

Lac Humanum, the true Universal Remedy, a layer to be found in all cases

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Breastfeeding is the norm for human infants

- The WHO and the Centers for Disease Control and Prevention have affirmed breastfeeding's value to public health.
- Strong organisations such as the American Academy of Pediatrics, American College of Obstetricians and Gynecologists, American Association of Family Practice, and the Academy of Breastfeeding Medicine have confirmed the value of human milk.
- The discussion is over....

• Lawrence RA: Breastfeeding triumphs Birth 2012 Dec;39(4):311-4.

A Line in the sand has been drawn!



Human milk is species-specific

- Humans are the only mammals who drink the milk of another mammal after weaning!
- Humans are primates and primates lactate for 6x the gestation rate.
- The orangutan (our closest DNA "cousin") lactates for 8 years.

Babies don't get human milk for long enough!

- Australia at 6 months: 14%
- Canada at 6 months: 14%
- UK at 6 months: 1%
- USA at 6 months: 50%
- "Infants who do not receive human milk in the United States cost its healthcare system over \$13 billion each year and result in over 900 unnecessary infant deaths annually."

• Dr. F Nice Domperidone and Breastfeeding GOLD Feb 2014

Aphorism 9

- Our physical body, needs to be "a healthy instrument" of which "the spirit-like life force...can freely avail itself...**for the higher purposes of our existence**".

UNICEF: 1.4 million babies die yearly due to lack of breastmilk

UNICEF, "Breastfeeding: impact on child survival and global situation", <http://tinyurl.com/9e6ic2>



Morbidities linked by research to lack of breastfeeding

- SIDS
- Brain growth & cognitive ability
- URTIs; Otitis media; Asthma
- UTIs
- Diabetes (protects both baby & mother)
- Crohn's
- Ulcerative colitis
- Cardiovascular disease (both baby & mother)
- Bone density (both baby & mother)
- Obesity (artificially fed infants consume 30,000 more calories than breastfed babies in the first 8 months).

CONSTITUENTS OF MILK (g/100 g) OF VARIOUS MAMMALS

• Mammal	total solids	fat	total protein	lactose	ash
• Ass	11.1	1.2	1.7	6.9	1.3
• Camel	14.4	4.9	3.7	5.1	0.7
• Cat	25.4	10.9	11.1	3.4	
• Cow (Jersey)	15.0	5.5	3.9	4.9	0.7
• Dog/Wolf	25.1	12.9	7.9	3.1	1.2
• Dolphin	30.4	14.1	10.4	5.9	
• Elephant	24.1	15.1	4.9	3.4	0.76
• Goat	12.0	3.5	3.1	4.6	0.79
• Horse	11.0	1.6	2.7	6.1	0.51
• Human	13.6	5.5	1.0	7.0	0.1
• Kangaroo	9.5	2.1	6.2	trace	1.2
• Lion	24.8	13.7	8.5	2.6	
• Llama	14.0	5.6	4.3	3.3	0.8
• Pig	19.5	8.2	5.8	4.8	0.63
• Rabbit	26.4	12.2	10.4	1.8	2.0
• Seal (grey)	67.7	53.2	11.2	2.6	0.7



Promotes immuno-competence

- Human milk contains **many hundreds to thousands of distinct bioactive molecules** that protect against infection and inflammation and contribute to immune maturation, organ development, and healthy microbial colonisation.
- Breast-feeding maintains the maternal-foetal immunological link after birth, (which is thought to favor the transmission of immuno-competence from the mother to her infant), and is considered an important contributory factor to the neonatal immune defense system during a delicate and crucial period for immune development.

• Ballard O, Morrow AL. Human milk composition: nutrients and bioactive factors. *Pediatr Clin North Am.* 2013 Feb;60(1):49-74

Immune System of the Infant

- Several studies have reported that breast-feeding, because of the antimicrobial activity against several viruses, bacteria, and protozoa, may reduce the incidence of infection in infants.
- The protection from infections may be ensured either passively by factors with anti-infective, hormonal, enzymatic, trophic, and bioactive activity present in breast milk, or through a modulator effect on the neonatal immune system exerted by cells, cytokines, and other immune agents in human milk.

• Chirico G et al. Anti-infective properties of human milk. *J Nutr.* 2008 Sept;138(9):1801S-1806S

• Anderson Y. Formula feeding skews immune cell composition toward adaptive immunity compared to breastfeeding. *J Immunol.* 2009 Oct 1;183(7):4322-8

What are some of these unique factors?

- Amylase
 - negligible levels in neonate at birth; found in significant quantities in both colostrum and mature milk;
 - remains active in duodenum after a feed;
 - thought to inhibit growth of certain organisms.

Maternal antibodies

- Depends on maternal serum profile; and, as such, mirrors her immunological state.
- Lack of exposure to “childhood diseases” among little girls, is resulting in a generation of women who lack these antibodies; and so newly-delivered mothers are being offered vaccines straight after birth.

Antioxidants

- Various; including vitamin C, uric acid, α -tocopherol and β -carotene.
- As anti-inflammatory agents and scavengers of free radicals, all play a part in protecting against infection.
- Prematurity is associated with protracted oxidative stress, and human milk is partially protective.

• Ledo A et al; Human milk enhances antioxidant defenses against hydroxyl radical aggression in preterm infants. *Am J Clin Nutr* January 2009 vol. 89 (1) 210-215

Antioxidants

- Human milk has been shown to exert a direct pharmacologic relaxation effect and provide better antioxidant protection compared with infant formulas because of the presence of specific enzymatic components, such as **human superoxide dismutase** and free radical scavengers such as **tryptophan**.
- Oxidative stress is well-addressed by tryptophan.

• Lugonja N et al; Differences in direct pharmacologic effects and antioxidative properties of mature breast milk and infant formulas. *Nutrition* 2013 Feb;29(2):431-5.
• Tsopmo A et al; Tryptophan released from mother's milk has antioxidant properties. *Pediatr Res*. 2009 Dec;66(6):614-8

Antistaphylococcus factor

- Inhibits systemic staphylococcal infection.

Antiviral activity

- sIgA known to protect against:
 - Enteroviruses [Poliovirus types 1, 2, 3; Coxsackievirus types A9, B3, B5; Echovirus types 6 & 9];
 - Herpes virus;
 - [Cytomegalovirus; Herpes simplex];
 - Semliki forest virus;
 - Respiratory syncytial virus; Rubella; Reovirus type 3; Rotavirus
- IgM & IgG protect against:
 - Respiratory syncytial virus; Rubella

B₁₂ binding protein

- Renders vitamin B₁₂ unavailable for bacterial growth.

Bacteria

- The new concept of the 'milk microbiome', seeks to understand the possible mechanisms (contamination versus active migration) by which bacteria can reach the mammary gland. Breastmilk may contain
 - *Staphylococcus epidermis* and *Staphylococcus aureus*
 - α -haemolytic *Streptococcus*
 - β *Streptococcus* (keynote: alternates breasts)
 - Non-haemolytic *Streptococcus*
 - *Enterococcus*; *Escherichia coli* (governs vitamin K production)
 - *Candida albicans*
- so may be a major source of bacterial diversity to the neonatal gut, including gut-associated obligate anaerobes, and may thus significantly influence gut colonisation and maturation of the immune system.

• Jeurink PV et al; Human milk: a source of more life than we imagine *Benef Microbes*. 2013 Mar 1;4(1):17-30
 • Joat T et al; Assessment of bacterial diversity in breast milk using culture-dependent and culture-independent approaches. *Br J Nutr* 2013 Mar 14;1-10

Bifidus factor

- Enhances proliferation of lactobacilli thereby inhibiting some E coli and Enterobacteriaceae including shigella and salmonella.
- Probiotics administered to the pregnant and breast-feeding mother, prenatally and postnatally, is safe and effective in reducing the risk of eczema in infants with allergic mothers who are positive for skin prick test.

• Rautava S et al; Maternal probiotic supplementation during pregnancy and breast-feeding reduces the risk of eczema in the infant *J Allergy Clin Immunol*. 2012 Dec;130(6):1355-60

Bile salt-stimulated lipase

- Generates fatty acids and monoglycerides that inactivate
 - *Giardia Lamblia*
 - *Entamoeba histolytica*
 - *Trichomonas vaginalis*

Cancer...HAMLET

- One of the primary components of human milk that is postulated to affect cancer risk is α -lactalbumin. (Primary protein of cows milk is β -lactoglobulin)
- Tumour cell death can be induced by HAMLET [Human α -Lactalbumin Made Lethal to Tumour Cells]; a human milk complex of alpha-lactalbumin and oleic acid discovered in 2004.

• Ficher W et al; (HAMLET) Kills Human Glioblastoma Cells in Brain Xenographs by an Apoptosis-Like Mechanism and Prolongs Survival *Cancer Research* March 15, 2004; 64:2105-2112

Cancer...HAMLET

- HAMLET induces apoptosis only in tumour cells, while normal differentiated cells are resistant to its effects.
- Therefore, HAMLET may provide safe and effective protection against the development of breast cancer.
- Clinical evidence has shown that there is a lower risk of breast cancer in women who breastfed their babies.

• Franca-Botelho Ado C et al; Breastfeeding and its relationship with reduction of breast cancer: a review *Asian Pac J Cancer Prev*. 2012;13(11):5327-32.

FOOD: Desires ginger: lac-h

- Differential Control of Growth, Apoptotic Activity, and Gene Expression in Human Breast Cancer Cells by Extracts Derived from Medicinal Herbs *Zingiber officinale*
- Ginger treatment suppressed the proliferation and colony formation in breast cancer cell lines, MCF-7 and MDA-MB-231. Meanwhile, it did not significantly affect viability of nontumorigenic normal mammary epithelial cell line (MCF-10A).

* Journal of Biomedicine and Biotechnology Volume 2012 (2012), Article ID 614356, 14 pages
Ayman I. Elbadry, Osama A. Aboulnasr, Nabil A. Baeshen, Tarek B. Rahmy

Breastfeeding amel: lac-h

Lump in breast on weaning: lac-h

- In search of a more exact prescription....a journey of discovery towards understanding *Lac-humanum* (*Similia* vol 18 (1) 2006)
- Case #3 (pgs:198-203) *The Materia Medica of Milk* (Homeolinks Publishers Haren 2002)

microRNA (miRNA)

- Because miRNAs (which exist in human body fluids) are known to regulate various immune systems, it was hypothesised that human breast milk may contain miRNAs.
- Study (2010) detected high expression levels of immune-related miRNAs in the first 6 months of lactation and that these miRNA molecules are stable even in very acidic conditions, indicating that breast milk allows dietary intake of miRNAs by infants.

* Kosaka N et al; microRNA as a new immune-regulatory agent in breast milk. Silence. 2010 Mar 1;1(1):7.

microRNA (miRNA)

- miRNA isolated from infant stool has determined that breastmilk induces genetic pathways that are quite different from those of formula-fed infants.
- The gene most often expressed is associated with the cellular response to oxygen deprivation most associated with NEC.

* Goode N; Human Milk causes different gene expression in the gut. Biotechnology Newsletter; May 2010

Other GIT issues

- Lack of human milk in the early months has both short term and long term consequences for the gut.
- **NEC**
- **Botulism**
- **Diarrhoea**
- **Coeliac disease**
- **Crohn's disease**
- **Ulcerative colitis**

Note about premmie babies

- NEC (Necrotising Enterocolitis) and late onset sepsis
- Bacterial meningitis (in the NICU [Neonatal Intensive Care Unit] it's the Tubercular miasm infants who have bleeding into the brain when they're given "human milk fortifier" [i.e. cow's milk formula])
- Costs about \$2500 a day for a baby in the NICU and about \$1200 a day for a baby in Special Care.
- Per infant with NEC: \$75,000 and up to \$200,000 if surgery is needed.

Lac-h Abdomen rubrics

- Distension < eating
- Flatulence
- Gaseous distension;
 - sense of extreme uneasiness, with
 - tension; abdomen in, with
- vs
- Constriction; sense of; left inguinal region; dull aching pain, with
- Constriction; umbilicus; region of

Lac-h Abdomen rubrics

- Pain
- Pain; hypogastrium; right
- Pain; hypogastrium; jarring <
- Pain; stitching; hypochondria; right to left
 - morning; waking, on
 - > pressure
- Pain; inguinal and umbilical regions

Lac-h Abdomen rubrics

- Pain; morning
- Pain; stool, before
- Pain; cramping
- Pain; cutting; pressure >
- Pain; cutting; sides; right to left
- Pain; drawing
- Tension; evening
- Heaviness; **S/if**: intestines were being pulled from the inside

Lac-h Rectum rubrics

- Urge; sudden
- Urge; sudden; irresistible; evening
- Urge; sudden; tenesmus, with; 3 am
- Pain; burning and Pain; tenesmus; stool, before
- Diarrhoea
- Diarrhoea; forcible; immense burning in rectum, with sense of collapse, with
- Straining required; initial part of stool
- Stool hard; difficult to pass
- Rectum tears; passing stool, while
- Constipation; severe; difficult stool
- Urge; ineffectual

Lac-h Stool rubrics

- Stools; first hard, then soft (*lyc*) **s/if**: a plug
- Stools; ball like
- Stools; soft
- Stools; floating; Lumps; liquid stool; Watery
- Flatulent
- Frequent; Forcible; sudden; gushing
- Mucous in stool
- Offensive
- Offensive; accompanied by flatus

Diabetes type 1

- Blood profile of diabetics demonstrates higher levels of antibodies to bovine proteins; particularly β -lactoglobulin and bovine serum albumin.
- These antibodies cross-react with β cell membrane proteins, destroying them, and thus, the islet beta cells.

• Martin JM et al; Milk proteins in the etiology of IDDM *Ann Med*; 23; 1991

Diabetes type 2

- A Sydney study of 52,731 women demonstrated that, compared to nulliparous women, childbearing women who do not breastfeed, have about a 50% increased risk of type 2 diabetes in later life.
- Breastfeeding substantially reduces this excess risk.

• Liu B et al; Parity, breastfeeding, and the subsequent risk of maternal type 2 diabetes. *Diabetes Care*. 2010 Jun;33(6):1239-41

Lac Humanum Food Desires

- Sweets; starches (puddings); ginger, chocolate, milk; cream
- Sticky-date pudding and custard; caramel or vanilla milkshakes
- Rich food

α_1 -Antitrypsin

- Inhibits trypsin dependent Rotavirus
- Along with lactoferrin, haptocorrin and transforming growth factor-beta, it appears that these bioactive proteins are resistant against proteolysis and can remain intact or as larger fragments through passage of the gastrointestinal tract.

• Lönnertdal B Bioactive proteins in human milk: mechanisms of action / *Pediatr*. 2010 Feb;156(2 Suppl):S26-30.

α_2 -Macroglobulin protein

- inhibits hemagglutinin activity;
- organisms affected include Influenza, Parainfluenza and Rotavirus

Amino Acids

- all essential and non-essential;
- low in methionine, phenylalanine and tyrosine;
- rich in cystine and taurine

Amino Acids

- Rich in Cystine and low in Methionine, means?
 - an enzyme (cystathionase) is late to develop in the foetus;
 - this impairs optimum conversion of methionine to cystine which is need for growth and development
 - methionine may increase in the blood stream of babies given cow's milk --> CNS damage

Amino Acids

- Lower in phenylalanine and tyrosine, means?
 - enzymes tyrosine amino-transferase and para-hydroxyphenol pyruvate oxidase are also late in developing;
 - these amino acids may accumulate in the blood of babies fed cow's milk -->CNS damage especially in the premature

Amino Acids

- Rich in taurine
 - this amino acid is necessary for bile acid conjugation and thought to be a neurotransmitter or neuro-modulator in the brain and retina;
 - humans cannot synthesise taurine well and cow's milk contains little taurine

Cholesterol

- May contribute to more effective cholesterol metabolism in adult life
 - studies in rats indicate that exposure to high levels in early life results in increased ability to tolerate large amounts later and maintain low cholesterol levels
 - human studies indicate that breastfed individuals are much less likely to develop atherosclerotic plaques in adulthood

Martin RM, Davey Smith G. Does having been breastfed in infancy influence lipid profile in later life?: a review of the literature. *Adv Exp Med Biol.* 2009;646:41-50.

Parikh NI et al. Breastfeeding in infancy and adult cardiovascular disease risk factors. *Am J Med.* 2009 Jul;122(7):656-63.

Complement

- Opsonic, chemotactic and bacteriolytic activity against *E. coli*

Cytokines

- Initiate and stimulate host defence; so prevent auto-immunity.
- Have anti-inflammatory effects on the upper respiratory and GI tract and stimulate development of the digestive system.
- Exclusive breast-feeding promotes an anti-inflammatory cytokine milieu, which is maintained throughout infancy.
- Such an immunological environment limits hyper-responsiveness and promotes tolerisation, possibly prohibiting the onset of allergic disease.

Kaïnonen E et al. Immunological programming by breast milk creates an anti-inflammatory cytokine milieu in breast-fed infants compared to formula-fed infants. *Br J Nutr.* 2012 Oct;30:1-9.

Cytokines

- Epidermal growth factor (EGF)
- Nerve growth factor (NGF)
- Insulin-like growth factors (IGFs)
- Tumor necrosis factor-alpha (TNFα)
- Transforming growth factor-alpha (TGFα)
- Transforming growth factor-beta (TGFβ)
- Granulocyte colony-stimulating factor (G-CSF)
- Interleukins: IL-1β, IL-6, IL-8, IL-10, IL-15
- Prostaglandins
- Basic fibroblast growth factor (bFGF)

Interleukins

- IL-1 β , IL-6, IL-8, IL-10, IL-15
- A sub-group of cytokines;
 - augments newborn's immune system by increasing antibody production (especially IgA);
 - enhancing phagocytosis;
 - activating T cells and increasing α_1 -antitrypsin production by mononuclear phagocytes

IL-15 and HIV

- Given the central role that interleukin 15 (IL-15) plays in human immunodeficiency virus (HIV) immunity, it was hypothesised that IL-15 in breast milk may protect against postnatal HIV transmission.
- In a nested case-control study, breast milk IL-15 levels in 22 HIV-infected women who transmitted HIV to their infants were compared to those in 72 non-transmitters. Samples were collected in the first month of life, prior to HIV infection.
- IL-15 concentrations were associated with a decreased risk of HIV transmission in unadjusted analysis and after adjusting for milk viral load, CD4 cell count, and other cytokines in breast milk.
- IL-15-mediated immunity may protect against HIV transmission during breast-feeding.

Walter J et al. High concentrations of interleukin 15 in breast milk are associated with protection against postnatal HIV transmission. J Infect Dis. 2009 Nov 15;200(10):1498-502

IL-1 β and breastmilk jaundice

- Up to 40 per cent of breastfed infants are jaundiced at 14 days of age; needing treatment merely of reassurance and monitoring.
- IL-1 β concentration seems to be increased in milk of mothers whose infants have BMJ.
- Although the effect of these cytokines on BMJ is unknown, it may cause prolonged jaundice via hepatic uptake, hepatic excretion, conjugation and intestinal absorption.

Apaydin K et al. Cytokines in human milk and late-onset breast milk jaundice. Pediatr Int. 2012 Dec;54(6):801-5

Paul SP et al. Prolonged jaundice in neonates. Pract Midwif. 2012 Jun;15(6):14-7

Enzymes

- 20 different enzymes;
- perform various functions including
 - bio-synthesis and preservation of milk components in mammary gland;
 - digestive function in the neonate;
 - transport;
 - anti-infective role.

Epidermal growth factor

- Cytokine which promotes increased growth and maturation of the fetal pulmonary epithelium;
- stimulates ornithine decarboxylase activity and DNA synthesis in the digestive tract
- and accelerates the healing of wounds of the corneal epithelium.

Lactic acid

- Lactic acid bacteria (LAB) was isolated from the breastmilk of healthy women for the ability to inhibit HIV-1 infection in vitro. A total of 38 strains of breastmilk bacteria were evaluated in this study.
- Both heat-killed bacteria and cell-free conditioned supernatants from bacterial cultures were tested for the ability to inhibit infection with HIV-1 using viral isolates with tropism for CCR5 (R5), CXCR4 (X4), or R5/X4 dual-tropism.

Lactic acid

- Significant inhibition of R5-tropic HIV-1 was demonstrated using heat-killed bacteria, most notably among breastmilk strains of *Lactobacillus* and *Pediococcus*.
- Selected strains of breastmilk LAB also demonstrated significant inhibition of HIV-1 infection against virus with tropism for X4 and R5/X4.
- These results demonstrate for the first time that commensal LAB from human breastmilk inhibits HIV-1 infection in vitro and suggests a possible role for these bacteria in mucosal protection against HIV-1 in the breastfeeding infant.

• Martin V et al; Inhibition of human immunodeficiency virus type 1 by lactic acid bacteria from human breastmilk. *Breastfeed Med*. 2010 Aug;5(4):153-8.

HIV and erythropoietin

- Breast milk has concentrations of erythropoietin, a factor with trophic effects on infant gut epithelia, and its been demonstrated to have a protective effect against mother-to-child-transmission of HIV.

• Arsenault JE et al; Association between breast milk erythropoietin and reduced risk of mother-to-child transmission of HIV. *J Infect Dis*. 2010 202(3):370-3.

Hormones

- Various; include gastrin; gonadotrophin-releasing hormone; thyroid-releasing hormone; thyroid- stimulating hormone;
- gonadotrophins; ovarian hormones;
- corticosteroids; erythropoietin; insulin;
- cyclic adenosine monophosphate and cyclic guanosine monophosphate
- AND oxytocin “the hormone of love”!

Immunoglobulins

- More than 30 have been identified; 18 from maternal serum, the rest are found exclusively in the milk;
- sIgA is the most important of these; ***found in levels five times that of maternal serum***; has bacterial and viral neutralising capacity; protects mucosa.

Interferon

- isolated in vitro from T cells;
- thought to have antiviral activity

Lactoferrin

- Lactoferrin is a multifunctional protein and a member of the transferrin family. It binds iron and therefore inhibits host-pathogen interactions.
- The antimicrobial characteristics of lactoferrin may facilitate a healthy intestinal microbiome and supplementation interferes with its effectiveness.

Lactoferrin

- Iron absorption is enhanced by: lactoferrin, high levels of lactose and low levels of phosphorus
 - 40% Fe in human milk is absorbed
 - 10% in cow's milk
 - 4% in formula (although follow-on formula enhances iron stores)

Lactoferrin

- Lactoferrin along with lysozyme kills bacteria. In the stomach, pepsin digests and releases a potent peptide antibiotic called lactoferricin from native lactoferrin.
- Its highest concentration is in colostrum. Recently, researchers suggest that early feeding of colostrum, and also fresh mature milk, is a way to prevent NEC.

• Sherman MP; Lactoferrin and necrotizing enterocolitis. Clin Perinatol 2013 Mar;40(1):79-91.

Lactoferrin

- A cross sectional survey was conducted to examine the physical growth, incidence of anemia, mean haematocrit (Hct) level and other red cell indices among 63 six-month-old infants visiting a well-child clinic in Thailand.
- The prevalence of anemia was higher among non-EBF compared to EBF up to 6 months.

• Sawasdirom S, Tansiriyakul S. Are infants exclusively breastfed up to 6 months of age at risk of anemia? J Med Assoc Thai. 01 Aug;94 Suppl 3:S179-82

Lactose

- Predominate carbohydrate is lactose which is synthesised in the mammary gland from galactose and glucose
 - hydrolysed by lactase (a brush-border enzyme which is **zinc-dependent** and located predominantly in the tip of the intestinal villi)

Lactose

- Its presence in the gut promotes L-bifidus which produces organic acids and synthesises many of the B vitamins
- Promotes an acid milieu which checks the growth of enteropathogenic organisms and improves the absorption of calcium, phosphorus, magnesium and other metals

Lactose

- Correlations have been made between the amount of lactose in the milk of a species and the size of its' brain
 - human milk has the highest lactose content of all mammalian milks
 - the human brain's major differentiation is not complete until the 3rd year

Lactoperoxidase

- Destroys streptococci and enteric bacteria

Leucocytes

- Involved in the phagocytosis of:
 - bacteria
 - viruses
 - fungi

Lipids

- Lipids constitute 2-5% of human milk; prevalent in the "hindmilk"; mostly (90%) in the form of triglycerides (some phospholipids and sterols);
 - provide the largest source of calories
 - have diurnal variation
 - are more concentrated in the hind milk
 - are more concentrated when feeds are close together

Lipids

- Enhance mental acuity
 - longer chain polyunsaturates also present in brain and visual cells
 - affect the quality of the myelin laid down
- Slow down gut motility
- Promote satiety and good weight gain in the infant
- Profile reflects and is modified by maternal diet; fish and flaxseeds are important for LCPUFAs

Fatty acids

- Women who lactate for more than 1 year have higher C12 and C14 PUFA percentages in their milk than women who lactate for 2-6 months.
- Antipathogenic to enveloped viruses such as Giardia Lamblia.

• Lubetzky R et al; Human milk fatty acids profile changes during prolonged lactation: a cross-sectional study. *Int Med Assoc J.* 2012 Jan;14(1):7-10

Fatty acid conversion

- linoleic and linolenic convert to longer chain polyunsaturates
- these metabolites important for fluidity of membrane lipids and prostaglandin synthesis
 - prostaglandins affect: local circulation; gastric and mucous secretion; electrolyte balance; zinc absorption and the release of brush border enzymes which confer "cytoprotection" on the GIT against toxins

Long chain fatty acids

- The (n-3) LCPUFA specifically exert their positive immuno-modulatory activities at different levels, thereby contributing to immunological functional changes.
- The (n-3) LCPUFA metabolites
 - induce eicosanoid production,
 - alter gene expression,
 - and modify lipid raft composition, altering T-cell signalling

Gottbrand F; Long-chain polyunsaturated fatty acids influence the immune system of infants. J Nutr 2008 Sep;138(9):1807S-1812S

Low-molecular weight glycosides and oligosaccharides

- Inhibit heat-stable and heat-labile toxins from *E. coli*
- Prevent bacterial adhesion to epithelial cells by acting as receptor analogues

Low-molecular weight peptides

- Display antiviral activity by interfering with virus attachment on to target cells

Lymphocytes

- Human milk contains both T (thymus) and B (bursa) lymphocytes, which transfer long-lasting maternal antibodies to the infant
- Synthesise sIgA antibodies in the breast

Lysozyme

- Is found in large quantities in stool of breastfed babies
- It lyses bacteria through destruction of the cell wall; acts synergistically with peroxide and ascorbate to destroy *Escherichia coli* and some *Salmonella* strains
- So is thought, therefore, to affect the flora of the intestinal tract

Macrophages

- Synthesise complement, lactoferrin, lysozyme
- Perform a variety of other functions including phagocytosis of fungi and bacteria

Minerals

- Species specific; major cations: Na, K, Ca, Mg
- High lactose milks have less total sodium content than low lactose milks
- Renal solute load for breastfed infants, is therefore, approximately 1/3 that of formula fed infants

Minerals...calcium

- Ca is better absorbed when P levels are low and when it is not bound to casein
 - in human milk 60% of Ca is in the skim milk fraction and NOT bound to casein
 - 4% bound to Fe
 - the rest is found in the fat fraction
 - in human milk Ca/P is 1:1
 - in cow's milk it is 1:3

Minerals

- Major anions include phosphate, chloride and citrate
- Contains trace elements: zinc, copper, selenium, chromium, manganese, molybdenum and nickel; also fluorine and iodine (all dependent on diet and environmental exposure)
- Toxic metals As, Cd, Pb, Sb and V. Arsenic and B (Actinium) were positively correlated with fish consumption
- Japanese study showed that Hg levels in infants dropped 60% after 3 months breastfeeding

• Ljung Björklund E et al: Metals and trace element concentrations in breast milk of first time healthy mothers: a biological monitoring study. *Environ Health*. 2012 Dec 14;111(1):92.
 • Sakamoto M et al: Changes in body burden of mercury, lead, arsenic, cadmium and selenium in infants during early lactation in comparison with placental transfer. *Ecotoxicol Environ Saf*. 2012 Oct;84:179-84

Nucleotides

- Constitute 15-20% of the non-protein nitrogen in human milk;
 - thought to influence the immune system;
 - iron absorption;
 - intestinal flora;
 - plasma lipoproteins and growth of intestinal and hepatic cells.

Oligosaccharides

- A family of structurally diverse unconjugated glycans **that are highly abundant in and unique to human milk**; more than 80 identified.
- HMOs are anti-adhesive antimicrobials that serve as soluble decoy receptors, prevent pathogen attachment to infant mucosal surfaces and lower the risk for viral, bacterial and protozoan parasite infections.
- In addition, HMOs may modulate epithelial and immune cell responses, reduce excessive mucosal leucocyte infiltration and activation, lower the risk for necrotising enterocolitis and provide the infant with sialic acid as a potentially essential nutrient for brain development and cognition.

• Bock I: Human milk oligosaccharides: every baby needs a sugar mama. *Glycobiology*. 2012 Sep;22(9):1147-62

Polyamines

- Putrescine
- Spermidine
- Spermine
- Promote gut closure and therefore help protect against allergies

Stem Cells

- Dr Mark Gregan, a member of the UWA Hartmann Human Lactation Research Group, discovered in 2008, that human breastmilk contains stem cells.
- Another member of that team, Dr Foteini Hassiotou, has since determined that these cells, which are able to be garnered ethically, are pluripotent and can be turned into not only breast cells, but also into cells of bone, cartilage, fat, brain, liver and pancreas, depending on the medium in which they are grown.
- She presented her findings at the National finals at the 2011 AusBiotech Conference in Adelaide.

Vitamins

- All vitamins diet-dependent to some degree and perform a range of roles
- Amounts vary from individual to individual and are dependent on such factors as diet; seasonal variation; genetic differences and lifestyle
- Foetal or maternal supplementation is sometimes necessary for: K; D [400IU/daily]; B6 & B12

Zinc

- Zinc levels in breastmilk are approx thrice that of copper by the time the infant is two months old... [625 ug/L and 239 ug/L]. [At birth copper is twice the non-pregnant level.]
- Improving prenatal zinc nutrition protected against diarrheal morbidity in infant offspring through 12 months of age and reduced likelihood of prematurity by 14%.
- Zinc is the only mineral to drop off after 6 months lactation so mothers need to supplement and/or concentrate on their diet and that of their infants lest low weight gain becomes problematic.

• Oron E et al; Zinc and copper concentrations in breastmilk at the second month of lactation. *Indian Pediatr*. 2012 Feb;49(2):133-5.
 • Hess SY, King JC. Effects of maternal zinc supplementation on pregnancy and lactation outcomes. *Food Nutr Bull*. 2009 Mar;30(1 Suppl):560-78.
 • Yanotti LL et al; Maternal zinc supplementation reduces diarrheal morbidity in Peruvian infants. *J Pediatr*. 2010 Jun;156(6):960-4.
 • Seaver RG et al; Effect of Breastfeeding on Serum Zinc Levels and Growth in Healthy Infants. *Breastfeed Med*. 2012 Oct 5.

Brain growth

- Various studies have made a link between breastfeeding and enhanced cognitive ability; and it has been suggested that one or more constituents of breast milk may facilitate cognitive development, particularly in preemies.
- Because cognitive scores are related to head size, it was hypothesised that breast milk mediates cognitive effects by affecting brain growth....
- Recent data confirms this with respect to the development of white matter in the brain, especially in boys.

• Isaacs EB et al; Impact of breast milk on intelligence quotient, brain size, and white matter development. *Pediatr Res*. 2010 Apr;57(4):357-62

ADHD

- A study which used nutritional epidemiology linked to exclusive breastfeeding for both 6 months and 3 months, showed a highly significant inverse relationship of ADHD to exclusive breastfeeding.
- Breast milk contains components that appear to prevent ADHD.

• Shamberger R; Attention-deficit disorder associated with breast-feeding: a brief report. *J Am Coll Nutr*. 2012 Aug;31(4):239-42.
 • Mimouni-Bloch A et al; Breastfeeding May Protect from Developing Attention-Deficit/Hyperactivity Disorder. *Breastfeed Med*. 2013 Apr 6. [Epub ahead of print]

The Australian situation in children up to 19 years

- ASD 1%
- ADHD 6.8%
- ODD 10.2% (slightly more in boys)
- LD 10%
- Total of over 1 million children and young people, not taking into account those in dysfunctional families or those with mental illness

• <http://www.everydaywithadhd.com.au/TAQ/Interview.aspx?ID=41495>
 • <http://www.mymc.com/diseases/oppositional-defiant-disorder-odd/>

Lac Humanum...MIND (ADD):

- *Absent-minded*
- Prostration of mind; mental exhaustion; brain fag
- Confusion of mind
- Confusion; headache, during
- *Thoughts disconnected* cannot read
- Thoughts vanishing
- Thoughts; strangeness, of

Lac Humanum...MIND (ADD):

- **Concentration difficult**
- Concentration difficult; calculating, while
- Concentration difficult; driving, while
- Dullness; sluggishness; difficulty in thinking; afternoon
- Memory weak; read for; what has read
- **Mistakes**; calculations, in; reading; space and time, in; spellings
- Mistakes makes; time, in
- Work; mental aversion to

Lac Humanum...Mind (ADHD):

- Impatience; hurry
- Excitement; trifles, over
- *Gestures; wringing the hands*
- Impulses
 - to burn matchsticks
 - to harm loved ones, even though the very thought caused him to shudder
 - to throttle teacher; sudden
 - *to injure self*
 - morbid desire to run about
- Impulse to move about; hyperactive

Lac Humanum...Mind (ADHD):

- Activity; desire for
- Restlessness; nervousness
- Restless
 - evening
 - alone >
 - compelled to do something
 - sitting, while
- Busy
- Self-control, loss of

Lac Humanum Mind...(ODD):

- *Changeable moods*; anger alternating with quick repentance
- *Will; contradiction of*
- Dictatorial
- Capriciousness (*lac-cp; lac-del*)
- Laughing; serious matters, over
- Restlessness; nervousness
- Activity; desire for

Lac Humanum Mind...(ODD):

- *Cursing*
- *Irritability*; irritability; mother; to her
- *Malicious*
- Contradiction; intolerant, of
- Anger; contradiction, from
- Anger; will; if things do not go after his
- Anger interruption; *answers snappishly*
- Thoughts, violent
- Intolerant; Striking
- Dwells on past disagreeable occurrences
- Quarrelsomeness; scolding; family, with

Lac Humanum Mind...(Self Esteem)

- *Antagonism with self*
- **Detached; indifferent (to suffering; to everything)**
- *Sense of isolation*
- **Forsaken feeling**
- Forsaken; isolation; sense of
- Estranged; friends, from
- Forsaken feeling; beloved by parents; wife; friends, feels is not being
- **Delusion:** *friends; unwanted by*
- **Delusion:** *alone; always*
- **Delusion:** alone in the world
- **Delusion:** friendless; he is

Lac Humanum Mind...(Self Esteem)

- Anxiety; company, in
- Scrutiny; others, of < vs Scrutiny; self, of <
- Lamenting; futility of human relationships, about
- Sadness; melancholy
- Weary of Life; existence seems painful
- Despair; Life, of
- Death; thoughts of
- Death; desires

Lac Humanum Mind...(Self Esteem)

- **Delusion:** worthless; that he was
- *Lack of self-confidence*
- **Awkward**
- Anxiety
- **Dream:** accusations; crime; wrongful
- Apprehensive
- Nervous
- Impulsive... desire to harm self

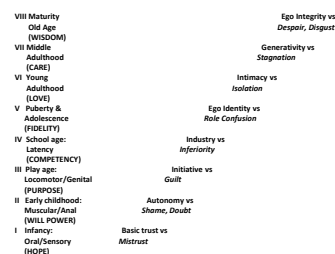
Lac Humanum Mind...(Self Esteem)

- *Irresolute*
- Embarrassment
- Indecisive
- Succeeds; never
- Fear; examination, before
- Indolence; aversion to work
- Indifference; everything, to
- Ennui
- Discontented
- Brooding
- Introspection

Lac Humanum Delusions

- Friends; he had done a lot for his, and got nothing in return
- *Friends; unwanted, by*
- Friendless; that he is
- *Alone always*
- Alone in the world
- *Neglected; she is*
- Self-centred; all others were
- Worthless; that he was
- Wrong; he has done

Eric Erikson's 8 Epigenetic Stages



Adapted from *Childhood and Society*, Erik H. Erikson, 1963, in *Personality Theories* (2nd edn), Haele LA and Ziegler DI, McGraw Hill Inc 1985

Lac Humanum...MIND:

- Egoism
- Empathic
- Benevolent
- Colleagues; in tune, with
- Isolation; feelings of; but not worried by them
 - “Alone, but not lonely!”
- Comfortable; people, with
- Positiveness

Lac Humanum...MIND:

- Confidence increased
- Confidence; self, in
- Assertive
- Dressing colourfully
- Untidiness <
- Untidiness; appearance of <
- Fastidious

Lac Humanum...MIND:

- **Impulse to tidy:**
 - clean car;
 - mow lawn;
 - do housework [**Delusion:** nesting; as if she is];
 - personal appearance, improve
- Impulse to effect closure; move on from the past
- Relaxed
- *Tranquillity*
- Patient

Lac Humanum...MIND:

- **Alert**
- Concentration >
- Concentration active
- Thoughts; rush of
- Increased ability to think
- Thoughts; clearness of
- Clarity of mind with increased ability for mental work (*iridium*)
- Work; desire for; mental
- Thoughts persistent; of improving at work, alternating with thoughts of leisure

Lac-h case

- Male D of B: 13/6/1974
- A 27 year old electrician (small in stature), presented in July 2001 with “on-going sniffles”.
- Previous **history of ++ upper respiratory tract infections**, which settled but have re-surfaced during the past 2 years. He says the symptoms can drag on for weeks at a time.
- He has suffered from “**reflux**” since 4 years old. He would constantly regurgitate small amounts of food into his mouth and then would swallow again. Consequently he began to “park” his food as he was afraid of swallowing and feared throwing up. He “lived on Mylanta”.
- He still gets lots of indigestion (< raw onions and milk); no particular food cravings but loves **dates**.

- On the maternal side of the family there’s a history of arthritis and **renal failure**. On the paternal side, there’s asthma and **renal failure**.
- He is a second child born after a 3-year gap. He was born with the umbilical cord around his neck and he needed resuscitation. **He was never breastfed**, and was described as being a very “colicky” baby.
- Grommets were inserted and tonsils removed at 8 years of age. History of bronchitis in childhood.
- “I was a brat as a kid...**full of energy**” He broke his R arm doing back-flips on a trampoline. He later broke his L arm on a slide. Now he snowboards and rides a motorbike.

- Says he had a happy home life but was **picked on a bit at school**. He couldn't settle into school work, so was labelled "ADHD". He particularly struggled with Maths.
- In his final year at school he did a pre-vocational course and was then apprenticed to an Electrician. He's still with his employer. However he's feeling stuck at work and hasn't been given any promotional opportunities. He feels it's because of his lack of qualifications so has enrolled at TAFE to do an Associate Diploma in Electrical Engineering.
- He says **he has poor concentration span and is easily distracted** so studies with headphones on to minimise distraction.

- [I observed during the interview that this man was **VERY RESTLESS +++**; could not sit still. He kept crossing and uncrossing his limbs, picking at his clothes, and he spoke very hurriedly.
- He has a hobby of **snowboarding**, and has been both to Canada & New Zealand in last few years. Canada was his first experience of **snow**. He returned home each time with a "sniffle" which took ages to clear.

- He says that during the past 18 months he's been very tired. He rises at 5.30, is at work by 7 and has to be in bed by 9 or else **"is stuffed the next day"**. Prior to this he'd had been "a rager".
- Previously not prone to headaches but he has had some over the past 3 years. (Had a hep B vaccination 5 years ago).
- He gets a "sudden sharp bout of pain at the back of the head" which lasts about 30 seconds.
- Two years ago he had a bout of conjunctivitis; remembers having this also when 10 years old.
- Says he has tinnitus "from too much loud noise at work"; says it changes from a dull buzz to a ring (high frequency). He gets dizzy if he blows his nose to make his ears pop.

- He has had **constant clear coryza** (past few months) and post-nasal drip which has a pussy texture and a sweet taste. He **expectorates** constantly (clear, sticky, stringy).
- He hates stuffy rooms so sleeps with door open. However, **if it's a cold night or there is a draft, he wakes with increased phlegm**.
- During the past 2 months he's has had **tongue ulcers**. The first one was on R edge towards the back of the tongue; the second was on the L edge more towards the front.

- Has spatulate shaped nails and suffers from night sweats. He says he has to change pyjamas several times a week due to this problem. He sleeps covered and on the L side in the **recovery position**.
- Says he's **THIRSTY** and prefers water (room temperature).
- Reports that he can get occasional **chest pain** when he breathes deeply.
- Bowels are daily after breakfast; too many dried fruits can give **"disgusting wind"** & **"diarrhoea"**.

- He fears drowning and has a lot of **water dreams**. As a kid he was held underwater by his **cousins** and, as a 30 year old he fell into the pool at his **aunt's** place and had to be resuscitated.
- Has had **lots of flying dreams** (even now would like a para-gliding licence); also lots of **falling dreams**.
- Last night dreamt he was on a **billy-cart, which careered down the road** onto a jetty and into the lake.

- Since taking up snow boarding he has had on-going **problems with his knees and has a clicky wrist**.
- Says that when he's been on his feet too long, he gets shooting pains up his heels and he can wake with **numb toes and fingers**.
- He requires a heavy tool belt at work and tries to wear it as little as possible as it **< his lower back**.

- He has no other fears apart from drowning. When asked if he had any fears/phobias, he replied not really and that he used to keep snakes as pets. Says he fears old age more than death.
- He says he doesn't get angry easily; prefers to "stuff it down".
- When asked what his greatest joy is he replied: **"my fiancée"**. He is to be married next year and is really looking forward to it. His first girlfriend really broke his heart and it took him a while to get over it.

28/7/2001 Rx: Lac-h LM 1; a dose each morning with 4 succussions between doses

- Never put to the breast → history of compromised gut and upper respiratory tract function
- Poor self esteem
- Issues with cousins
- Has twice needed resuscitation = MIND:
 - detached from ego (Houghton & Halahan)
 - dream, as if in a (H & H)
 - indifference (H & H)

- DREAMS: water (Sankaran)
- DREAMS: flying (S)
- DREAMS: falling...(H & H); (S)
- MIND: concentration difficult (H & H)
- MIND: concentration difficult, calculating while (H & H)
- MIND: memory weak, read, for what he has (H & H)
- MIND: mistakes calculations in (H & H)
- MIND: mistakes reading (H & H)
- MIND: thoughts, vanishing of (H & H)
- MIND: restless, compelled to do something (H & H)
- MIND: restless, sitting while (H & H)
- MIND: scrutiny, others from < (H & H)

- NOSE: discharge clear (H & H)
- NOSE: catarrh, postnasal (S)
- NOSE: sneezing < cold air; < draught
- MOUTH: pain; sore, tongue, spots (H & H)
- MOUTH: pain; sore, tongue, tip (H & H)
- MOUTH: vesicles (H & H)
- STOMACH: thirst increased (H & H)
- STOMACH: heartburn (H & H)
- STOMACH: eructations constant (H & H)
- STOMACH: desires dates (H & H)

- BACK: pain lumbar region (S)
- EXTREMITIES: lameness, knee, walking while (H & H)
- EXTREMITIES: stiffness, knee (H & H)
- EXTREMITIES: aching wrists (clinical observation; Timmermann)
- EXTREMITIES: numbness foot, sole of (H & H)
- EXTREMITIES: numbness, hand, fingers, night...(S)
- GENERALITIES: energy increased (H & H)
- GENERALITIES: weariness (S)

- At his first follow-up 1 month later and the first thing I observe is that he's **less restless** and **more inclined to engage with me by looking me in the eye while speaking**.
- He says his **indigestion is much improved**. (No Mylanta this month) The only incident he's had has been after some chilli which gave him "**heartburn**" [taste of ingesta (O/S)] and produced a bout of very **runny diarrhoea** next morning.
- The nose is less runny, but he still has post-nasal drip and the phlegm is still **< cold** but it's got "**thicker**".
- Once last week when he blew his nose dark, dry blood came out. He has had a history of occasional nosebleeds.

- He says **he's not so tired** and is waking with more energy, although still < he if stays up late.
- His current **dreams are of water but not personally threatening**. He had one of kids camping and swimming in a river where they were attacked by a **crocodile**.
- He had dream which featured **John Howard**, and another of **Kim Beazley** being shot.
- [John Howard was the then Australian Prime Minister. Kim Beazley was the then Leader of the Opposition...."important people!"]

- He's had one headache. However the pain has been dull; not sharp as usual.
- Still has tinnitus, but no dizziness.
- **Eyes have been painful** and very **watery**; "unfocused"
- Says he's had no more night sweats, but he's more chilly and has taken to wearing socks to bed ... (It's August [ie wintertime]).
- Still wants **++ water**; got a pain R side of chest once on deep breathing.
- Has been **more hungry** and **wanting tasty food**; pickles; sauces; Thai food.
- Mouth has been dry; **corners of lips have been cracked**.
- Hands have been very dry with cracking around the nails; elbows DRY > moisturiser

25/8/2001 Rx: Lac-h LM 2

- DREAMS: water (S)
- DREAMS: water, swimming (S)
- DREAMS: danger, death of (S)
- DREAMS: children (H & H)
- DREAMS: camping (H & H)
- DREAMS: amphibious creatures (H & H)
- DREAMS: animals, huge (S)
- DREAMS: animals, wild (S)
- DREAMS: important, famous people (new rubric from my clinical observation)

- EYES: pain as if from sand (H & H)
- EYES: lachrymation... (H & H)
- NOSE: discharge thick (S)
- STOMACH: thirst increased (H & H)
- STOMACH: appetite increased (H & H)
- GENERALITIES: food, spicy food (H & H)
- FACE: cracked, corners of mouth (H & H)

- One month later he reports that his **indigestion is negligible** but will < if he has hot spices. **He's wanting mornays, milky custards with sticky date pudding and having more cheese and yoghurt than usual**.
- **Post-nasal drip** symptoms still persist.
- He still needs 8 hours sleep and is good if he gets this much. There's been no scary dreams. He's still sleeping on L side in **recovery position** but is less chilly. He's wearing boxers and T shirt to bed but still wants the covers on.
- Last weekend he had some broken sleep and had to get up one night to move bowels.

- He feels he's getting "the run-around" at work, as promises of advancement and further training don't eventuate. So he's decided to look for another job but fears having to give his boss notice, and of going to be interviewed for another position.
- He's now moving his bowels both am and pm; had one bout of diarrhoea after pumpkin and leek soup.
- He says his knees and wrists are "not too bad"; < on waking but settle once he "warms up". He has woken a few times with numb hands after rolling onto his back and putting his arms above his head. During the interview he will often sit with his hands behind his head.
- He is getting lots of pimples on his back, chest and shoulders.

29/9/2001 Rx: Lac-h LM 3

- MIND: Egoism (S)
- MIND: Confidence increased (both provings)
- MIND: thoughts persistent work, of improving at... (S)
- MIND: thoughts; clearness of (S)
- MIND: scrutiny others < (H & H)
- GENERALITIES: food & drink milk desires (S)
- GENERALITIES: food & drink, rich food desires (S)
- STOMACH: desires sweets; desires dates (H & H)
- EXTREMITIES: numbness, hands, fingers, night (S)

- This gentleman did not keep his next monthly appointment. He phoned to report that his indigestion was completely settled. He was busy settling into his new job and organising his upcoming wedding.
- July 2002: I phoned to check progress. He reported that his sinus and digestion are still fine. He's happily married and has been offered a promotion at work with the promise that when he finishes his Associate Diploma his employer will put him through further studies.