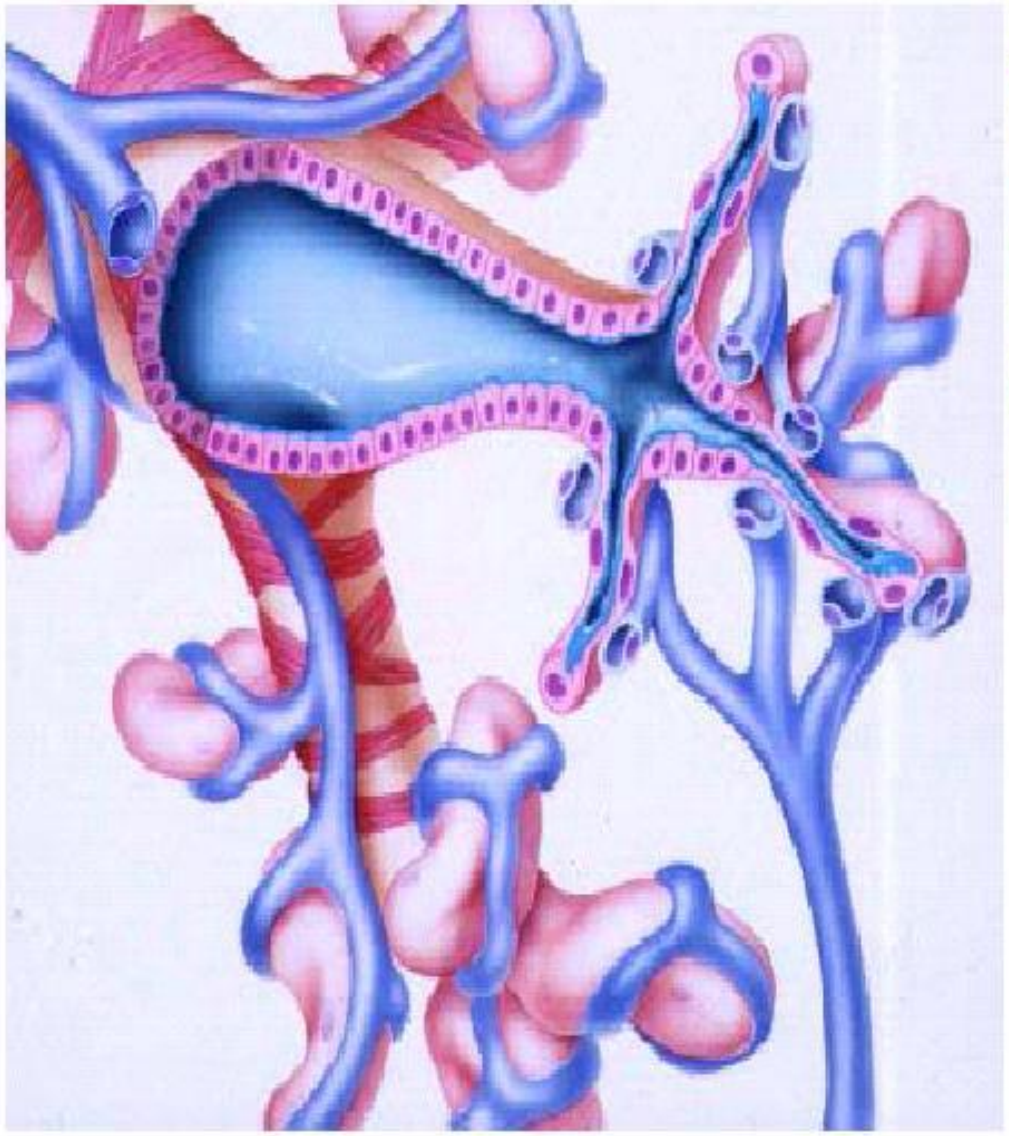
First breath

- High positive inspiratory pressure in airways
- 50 ml air 20-70cm H2O intervals 0,5-1 sec
- First few breaths 20-30 cm H2O
- Then 4 cm H2O
- Amnotic fluid is resorbed within few minutes
- FCR 20-30 ml (functional residual capacity)

SUFRACTANT

- SURFACTANT- lipoprotein – substance which help to expand and prevent to collapse small airspace

- Surfactant is produced by pneumocytes type II since 24 hbd



SURFACTANT EFFECTS

- Decrease of alveolar tension
- Convenience of amniotic fluid absorption
- Anti- oedemathosus
- Decrease of viscosity of airwives secretion
- Increase of bronchial motile
- Infuence on migration and activation of macrophages
- Inhibiton of lymphocytes and cytokines

Blood flow in pulmonary circulation

First breath

Changes of alveolar tension
Air- fuid phase

⬇ preassure in tissue around the vessels

⬇ Decrease of pulmonar vessels resistance

NO

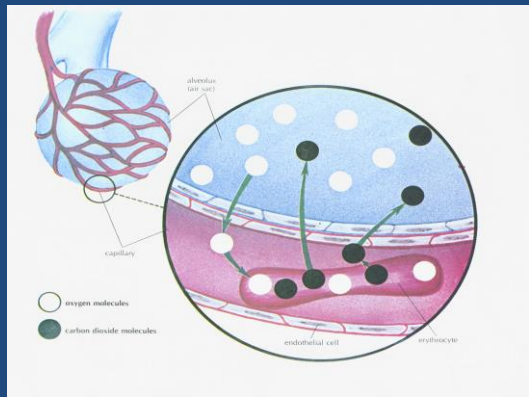
prostacykline

leukotriens

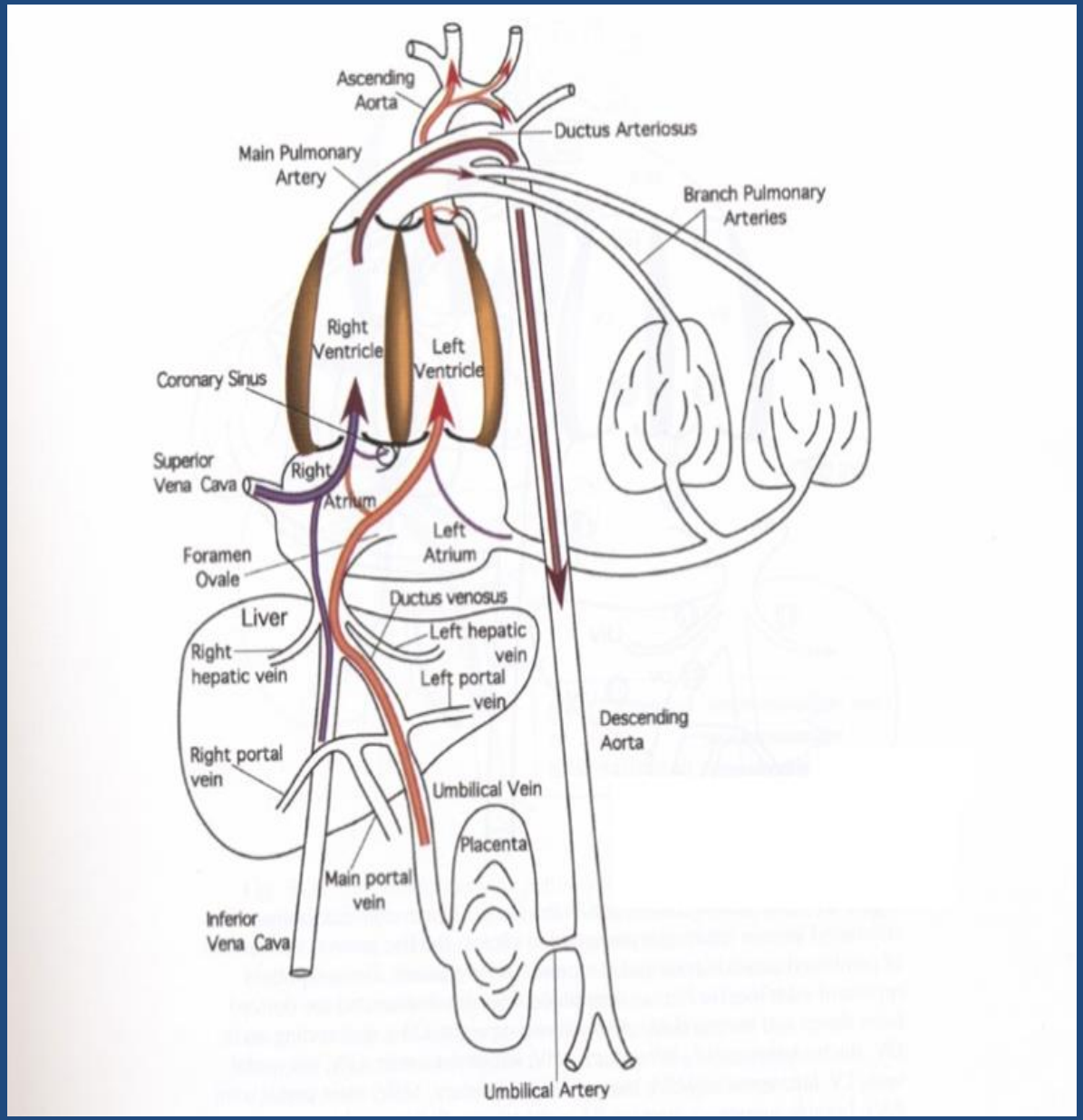
bradykinin

angiotensin 2

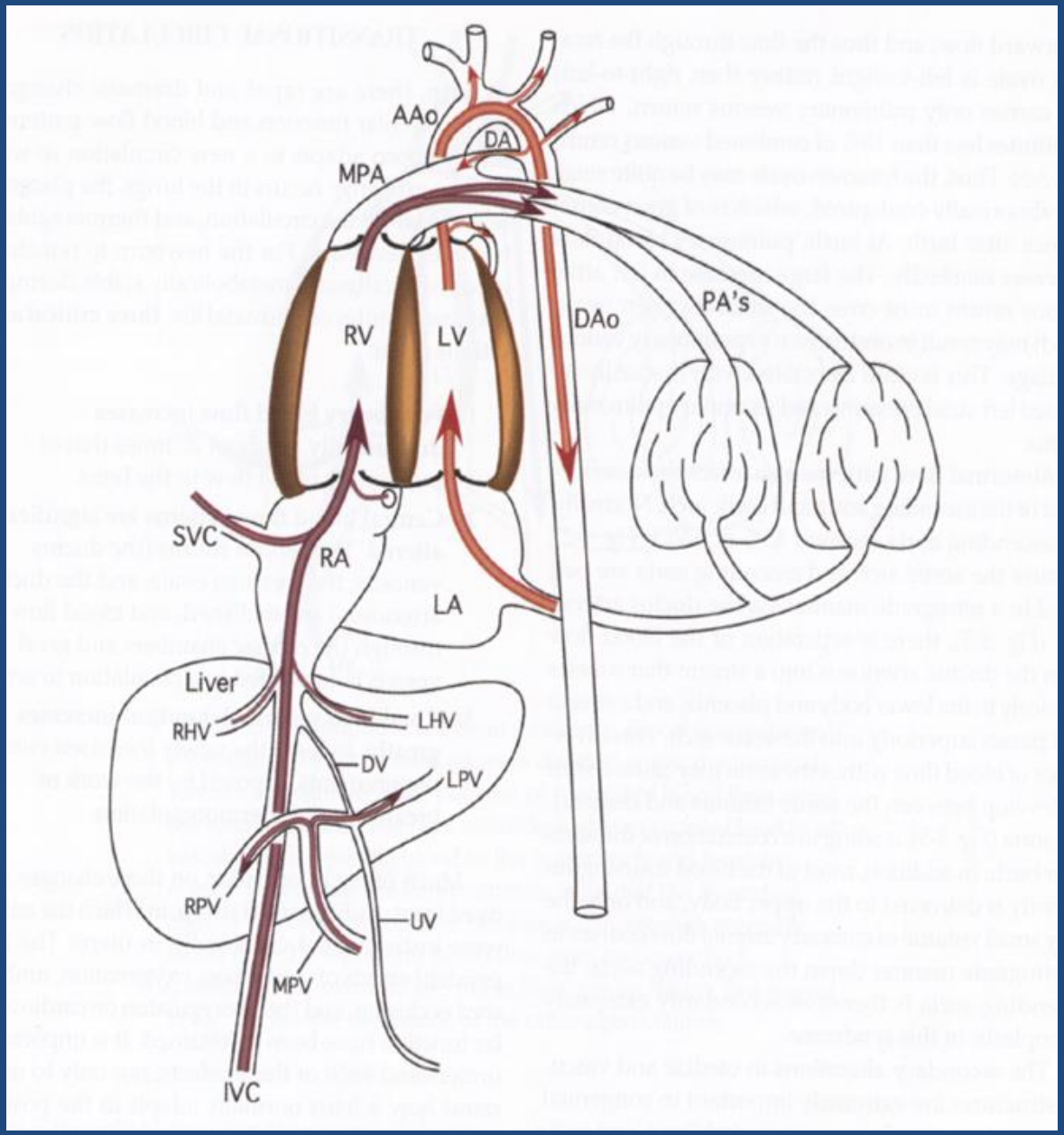
histamin



Fetal blood circulation



Neonatal blood circulation



Adaptation of blood circulation

- Change of low flow and high resistance intrauterine pulmonary circulation to high flow and low resistance pulmonary circulation of the newborn

- Clousure of ductus arteriosus, foramen ovale and ductus venosus

Haemodynamic changes

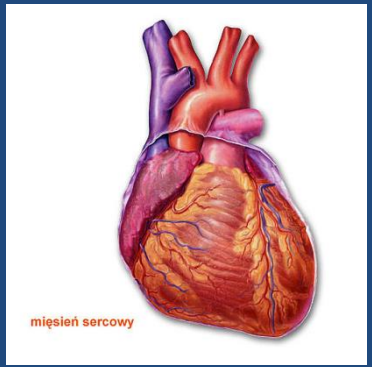
- ↑ blood flow in systemic circulation (clousure of ductus arteriosus, foramen ovale and ductus venosus)

Heart muscle

Just after birth minute heart volume increase 3x

- Increase of heart rate
- Increase of cardiac output
- Increase of activity of β-adrenergic receptors
- Change of anatomic and physiologic predominance right ventricule intrauterine to left ventricule after birth

To maintance an aprioprate circulating blood volume and optimal hematocrite we should to delay umbilical clamping at least 40-60 sec after birth

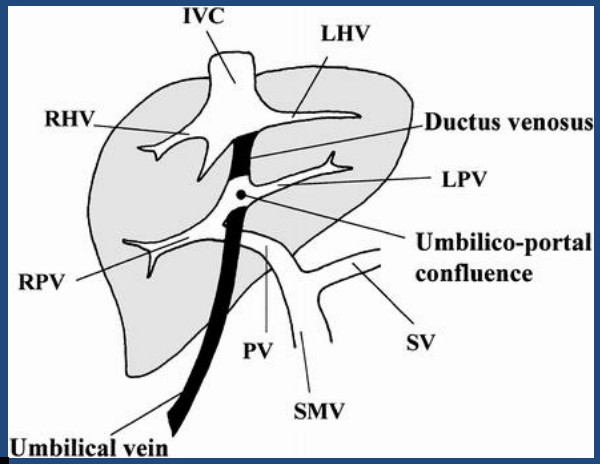


Saturation after birth

- 1’ – 60%
- 3’ – 70%
- 4’ – 80%
- 5’ – 85%
- 10’ – 90%

Ductus venosus

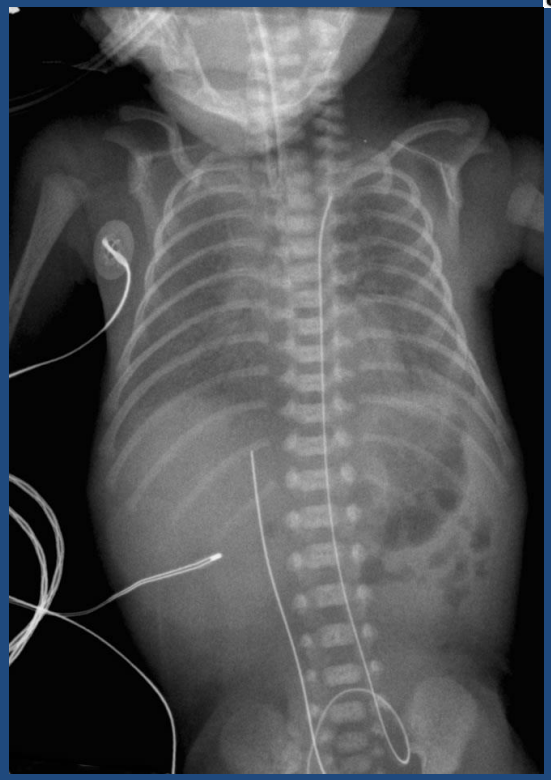
Clousure of ductus venosus in newborn



until 3. day – 12%

until 7. day – 76%

until 18. day – 100%



Ductus arteriosus

Full term newborn – clousure within 48 h- to 3 month

- Spiral muscel of DA wall
- Increase of oxygen concentration
- Decrease of prostaglandin concentration
- Decrease of NO production

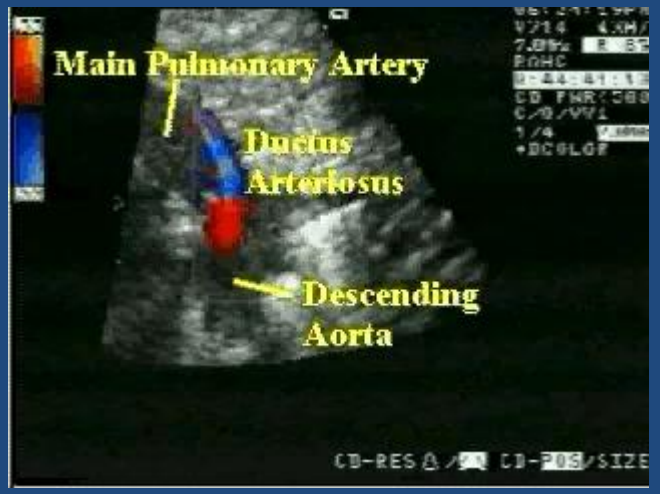
Preterm newborn- clousure of DA delayed

- Smaller muscel stratum in pilmonar arteriolas
- Lower sensitivity of DA wall for an oxygen
- Higher sensitivity of DA wall for prostaglandin
- Often coexistence of respiratory distress syndrom
- Necessity of using high volume of fluids i.v.

Ductus arteriosus

What delay clousure of DA

- Hypervolemia
- Immaturity of lungs and pneumonia
- Surfactant administration
- Birth aphyxia
- Blood transfusion



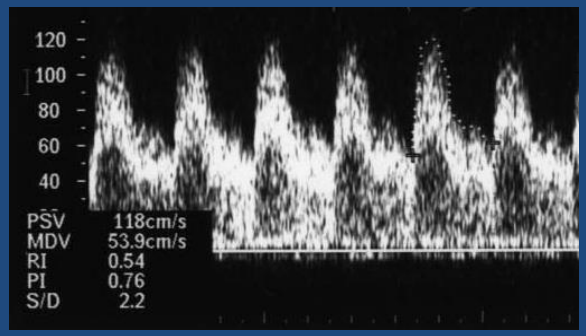
Cerebral blood circulation

Intrauterine, in I and III trimester – increase of cerebral flow in fetus

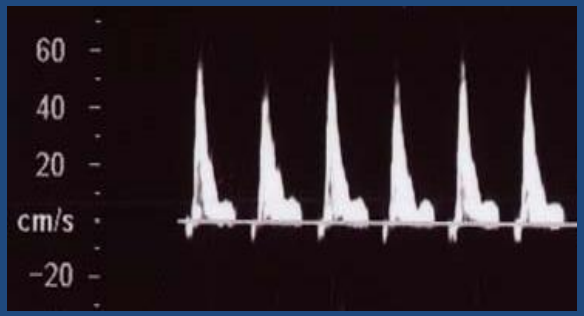
(large metabolic needs for fetal growth and movements)

Just before delivery decrease of cerebral blood flow is observed- centralization (uterine contraction, compensation of fetal head)

Flow in mean cerebral artery



Flow in mesenteric artery



Blood preassure

One of the most important life parameters –maintans apropriate perfusion of tissue of life important organs

Blood preassure in newborn

HBD	Systolic preassure mmHg	Diastolic preassure mmHg
< 24	48 - 63	24- 39
24-28	48 - 58	22 - 36
29-30	47 - 59	24 - 34
> 32	48 - 60	24 - 34

Blood preassure

BP increase about 10 mmHg for 48 hours

Newborns of smoking mothers have higher BP

Newborns born by cc have flower BP

MAP for full term newborns 30 mmHg

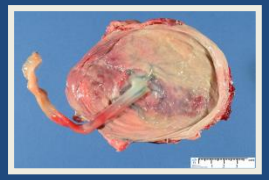
Preeterms- MAP shouldn’t be lower than HBD

Preterm newborns - 25hbd = MAP 25 mmHg

Thermoregulation

Thermoregulation of the fetus

85% wormth energy produced by fetus is changed by placenta



The biggest influance on temperature of fetus has mother's blood temperature

Metabolic processes of fetus are higher than mother's,
so it's teperature is higher- about 37 ° C

At delivery temperature of newborn decrease about 2° C
during few minutes after birth.

Thermoregulation of the newborn

- Full term newborn are able to keep appropriate temperature for a short time- few minutes

- It is impossible for premature babies – immature thermoregulation center in hypothalamus, low fat tissue, low muscles tone

- For keeping right body temperature, newborn use 42% of produced energy

Mechanisms af wartmth loose

1. Evaporation - through skin and airwives

2. Radiation - to cold objects

3. Convection - to surrounding air

4. Conduction - to objects in direct contact

Procedures at delivery room

Temperature of air 24.0 – 26.5° C

- **Comfortable and easy acces to place for resuscitation with heater- this place should be always ready for use**

- **Term born babies, in good condition should stay with mother with skin to skin contact**

- **If it's immposible - newborn should be dried, coverd worm blankets**

- **Put on cotton cup on a head**

- **Bath at least 4-6 hours after birth**

Delivery room- preterm newborns

- For newborn VLBW prepare worm, dry nipples, and very worm place for resscitation
- Newborn with VLBW- isolation from dry and cold air by putting in polyethylen bag
- Transport incubator is always ready to use and heated to temp. 34-36° C

Hypothermia – sympthoms and consequences

- Skin- cold, light-pink coloure, peripheral or central cyanosis
- General condition – weak appetite, apathy, weak cry
- Breath disorders – bradypnoe, expiratory grunting, apneas, pulmonary haemorrhage
- Circulation disorders –distal oedemas, oliguria, hypovolemia, bradycardia, asystolia
- Metabolic disorders – hypoglycemia, metabolic acidosis, hyperkaliemia,
- coagulopathy

Hypothermia – general rules

- Minimalizing any activities leading to loosing temperature
- Always heat places and equipmnents for nursing
- Don’t isolate newborn from heat source.

NEWBORNS LOVE AND NEED WARMTH!!!

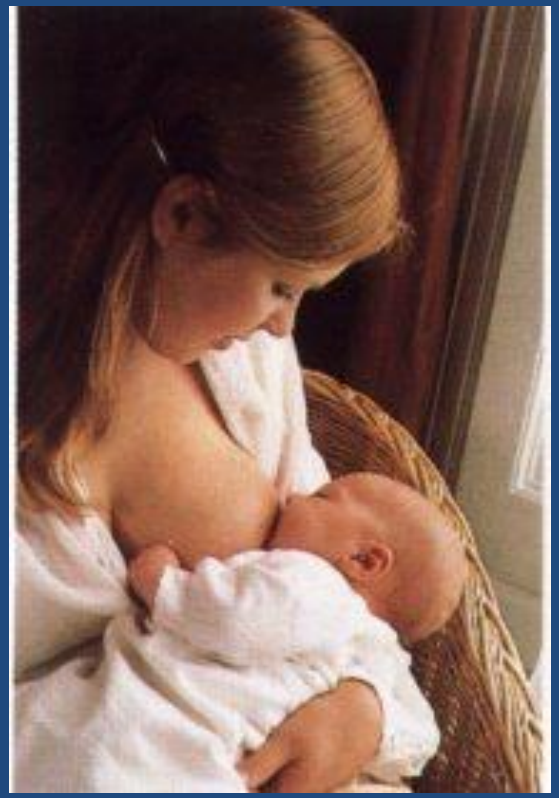
VERNIX CASEOSA

- Wather
- Sebum
- Triglycerides
- Epidarmal cells
- Amniotic fluid cells

Protective role of vernix caseosa

- Preventing losing of wather
- Moisturing the skin
- Protection before infection
- Cleaning the skin
- Antioxydant effects

- Feeding of the neweborn



BREAST- FEEDING – within 2 hours after birth

- Presence and warmth of the mother
- Beestings
- Colonisation of gestational duct
- Stimulation of guts movements
- Avoiding of hypoclycaemia
- Stymulation of lactiation

Passage of stools

- Meconium: pass within 24-48 hours
- Delay of meconium passage: higher jaundice, mucoviscidosis, meconium leus, colonic atresia, intestinal obstruction, Hirshsprung disease (congenital aganglionic magacolon)
- Transient stools
- Proper stools

Renal circulation and filtration

High resistanse of renal arteties flow couses

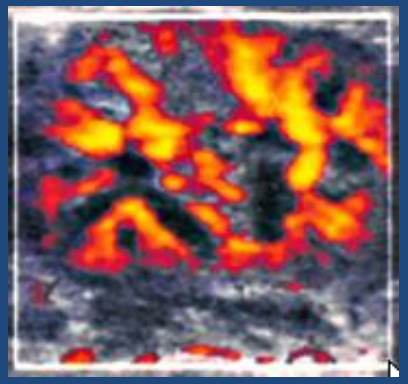
- Low renal blood flow (30%)
- Low glomerular filtration (30-50%)

Results: low filtration, urine cocnentration,
urine output

1 day – 90% newborns doesn't pass an urine

next days- urine output
1-2 ml/kg/hour = 15-30 ml/kg/day

about 8 mictions/day



Thank you