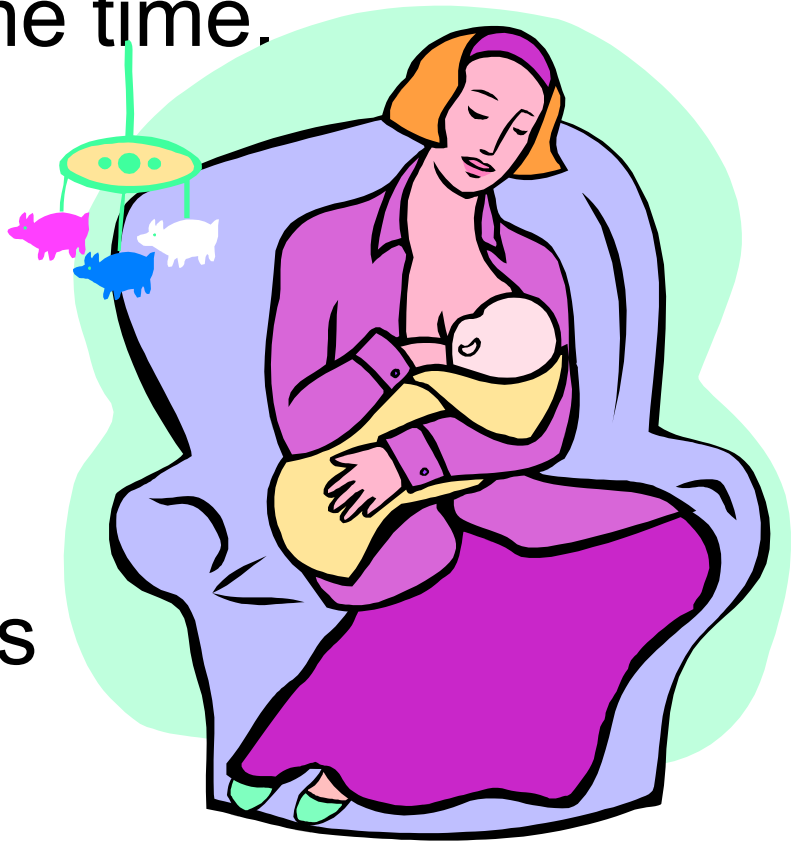
Beyond Breastmilk

May, 2007

Linda F. Palmer, DC

Life After Breastmilk

- It really has to end some time.
- But there's no hurry!
- Truly, nothing could possibly "replace" this ultimate nutrition and its powerful immune provisions and physioneurological benefits.



Introducing Solids

The beginning of the weaning process, but surely doesn't need to be heralding the end.

- When should solids begin?
- Where has today's advice come from?
- Does it work?
- Is there a better way?

- Common infant feeding information is chiefly based on formula and baby food industry advice
- Solid food introductions may be important for formula fed babies at 4 to 6 months
- But there's NO reason to hurry solids or supplements for a breastfed baby

Formula-fed babies may need solids sooner because in formula:

- It's difficult to absorb many nutrients
- Iron is very high but difficult to absorb
- The high iron blocks absorption of other important minerals
- Formula is very lean on antioxidants and has virtually no fiber

Formula-fed babies often benefit from solids because:

- Fat absorption from formula is difficult and baby could benefit from more varied fats
- Cow milk proteins are difficult to digest and irritate intestinal lining
- Formula is constipating
- Formula encouragesobesity

Michelle Ehlers Photographer

Trial on timing of introduction to solids and food type on infant growth

Pediatrics. 1998 Sep;102(3 Pt 1):569-73.**Mehta KC**, et al.Children's Hospital Med Center, Ohio, USA.

- **THESE ARE FORMULA-FEDS:**
- Early [3 months] versus late [6 months] introduction of solid foods …
- There were **no differences in growth or body composition between infants in early versus late introduction groups**
- The total energy intake was not different among infants in the early compared with the late group at any age.
- Infants consuming commercially prepared foods have a **decreased caloric intake from protein and fat**

- Solids for formula-fed babies are not to increase growth
- They're to increase antioxidants, fiber, absorbable minerals, and more assimilable proteins
- To relieve constipation
- To relieve kidney taxation
- Babies begin to lose their excess fat weight from formula feeding at the same time that they are gaining muscle and bone weight from more assimilable nutrients

What about starting supplemental foods in breastfed babies?

- Today, the AAP recommends “somewhere during the second half of the first year.”
- Most pediatricians interpret that as beginning solids at 6 months (and baby food companies perpetuate this interpretation)

- Read this again though: “somewhere during the second half of the first year.”
- **Immune- and nutrition-wise, formula is a solid-food.**

BREASTMILK IS NOT ENOUGH WHAT AFTER 6 MONTHS?

Breastmilk is said to be "Deficient." But in What?

- The studies that suggest that breastmilk becomes "deficient" in certain nutrients are performed nearly entirely on populations where mothers are quite malnourished.

- I looked very hard for anything concrete pertaining to well-nourished women or to industrialized nations.

Finding the Gold Standard

- Some papers show how breastmilk has lesser amounts of various nutrients than formula… of course, high amounts of many nutrients need to be added to formulas in attempt to attain adequate absorption.
- Other sources demonstrate how breastmilk has below-RDA levels of many nutrients.
- Where did they get these recommended levels?
- Again, based upon formula nutrition studies.
- There is no validation for these for breastfed children.

Recommended child and adult nutrient ratios

- Breastmilk is 40 to 50**% of calories** from carbohydrates, 35% to 50% from fat, and 5 to 12% calories from protein.

- Formula is 43% carbs, 45 -50% fat, 8-10% protein (more protein in soy formulas), fashioned after breastmilk as the gold standard.

- **Supposed child or adult ideal ratios are:**

  50 to 60 percent from carbs, 30% from fat, 10 to 20% from protein… much like breastmilk.

IS BREASTMILK PROTEIN DEFICIENT?

- Many standard sources recommend 10 to 15% protein for children or adults
- Breastmilk has 5 to 12% calories from protein (it's really on the lower side)
- **Babies do their greatest amount of growth and development on this diet alone**

WHAT'S THE OPTIMAL AMOUNT OF PROTEIN FOR 6 MONTHS TO 1 YEAR??

- **Infant calorie requirements are supposed to be 100 calories/kg/day according to some standards**…

- Weights 6-8 months: 6-10.5 kg (13-23 lbs)
- *So that's 600 to 1050 calories*
- At 10-15% protein, this would be

  14 to 36 grams protein/day

  And at 12 months:
- *800 to 1250 calories* (to 27.5lbs)

  18 to 43g protein

These amounts are higher than those derived from other studies

- Studies on protein requirements for infants are based on formula-fed studies –

- after formulas are based on breastmilk

Sarwar, G. *American Journal of Clinical Nutrition* 1990

Below refers to 7 % of calories from protein as being optimal:

Ghulam Sarwar

Bureau of Nutritional Sciences
Food Directorate, Health Protection Branch
Health and Welfare Canada, Tunney's Pasture
Banting Research Centre
Ottawa, Ontario, Canada K1A OL2

Beaton and Chery (1) have concluded that a formula or a fixed-ratio diet containing 14.5–17.0 g protein/1000 kcal would cover protein needs of 90–97.5% of infants. Implementation of this recommendation would result in lowering protein contents of currently available infant formulas. Amino acid profiles of infant formulas, however, suggest that any effort to reduce protein contents of infant formulas (to simulate human milk more closely) should be accompanied by a critical examination of their amino acid adequacy including the need for possible supplementation with deficient amino acids.

- **Various studies say**

  1.7–2.3 g/kg/day of protein

- That's 7.5% to 10% calories

- The "safe" level recommended by the FAO/WHO Committee in 1999:

  2.4 g/kg/day

- At 6 to 12.5 kg weight for 6 to 12 months **these would be**

  10 to 30 grams/day

- A jar of baby food meat has 10 grams of protein.

Here USDA says 9 grams protein/day at 6 months and 11 grams protein at 12 months (2002)

Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Macronutrients
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Total Water[a] (L/d)	Carbohydrate (g/d)	Total Fiber (g/d)	Fat (g/d)	Linoleic Acid (g/d)	α-Linolenic Acid (g/d)	Protein[b] (g/d)
Infants							
0–6 mo	0.7*	60*	ND	31*	4.4*	0.5*	9.1*
7–12 mo	0.8*	95*	ND	30*	4.6*	0.5*	**11.0**[c]
Children							
1–3 y	1.3*	**130**	19*	ND	7*	0.7*	**13**
4–8 y	1.7*	**130**	25*	ND	10*	0.9*	**19**

- Protein averages 4.3 calories per gram
- Carbohydrates 4.1 calories per gram
- Fats 9.3 calories per gram
- Generally quoted as 4, 4, and 9

- The USDA recommendation comes to 47 calories from protein per day at 12 months
- At 1,000 calories, that's under 5% of calories from protein

- The RDA is set at 56 grams for a “normal” adult male eating 2200 calories –

  that’s 11%.

- And **the RDA is calculated assuming only 75% utilization of consumed protein and is additionally padded by 30% of this total** http://class.fst.ohio-state.edu/FST201/rdas.htm

- … while the protein in breastmilk is nearly completely assimilable.

A current study shows that toddlers receiving more than 14% of their calories from protein have a greater chance of becoming obese later in life.

Experiments in increasing protein in infant formulas lead to several problems, including kidney and brain damage.

Then…

- The WHO (World Health Organization) says humans need about 5% of their daily calories to come from protein to be healthy.

- The USDA puts this figure at 6.5%.

- So breastmilk is **clearly not** deficient in protein at all, for any age

Maybe it's the quality of the protein??

- According to the WHO: newborn infants need 37 percent of their dietary protein in the form of essential amino acids.
- The adult figure is about 15 percent.
- Human milk is very high in the percentage of essential free amino acids.
- It is high quality protein versus average "solid food" or formula protein.

D.M. Hegsted, ***Minimum protein requirements of adults*** *Am J Clin Nutr* 21, no. 5 (May 1968): 352-7.

Now, let us turn to the nature of the dietary proteins. It is clear that dietary proteins vary widely in their ability to support nitrogen balance. At the top end of the scale we have proteins like egg protein or lactalbumin which are well digested and utilized. These proteins have a biological value of essentially 100% which means that they can replace the ordinary nitrogen losses on a gram-for-gram basis. This is

- Hegsted refers to “lactalbumin” as having 100% biological value. Lactalbumin is the chief protein in breastmilk, i.e. very high quality protein.

- Egg protein: Eggs are essentially chicken milk, with the same allergenic potential as animal milks but with highly assimilable protein.

Bottom Line

- I can only find sources on protein malnutrition in breastfed children in developed countries based upon (the randomly derived) RDA's.

- NOTHING based upon clinical signs and symptoms, or physical or mental development.

- Nothing.

- There are no suggestions anywhere that any exclusively breastmilk-fed infants consuming adequate calories have any physical evidence of inadequate protein.

- Very Low Birth Weight newborns, or early preemies, are different situations.

On the other hand…

- Too much protein is simply a negative
- Quite taxing to the kidneys
- Lost through urine and feces

CONCLUSION:

Exclusive breastmilk diet is NOT deficient in protein

…

to any age!

PROTEIN after breastmilk:

- According to all the information available, 5 to 10% of calories from protein is fine when it's from human milk or from eggs.
- Meat is rather high quality protein as well.
- When using other protein sources, one may need a little more to cover all the amino acids

Is human milk deficient in carbs??

- Today's suggested best adult fat ratio is slightly lower than that in breastmilk. (The low level recommendations mostly stem from misunderstandings of dietary fat-linked damages which have actually occurred due to artificially hydrogenated fats and high temperature exposures for fats, not overall level of consumption).
- And suggested carbohydrates are thus slightly higher.
- When her child is over 1 year of age, mother's milk has significantly increased fat and calorie content – with a lower percentage of carbohydrates. One would assume there is a healthy reason for this.
- We actually consume slightly fewer carbohydrates than we measure: Food labels include some indigestible fibers.
- Mother's milk has oligosaccharides as fiber and these are NOT included in the carbohydrate count for human milk.

What about carbohydrate utilization?

- Lactose breaks down to glucose, the best energy form of sugar, and to galactose.
- These are important for brain development.
- Human milk has one of the greatest percentages of lactose of all animal milks.

Why are carbs needed?

- Sugar for the brain (especially in infants)
- Sugar for energy
- Complex carbohydrates
- Fibers: Glyconutrients
  Soluble and insoluble fibers

Key **glyconutrients** known to be valuable human nutrients and immune boosters:

sialic acid

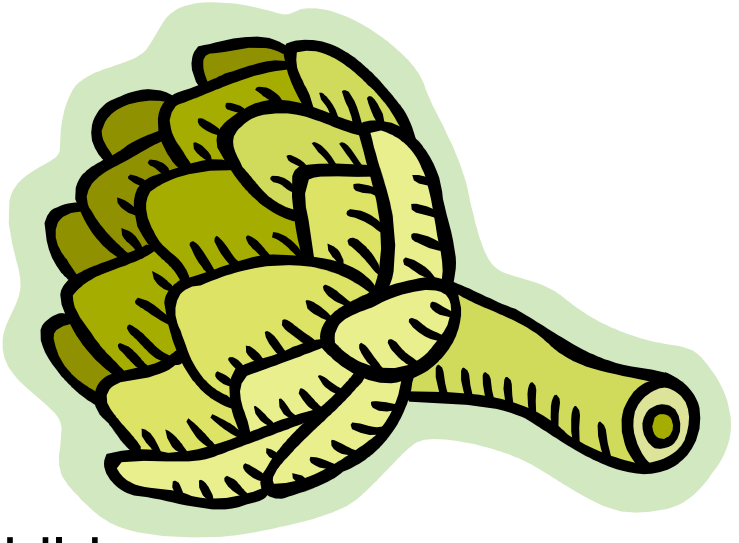
mannose galactose

fucose xylose

n-acetyl-glucosamine

n-acetyl-galactosamine

n-acetyl-neuraminic acid



As well as…

lactose: the glyconutrient just for children

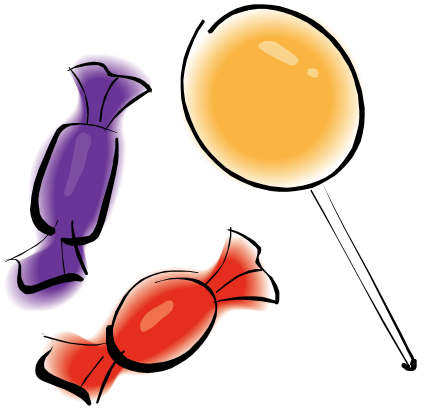
and glucose: the only one not lacking in standard American diets.

Breastmilk has nearly all the glyconutrients; likely the widest variety of any human food.

These are very poorly represented in infant formula.

Is human milk sugar deficient??

- Apparently breastmilk has enough sugar for the brain in its most rapid developmental stage…



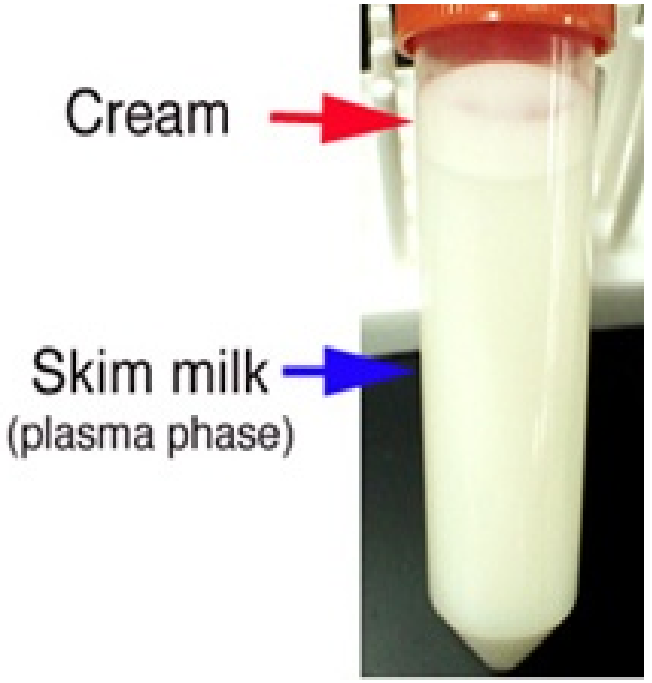
- I've never heard of a carbohydrate deficiency (except for newborns)
- (calorie deficiency yes)

Clearly Human Milk is Not Deficient in Carbohydrates

It must be fat then??

- In artificial milk (formula) the fat percentage is a little lower than in human milk – so which is better?

- The fat content in human milk goes up with the age of the child.



- There are an incredible number of fatty acids and other lipid components required for optimal growth and development.
- There is nothing that suggests that cow fat or French fry fat is superior to that in breastmilk.
- Commonly prescribed first foods are very low in fat so apparently common advice to supplement with formula or baby food is not intended to increase fat.

- I’ve seen no studies to suggest that children need any certain kinds of fats different from those in breastmilk
- Except for reports about for omega-3’s
- But mom (and everyone) should be consuming adequate sources of DHA and all important fatty acids, and then we can call breastmilk fat composition optimal.

Matching breastmilk nutrition

- Breastmilk has more saturated fat than the recommended adult diet (but not more than the average adult diet)
- However, it's very high in monosaturateds
- And lower in polyunsaturateds
- And has a superior ratio of the polyunsaturated omega-3 to omega-6, one that few of us would ever achieve.

SO, Breastmilk is apparently not deficient in fat for a child at any age

It’s got to be iron then!

IRON DEFICIENCY?

Iron sufficiency with prolonged exclusive BF'ing in Peruvian infants.

Pastel RA,**Howanitz PJ**,**Oski** *Clin Pediatr* (Phila). 1981 Oct;20(10):625-6.

- [Iron levels] were measured in **seven Peruvian infants**, who ranged in age from **7.5-12.0** months (average: 9.3 months), who had been **exclusively breast-fed** all their lives.
- **No infant had evidence of iron deficiency,** as reflected by a reduced serum ferritin or an increased erythrocyte porphyrin.
- Mean serum ferritin and erythrocyte porphyrin values in these seven infants were similar to those of 40 non-anemic, non-iron-deficient U.S. infants who ranged in age from 9 to 12 months, on a mixed diet.

Iron status in breast-fed infants

Pisacane et al.,. *J Pediatr*. 1995 Sep;127(3):429-31.

- Iron status of 30 infants who had been breast fed until their first birthday and who had never received cow milk, medicinal iron, or iron-enriched formula and cereals was investigated; 30% were anemic at 12 months of age.
- **The duration of exclusive breast-feeding was significantly longer among non-anemic infants (6.5 vs 5.5 months).**

Continued…

- **None of the infants who were exclusively breast fed for 7 months or more and**
- **43% of those who were breast fed for a shorter time were anemic.**
- **Infants who were exclusively breast fed for a prolonged period had a good iron status (later) at 12 and 24 months.**

Unneeded Iron Supplementation is Dangerous

- Needless iron supplementation: Excess iron in the blood is thought to cause free-radical damage to arteries.

- Iron supplements can cause slowed growth, reduced mental development, constipation, and reduced absorption of selenium and other important minerals.

Redistribution of vitamin A after iron supplementation in Indonesian infants

Wieringa FT, et al., *Am J Clin Nutr*. 2003 Mar;77(3):651-7.

- Iron supplementation in (Indonesian) infants with marginal vitamin A status led to lower plasma vitamin A concentrations and simultaneously to greater vitamin A liver stores.
- This implies a redistribution of vitamin A after iron supplementation, which **might induce vitamin A deficiency**.

Iron supplementation affects growth and morbidity of breast-fed infants: results of a randomized trial in Sweden and Honduras

Dewey KG et al.,. *J Nutr*. 2002 Nov;132(11):3249-55.

- [232 infants from Sweden and Honduras]
- **Gains in length and head circumference were significantly lower in those who received iron than in those given placebo from 4 to 9 mo.**
- Among infants with Hb < 110 g/L at 4 mo, diarrhea was less common among those given iron than in those given placebo from 4-9 mo, whereas the opposite was true among those with Hb > or = 110 g/L (P < 0.05).
- **We conclude that routine iron supplementation of breast-fed infants may benefit those with low Hb but may present risks for those with normal Hb.**

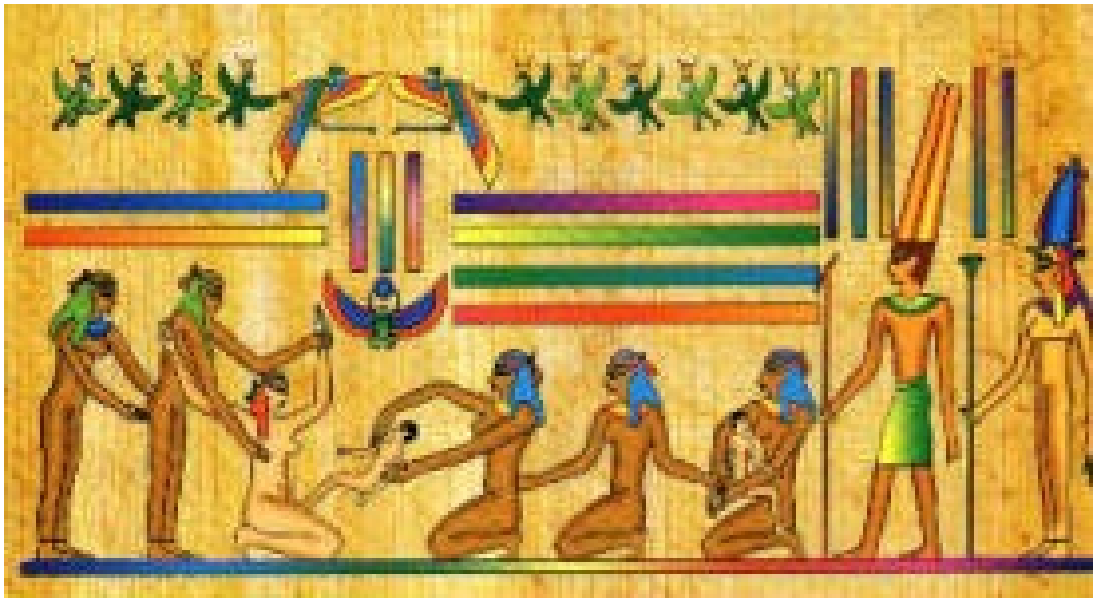
- So, breastmilk is not deficient in iron and efforts to raise iron levels in the absence of proven anemia are not beneficial.

- This does not mean that a breastfed child cannot become anemic, though it's less common than in formula-fed or early solid food fed babies.

Nope, Breastmilk is not deficient in iron, even for older babies

What are risks for iron deficiency anemia in baby?

- Premature birth
- Immediate cord cutting
- Intestinal bleeding from cow's milk proteins in formula
- Other bleeding
- Feeding cow's milk



Anemia is low hemoglobin (Hb)
(and not just low stores, which are often low by design in naturally breastfed infants)

- Can easily be tested for
- Can be caused by low B12, folic acid, or low iron
- The limits set I do not feel are entirely set in stone
- For one, I would look at gestational age, not birth age
- I'd also look at the size of the child for their age

- Also, assume that the optimal level doesn't suddenly go up by 1 point when child turns one day older
- Remember that Hb can be a little low when the child is ill, so need to test a second time
- Do not supplement iron unless anemia is measured via blood testing
- Iron supplementation of some form is important if anemia is determined
- Prescribed iron supplementations are sometimes excessively high and can have negative side effects

- Iron deficiency anemia in human-milk-fed children is most commonly seen when??

- Not before… but During the transition to solid foods.

When giving formula supplements or other foods to a breastfed baby:

- The iron in the food or formula binds with mother's lactoferrin. Lactoferrin is an immune-enhancing system of providing iron in a highly accessible and absorbable form to baby while protecting the iron from consumption by intestinal flora – thus keeping the friendly, sweet-smelling flora that reduces baby's risk of infections.

- This dietary iron, binding with lactoferrin from breastmilk, now hinders mom's own iron provision.

- At the same time, this unprotected dietary iron feeds intestinal flora, allowing for the growth of less-safe, adult-type flora. During the transition period, these hungry flora are eating the small amounts of iron coming from solid foods and leaving little for baby to absorb, while the iron provision from mom's milk is now impaired.

- Some think little of supplementing with formula but once done, the immune bubble from the lactoferrin in breastmilk is broken.

- The common finding that anemia generally happens in breastfed children around 6 to 9 months, (if it does happen), leading to advice that breastfed babies need solid foods at 4 to 6 months, has developed actually as a result of common solid food introductions at 4 to 6 months, which occasionally bring on anemia.

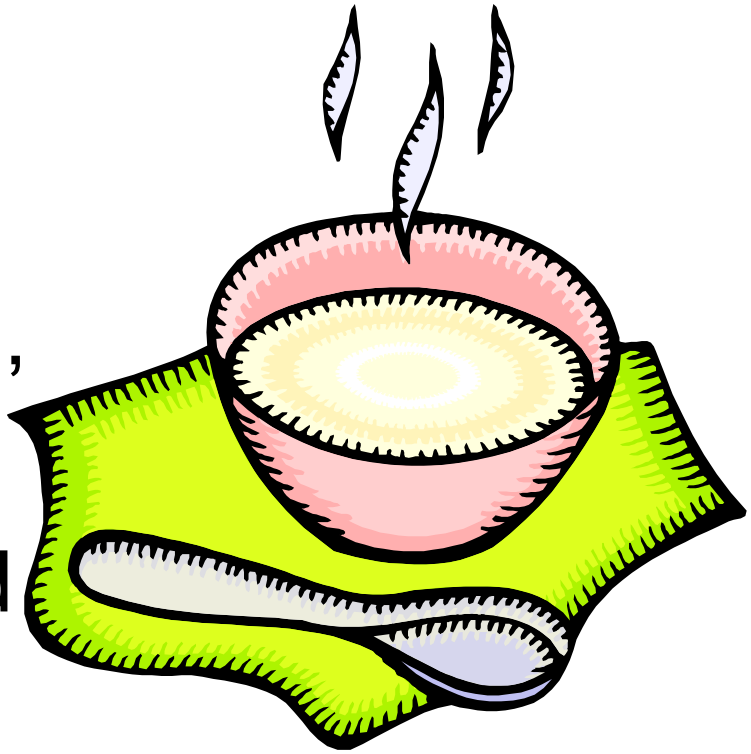
The last possibility: **ZINC**

- If there is any nutritional concern in terms of wanting complimentary foods, zinc is all that we have left.
- Yet zinc is barely found in common first foods such as bananas, pears, carrots, green beans, squash, apple juice (Gerber 1st foods).
- p.s. neither is protein nor fat

- The other commonly recommended food is commercial cereal.
- Cereals are VERY nutrient poor compared to breastmilk or formula, except for whatever may be added.
- Gerber's site has a link for "Why cereals are so important" where they explain that their refined white-grains are all fortified with iron, zinc, and B vitamins.

Can it be zinc??

- Zinc is now added to many of the iron-fortified infant cereals
- This is very new
- So baby apparently needs artificially fortified, artificially refined, highly allergenic grains instead of breastmilk??



- It’s been recognized that iron fortification reduces zinc absorption and can cause zinc deficiency
- There have been no reports of zinc deficiency symptoms in the last decades in **developed** countries
- Except for borderline findings where caused by iron supplementation
- With high zinc and iron fortification, now baby will become deficient in selenium and other important minerals

Breastmilk is not deficient in zinc for babies at any age

- Zinc deficiency is commonly reported in countries where mothers are malnourished.

- Premature infants have had less time to store zinc and iron and have difficult beginnings in terms of being able to digest and utilize their various preemie feeds. These babies present special cases that require individualized attention.

- **Acrodermatitis – Zinc deficiency**

http://avd.rikshospitalet.no/hps/pasientinformasjon/acrodermatitt.asp © Rikshospitalet. Nettredaksjonen.

They must need cow's milk!!!

OK, except that… for a human baby…

- Whole cow and goat milks have too little vitamin C, vitamin E, and vitamin K
- Too little selenium, iron, folic acid, and essential fatty acids
- Way too little manganese and way too little carbohydrate, and likely other nutrients
- An unfavorably high casein to whey ratio
- They have far too much protein, calcium and phosphorous, and too much sodium, chloride, potassium, and likely others
- The high protein is damaging to kidneys

Cow's or goat's milk for baby

- Has far fewer and imbalanced free amino acids
- Is higher in phenylalanine (think PKU) and tyrosine
- Is lower in cysteine and has no taurine. (Cysteine and taurine are usually added to formulas). Baby supposedly cannot convert cysteine and methionine to taurine.
- The proteins and fats are more difficult to digest and absorb

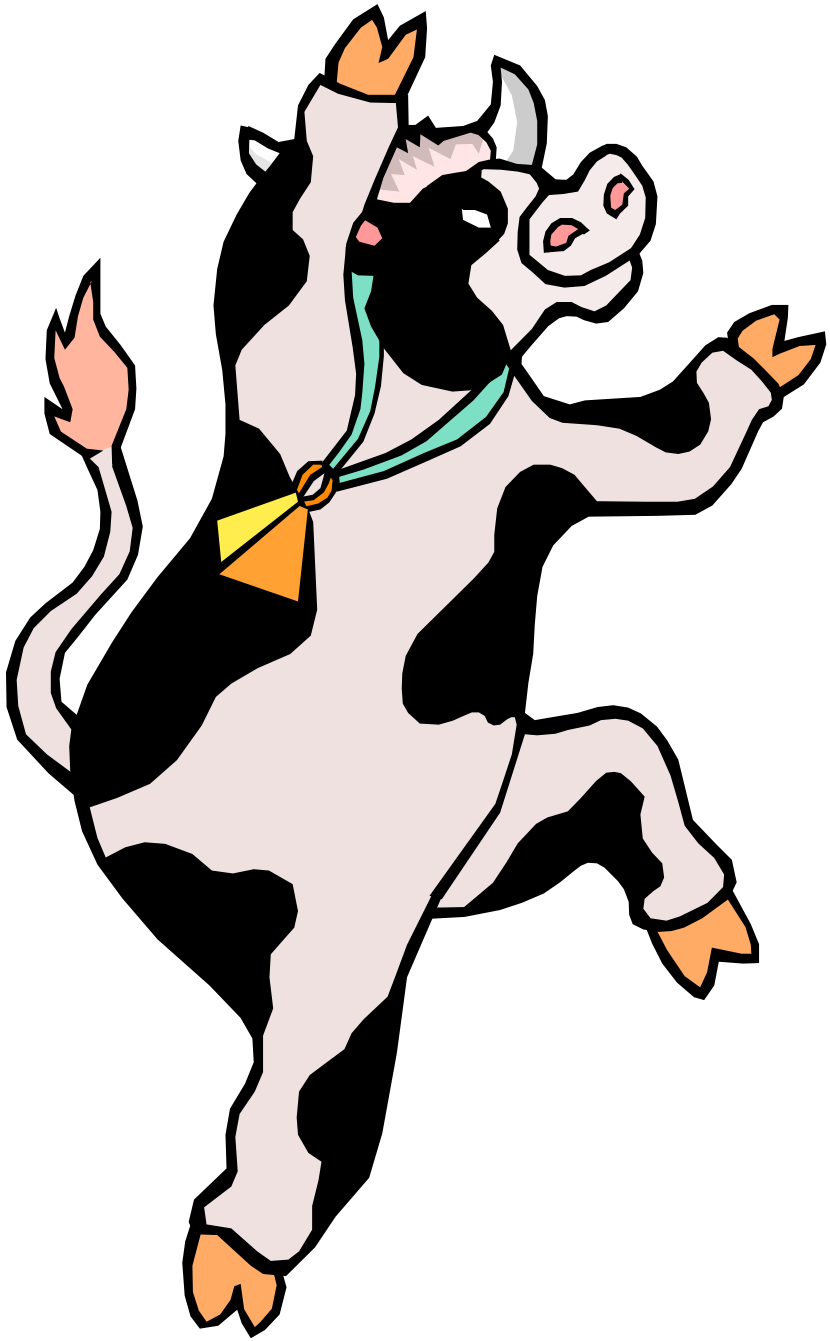
And…

- Cow's (or goat's) milk as a complete nutritional food for human children is also lacking in fiber (human milk has oligosaccharides and other glyconutrients) and antioxidants.

- Of course, we're talking nutrition, not immune provision, for which there is a scant amount for human babies compared to human milk.

- Then there are the incompatibilities of hormones and proteins that can lead to allergic and auto-immune reactions in human babies (such as those leading to diabetes).

YUP.
That
must be
what
human babies
need ???



Linda Palmer says:

The idea that the majority of babies need supplemental foods, animal or artificial milk supplements, or simply a greater amount of calories than that provided by mother's milk is a fallacy

Don’t worry if the next three slides seem too daunting to take in…

Duration of exclusive breast-feeding: introduction of complementary feeding may be necessary before 6 months of age.

Reilly JJ, **Wells JC**. Division of Developmental Medicine, University of Glasgow, Yorkhill Hospitals, Glasgow, G3 8SJ, UK. jjr2y@clinmed.gla.ac.uk

- Evidence from our recent systematic review suggests that mean metabolisable energy intake in exclusively breast-fed infants at 6 months is 2.2-2.4 MJ/d, and mean energy requirement approximately 2.6-2.7 MJ/d, leading to a **gap between the energy provided by milk and energy needs by 6 months for many babies**.
- (That's a 16% drop in calories)

Duration of exclusive breast-feeding: Introduction of complementary feeding may be necessary before 6 months of age

John J. Reilly1* and Jonathan C. K. Wells, 2005

- Proponents of the recommendation to breast-feed exclusively for 6 months argue that the infant ‘drives’ lactation, by increasing milk transfer where necessary…

- This view is inconsistent with evolutionary considerations related to the cost of lactation and the degree of maternal–offspring ‘conflict’.

- Lactation is costly in energetic and other terms (Goldberg et al. 1991; Lovelady et al. 1993; Butte et al. 2001; Wells, 2003) and it reduces both maternal and offspring inclusive ‘fitness’ by restricting reproductive capacity via lactational amenorrhoea.

- Selection pressure has acted to reduce lactation duration in man compared with other apes (Wells, 2003) and Aiello & Key (2002) have argued that a shorter duration of lactation has been a key component in the evolution of our genus. Mothers are in conflict with their offspring over the optimum duration of lactation (they share only 50% of their genes with each offspring… evolved to distribute total maternal resources amongst their total offspring BLA BLA BLA

Metabolisable energy consumption in the exclusively breast-fed infant aged 3--6 months from the developed world: a systematic review.

- **Reilly JJ**, **Ashworth S**,**Wells JC**.
- University of Glasgow, Division of Developmental Medicine, Yorkhill Hospitals, Glasgow jj2y@clinmed.gla.ac.uk

- … in the developed world who were exclusively breast-fed
- We carried out a systematic review aimed at answering three questions: how much milk is transferred from mother to infant?; does transfer increase with the age of the infant?; and what is the metabolisable energy content of breast milk?
- Thirty-three eligible studies … Nine longitudinal studies reported no significant increases in milk transfer after 2--4 months.
- Breast-milk metabolisable energy content is probably lower, and breast-milk transfer slightly higher, than is usually assumed. Longitudinal studies do not support the hypothesis that breast-milk transfer increases markedly with age… and **information on the metabolisability of breast milk in mid-infancy is desirable.**

- The previous slides present lots of in-depth gibberish in attempt to prove that breastmilk is inadequate after 6 months of age, but the real proof is in the pudding.

- Children exclusively breastfed beyond 6 months of age do not show any preponderance of malnutrition or inadequate growth.

Do Solids Increase Caloric Intake??

Most studies that measure it, report that there's greater caloric intake when solids are consumed, with or without attendant breastfeeding, than with exclusive BF.

- **So What.**
- **Breastmilk is much more highly digestible and absorbable than any other food**
- **They never correct for the non-digestible fibers that are reported as caloric**
- **Who's to say the higher intake is preferable?**

Effect of early, short-term supplementation on weight and linear growth of 4-7-mo-old infants in developing countries: a four-country randomized trial

Effect of early, short-term supplementation on weight and linear growth of 4-7-mo-old infants in developing countries: a four-country randomized trial. Simondon KB, Gartner A Am J Clin Nutr. 1996 Oct;64(4):537-45.

- (Many studies will suggest that early introduction of solids will increase infant weight while some suggest it will decrease weight. This one, performed in 4 diverse areas suggests almost no difference):
- At 7 mo of age, all infants were still breast-fed in the Congo, Senegal, and Bolivia compared with 47% in New Caledonia.
- The mean 4-7 mo length increment was 0.48 cm higher for supplemented than for control infants in Senegal ($P < 0.05$), whereas weight increments did not differ. No significant effect was found in the other countries.

Energy intakes of human milk-fed infants during the first year

Garza C, Butte NF. Div of Nutritional Sciences, Cornell University, Ithaca, New York

- **By 4 months of age, gross energy intakes of exclusively breast-fed infants are significantly less than current recommendations.**
- Weight-for-age percentiles also fall during that period.
- **Weight-for-age percentiles continue to drop <u>after solid foods are added</u>** to the diet and energy intakes persist at less than recommended amounts
- Energy intakes of formula-fed infants appear significantly higher than those of infants who are fed human milk.
- Growth rates, total daily energy expenditure, sleeping metabolic rates, minimal rates of energy expenditure, rectal temperature, and heart rates have been found to be lower in breast-fed infants.

Child-rearing practices in the highlands of New Guinea: general features

Becroft TC Med J Aust. 1967: **as summarized by** Borresen, *J Hu Lact* 1995

- Report said: “Exclusively breastfed Enga infants consume too little breastmilk to meet accepted energy requirements”

- But, it was exposed that: “Since babies slept with their mothers, cheating (in the measured milk amounts) at night was possible.”

Continued…

Borresen, *J Hu Lact* 1995

- Weaning took place at 4.5 years
- Malnutrition was never observed in 1 or 2 year olds
- Malnutrition was observed in those aged 4 to 5 years <u>in connection with weaning</u>

Growth of the exclusively breast-fed infant.

Growth of the exclusively breast-fed infant. Ahn CH, MacLean WC Jr. *Am J Clin Nutr*. 1980 Feb;33(2):183-92.

- 96 LLLI mothers
- Average exclusive bf to 7 months
- 3 exclusive to 12 months
- “do not need supplementation during the major part of their first year of life in order to grow adequately.”

Numerous studies reveal various improved factors when solid foods are introduced later vs. earlier, although, unfortunately, the bulk of these studies only look inside the first 6 months.

Full breastfeeding duration and associated decrease in respiratory tract infection in US children.

- Chantry et al., *Pediatrics.* 2006 Feb;117(2):425-32.
- [U.S.] … Data from 2277 children aged 6 to < 24 months,
- statistically significant increased risk for **pneumonia** (odds ratio **[OR]: 4.27**) (more than 4 times the risk) and for
- Multiple episodes of **otitis media** (ear infection) **(OR: 1.95**) (nearly double)
- in those who were **fully breastfed for 4 to < 6 months compared with > or = 6 months**.

Breastfeeding and Hospitalization for Diarrheal and Respiratory Infection in the United Kingdom Millennium Cohort Study

PEDIATRICS Vol. 119 No. 4 April 2007, pp. e837-e842 **Maria A. Quigley**

- … Compared with infants who were not **breastfed**, those who were exclusively breastfed **had a large and statistically significant reduction in risk for hospitalization for diarrhea (adjusted OR: 0.37**) **and lower respiratory tract infection (adjusted OR: 0.66)**.
- **The effect of partial** breastfeeding **was weaker and not statistically significant.**

The optimal duration of exclusive breastfeeding: a systematic review

Kramer & Kakuma,. *Adv Exp Med Biol*. 2004;554:63-77.

- We systematically reviewed available evidence concerning the effects on child health, growth, and development and on maternal health of exclusive breastfeeding for 6 months vs. exclusive breastfeeding for 3-4 months followed by mixed breastfeeding
- Neither the trials nor the observational studies suggest that infants who continue to be exclusively breastfed for 6 months show deficits in weight or length gain.
- **The infants who continue exclusive breastfeeding for 6 months** or more appear to have a significantly **reduced risk of one or more episodes of gastrointestinal tract infection.** …
- **No deficits** have been demonstrated in growth among infants from either **developing or developed countries** who are **exclusively breastfed for 6 months or longer.**

Full breastfeeding duration and associated decrease in respiratory tract infection in US children.

Chantry et al., *Pediatrics.* 2006 Feb;117(2):425-32. Department of Pediatrics, University of California Davis Medical Center, Sacramento USA. caroline.chantry@ucdmc.ucdavis.edu

- Adjusting for demographic variables, childcare, and smoke exposure revealed **statistically significant increased risk for both pneumonia** (odds ratio [OR]: **4.27**) and **> or = 3 episodes of OM** (OR: **1.95**) in those who were fully breastfed for 4 to < 6 months compared with > or = 6 months.

Episodes of illness in breast-fed and bottle-fed infants in Jerusalem

H. Palti et al., *Israel Journal of Medical Science* (Israel) 20, no. 5 (May 1984): 395-9.

- 274 middle-class Jewish women …
- Infants exclusively breastfed at 20 weeks had significantly fewer symptoms than partially breastfed and bottlefed infants.
- … the proportion of infants who had more than 1 symptom was 8% for the exclusively breastfed, 43% for the partially breastfed, and 43% for the bottlefed infants.

A longitudinal analysis of infant morbidity and the extent of breastfeeding in the United States

Scariati et al.,. *Pediatrics*. 1997 Jun;99(6):E5.

- [U.S.] …the risk for diarrhea remained significant only in infants who received no breast milk compared with those who received only breast milk (odds ratio = 1.8);
- the risk for ear infection remained significant in the low mixed feeding group (odds ratio = 1.6) and among infants receiving no breast milk compared with those who received only breast milk (odds ratio = 1.7)

Effects of infant feeding practices and birth spacing on infant and child survival:

Journal of biosocial science [0021-9320] Kuate Defo, B yr:1997 vol:29 iss:3 pg:303 -26

- Camaroon
- Breastfeeding-mortality association is strongly type- [of breastfeeding] and age-dependent.
- For the **first 2 years of life as a whole…**

  the protective effects of full breastfeeding are higher than those of partial breastfeeding

DELAYING SOLIDS

Potential benefits of delaying solids

- Delay the iron competition
- Delay the loss of full immune protection
- Immune protection extends beyond weaning and lasts longer the more breastmilk baby receives
- Delaying the high stress of initial weaning if child is not well
- Providing baby with a more “natural” feeding progression
- Reducing risks of allergies
- Delaying stinky diapers

Possible reasons not to delay solids beyond 6 months

- Baby says so
- Mom needs the break
- It's just so fun to feed the baby
- Baby tests positive for anemia and can benefit from high-iron foods

Linda Palmer Says:

- Do not offer/encourage solids
- Distinguish the difference between teething or curiosity, and actual desire for food
- Use close-to-no-iron foods for experimentation (pear, cucumber, apple, plum, papaya, melon, banana) to protect baby's immune advantages before solid foods are a sure thing

- And feed high iron foods once solids are a “go”
- These include peas, prunes, apricots, meats, beans (especially soy), potato skins, spinach, fortified cereals
- Don’t push consumption even once solids have started
- Is there even a need for pureed foods?
- If only finger foods are available, baby will only eat these and only when ready
- I think pureed foods are OK – great for some and not needed for others

Optimal Weaning Age?

Optimal Weight Gain = Optimal Weaning Age?

- Many studies on optimal age of weaning look simply at weight and no other indicators.
- Weight is not the end-all of an infant's health
- Lower weight is often a greater sign of health than higher, in terms of long-term outcome.

Association of breastfeeding and stunting in Peruvian toddlers: an example of reverse causality

Marquis GS, et al.,*Int J Epidemiol*. 1997 Apr;26(2):349-56

- "The negative association between breastfeeding and linear growth reflected reverse causality. **Increased breastfeeding did not lead to poor growth; children's poor growth and health led to increased breastfeeding."** [Peru]

A positive association between extended breast-feeding and nutritional status in rural... China. 1993

Am J Clin Nutr. 1993 Dec;58(6):862-7. Taren D, Chen J. Tucson

- 2148 initially breast-fed children between 12 and 47 mo of age.
- Breast-feeding for > 24 mo was associated with a greater height-for-age Z score, and breast-feeding for > 18 mo was associated with greater weight-for-age and weight-for-height Z scores.
- These results remained significant after [many factors] were controlled for.
- These results suggest that **extended breast-feeding** in this population, in which food was introduced late in infancy, was associated with **improved nutritional status** as measured by standard anthropometric indicators.

Studies once suggested all breastfeeding should end by some certain young age, such as 18 months or two years

- Again, studies finding fault with human milk are chiefly performed in regions where mothers are malnourished.
- Additionally, these are older studies. Newer studies take situation factors into account and do not find disadvantages to extended breastfeeding.

Caulfield LE et al. "Is prolonged breastfeeding associated with malnutrition? Evidence from nineteen demographic and health surveys." *Int J Epidemiol*. 1996 Aug;25(4):693-703.

- "A unifying interpretation of the observed relationships is that child size is somehow related to the decision to wean, and that whereas in sub-Saharan Africa, the biggest children are weaned first, in [other African countries], the smallest children are weaned last."

- In-depth studies on extended breastfeeding find only greater advantages the longer the period of breastfeeding.

WHEN SOLIDS DO START

Typical first foods are of little nutritional value

- The typical baby diet of juice, applesauce, squash, puddings, white rice cereal with added iron, French-fries, (soda) and cow's milk, doesn't hold a candle to breastmilk (or even to formula).

- There is generally NO reason to feed grains early
- No reason to feed sweet fruit sauces and the like
- Only dark colored veggies, beans or meat and fish can hold a candle to breastmilk's nutrition
- Eggs are wonderful, and yolks only or complete egg can be tried before age one in a non-allergic family

Possibly more-optimal first foods

- Meat, high in iron and zinc, is far better than fortified white cereal so that minerals are not set off-balance
- How many have ever heard of a meat allergy?
- I imagine that bones were chewed on by teething babies in past
- I'm not against adult or older-child vegan lifestyles but nutritionwise, babies are not meant to be vegans
- Breastmilk is an animal food. If breastmilk ends early (like before age 3) then other animal foods need to take its place, or great efforts need to be made to compensate for B12, zinc, DHA, chondroitin sulfate and other vegan challenges

- Salmon is great: zinc, iron, selenium, retinol, omega 3's, high-quality protein (fish allergies are more common in adults)
- A diet of broccoli, carrots, peas, walnutbutter & eggs or meat might not pale too badly in comparison to breastmilk nutritionally

Complementary feeding: clinically relevant factors affecting timing and composition

Krebs NF and **Hambidge KM**, *Am J Clin Nutr.* 2007 Feb;85(2):639S-45S.Denver, CO.

- Foods with a higher zinc content, such as meats, are much more likely to be sufficient to meet dietary requirements.
- Current plant-based complementary feeding patterns for older fully breastfed infants in both developed and developing countries pose a risk of zinc deficiency.

Meat as a first complementary food for BF infants: feasibility and impact on zinc intake and status.

Krebs et al., *J Pediatr Gastroenterol Nutr*. 2006 Feb;42(2):207-14.

- 88 exclusively breastfed infants… to receive either **pureed beef or iron-fortified infant cereal as the first complementary food**, starting after 5 months
- Mean daily zinc intake from complementary foods at 7 months for infants in the meat group was 1.9 mg, whereas that of the cereal group was 0.6 mg, which is approximately 25% of the estimated average requirement.

Continued…

- **Increase in head circumference from 7 to 12 months was greater for the meat group, and zinc and protein intakes were predictors of head growth.**
- The high percentage of infants with biochemical evidence of marginal zinc and iron status suggests that additional investigations of optimal complementary feeding practices for breastfed infants in the United States are warranted.

Liquids

- Fiber-void juices promote sweet preferences and should only be served diluted and occasionally.
- Another white liquid
  is not needed after breastmilk ends
  (though formula should be used
  when breastmilk ends before 12
  months, or certainly before 6 months.

- Weak herbal teas or watered-down juices and water are the best options

CALCIUM

But doesn't my child need the babymilk of the cow to grow strong human bones?

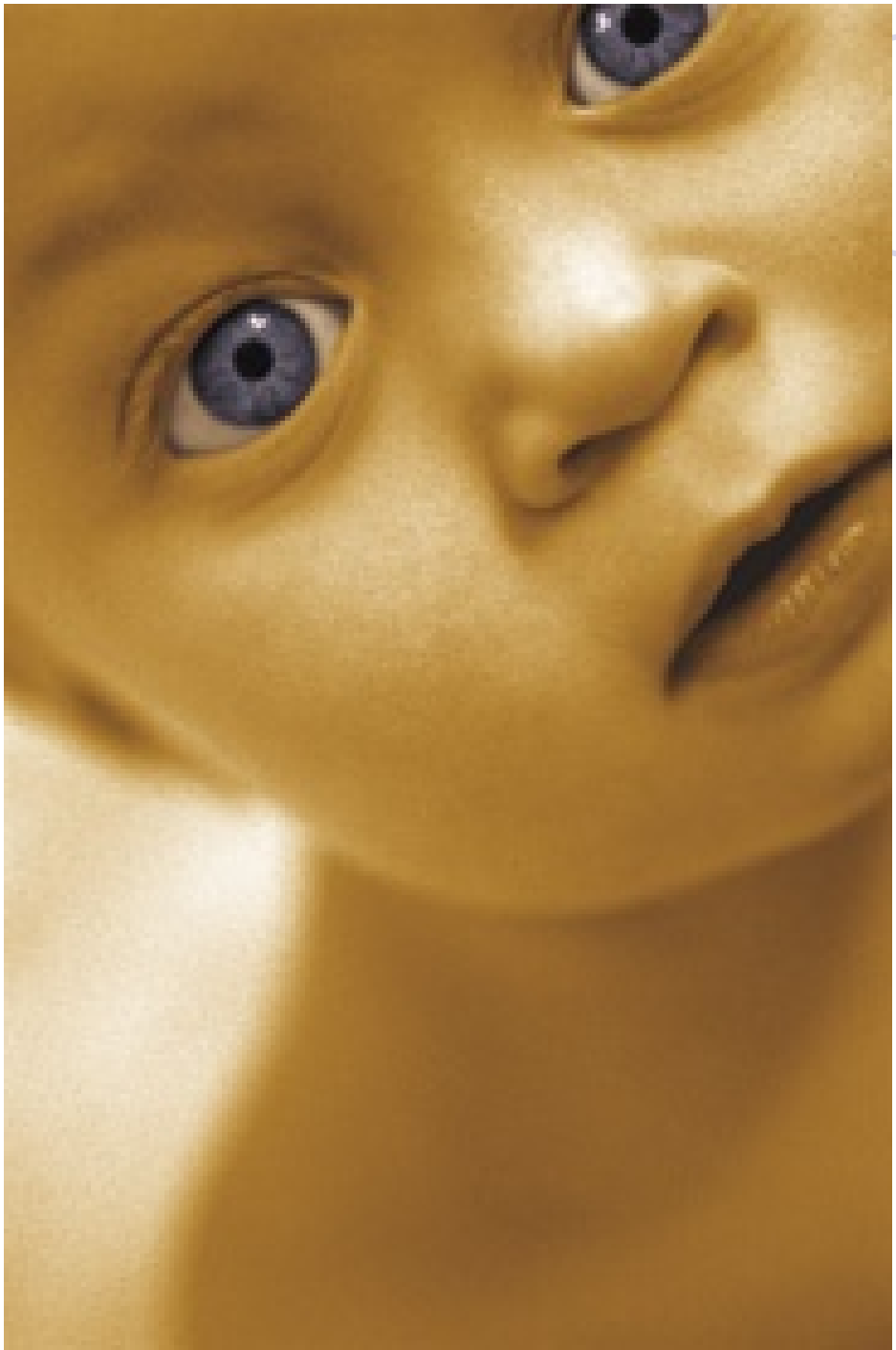
NO

Read my article on dairy and bones:

http://www.babyreference.com/**MilkingYourBones.htm**

Of course Human milk has perfect calcium delivery for Human children

- After mom's milk:
- CALCIUM listed in order of amount per calorie: molasses, dark salad greens, cabbage, broccoli, green beans, cucumber, peas, soy, squash, most other types of beans (including cocoa), figs, kiwi, almonds, real maple syrup, brown sugar, and tomatoes.



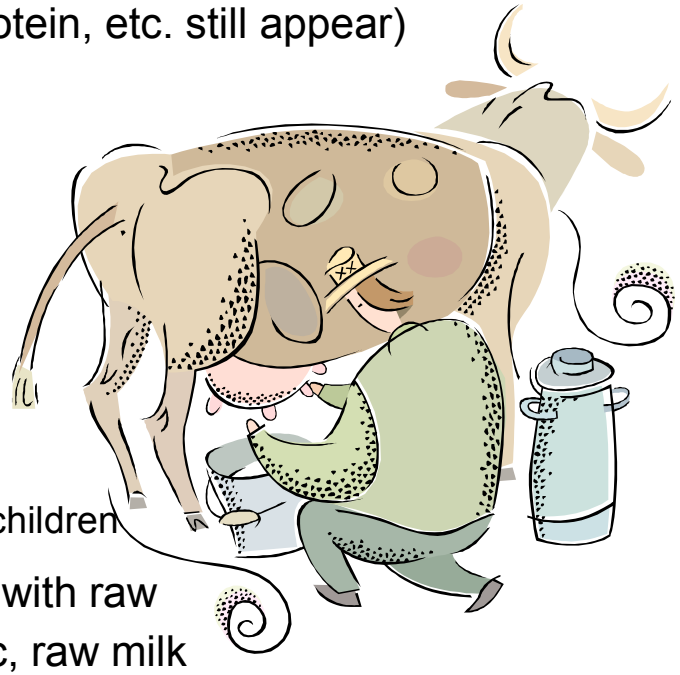
HOMEMADE FORMULAS

Homemade Formulas – The New Trend

- WHY THE INTEREST?
- Natural, alternative, health food families are looking to making their own infant formulas for multiple reasons:
- Distaste for the commercialism
- All the (very valid) anti-formula industry information
- Interest in organic products
- Interest in raw milks
- Goat's milk hype (claims it won't have the negative effects studies show with cow's milk)

Popularity of Raw Milks

- Think they won't have all the negative health consequences shown in studies on cow's milk (but actually raw milks are represented in a small portion of these studies and the negative effects of consuming hormones, excessive animal protein, etc. still appear)
- Fresher
- More natural sounding
- Fallacies passed around such as some say that raw milk has lactase enzyme, but this is not true. The bacteria will digest some of the lactose when milk is older/soured. Of course, all babies have lactase enzyme, when not temporarily reduced by diarrheal illness or milk protein allergic reactions, so this is not a concern for young children



- Bacteria bacterial illness is truly not a concern with raw milks and the bacteria have healthy qualities. Organic, raw milk farms have to keep their cows healthy. Big-industry milks have more bacterial danger concerns and sometimes the leukemia virus is even a preferred chronic infection.
- It's still not for humans especially not more than one serving per day

Meyenberg Oh My!

- Recipe on Sears' website called "BEGINNING FORMULA"
- Very dangerous for newborns
- Not even fresh, raw milk
- Evaporated and powdered
- At least it's fortified with folic acid and vitamin D
- A suggestion at the bottom of Sears' page and on Meyenberg site to add a multivitamin supplement when using this formula. This helps make it survivable but it's so far from nutritionally balanced.

Meyenberg

- **If you do the math…**
- **Quite a difference in the dilution amount** (compared to reconstitution amount) when creating from evaporated (twice the water equals half the protein)
- Versus from the powdered (50% more water and thus greater portion of syrup to equal same calories).
- **The randomness of this finding alone** reveals the lightness of responsibility with which this recipe is provided.

The Meyenberg Goat's Milk recipe is not adequate to be used as the total nutrition for a young baby. It's less dangerous once solid foods are introduced, but is still not optimal. One serving per day would be fine.

- Using what I can find on Meyenberg website and USDA website, my best math says their evaporated milk formula recipe is 17 calories/oz although they say it's the appropriate 20. Proper caloric intake per amount of liquid is very important for young babies.
- These aren't even the beginning of the problems with this "formula"
- For starters, the fat is much too low and many important fatty acids are missing
- There's hardly any vitamin A or C and the phosphorous is very high, leading to leaching of calcium

- See chart on next two slides. Even where nutrients may look comparable to breastmilk, they are not necessarily as utilizable. This is why higher amounts of many nutrients are added to standard formulas

- Many parents then get the **dangerous** idea to leave out the sugar, or to replace it with non-carbohydrate stevia. This is very unfortunate as babies desperately need adequate sugar for proper brain development (lactose being the best)

- It's odd to me that optimal-health-oriented families will select this as an alternative to more complete formulas when the nutrition is so far from optimal; i.e. so much less healthy.

	Breast Milk	Goat Milk "Formula" From Evap	WestonPrice Cow's Milk Formula (per WP)	Nestle' Good Start Supreme DHA	Baby Food Cereal-Oatmeal/milk +Iron & Zinc	Apple Juice
Calories	70Kcal	55 - 65	78Kcal	66Kcal	116kcal	47Kcal
Protein	.8 to 1.3	1.7g**H	1.6g	1.5g	5g	.06g
Carbohydrates	6.9 - 7.5 (plus .5 oligosac's)	7.3	7.2g	7.4g	15.3g**	11.7g
Total Fat	4.0 - 4.4g	1.6g**L	4.7g	3.4g	4.1g	.1g
Saturated Fat	2q	1q	2.5q	1.2q		
Mono Fat	1.6q	.1q	1.5q	1.2q		
Poly Fat	.5g	.48g	.5g	.6g		
Omega-3 FA	.05g	-0- **L	.1g	.01g		
Omega-6 FA	.4g	-0- **L	.4g	.02		
Cholesterol	14mg	5.5mg	12.5mg		11mg	-0-
Vitamin A*	212IU	69 IU**L	455IU	198IU	105IU	1IU
Thiamin-B1	.014mg	.024mg	.1mg	.066mg	.5mg	.021mg
Riboflavin-B2	.036mg	.069mg	.1mg	.092mg	.563mg	.017mg

Niacin-B3	.17mg	.14mg	.23mg	.69mg	5.98mg	.10mg
Vitamin B6	.011mg	.023mg	.05mg	.05mg	.06mg	.03mg
Vitamin B12	.05mcg	.03mcg	.17mcg	.22mcg	.30mcg	-0-
Folate	5mcg	16mcg	21mcg	10mcg	10mcg	-0-
Vitamin C	5mg	.5mg**L	5.2mg	5.9mg	1.3mg	.9
Vitamin D	4IU	20IU	42IU	40IU	-0-	-0-
Vitamin E***	.08mg	.03mg	.56mg	1.3IU	-0-	-0-
Calcium	32mg	60mg	62mg	44mg	220mg	7mg
Copper	.052mg	.023mg	.03mg	.053mg	.09mg	.022mg
Iron	.03mg	.02mg**L	.13mg	1mg**H	12mg	-0-
Magnesium	37.4mg	7mg**L	8.3mg	4.62mg**L	35mg	3mg
Manganese	.026mg	.009mg	.003mg**L	.01mg	-0-	.113mg
Phosphorus	14mg	55mg**H	56mg**H	25mg	160mg	7mg
Potassium	51mg	102mg	86mg	71mg	204mg	119mg
Selenium	1.8mcg	.7mcg	1.4mcg	2mcg	-0-	.1mcg
Sodium	17mg	22mg	28mg	18mg	46mg	3mg
Zinc	.17mg	.15mg	.25mg	.53mg	.92mg	.03mg

Non-diluted, unfortified ANIMAL MILKS are not appropriate for babies before one year of age.

- Whole cow's or goat's milk has too little vitamin E, vitamin C, vitamin K, selenium, iron, folic acid, essential fatty acids, carbohydrates, way too little manganese and likely other nutrients, and a high casein to whey ratio. They have too much protein, calcium, sodium, chloride, phosphorous and potassium, and likely others. The high protein is damaging to kidneys.
- Cow's milk is higher in phenylalanine (think PKU) and tyrosine, lower in cysteine and has no taurine. (Cysteine and taurine usually added to formulas). Baby supposedly cannot convert cysteine and methionine to taurine.

Consequences of early cow's milk diets

The social bases of declining infant mortality: lessons from a nineteenth-century Italian town.

Hogan DP, Kertzer DI. Eur J Popul. 1987 May;2(3-4):361-85.

- Infant mortality for "women who worked in emerging textile factories who could not breastfeed and used animal milk":

  682 deaths per 1000 in 1903" …

- vs. 100/1000 in 1900
- and 75/1000 in 1910

- It's evident that the infant death rate for those being fed animal milks was around 7 times the overall infant death rate.

Goat's versus cow's

- Goat's has less casein but not less lactalbumin
- The fats may be a little more digestible
- Equally allergenic
- Smaller industry may lead to more conscientious farming
- Probably not as infected
- As nutritionally inappropriate for babies as cow's milk

Weston-Price Homemade Formula

- **(They offer no lower age limit)**
- *2 cups whole milk, unprocessed, pasture-fed*
- *1/4 cup **homemade liquid whey (See recipe**)*
- *4 tablespoons lactose**
- *1 tsp bifidobacterium infantis***
- *2 or more tablespoons cream (not ultrapasteurized)…*
- *1 tsp regular dose cod liver oil or 1/2 teaspoon high-vitamin cod liver oil**
- *1 tsp expeller-expressed sunflower oil**
- *1 tsp extra virgin olive oil* 2 tsp coconut oil**
- *2 tsp Frontier brand nutritional yeast flakes**
- *2 tsp gelatin**
- *1 7/8 cups filtered water 1/4 tsp acerola powder**

- I feel uncomfortable with home-made formulas as it's very simple to make an extreme mistake
- The Infant Formula Act was created in reaction to an infant formula company's decision to put soft water in their formula, which led to a big rush of babies to emergency rooms
- Babies skipping heartbeats, getting severely ill, and dying
- The formula was chloride deficient
- Congress decided that such a product needed to be more closely monitored.
- Infant Formula Act of 1980, made the FDA the sole regulator of infant formula

Weston Price Formula

- Still, I find Weston Price Formula to appear pretty complete nutritionally
- With exception of low manganese, and again, it's high in phosphorous
- See graphs. Most amounts are from Weston Price's site although I re-calculated several of the nutrients on my own; finding his claims accurate
- Every ingredient is in there for a reason, though many families want to leave out various ones

EXAMPLE of how new nutrient imbalances are constantly found in commercial formulas:

- 2005: Enfamil LIPIL® with Increased Choline: “Enfamil LIPIL becomes the first infant formula to increase the level of choline to the level found in breast milk.† Choline is an essential nutrient that supports baby's brain development.”

- Before that it was selenium. In last years it’s been DHA and ARA, attempting to alleviate the **slight brain damage** seen with formula use from birth.

	Breast Milk	Goat Milk "Formula" From Evap	WestonPrice Cow's Milk Formula (per WP)	Nestle' Good Start Supreme DHA	Baby Food Cereal-Oatmeal/milk +Iron & Zinc	Apple Juice
Calories	70Kcal	55 - 65	78Kcal	66Kcal	116kcal	47Kcal
Protein	.8 to 1.3	1.7g**H	1.6g	1.5g	5g	.06g
Carbohydrates	6.9 - 7.5 (plus .5 oligosac's)	7.3	7.2g	7.4g	15.3g**	11.7g
Total Fat	4.0 - 4.4g	1.6g**L	4.7g	3.4g	4.1g	.1g
Saturated Fat	2q	1q	2.5q	1.2q		
Mono Fat	1.6q	.1q	1.5q	1.2q		
Poly Fat	.5g	.48g	.5g	.6g		
Omega-3 FA	.05g	-0- **L	.1g	.01g		
Omega-6 FA	.4g	-0- **L	.4g	.02		
Cholesterol	14mg	5.5mg	12.5mg		11mg	-0-
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Vitamin B12	.05mcg	.03mcg	.17mcg	.22mcg	.30mcg	-0-
Folate	5mcg	16mcg	21mcg	10mcg	10mcg	-0-
Vitamin C	5mg	.5mg**L	5.2mg	5.9mg	1.3mg	.9
Vitamin D	4IU	20IU	42IU	40IU	-0-	-0-
Vitamin E***	.08mg	.03mg	.56mg	1.3IU	-0-	-0-
Calcium	32mg	60mg	62mg	44mg	220mg	7mg
Copper	.052mg	.023mg	.03mg	.053mg	.09mg	.022mg
Iron	.03mg	.02mg**L	.13mg	1mg**H	12mg	-0-
Magnesium	37.4mg	7mg**L	8.3mg	4.62mg**L	35mg	3mg
Manganese	.026mg	.009mg	.003mg**L	.01mg	-0-	.113mg
Phosphorus	14mg	55mg**H	56mg**H	25mg	160mg	7mg
Potassium	51mg	102mg	86mg	71mg	204mg	119mg
Selenium	1.8mcg	.7mcg	1.4mcg	2mcg	-0-	.1mcg
Sodium	17mg	22mg	28mg	18mg	46mg	3mg
Zinc	.17mg	.15mg	.25mg	.53mg	.92mg	.03mg

- Weston Price has very unfortunate comments on website – attempting to convince that it may be healthier than human milk with all of breastmilk's dozens (or hundreds) of different immune-providing factors (barely represented in raw animal milks), specialized nutrient delivery systems, and proper growth hormones
- Website is full of comments about reduced illnesses with the formula – hinting at being versus breastmilk
- Of course, many of these have been children not tolerating ingredients in standard formulas or possibly reacting to something in breastfeeding mother's diet, although cow's milk proteins are the most common allergenic factor in mothers' milks or formulas
- It may be a good option when breastmilk is not an option

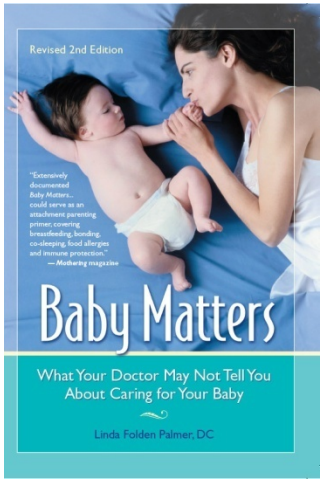
- Still, Weston-Price's formula has improved importantly over time, leading one to realize that it was not optimal before. Is it now?
- Mercola seems to have deleted his own homemade formula that he once widely publicized (and that frightened me)
- This current Weston-Price recipe is better, but still, Weston-Price's 2005 formula article on Mercola was in **9** parts!! and thus seen over & over, promoting the idea of replacing breastmilk and perpetuating an inappropriate recipe

SEE: **In Search of the Natural Weaning Age of Humans** Linda F. Palmer, DC

http://www.babyreference.com/NaturalWeaningAge.html

Beyond Breastmilk

Contact Palmer for permissions:
LFPalmer@BabyReference.com



BUY: "Baby Matters, What Your Doctor May Not Tell You About Caring for Your Baby, Revised 2nd Ed."
http://www.babyreference.com/aboutthebook.htm

…the science supports natural parenting practices…