HUMAN MILK AND BREASTFEEDING RELATED ISSUES

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Types and Composition of Human Breast Milk

- **Types of Breast Milk:**
  - Colostrum or Early Milk
  - Transitional Milk
  - Mature Milk
- **Colostrum or Early Milk**: is produced in the late stage of pregnancy till 4 days after delivery; and is rich in antibodies.
- **Transitional Milk:** produced from day 4 – 10 is lower in protein in comparison to Colostrum.
- **Mature milk:** is produced from approximately ten days after delivery up until the termination of the breastfeeding.

Kind (In 100 ml)	Protein (g)	Fat (g)	Carbohydrate (g)	Calorie (Kcal)
Colostrum	7.5	2	4-5	150
Transitive	2.5	3.2	5.5 – 6.6	60-80
Mature	1.1-1.5	3.5-4.5	7	65-70

❑*Milk which outpoured in one feeding can be classified as:*

- ***Fore milk*** Early milk – At the beginning of the feeding, got more lactose, proteins and water and water and satisfies the baby's thirst.
- ***Hind milk*** Late milk – comes later towards the end of a feed and is richer in fat content and provides more energy, and satisfies the baby's hunger.

✓ For optimum growth the baby needs both fore and hind milk.

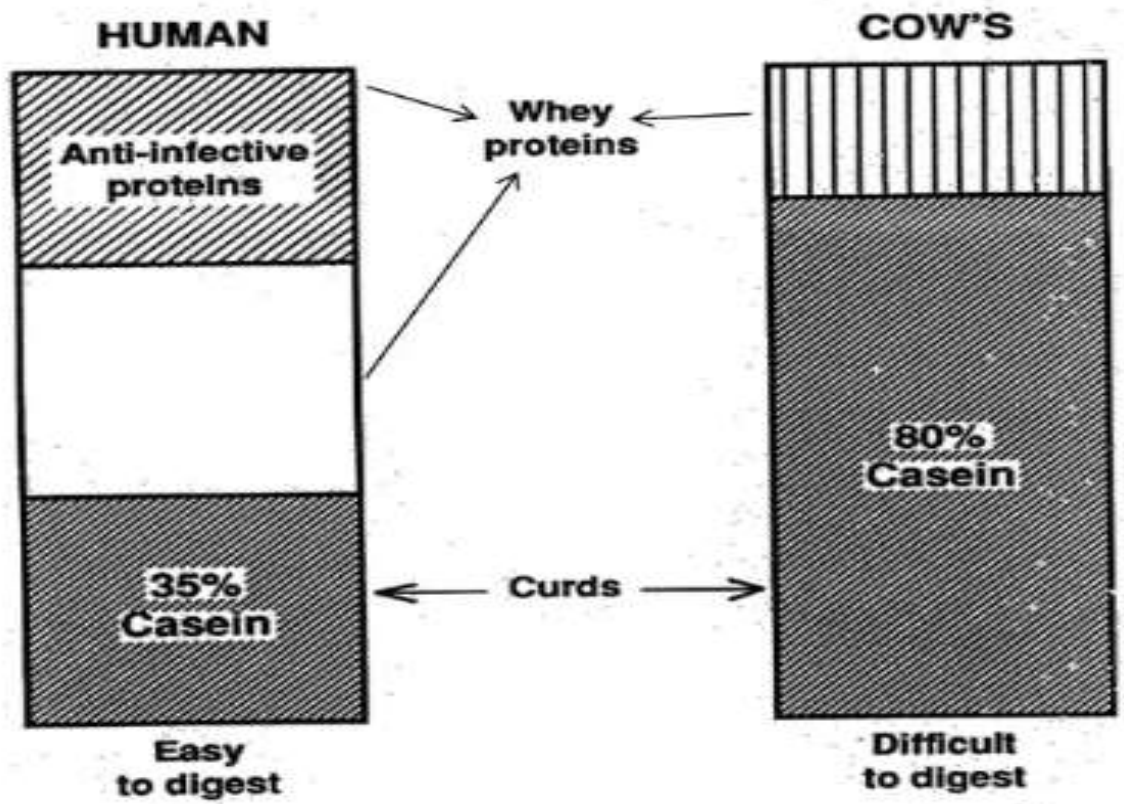
✓ The baby should therefore be allowed to empty one breast.

✓ The second breast should be offered after emptying the first.

Summary of differences between milks

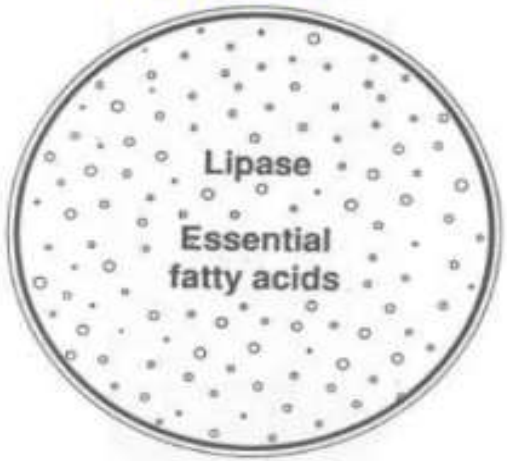
	HUMAN MILK	ANIMAL MILK	FORMULA
Bacterial contaminants	none	likely	likely when mixed
Anti-infective factors	present	not present	not present
Growth factors	present	not present	not present
Protein	correct amount easy to digest	too much difficult to digest	partly corrected
Fat	enough essential fatty acids lipase to digest	lacks essential fatty acids no lipase	lacks essential fatty acids no lipase
Iron	small amount well absorbed	small amount not well absorbed	extra added not well absorbed
Vitamins	enough	not enough A and C	vitamins added
Water	enough	extra needed	may need extra

Differences in the Quality of the Proteins in Different Milks



Differences in the Fats of Different Milks

HUMAN

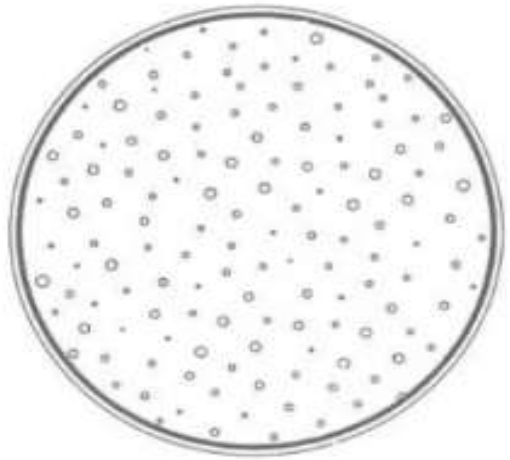


Contains

Essential Fatty Acids,

Enzyme Lipase

COW`S

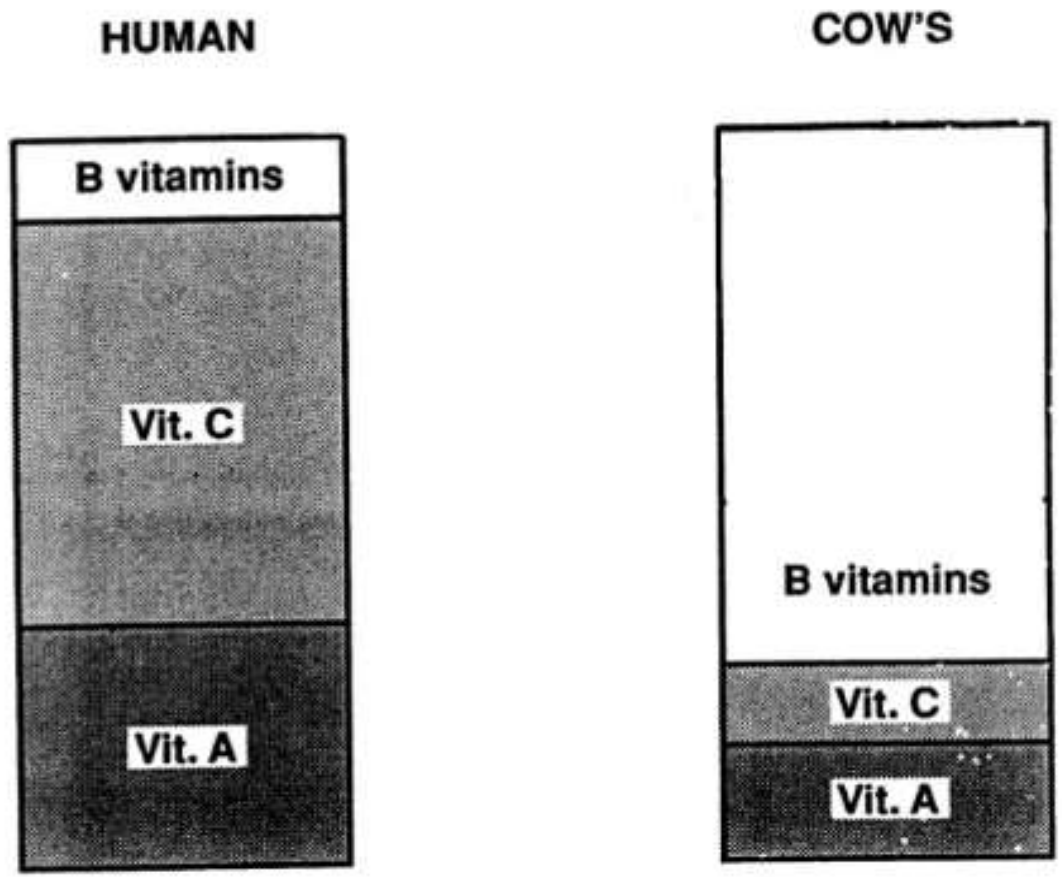


Contains

No Essential Fatty Acids

No Enzyme Lipase

Vitamins in Different Milks



Iron in Milk

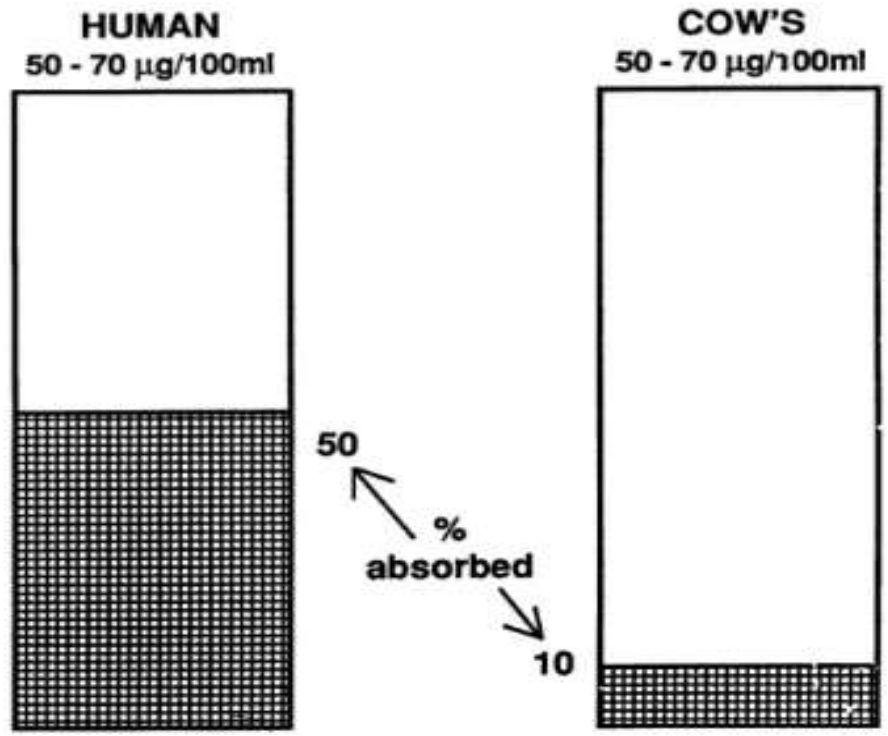


Table 45-1	Selected Beneficial Properties of Human Milk Compared to Infant Formula
Secretory IgA	Specific antigen-targeted antiinfective action
Lactoferrin	Immunomodulation, iron chelation, antimicrobial action, antiadhesive, trophic for intestinal growth
κ-Casein	Antiadhesive, bacterial flora
Oligosaccharides	Prevention of bacterial attachment
Cytokines	Antiinflammatory, epithelial barrier function
Growth factors	
Epidermal growth factor	Luminal surveillance, repair of intestine
Transforming growth factor (TGF)	Promotes epithelial cell growth (TGF-β) Suppresses lymphocyte function (TGF-β)
Nerve growth factor	Promotes neural growth
Enzymes	
Platelet-activating factor-acetylhydrolase	Blocks action of platelet-activating factor
Glutathione peroxidase	Prevents lipid oxidation
Nucleotides	Enhance antibody responses, bacterial flora

Table 45-2	Conditions for Which Human Milk Has Been Suggested to Possibly Have a Protective Effect

Acute disorders	Crohn disease
Diarrhea	Childhood cancer
Otitis media	Lymphoma
Urinary tract infection	Leukemia
Necrotizing enterocolitis	Recurrent otitis media
Septicemia	Allergy
Infant botulism	Obesity and overweight
Insulin-dependent diabetes mellitus	Hospitalizations
Celiac disease	Infant mortality

Maternal Benefits

- Decreased postpartum blood loss
- Rapid involution of the uterus
- Continued breastfeeding leads to increased child spacing
- Rapid return to pre-pregnancy weight
- Reduced risk of rheumatoid arthritis, hypertension, hyperlipidemia, cardiovascular disease, and diabetes
- Reduction in risk of breast and ovarian cancer

Breast Feeding

- Breast milk is specifically designed to optimise the baby's growth and development.

Two important concepts of Breast feeding

- Early initiation of breast feeding
- Exclusive Breastfeeding for six months

How often will my newborn feed?

- 8- 12 times per day

- 5-15 minutes per breast

❑ Indicators of successful feeding in babies:

- Frequent feedings 8-12 times daily.
- audible and visible swallowing
- sustained rhythmic suck
- relaxed arms and hands
- moist mouth
- regular soaked/heavy nappies, about 6-8 wet diapers in a 24 hour.
- Average daily weight gain of 20 -40g.
- Go to sleep and comfort after feeding.

Breast Pumps

- Hand Expression
- Manual Pumps
- Mechanical Pumps

Breast milk Storage

- Store in:
  - glass or BPA-free plastic bottle
  - Breast milk storage bags
- Good for:
  - 3-4 hours at room temperature
  - 24 hours on ice
  - 3-7 days in fridge
  - 6 months in freezer

- All breastfed infants should receive **400 IU** of oral vitamin D drops daily beginning during the first 2 months of life.
- Do not forget : administration of intramuscular vitamin K until after the first feeding is completed but within **6 h** of birth

Galactocemia and phenylketonuria

Table 45-3 Absolute and Relative Contraindications to Breastfeeding Because of Maternal Health Conditions

MATERNAL HEALTH CONDITION	DEGREE OF RISK
HIV and HTLV infection	In the United States, breastfeeding is contraindicated In other settings, health risks of not breastfeeding must be weighed against the risk of transmitting virus to the infant
Tuberculosis infection	Breastfeeding is contraindicated until completion of approximately 2 wk of appropriate maternal therapy
Varicella-zoster infection	Infant should not have direct contact to active lesions Infant should receive immune globulin
Herpes simplex infection	Breastfeeding is contraindicated with active herpetic lesions of the breast
CMV infection	May be found in milk of mothers who are CMV seropositive Transmission through human milk causing symptomatic illness in term infants is uncommon
Hepatitis B infection	Infants routinely receive hepatitis B immune globulin and hepatitis B vaccine if mother is HbsAg positive No delay in initiation of breastfeeding is required
Hepatitis C infection	Breast-feeding is not contraindicated
Alcohol intake	Limit maternal alcohol intake to <0.5 g/kg/day (for a woman of average weight, this is the equivalent of 2 cans of beer, 2 glasses of wine, or 2 oz of liquor)
Cigarette smoking	Discourage cigarette smoking, but smoking is not a contraindication to breastfeeding
Chemotherapy, radiopharmaceuticals	Breastfeeding is generally contraindicated

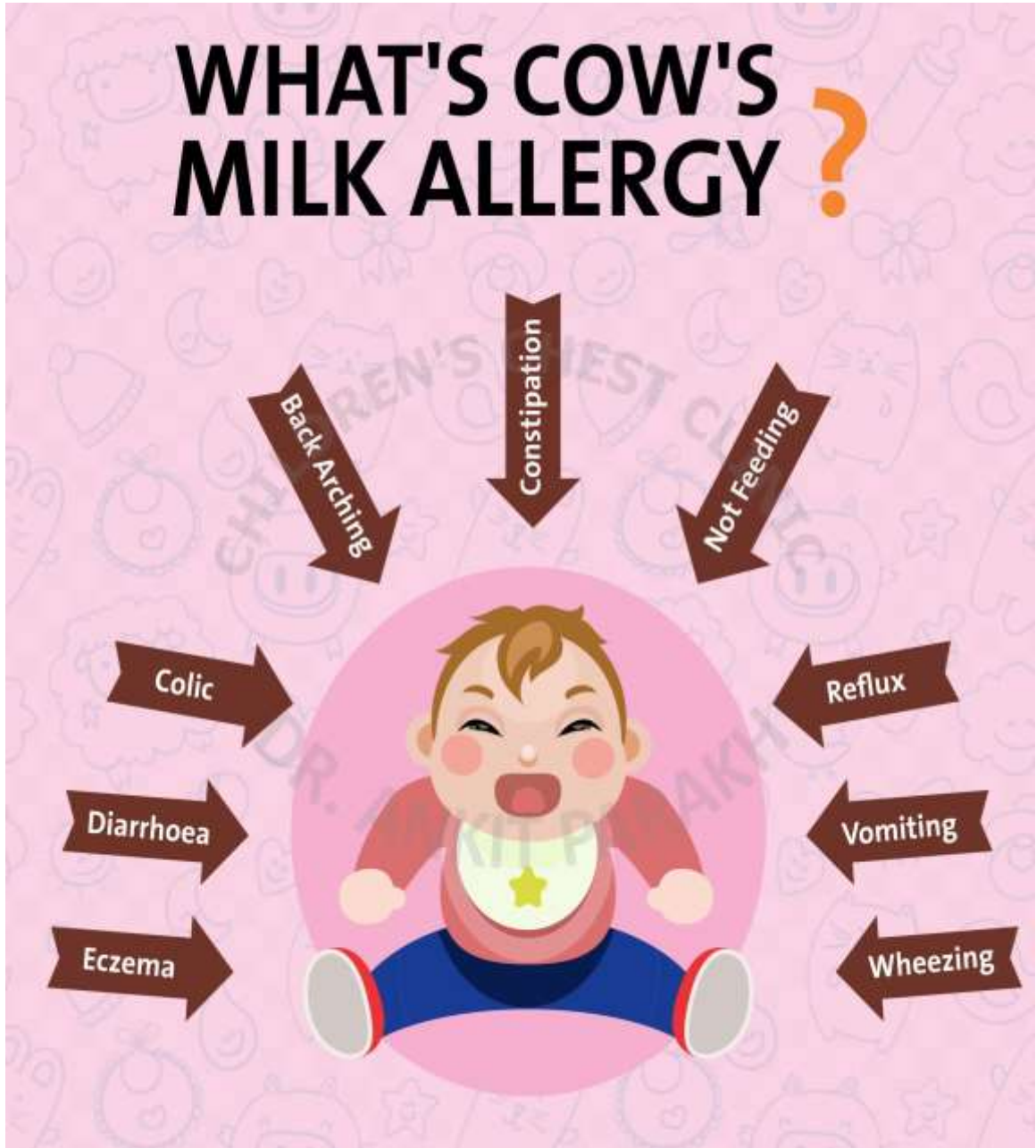
Breast Milk Jaundice	Lactation Failure Jaundice
Most commonly presents in the second week of life	Usually presents in the first week of life
Affected infants are thriving and weight gain is adequate	Affected infants are often dehydrated and have weight loss or poor weight gain
Breastfeeding is adequate	Breastfeeding is NOT providing sufficient nutrition
Treatment is usually NOT required	Optimize/supplement breastfeeding ± consider consultation with a lactation specialist
Spontaneous resolution usually occurs within twelve weeks of age	Spontaneous resolution usually occurs by the third week of life

Cow’s Milk Protein Allergy

- **Cows' milk protein allergy** is an immune-mediated allergic response to proteins in milk [Vandenplas et al, 2007; Ludman et al, 2013].
  - Milk contains casein and whey fractions, each of which have five protein components.
  - A person can be sensitized to one or more components within either group.
- **Cows' milk protein allergy is classified according to the underlying cause** [Vandenplas et al, 2007; Caffarelli et al, 2010;NICE, 2011; Koletzko et al, 2012; Ludman et al, 2013]:
  - Immunoglobulin E (IgE)-mediated reactions are acute and frequently have a rapid onset. They occur up to 2 hours after ingestion of cows' milk, usually within 20–30 minutes.
  - Non-IgE-mediated reactions are generally delayed and non-acute. They manifest up to 48 hours or even 1 week after ingestion of cows' milk protein [Koletzko et al, 2012].
  - Mixed IgE and non-IgE allergic reactions involve a mixture of both IgE and non-IgE responses.

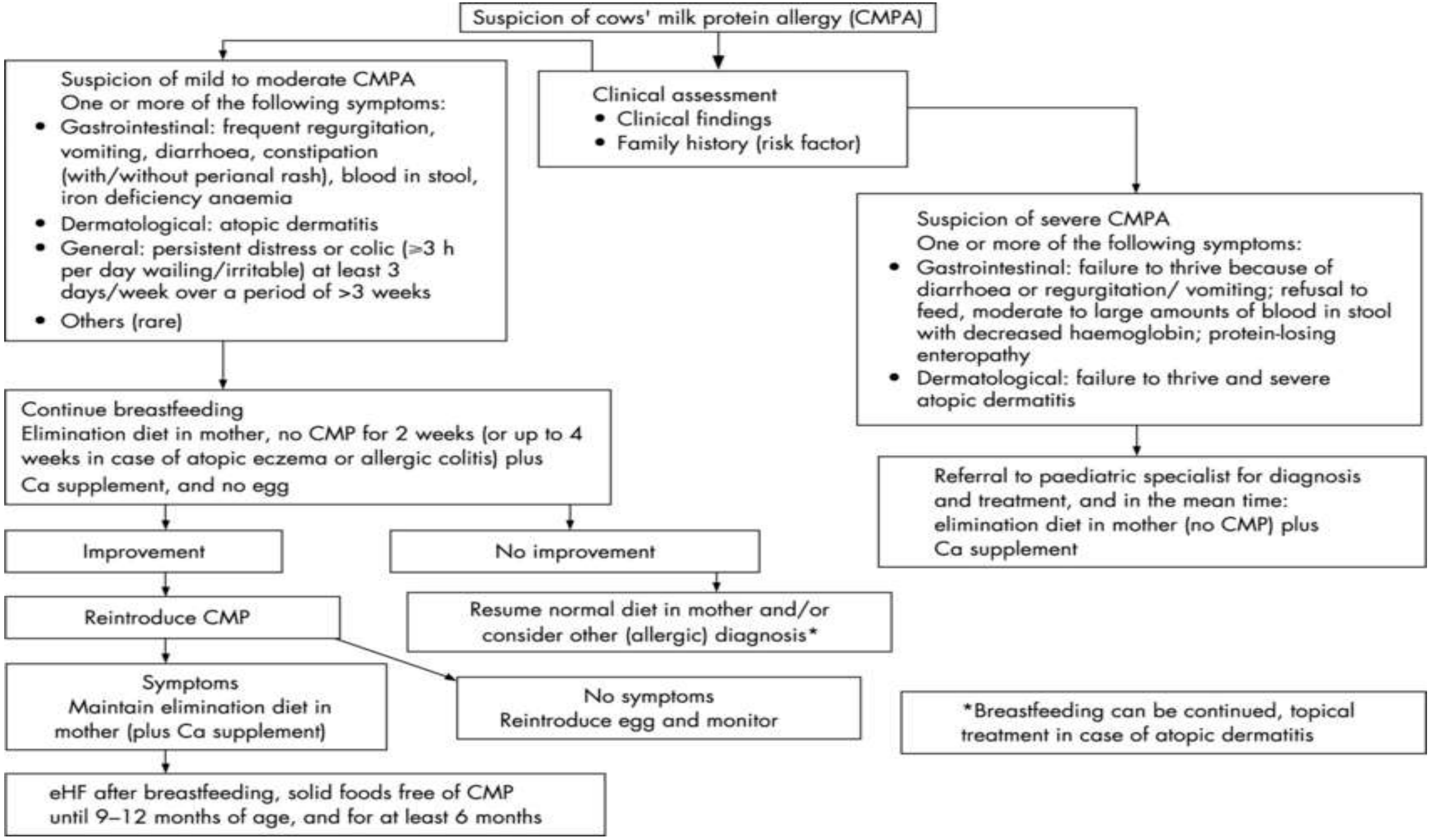
Therapeutic area	Symptoms
Gastrointestinal	• Frequent regurgitation • Vomiting • Diarrhea • Constipation • Blood in stool without failure to thrive
Dermatological	• Atopic dermatitis • Swelling of lips or eye lids • Urticaria unrelated to acute infections, drug intake, or other causes
Respiratory	• Runny nose • Recurrent otitis media • Chronic cough • Broncho-constriction unrelated to infection
General	• Persistent distress • Colic (≥3 h/day wailing/irritable) over a period of >3 weeks

CMPA: cow's milk protein allergy.
[a]Infants with CMPA in general show one or more of the listed symptoms.

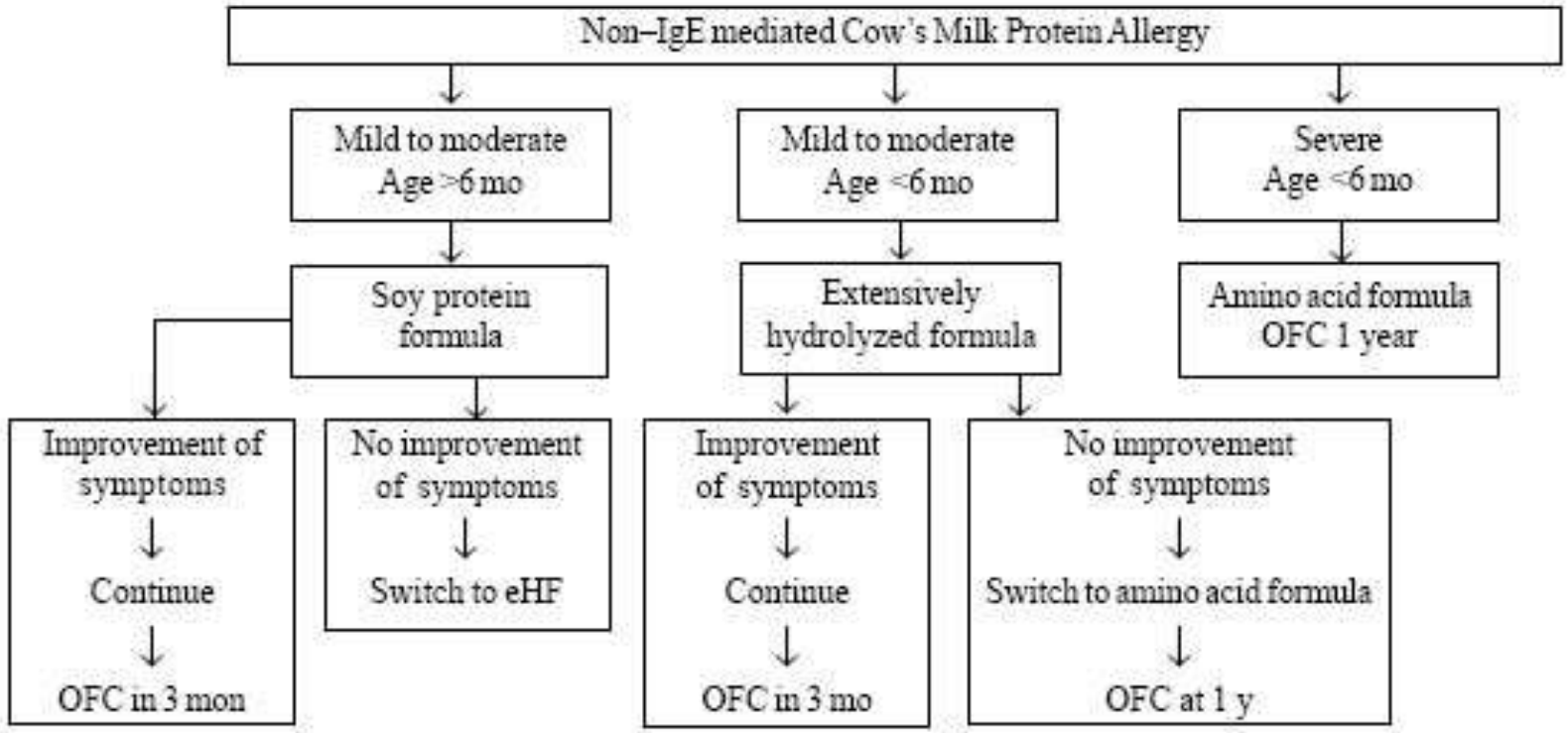


Cow's Milk Protein Allergy

- **Based on the findings of the allergy-focused clinical history, physically examine the child,** paying particular attention to:
  - Growth and physical signs of malnutrition.
  - Signs indicating other comorbidities (such as atopic eczema, asthma, or allergic rhinitis).
  - Signs indicating an alternative diagnosis.


Suspicion of cows' milk protein allergy (CMPA)
Suspicion of mild to moderate CMPA
One or more of the following symptoms:
• Gastrointestinal: frequent regurgitation, vomiting, diarrhoea, constipation (with/without perianal rash), blood in stool, iron deficiency anaemia
• Dermatological: atopic dermatitis
• General: persistent distress or colic (≥3 h per day wailing/irritable) at least 3 days/week over a period of >3 weeks
• Others (rare)
Clinical assessment
• Clinical findings
• Family history (risk factor)
Suspicion of severe CMPA
One or more of the following symptoms:
• Gastrointestinal: failure to thrive because of diarrhoea or regurgitation/ vomiting; refusal to feed, moderate to large amounts of blood in stool with decreased haemoglobin; protein-losing enteropathy
• Dermatological: failure to thrive and severe atopic dermatitis
Continue breastfeeding
Elimination diet in mother, no CMP for 2 weeks (or up to 4 weeks in case of atopic eczema or allergic colitis) plus Ca supplement, and no egg
Referral to paediatric specialist for diagnosis and treatment, and in the mean time: elimination diet in mother (no CMP) plus Ca supplement
Improvement
No improvement
Reintroduce CMP
Resume normal diet in mother and/or consider other (allergic) diagnosis*
Symptoms
Maintain elimination diet in mother (plus Ca supplement)
No symptoms
Reintroduce egg and monitor
*Breastfeeding can be continued, topical treatment in case of atopic dermatitis
eHF after breastfeeding, solid foods free of CMP until 9–12 months of age, and for at least 6 months

Cow's Milk Protein Allergy



OFC: Oral food challenge; eHF: Extensively hydrolyzed formula.

Cow’s Milk Protein Allergy

The Gastrointestinal Microbiome

A Bridge Between Pathogenesis and Management

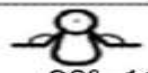
While the composition of the gastro-intestinal (GI) microbiome and its manipulation is not a main factor in the management of CMA, it is interfering independent of the dietary management option chosen. There is an increasing body of evidence showing that the composition of the GI microbiome is a key factor in the development of immune function.[109,110]

Gestational age

- It is calculated from the first day of the last menstrual period to the date of birth.
- **Stillbirth**: Infant expelled from birth canal at or after 24weeks of pregnancy who shows no signs of life and has no heart beat.
- Establishing the exact gestational age is sometimes difficult, and so for many years classification and outcome studies have been based on **birthweight**, which is measureable.
- **The survival and neurodevelopmental outcome** are more strongly determined by the degree of **prematurity than by birth weight**.
- **New Ballard examination**: an objective examination of the newborn baby.

New Ballard score

Neuromuscular Maturity

Score	-1	0	1	2	3	4	5
Posture							
Square window (wrist)	 >90°	 90°	 60°	 45°	 30°	 0°	
Arm recoil		 180°	 140°–180°	 110°–140°	 90°–110°	 <90°	
Popliteal angle	 180°	 160°	 140°	 120°	 100°	 90°	 <90°
Scarf sign							
Heel to ear							

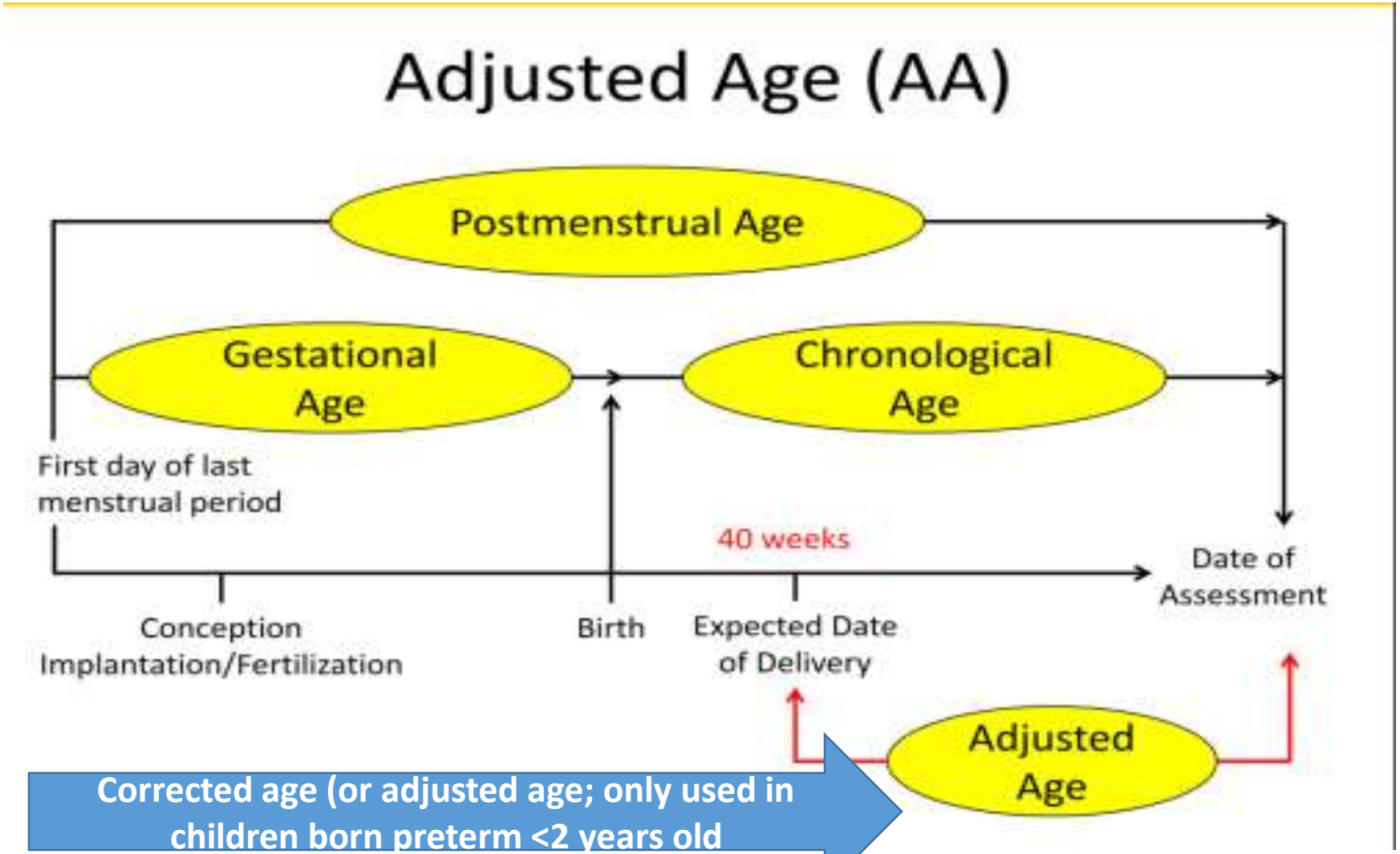
Physical Maturity

Skin	Sticky, friable, transparent	Gelatinous, red, translucent	Smooth, pink; visible veins	Superficial peeling and/or rash; few veins	Cracking, pale areas; rare veins	Parchment, deep cracking; no vessels	Leathery, cracked wrinkled
Lanugo	None	Sparse	Abundant	Thinning	Bald areas	Mostly bald	
Plantar surface	Heel-toe 40-50 mm: –1 <40 mm: –2	>50 mm, no crease	Faint red marks	Anterior transverse crease only	Creases anterior ⅔	Creases over entire sole	
Breast	Imperceptible	Barely perceptible	Flat areola, no bud	Stippled areola, 1–2 mm bud	Raised areola, 3–4 mm bud	Full areola, 5–10 mm bud	
Eye/Ear	Lids fused loosely: –1 tightly: –2	Lids open; pinna flat; stays folded	Slightly curved pinna; soft; slow recoil	Well curved pinna; soft but ready recoil	Formed and firm, instant recoil	Thick cartilage, ear stiff	
Genitals (male)	Scrotum flat, smooth	Scrotum empty, faint rugae	Testes in upper canal, rare rugae	Testes descending, few rugae	Testes down, good rugae	Testes pendulous, deep rugae	
Genitals (female)	Clitoris prominent, labia flat	Clitoris prominent, small labia minora	Clitoris prominent, enlarging minora	Majora and minora equally prominent	Majora large, minora small	Majora cover clitoris and minora	

Maturity Rating

Score	Weeks
-10	20
-5	22
0	24
5	26
10	28
15	30
20	32
25	34
30	36
35	38
40	40
45	42
50	44

Gestational age



Gestational age

Table 11.1 Gestational age bands and their incidence.

Gestational age (weeks after LMP)	Terminology	Approximate incidence (as % singleton live births)[a]
>42 weeks	Post term	4
37–42 weeks	Term	90
<37 weeks	Preterm	6–8
34–36 weeks	Late preterm[b]	4.9
32–34 weeks	Moderately preterm[b]	0.8
28–32 weeks	Very preterm[b]	1.3
<28 weeks	Extreme preterm[b]	0.4
≤24 weeks	Threshold of viability	0.14

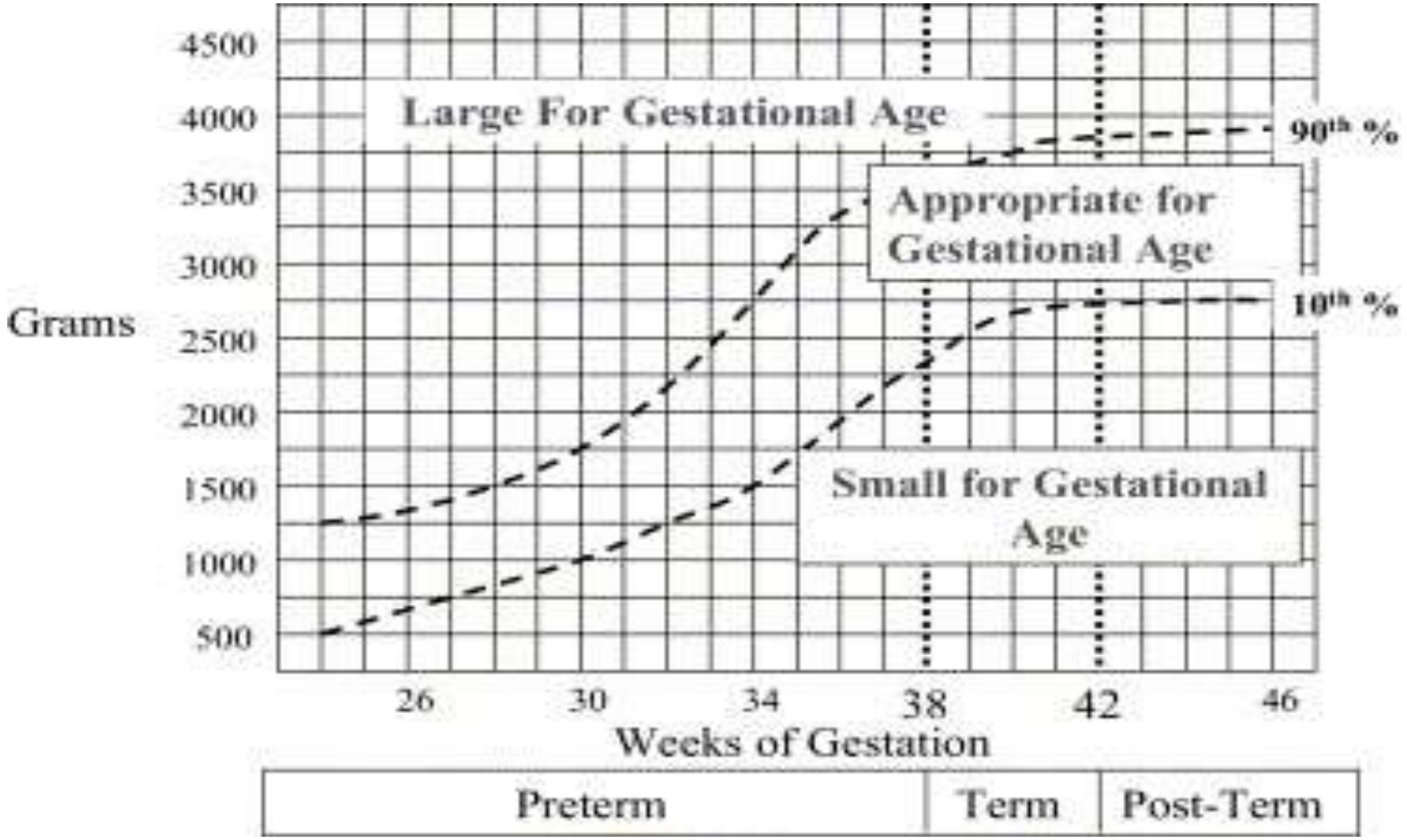
[a] The frequency of preterm birth is much higher in multiples (twins, triplets, etc.).

[b] The definitions of these gestation bands vary between different countries and authors.

Birth weight classification

Macrosomia	• More than 4000 gm
Normal	• Between 2500 – 4000 gm
Low birth weight	• Less than 2500 gm • More than 1500 gm
Very low birth weight	• Less than 1500 gm. • More than 1000 gm.
Extremely low birth weight	• Less than 1000 gm.

Definitions AGA, SGA, and LGA



Causes of SGA

Fetal	Maternal	Uterine/Placental	Demographic
Karyotypic	**Medical conditions**	**Gross structural placental factors**	**Maternal age**
-Trisomy 21	-Hypertension	-Single umbilical artery	-Very young age
-Trisomy 18	-Renal disease	-Placental hemangiomas	-Older age
-Monosomy X	-Diabetes mellitus	-Infarcts, focal lesions	**Maternal height**
-Trisomy 13	-Collagen vascular diseases	**Insufficient uteroplacental perfusion**	**Maternal weight**
Chromosomal abnormalities	-Maternal hypoxemia	-Suboptimal implantation site	**Maternal and paternal race**
-Autosomal deletion	**Infection**	**Placenta previa**	**History of SGA**
-Ring chromosomes	-Toxoplasmosis	**Low-lying placenta**	
Genetic diseases	-Rubella	**Placental abruption**	
-Achondroplasia	-Cytomegalovirus		
-Bloom syndrome	-Herpesvirus		
Congenital anomalies	-Malaria		
-Potter syndrome	-Trypanosomiasis		
-Cardiac abnormalities	-HIV		
	Nutritional status		
	-Low prepregnancy weight		
	-Low pregnancy weight		
	Substance use/abuse		
	-Cigarette smoking		
	-Alcohol		
	-Illicit drugs		
	-Therapeutic drugs		

HIV, human immunodeficiency virus; SGA, small for gestational age.
Reprinted with permission from [3].

IntraUterine Growth Restriction (IUGR)

- A **fetus** with an estimated fetal weight (EFW) **<10%** of gestational age. It is the condition where infants have not achieved their optimal **intrauterine** growth potential.

- **Symmetric or asymmetric FGR**
  - **Symmetric fetal growth restriction**
    - (head circumference, height, and weight all <10th percentile).
    - Is due to either decreased growth potential of the fetus (congenital infection or genetic disorder) or extrinsic conditions that are active **very early** in pregnancy.

  - **Asymmetric fetal growth restriction (more common).**
    - Fetal weight is reduced out of proportion to the length and head circumference.
    - In these infants, brain growth is usually spared.
    - Common etiologies include uteroplacental insufficiency, maternal malnutrition, and extrinsic conditions appearing **late** in pregnancy.

IntraUterine Growth Restriction (IUGR)

- Complications of IUGR:

1. **Hypoxia and asphyxia**
2. **Hypothermia.**
3. **Metabolic: Hypoglycemia or Hyperglycemia, Hypocalcemia.**
4. **Liver disease.** Cholestasis and Hypertriglyceridemia
5. **Hematologic disorders.** Hyperviscosity and polycythemia; Thrombocytopenia, neutropenia, and altered coagulation profile.
6. **Altered immunity.**

THANK YOU