

Pediatrics TeamWork ^K
437

Breastfeeding

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Overview



Breast milk vs Formula: Are they the same?

- Until now, we don't really know what is breast milk, and formula is only superficially similar to breast milk; they are **NOT** the same
- There is no such thing as a **standard breast milk** and companies may use this to **market their formulas** specially for special babies

Breast milk varies:

1. From woman to woman
2. Depending on the baby's gestational age mater
3. With the mother's diet pre approve
4. With the time of day
5. With the length of time after birth
6. During a single feeding
7. With which breast is offered first
8. With the time of the mother's menstrual cycle
9. With the number of previous pregnancies
10. Depending on how the milk is obtained



Remember breast is the best!

Dr's notes

- Premature babies need differs from term babies need; the younger the gestational age the more content that's useful in the maturation of the infant.
- The colostrum and milk will adapt to the deficiency of the preterm baby.
- When you use exclusive fresh breast milk as much as she can with kangaroo care. She will have the same health of a term baby.
- Colostrum content differs with time
- The baby should suck from each breast equally or she will have unequal breast size
- Colostrum is small in amount but it's enough for the baby.
- The normal flora of the mother that's present in the breast areola is beneficial to the neonate
- الصدر يترهل بسبب الريلاكسن الي يفرز وقت الحمل بالاضافة الي زيادة الوزن بعد الولادة وعدم لبس البرا المناسبة او ما تلبس من الاساس بشكل دائم
- Mother with preterm baby has a longer excretion of colostrum, it can last for 10 days
- There's a myth says that premature baby has to have a special formula
- According to the mother's diet there will be changes in breast milk
- Delaying administration of colostrum or using formula are both risk factors of necrotizing enterocolitis
- A mother presents with a hx of gastric bypass and she wants to treat her baby what should you advise her? To eat frequent healthy meals with supplements.

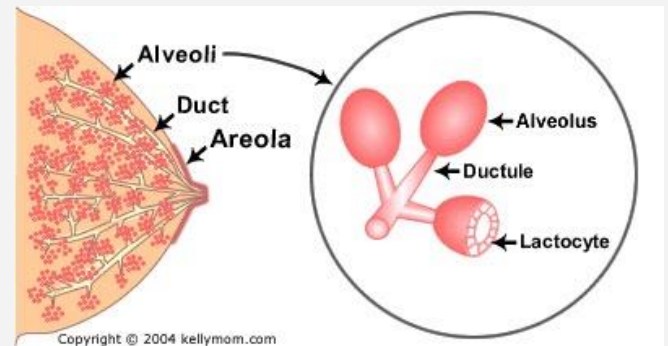
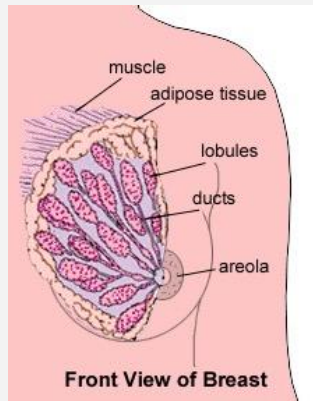
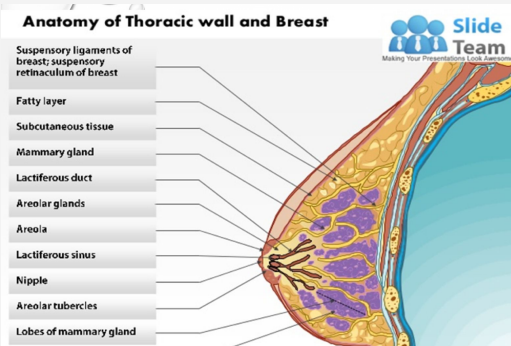
Human milk

- The defining characteristic of the class mammalia is the ability to produce milk, an externally secreted fluid designed specifically to nourish the young
- It is a **unique complex living fluid** with a composition that is **species specific**
- It is the most appropriate source of nutrition for the infant up to the **age of 6 months**
- It is rich in nutrients needed for the growth of the newborn, and in non-nutritional bioactive components such as the **maternal antibodies, chemical mediators, vitamins, enzymes** and **some types of white blood cells in breast milk (particularly in colostrum)** augment the action of the baby's immune system.
- This unique fluid evolves to meet the changing needs of the baby during growth and maturation.

Overview



Breast anatomy



Latching

Good latch (CLAMS)	Bad latch
<ul style="list-style-type: none"> -Chin touching lip -Bottom lip curling back -More areola visible above lip than below lower lips -Mouth wide open with big mouthful of breast -Sucking pattern change from short sucks to long deep sucks with pauses 	<ul style="list-style-type: none"> -Pain is the first sign of something being wrong with breastfeeding -Lips rolled in or circle "O" lips -Clicking or smacking sounds at the breast -Biting sensation during feed -Compression stripe on nipple after feeding -Nipple easily slips out of mouth when baby pauses -Bleeding or injured nipple after feed -Baby is not gaining weight (remember other causes for not gaining weight!)



In BAD Latch:

Milk production will be less because there's no full emptying of the breast.

كيف تعرف الام ان الحليب الي في صدرها اخر قطرة؟ لما تضغط على الحلمة وما يطلع شي

Types of breast milk

Colostrum	Transitional milk	Mature milk
<ul style="list-style-type: none"> - It is the first stage of breast milk that is produced after birth and lasts for several day after child birth. premed -It has a yellowish to cream colored thick appearance. - It is high in protein especially antibodies (that provide protection to the newborn against infection) , vitamins (especially fat soluble vitamins), minerals but very low in fat compared to mature breast milk . 	<ul style="list-style-type: none"> - It occurs after colostrum stage and lasts for approximately two weeks until it is replaced by mature milk. -The transitional milk contains high levels of fat, lactose, and vitamins to help the baby regain any weight lost after birth . -It contains more fat and lactose than colostrum and has water-soluble vitamins. 	<ul style="list-style-type: none"> - It is the final milk that is produced and lasts throughout lactation. -Ninety percent is water, which is necessary to maintain hydration of the infant. the other 10% is made up of carbohydrates, proteins, and fats, which are necessary for both growth and energy. -There are two types of mature milk: foremilk and hindmilk.

Breast Milk



Types of breast milk

Mature milk

During each breastfeeding session, the baby should receive two types of mature milk, the foremilk and the hind milk to ensure that the baby is receiving adequate nutrition to grow and develop properly:

The foremilk (the milk "in front"); is produced at the beginning of each feeding. it contains **water, vitamins, and protein.**

The hind milk; is pushed out latter , it is **heavier , richer in lipid and carbohydrates (CHO).**

Composition of mature milk:

Lipids (38 g / L)	The main lipids found in human breast milk are the triacylglycerols, phospholipids and fatty acids including essential fatty acids. Maternal diet does not affect the amount of fat in milk but does affect the types of fat. cholesterol is present in breast milk but not or very low in Formulas.
Casein (2.5 g / L)	Protein - casein or curds are proteins with low solubility which complex with calcium. these are present in breast milk in much lower concentration than in cow's milk.
Whey (0.64 g / L)	Protein - the whey proteins are located in the clear liquid left behind when clotted milk stands. the largest components are alpha lactalbumin, lactoferrin, lysozyme, albumin and immunoglobulins.
Nonprotein nitrogen	-It is used in amino acid synthesis and includes the nitrogen in urea, creatine, creatinine, uric acid and ammonia. -Peptides, such as epidermal growth factor, somatomedin - c and insulin are also present in this fraction. -Nucleotides such as cytidine monophosphate are derived from nucleic acids and play an important role in the immune system and protein synthesis.
Lactose (70 g / L)	Carbohydrate - lactose is the major carbohydrate in breast milk. it is composed of galactose and glucose. lactose concentration in breast milk increases over the duration of breastfeeding.



Energy; (670-750 kcal / liter)

Breast Milk



Types of breast milk

Composition of mature milk:

The immunologic components of mature milk while awaiting endogenous maturation of the baby's own immunologic systems, various immunologic and bioactive milk components act synergistically to provide a passive immunologic support system from the mother to her infant in the first days to months after birth.

The immunologic components include:

Immunoglobulins	Human milk contains all of the different antibodies (m, a, d, g, e), but secretory immunoglobulin a (siga) is the most abundant
Lactoferrin	Which binds to iron, thus making it unavailable to pathogenic bacteria
Lysosomes	Which enhances siga bactericidal activity against gram- negative organisms
Mucins	Adhere to bacteria and viruses and help eliminate them from the body
Leukocytes	With the transition from colostrum to mature milk, the percentage of macrophages increases from 40-60% of the cells to 80- 90%

Human milk contains various enzymes:

- Some are specific for the **biosynthesis** of milk in the mammary gland (eg, lactose synthetase, fatty acid synthetase, thioesterase),
- Others are specific for the **digestion** of proteins, fats, and carbohydrates that facilitate the infant's ability to break down food and to absorb human milk (such as lipase, and protease, amylase)
- Certain enzymes also serve as **transport moieties for other substances**, such as zinc, selenium, and magnesium.
- Some have **antimicrobial activity** such as lysozyme: **the enzyme lysozyme which inhibits the growth of many bacterial species by disrupting the bacterial cell wall**, more specifically, the proteoglycan layer. In addition:

Casein	may inhibit the adhesion of various bacteria at different epithelial sites.
Lactalbumin	is part of an enzyme complex that: <ul style="list-style-type: none"> • 1-synthesizes lactose, and • 2- upon modification seems to contribute to the apoptosis of malignant cells.

Breast Milk



Types of breast milk

Composition of mature milk:

Vitamins & Minerals:



Fat soluble vitamin a, d, e & k

Water soluble vitamins in general are present ,their content **reflective of the mother's diet** .

Minerals: the most important salts are calcium, sodium, potassium and magnesium, representing the predominating mineral.



Low vitamin B12 is seen in women who are vegetarians, malnourished or have had gastric bypass!

Milk carbohydrates:

Lactose

is the principal carbohydrate of human milk

Oligosaccharides

Second dominant cho
Prevent binding of pathogenic microorganisms to gut, which prevents infection & diarrhea.

Milk lipids:

- More than **98%** of the fat in breast milk is in the form of **triglycerides**.
- Short-chain fatty acids (carbon chain length 8) are only present in trace amounts.
- **Oleic acid** (18:1) and **palmitic acid** (16:0) are the most abundant fatty acids in breastmilk
- Cholesterol (lcp) fatty acids(18- to 22-carbon length) **are needed for brain and retinal development of the infant**

Triglycerides	They are fat. they are the main lipid found in breast milk, and they make up 98% of breast milk fat. Triglyceride are responsible for the storage of energy. The bonds that hold the triglyceride molecules together contain the energy, and when the triglycerides are broken down, the bonds break and release the energy.
Cholesterol	- Cholesterol is a steroid, and it's essential for brain and nerve development. cholesterol is also needed to make hormones which regulate the functions of the body. Studies show that children exposed to cholesterol in breast milk appear to have better heart health as they grow. It seems that adults who were breastfed as children have lower levels of bad (ldl) cholesterol and a lower risk of heart disease. - Human milk contains 90 to 150 mg/l cholesterol , in contrast to no appreciable cholesterol content in vegetable oil-based infant formulae and to approximately 40 mg/l in dairy fat-based infant formula .
Docosahexaenoic acid (DHA)	DHA is an essential fatty acid that contributes to the development of the central nervous system and the brain. It's also important for vision and the development of the eyes, especially for premature infants.
Arachnoid acid (ARA)	The importance of the essential fatty acid ara in breast milk is not entirely understood. it may play a role in infant growth,or it may be necessary to balance the dha.
Complex lipids	Complex lipids are believed to be important for the brain, stomach, intestines, and skin. they are found in a baby's brain, they help to fight infection, and they are believed to help reduce inflammation in the intestines to protect a baby against a serious intestinal condition called necrotizing enterocolitis (nec) .

Breast Milk



Milk lipids:

- The amount of fat in breast milk is not constant.
- It changes throughout the day and overtime as your baby grows. it even changes during each feeding. the **longer** your baby breastfeeds on the same breast and the closer she gets to emptying that breast, **the more fat** she will receive.
- Breast milk produced for **premature infants** is also very high in fat. it has about **30% more fat** than the breast milk that's made for full-term babies.
- **Vegetarian and vegan diets:** since vegetarians do not get dietary fat from animal products, the level of dha in their breast milk is lower. But, they tend to have very high levels of linoleic acid, a plant-based fatty acid. **DHA supplements** may be necessary **for those who follow a strict vegetarian or vegan diet.**
- **Breastfeeding providing dha and ara improves cognitive development and reduces asthma risk at school age** particularly in those children with a genetically determined lower activity of dha and ara

Maternal diet & Breast milk:

Diets high in carbohydrates: when women have diets high in carbohydrates **with little or no fat**, their breast milk has **higher levels of medium-chain fatty acids such as lauric acid and linoleic acid.**

Coastal fish eating diets: women who live in areas where **seafood is abundant and a large part of their diet**, have higher levels of dha in their breast milk. Pregnant women taking omega 3 supplements have higher levels of DHA, IgA and other immune properties

Studies indicate that the major portion of milk pufa is not derived directly from the maternal diet, but stems from endogenous body stores. thus, **not only the woman's current but also her long-term dietary intake is of marked relevance for milk fat composition.**

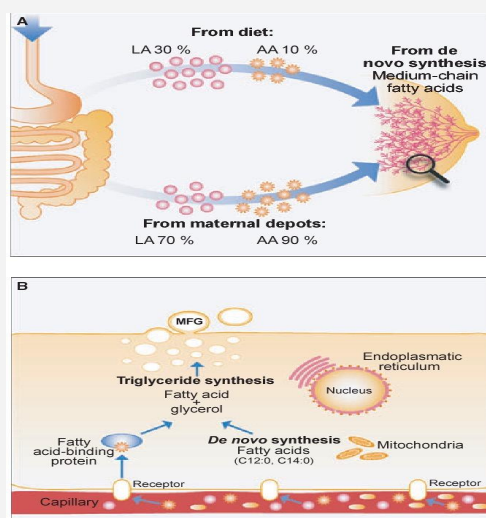


Table 6.4 Compositions of 100 mL colostrum (days 1–5 postpartum) and mature milk (day 15 postpartum)

Contents	Colostrum	Mature Milk
Calories (kcal)	55	67
Fat (g)	2.9	4.2
Lactose (g)	5.3	7.0
Total protein (g)	2.0	1.1
Secretory IgA	0.5 ^a	0.1
Lactoferrin	0.5	0.2
Casein	0.5	0.4
Calcium (mg)	28	30
Sodium (mg)	48	15
Vitamin A (µg retinol equivalents)	151	75
Vitamin B ₁ (µg)	2	14
Vitamin B ₂ (µg)	30	40
Vitamin C (µg)	6	5

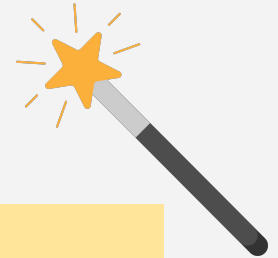
^aConcentration is considerably higher at 1–3 days postpartum than at days 4 and 5.

Breast Milk



Types of breast milk

Colostrum



Colostrum has:

more na, k, cl, protein, fat-soluble vitamins	more minerals
rich in immunoglobulins, especially siga	rich in cells (100,000-5,000,000 leukocytes per ml)
higher percentage of fat is docosahexaenoic (dha), arachidonic and linolenic acids in addition, colostrum...	

- 1 It facilitates establishment of *L. bifidus* flora in GI tract
- 2 It facilitates expulsion of meconium
- 3 It is the best "treatment" for preventing and treating **hypoglycemia** and **hyperbilirubinemia**

what's missing in breastmilk?

Iron	<p>-There is just the right amount of iron in breastmilk together with the stores the baby gets during pregnancy, at birth especially with delayed clamping of the cord, probably there is enough to keep the baby iron sufficient for up to 6 to 9 months.</p> <p>-Bean counters, be careful (amounts of breastmilk babies get, the amount of protein, iron etc)</p> <p>-How much fortification is necessary is unclear. human milk is low in iron (0.2–0.5 mg/l), with the majority of infant iron stores accumulated during gestation. over the first few months of life, these stores are depleted in breastfeeding infants; this decline has been previously largely perceived as pathological.</p> <p>-It may be instead an adaptive mechanism to minimize iron availability to pathogens coinciding with complementary feeding.</p> <p>-Many of the pathogens involved in infantile illnesses require iron for growth and replication.</p> <p>-By reducing infant iron stores at the onset of complementary feeding, infant physiology may limit its availability to these pathogens, decreasing frequency and severity of infection.</p>
Vitamins	<p>-Breastmilk does not need to supply vitamin D</p> <p>-All babies need vitamin d. artificially fed babies have vitamin D already added artificially to the milk at the factory.</p> <p>-Breastfed babies unable to get adequate sunshine exposure should receive supplementation</p>
Stem cells <small>Its maximum during the first days</small>	<p>It was discovered seven years ago that human breast milk also contains a kind of stem cell. The question was whether The above now demonstrate that as in humans, mouse milk contains cells that express stem cell markers. These studies in mice provide the first evidence of migration and integration of breastmilk stem cells to organs of the neonate.</p>

Breast Milk



what's missing in breastmilk?

Formula contains the same amount of protein as breastmilk, really?

- Breast milk contains at about 3 months after birth, 8 to 10 g/l of protein, this is somewhat less than most formulas (most contain 12-15 g/l or more) v but: up to 60-65% (about 5 g/l) of the protein in breastmilk is lactoferrin, which is not absorbed from the gut!
- About 6% (0.5 g/l) of the protein is immunoglobulin, which is also not absorbed from the gut so only at most, 4.5 g/l of protein. Babies can't grow on this amount, but they do!
- Formula contains way too much protein (3.5x more)

What about s100b protein?

- s100b is an acidic calcium-binding protein of the ef-hand family, characterized by the most common calcium binding motif of a helix-loop-helix structure
- The protein encoded by this gene is a member of the s100 family of proteins containing 2 ef-hand calcium-binding motifs.
- s100 proteins are localized in the cytoplasm and/or nucleus of a wide range of cells, and involved in the regulation of a number of cellular processes such as cell cycle progression and differentiation.
- It may be important to brain development
- **Altered expression of this gene have been implicated in several neurological, neoplastic, and other types of diseases**, including alzheimer's disease, down's syndrome, epilepsy, amyotrophic lateral sclerosis, melanoma, and type I diabetes [provided by refseq, jul 2008]
- Presents in much higher concentrations in breast milk than in formula (**and higher in mature breast milk than in colostrum**)

Breast Milk



what's missing in breastmilk?

Table 2. Cellular composition of human breast milk

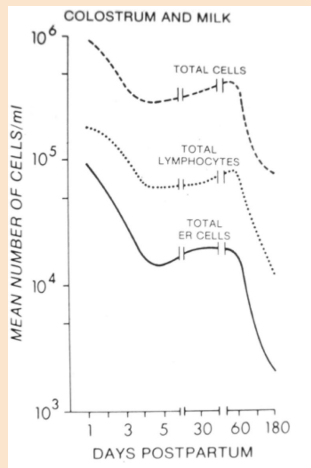
Cell type	Percentage*
Cell number/mL	10 ⁶ -10 ⁷ (colostrum), 0.5 × 10 ⁶ (mature milk)
Polymorphonuclear cells	Approximately 80%
Macrophages	Approximately 15%
Lymphocytes	4% (1-15)
T lymphocytes	80% of lymphocytes (65-83)
CD4+ T	45% of lymphocytes (10-83)
CD8+ T	35% of lymphocytes (11-78)
HLA-DR+	80% of T lymphocytes (56-98)
CD45 RO+	>95% of T lymphocytes
CD103+	70% of T lymphocytes (61-98)
CD49f+	50% of T lymphocytes (32-65)
γδ lymphocytes	11% of lymphocytes (6-26)
B lymphocytes	<2% of lymphocytes
Natural killer cells	3-4% of lymphocytes
Eosinophils	<3%
Epithelial cells (and fragments)	Present in mature milk

*Percentages represent the means (range of the results of several different studies).^{26,27}

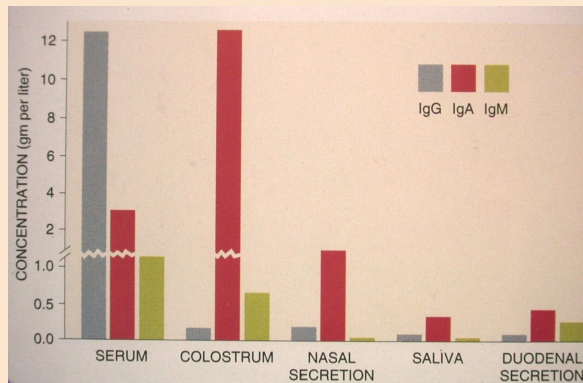
Table 1. Biochemically active substances in human milk.

Hormones		Cytokines	
Hypothalamic	GRH	Interleukins	IL-1α/β
Pituitary	Somatostatin	Other cytokines	IL-2
	TSH		IL-4
	Dopamine		IL-6
	Growth hormone		IL-8
Thyroid	ACTH	IL-10	TNF-α
	TSH	TGF-β	IFN-γ
Parathyroid	FSH/LH	Colony stimulating factors	RANTES
	Calcitonin		GROα
Adrenal	PTH and PTH related peptides	Nutrients	MCP-1
	Cortisol		MIP-1α
Gastrointestinal	Progesterone	Growth factors	GM-CSF
	Estradiol/Estriol		G-CSF
	Testosterone		M-CSF
	Gastrin		
Growth factors	Cholecystokinin	Igf	
	GIP		EGF
	VIP		NGF
	Peptide YY		MGF
	Erythropoietin (EPO)		

→ Nucleotides
→ Glutamine
→ Lactoferrin

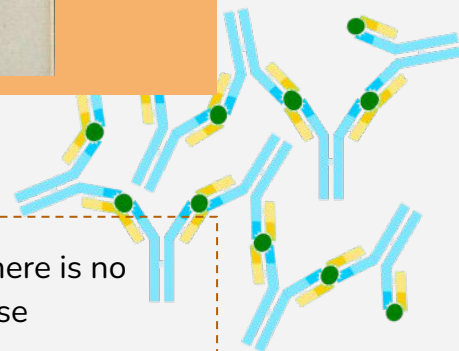


And these are not even all of the immune factors which are present in breastmilk, but absent from formulas!



DO MATERNAL ANTIBODIES PASS ON AUTOIMMUNE DISEASE TO THE BABY?

1. The predominant immunoglobulin in human milk is secretory **IgA**, but there is no evidence that secretory **IgA** is a pathogenic antibody in autoimmune disease
2. In any case, secretory **IgA** is not absorbed via the gastrointestinal tract
3. There is no evidence that **IgG** in human milk is absorbed into the circulation of the infant
4. **IgM** is also excluded from the infant's circulatory system



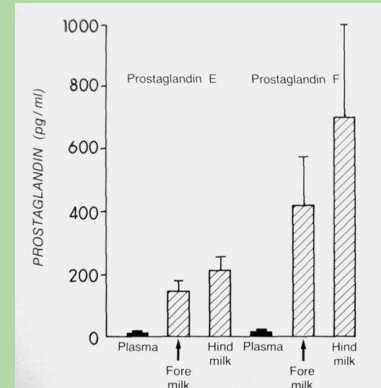
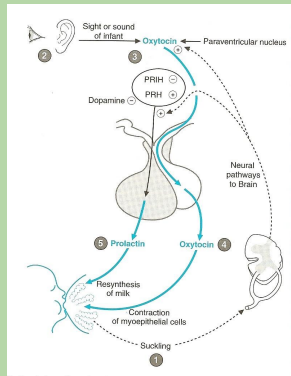
Breastfeeding



Stimulation of milk production

Milk ejection is promoted by:

- 1-neurogenic stimulant (stimulated by suckling)
- 2-hormonal reflex (oxytocin)



During suckling, a conditioned reflex is set up:

Ascending impulses from the nipple and areola



paraventricular and supra optic nuclei of the hypothalamus

Oxytocin from the posterior pituitary produces contraction of the myoepithelial cells of the alveoli and the ducts containing milk. (**"milk ejection" or "milk let down" reflex**)

Milk is forced down into the ampulla of lactiferous ducts, wherefrom it can be expressed by the mother or sucked by The baby.

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38



Is it good or bad (breast milk)?

- Breast milk is full of immune factors
- Immune factors in breastmilk work by lining the mucous membranes of the baby's body and prevent pathogenic bacteria from entering the baby's body
- When the baby spits up, immune factors line the babies upper respiratory tract and upper gut twice, once on the way down, again on the way up so if the baby aspirates breastmilk? formula= breast milk?

All this is very nice, but does it make a difference to the baby?!

- You bet it does!
- The studies are all there, but so many people prefer not to believe them because they don't want to believe them (my baby was formula fed and he's a phd)
- As soon as one study comes out doubting the results of many studies, we hear "you see? formula is just as good!"
- Studies showing risks of formula are never as well done as studies showing no risk...
- Remember, if studies showing risks of formula feeding are not perfect, the burden of proof that there is no risk to formula is on those who say it's okay

Breastfeeding



Is it good or bad (breast milk)?

Formula: a heavy metal cocktail

- Too much aluminum, cow milk formula 100x , Soy formula up to 2000x
- Too much manganese
- Too much lead
- Too much cadmium
- Too much iron
- Infant formula: enfamil (contaminated with e.coli), SMA (improper homogenization), neomulsoy and CHO free (hypochloremic alkalosis), syalac (too much vitamin D)

Conclusions:

- Breastfeeding is protective against SIDs, and this effect is stronger when breastfeeding is exclusive
- The recommendation to breastfeed infants should be included with other SIDs risk- reduction messages to both reduce the risk of SIDs and promote breastfeeding for its many other infant and maternal health benefits.

In fact...

- No evidence that simply adding dha and ara to formula gives the benefit
- It's supposed to these pufas need to be added in correct proportions, and they are not absorbed from formula in the same way as they are from breast milk
- Studies do not support any benefit when added to formula
- Aside from many recalls of formulas over the years:
 - for those who are fond of exotic food, interesting food that has been found in infant formulas:

Rat hair

Beetle parts and beetle larvae

Pieces of glass

Melamine due to adulteration of milk by greedy people

Other Risks of formula

Maternal risks

Risks to society

Breastfeeding



Risk for the mother

Ovarian cancer
Endometrial cancer
Breast cancer
Osteoporosis
Iron deficiency
Delayed involution of the uterus

Risks to the society

Environmental hazard
Loss of contraceptive effect
Loss of security, stable beginning for the child

Breast Cancer

- Women who breastfeed are less likely to develop breast cancer
- Collaborative group on hormonal factors in breast cancer
- **Breast cancer and breastfeeding:** collaborative reanalysis of individual data from 47 epidemiological studies in 30 countries, including 50,302 women with breast cancer and 96, 973 women without the disease lancet 2002;360:187-195. This study brings together >80% of the worldwide epidemiological data on breast cancer and breastfeeding

More maternal risks:

- Difficulty with weight loss
- Disempowerment
- Increased difficulty in attachment with baby vs cost

Type 2 Diabetes

Duration of lactation and incidence of type 2 diabetes ,longer duration of breastfeeding was associated with reduced incidence of type 2 diabetes!

Metabolic syndrome

Duration of lactation is associated with lower prevalence of the metabolic syndrome in midlife

What is metabolic syndrome?

- The metabolic syndrome is a clustering of the metabolic abnormalities: **insulin resistance, dyslipidemia, hypertension, and obesity**
- Women with metabolic syndrome are at increased risk of diabetes mellitus, major cardiovascular events, and increased all-cause mortality

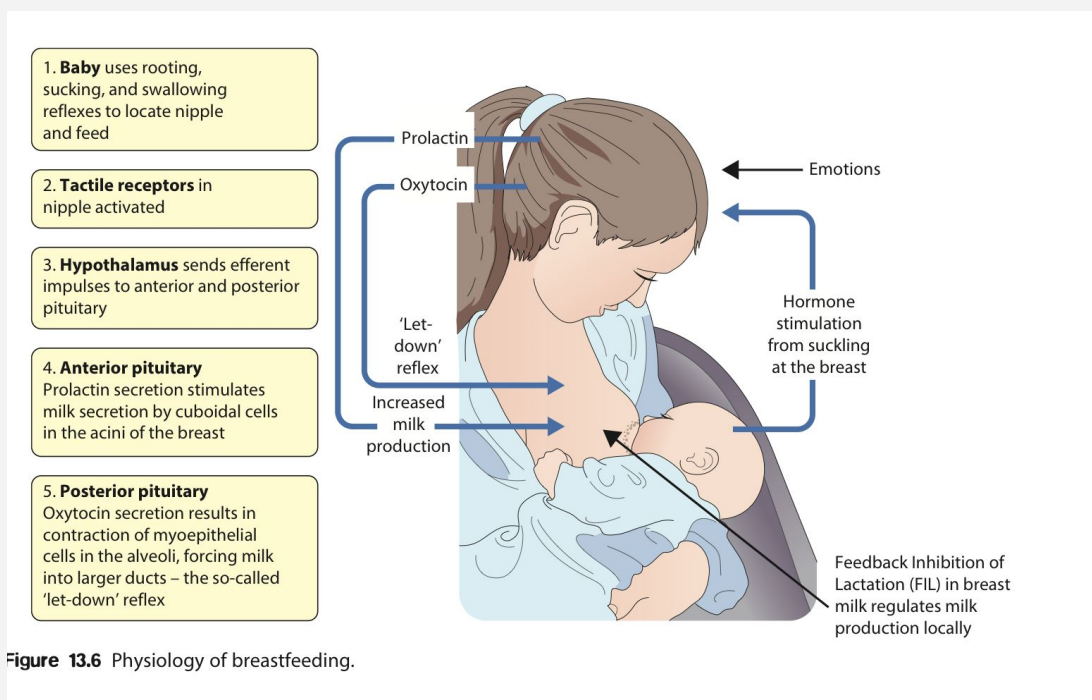
Book!



- Breastfeeding reduces risk of developing gastroenteritis and otitis media, and lower respiratory tract infections
- Breastfeeding lowers the risk of developing postnatal depression
- Stimulates the release of oxytocin, which causes the muscles in the uterus to contract, helping to reduce postpartum blood loss
- The important infection protection it confers is due to factors such as:

Secretory immunoglobulin A (SigA)	The primary protective agent, which coats the intestinal mucosa and prevents bacteria from entering the cells
Human milk oligosaccharides	Function as prebiotics, preventing pathogenic bacteria from attaching to mucosal surfaces
White blood cells	Which can kill microorganisms
Whey proteins (lysosomes and lactoferrin)	Which can kill bacteria, viruses and fungi

- Healthy, term babies often lose 7%–10% of their birth weight, but should regain their birth weight by 14 days. A baby who loses more than 10%, or fails to regain birth weight by 14 days, should be assessed to rule out an underlying medical problem



- Antimetabolites, lithium and radioactive therapy are contraindication to breastfeeding
- In certain rare metabolic disorders (such as **galactosaemia**, **glucose galactose malabsorption**, certain **long chain fatty acid oxidation disorders**), breastfeeding is contraindicated
- Tongue-tie, when the frenulum between the dorsum of the tongue and the base of the mouth is short and restricts movement of the tongue, has recently gained attention as a reason for difficulty to latch and feed effectively, to prolong feeding times and growth faltering. Treatment is division of the frenulum. There is considerable debate about indications and efficacy.
- Breastfeeding beyond 6 months without timely introduction of appropriate solids may lead to poor weight gain, iron deficiency and rickets.

Book!



- The WHO recommends continuing breastfeeding until 2 years of age
- Pasteurized cow's milk is not recommended before the age of 12 months
- Specialized infant formula:

Preterm formula	Increased energy, sodium, calcium, phosphate to match requirements of preterm infants
Extensively hydrolysed and amino acid formula	For treatment of cow's milk protein allergy
Medium chain triglycerides formula	For disorders of fat malabsorption – do not need pancreatic enzymes nor bile salts as directly absorbed into the small intestine
Soya based formula	-Originally developed for infants with cow's milk protein allergy, but a hydrolysed and amino acid formula is now used as a proportion of these infants are also allergic to soy protein. They are not advised under 6 months and usually avoided in the first year, after which normal soya milk can be used. -This is because of concern that they contain phytoestrogens (plant substances that mimic the effects of endogenous oestrogens), though there is no conclusive evidence of adverse clinical effects
Anti-Gastroesophageal reflux pre-thickened formula	Contain rice starch or carob bean gum and become more viscous in the stomach with fall in pH. These, as well as thickeners designed to be added to standard formula or given as a paste before a breastfeed, can be used for the treatment of uncomplicated gastro-oesophageal reflux.

- Weaning onto solid food is done gradually, often initially with small quantities of pureed fruit, root vegetables or rice. Foods high in salt and sugar should be avoided and **honey must not be given until 1 year of age because of risk of infantile botulism.**
- Early introduction of common allergens such as egg and peanut at, or around 4 months of age in infants at high risk of developing IgE-mediated allergy **may reduce the risk of developing allergy to these foods.**

Peds Cases!



BREASTFEEDING & INFANT FORMULAS



Best practice: Breastfeeding exclusively for first 6 months



BENEFITS

- ✓ **Breastmilk:** easily digestible, supports optimal growth, contains immunoglobulins + white blood cells, protects against GI infections, acute otitis media, respiratory tract infection & more
- ✓ Breastfeeding can promote maternal-infant bonding

Contraindications (Rare)

Maternal Medications: Chemotherapy agents, Radioactive isotope drugs
Maternal Medical Conditions: HIV; herpes lesions on both breasts; critical illness, untreated tuberculosis
Infant conditions: galactosemia



Breastfed infants require **Vitamin D3 400 units PO daily** to prevent rickets

CHALLENGES

- Breastfeeding isn't for everyone, and some mothers may be unable to or choose not to.
- Respect these decisions without judgement and work together to create a plan that keeps babies healthy & growing.
- Mothers can encounter difficulties with latching and can try expressing breast milk by hand or mechanical pump.
- Expressed breast milk (EBM) is nutritionally equivalent to breastfeeding.



Next best: Commercial iron-fortified cow's milk-based formula



Cow's milk based	Soy milk based	Partially Hydrolyzed	Extensively Hydrolyzed Protein	Amino Acid Based (elemental)	Premature formulas
First line	Indication: Galactosemia	Proteins are partially broken down (marketed as easier to digest) May reduce diarrhea in acute gastroenteritis	Proteins are fully broken down Indications: <ul style="list-style-type: none"> • Food protein induced allergic proctocolitis (cow's milk/soy protein intolerance) • GERD • Confirmed food allergies, malabsorption syndromes Cons: Higher cost, poor palatability	Indications: multiple food protein intolerances who cannot tolerate extensively hydrolyzed casein infant formulas Cons: Typically higher cost, poor palatability, and limited availability	Designed to help preemies have good catch-up growth Typically have more calories, protein, vitamins and minerals (higher in iron)

Caloric content: 0.68 kcal/mL in breastmilk and standard formulas, 0.80 kcal/mL in premature formulas

- ⚠ Infants should **not** be fed evaporated milk, cow's/goat's milk, or plant milks
- ⚠ Ingesting cow's milk <6 months old can lead to occult blood loss in stool and anemia

POWDERED FORMULA PREPARATION

Always clean surfaces + sterilize all equipment by boiling in a pot of water for 2 minutes. Allow equipment to air-dry

Powdered formula: Not yet sterile. Obtain tap water, bring to a boil for at least 2 minutes to sterilize. Let the water cool to room temperature (below 70°C). Mix formula and water, following directions on the label. Store in a fridge and use mixed formula within 24 hours.

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