Review Article

Dual Benefits, Compositions, Recommended Storage, and Intake Duration of Mother's Milk

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Abstract

Background: Breastfeeding benefits both infants and mothers. Mother's milk provides infants with immunity and protections from multiple diseases.
Objective: To comprehensively review the benefits and composition of mother's milk.
Methodology: 31,496 mother's milk-related abstracts (published until March 6th, 2019) from PubMed were analyzed using text mining and cited articles were studied through careful perusing.
Results: Our results suggest that mother's milk compositions (e.g. fatty acids) vary according to maternal diet and responses to infection in mothers and/or infants. Milk of malnourished mothers lacks certain important nutrients (e.g. DHA, vitamin B12). Since more mothers are expressing milk, we summarized the recommended storage and the effects on mother's milk compositions. Additionally, we examined the duration of mother's milk intake, concerns associated with mother's milk and the need and the possibility of relactation.
Conclusions: Healthy and unwell infants need mother's milk. Individualized mother's milk fortification and proper maternal supplementations may be needed to address the variability observed in mother's milk.

Keywords: breastfeeding; breastfeeding duration; exclusive breastfeeding; infant growth; lactation; maternal nutrition; milk composition; relactation

Introduction

Mother's milk help infants and preemies to develop immunity (Le Huërou-Luron et al., 2010) and long-term, dose-dependent protections from respiratory infections, gastrointestinal diseases, sudden infant death syndrome (SIDS), childhood cancers (leukemia and lymphoma) (Karimi et al., 2016), obesity, diabetes, multiple sclerosis (Conradi et al., 2013), behavior problems (Liu et al., 2013), and hand, foot and mouth disease (HFMD) (Supplementary).

In infants born to HIV-infected women, exclusive breastfeeding reduces diarrhea and respiratory infections (Mwiru et al., 2011). Breastfeeding duration also influences the protections against eczema, allergic rhinitis, rhino conjunctivitis, and asthma (Lodge et al., 2015; van Odijk et al., 2003). Even partial breastfeeding can reduce SIDS (Thompson et al., 2017). Mother's milk may reduce the risk of obesity and diabetes (Pereira et al., 2014); breastfeeding (for ≥3 months) may reduce overweight in children of gestationally-diabetic women (Schaefer-Graf et al., 2006). Mother's milk, especially its longer intake (Angelsen et al., 2001), promotes brain growth and cognition (Lucas et al., 1992);

For mothers, breastfeeding reduces their risks for breast cancer (Islami et al., 2015), endometrial cancer, ovarian cancer (Cramer, 2012), obesity-related diseases, postpartum depression and bone loss. Breastfeeding duration is inversely associated with risks for breast cancer (Lipworth et al., 2000). Breast cancer risks are lower for parous women (regardless of birth numbers) who have cumulatively breastfed for 12/> months (Anothaisintawee et al., 2013), as breastfeeding alters hormones, molecular histology and immunity (Islami et al., 2015) through undiscovered mechanisms. Breastfeeding lowers endometrial cancer risk through reduced estrogen (Okamura et al., 2006). Long-term breastfeeding protects against ovarian cancer (Jordan et al., 2010). Intense breastfeeding helps with managing pregnancy-gained weight and reducing risks for metabolic syndrome (Ram et al., 2008), hypertension (Schwarz et al., 2009), type 2 diabetes (Stuebe et al., 2005) and heart disease (Perrine et al., 2016). Lactating mothers secrete prolactin and oxytocin that help them to adapt to motherhood (Torner, 2016).

Despite these numerous benefits of breastfeeding, globally, less than half of the infants are exclusively breastfed for the initial six months. Studies suggest that knowledge on breastfeeding can improve this rate (Gupta et al., 2013; Valdés et al., 1993). This may be because mothers who understand the benefits of breastfeeding are more likely to exclusively breastfeed (Arage and Gedamu, 2016). Although there are many published articles reviewing the benefits of mother's milk, given the importance of educating mothers in promoting breastfeeding, it is important to update the information. This motivated us to review the literature on mother's milk by including results from text mining analysis of PubMed abstracts.

The results from text mining particularly suggest that ensuring maternal nutrition has a very important role in ensuring infant health during breastfeeding. We also reviewed literature on mother's milk storage, intake duration, associated concerns (Supplementary) and relactation (Supplementary).

Methodology

We retrieved PubMed abstracts related to mother's milk using several keywords and their combinations on March 6th, 2019 (Table 1). Using the results from the keyword search that returned the largest number of articles, i.e. 31,496 articles, we created a dataset and a word cloud (Figure 1), that suggested relationship between mother's milk compositions and the health of infants including preemies (see Results). A review of the literature was conducted by including the results from text mining.

Table 1: Number of Articles Retrieved using Different Keywords of Mother's Milk.

Keywords Used	Number of articles retrieved
"mother's milk"	1327
"human milk"	21.351
"breast milk"	12.275
"breastmilk"	1655
"breastfeed*"	4398
"breast milk" OR "breastmilk"	13.773
"mother's milk" OR "human milk" OR "breast milk" OR "breastmilk" OR "breastfeed*"	31.496

Figure 1:Text mining of mother's milk and breastfeeding literature. The word cloud shows the most frequent words in 31,496 abstracts retrieved from PubMed using the keywords "mother's milk" OR "human milk" OR "breast milk" OR "breastmilk" OR "breastfeed*".

Results

Several countries were frequently mentioned in article field, including Netherlands (1475 articles), Germany (1499), Switzerland (1273), and US (13,176). Authors were predominantly from US (19,329 authors). The article titles frequently referred the countries Australia (154 times), Bangladesh (87), Brazil (138), China (156), Ethiopia (96), India (160), Japan (127), Kenya (86), Niger (128), Nigeria (123), US (212) and the African continent (299).

The overall quality of mother's milk is highly conserved despite maternal diet (Ballard and Morrow, 2013); it nourishes and protects babies. However, the word cloud suggests that variability is observed in mother's milk composition of macronutrients and micronutrients which can affect infants (Azad et al., 2018; Grunewald et al., 2014; Saure et al., 2017) (Supplementary). For example, less interleukin-13 producing cells had been observed in mother's milk of infants with atopic dermatitis (Moradkhani et al., 2018); Low level of zinc (i) is observed in mother's milk of women with loss-of-function mutation in zinc transporters and (ii) causes transient neonatal zinc deficiency (TNZD) in exclusively breastfed infants (Golan et al., 2017). The risk of TNZD is at least 1 in 2334 infants (Golan et al., 2017); high mother's milk cytokine (TGFβ2) amounts were associated with high risks for eczema (Munblit et al., 2017).

Mother’s milk also lacks sufficient vitamin D (González and Visentin, 2016) and this increases infant’s risks for rickets, respiratory diseases, type 1 diabetes (Dawodu and Wagner, 2012), hypocalcemic seizures and dilated cardiomyopathy (Omotobara-Yabe et al., 2018). These studies suggest that early detection of nutrient deficiencies as well as proper supplementation of nutrients are necessary for breastfeeding women.

Timing of nutrient deficiency is important, also in case of the brain development of children (Nyaradi et al., 2013; Prado and Dewey, 2014). Some neurodevelopmental processes start during pregnancy and complete within the first few years of life and nutrient deficiencies in this time period can affect the process (Prado and Dewey, 2014). Mother's milk from women who do not consume food from animal sources may lack some important micronutrients in sufficient quantities such as vitamin B12 and DHA (Kuratko et al., 2013; Nyuar et al., 2010; Venkatramanan et al., 2016; Williams et al., 2016). The severity of nutritional deficiencies determines their negative effects on infants (Prado and Dewey, 2014). Sometimes, the effects may be irreversible when treated later (Lozoff et al., 2000, 2006; Prado and Dewey, 2014; Wise, 2016). Moreover, nutrients act synergistically causing deficiency of one nutrient to affect another (González and Visentin, 2016; Nyaradi et al., 2013). Recovery from the negative effects may only be possible, if the nutrients are available during the time the affected growth process is still occurring (Prado and Dewey, 2014). Therefore, improving maternal nutrition in malnourished pregnant and lactating women should be given increasing attention.

The variabilities observed in mother’s milk are particularly important in case of preemies since they have higher nutritional requirements and risks for diseases and growth retardation (Boquien, 2018). However, mother's milk is undeniably the best food for the preemies as it offers protection and ensures their proper development (Boquien, 2018). Therefore, individualized mother's milk fortification (de Halleux and Rigo, 2013) can be used to address this variability.

Next, we discuss (i) the mother's milk compositions and the variability in greater details, (ii) effects of storage on expressed mother's milk, (iii) recommended durations for breastfeeding and factors affecting the duration. See Supplementary for discussion on (i) concerns associated with mother’s milk and (ii) relactation.

Discussion

Mother's milk compositions and their variability

To meet infant developmental needs, mother's milk changes from colostrum, transitional milk, to mature milk (Supplementary) with distinct compositions. Mother's milk nutrients (proteins, fats, carbohydrates, vitamins) can promote infant health and survival (Ballard and Morrow, 2013) (Supplementary). Mature milk contains 60-75 kcal/100 ml and its fat, protein and carbohydrate contents are ~3-5%, 0.8-0.9% and 6.9-7.2%, respectively (Jenness, 1979). During early lactation, mother's milk contains more whey (protein that remains as liquid, e.g. lactoferrin, alpha-lactalbumin, immunoglobulins, lysozyme) than casein (protein that becomes curds in stomach and harder to digest) (Lönnerdal et al., 2017; Martin et al., 2016). Subsequently, their proportions equalize to facilitate nutrient absorption and immunity in infants (Lönnerdal et al., 2017). Mother's milk provides essential fatty acids (linoleic and alpha-linolenic acids) for infant growth and brain development (Lauritzen et al., 2016). Mother's milk fats (>98% triglycerides of palmitic and oleic acids) increase throughout a single nursing (Institute of Medicine (US) Committee on Nutritional Status During Pregnancy and Lactation, 1991). More than 98% of the fat is in the form of triglycerides (Pons et al., 2000). Main mother's milk carbohydrates include lactose, that induces innate immunity by triggering antimicrobial peptides production (Cederlund et al., 2013), and oligosaccharides, that shape microbiota and protect against Group B *Streptococcus* infection (Andreas et al., 2016).

Mother's milk completely provides carotenoids (Lipkie et al., 2015) for immunity and vision.

Although mother's milk has all essential fatty acids, its DHA level is variable and depends on maternal diet, particularly on fish products that are rich in preformed DHA (Nyuar et al., 2010). The rate of synthesis of DHA from alpha-linolenic acid, its precursor, is also inefficient for infants and the DHA level depends on maternal supply through mother's milk (Nyuar et al., 2010). DHA is essential for neurovisual development; its deficiency can negatively affect mental development and learning abilities (Nyuar et al., 2010). Maternal diets also influence vitamin composition in mother's milk, especially the composition of vitamins A, B1, B2, B3, B6, B12, C and D (Allen, 2012; Ares Segura et al., 2016; Dror and Allen, 2018; Kominiarek and Rajan, 2016; Neerven and Savelkoul, 2017; Nommsen et al., 1991; Valentine and Wagner, 2013). Deficiency of vitamin B6, vitamin B12, and thiamine causes growth stunting (Allen, 2012). Mother's milk minerals are important for infant growth, development and immunity (Klein et al., 2017). While mother's milk calcium, magnesium, iron, zinc, copper amounts are independent of maternal mineral status (Domellöf et al., 2004; Dorea, 2000; Li et al., 2016), selenium amount is dependent (Kumpulainen et al., 1985).

Since maternal nutrients affect mother's milk compositions, maternal supplementations are available. While folic acid intake is recommended in the first trimester to avoid fetal neural tube defects, it can alter gene expression epigenetically (McStay et al., 2017) and cause respiratory allergies in mice (Hollingsworth et al., 2008). Studies of the association between maternal folic acid intake beyond the first trimester and childhood allergic diseases remain inconclusive (McStay et al., 2017). While some studies reported their positive association (Dunstan et al., 2012; Håberg et al., 2011), maternal intake of folic acid might promote cow's milk allergy and childhood immunoglobulin E antibody-mediated allergic diseases (McStay et al., 2017; Tuokkola et al., 2016). In contrast, pregnancy supplementations of omega-3 polyunsaturated fatty acids (i.e. EPA and DHA) protect against childhood allergies (Munblit et al., 2015).

Mother's milk anti-inflammatory cytokines offer passive protection to infants from intestinal inflammation (Chatterton et al., 2013) whereas pro-inflammatory cytokines stimulate active immunity (Brenmoehl et al., 2018). TGFβ, the dominant mother's milk cytokine (Ballard and Morrow, 2013), promotes mucosal immunity by promoting immunoglobulin A production and may decrease allergic risk (Kalliomäki et al., 1999). Colostrum has the most leukocytes (Hassiotou et al., 2012), that significantly increase upon infection.

Expressed milk storage

More mothers are expressing milk while being away from their baby due to illness, premature delivery, or returning to work. Expressing milk also relieves engorgement. To prevent microbes' growth, expressed mother's milk (if not for immediate consumption) needs cooling/freezing. Storage temperature, freezing, thawing, light exposure, pasteurization and storage container affect mother's milk composition/quality (Supplementary) (Hamosh et al., 1996; Lawrence, 2007).

Creamatocrit and human milk analyzer (HMA) are for measuring mother's milk fat and caloric contents. The methods employ different parameters. To account for the effects of freezing on fat contents in mother's milk, Wang *et al*. used the following regression equations to calculate caloric contents in fresh and frozen mother's milk: for fresh mother's milk, energy (kcal/dl) = 5.99 x creamatocrit(%) + 32.5; for frozen mother's milk, energy (kcal/dl) = 6.20 x creamatocrit(%) + 35.1 (Wang et al., 1999). On the other hand, in HMA, protein, lactose and fat in mother's milk can be measured (O'Neill et al., 2013). In a study that used HMA (García-Lara et al., 2011), caloric contents in mother's milk was calculated using this equation: energy (kcal/dl) = 9.25 × fat + 4.40 × total nitrogen + 3.95 × lactose (García-Lara et al., 2011). While several studies suggest that creamatocrit correlated strongly with fat and energy content in mother's milk (Lemons et al., 1980; Lucas et al., 1978; Wang et al., 1999), Neill et al. reported that creamatocrit overestimates fat and energy content in mother's milk and HMA has increased accuracy (O'Neill et al., 2013). There are also inconsistencies in results from studies that used the different methods.

A study on frozen (–20°C) mother's milk samples for 28 days, that used the creamatocrit method, reported that caloric contents did not change much (Silprasert et al., 1987). However, in a study that used the HMA method, Garcia-Lara et al. observed that frozen (at less than –20°C) mother's milk contains less fat and calories than fresh mother's milk (García-Lara et al., 2011). They observed that fat and caloric contents decrease as duration (7, 15, 30, 60, and 90 days) of freezing increases. In their study, fresh mother's milk had 4.52-5.64 g/100 ml of fat and 0.72-0.82 kcal/ml of calories, whereas frozen mother's milk had only 3.84-5.14 g/100 ml of fat and 0.65-0.77 kcal/ml of calories after 90 days of freezing. Freezing for 7, 15, 30, 60, and 90 days, did not significantly change the nitrogen content in mother's milk, and the decrease of lactose in frozen mother's milk was only significant after 90 days of freezing.

Mother's milk fat and protein content are reduced by pasteurization (Vieira et al., 2011). Fat content is significantly reduced while delivery using continuous infusion feeding, due to the adherence of fat to the delivery system (Vieira et al., 2011). Protein denaturation occurs during freezing and thawing (Chang et al., 2012). Freezing mother's milk can change and destabilize casein micelles and change the quaternary structure of whey proteins, resulting in the formation of precipitates (García-Lara et al., 2011). However, storage temperatures have not shown to influence the protein concentration in mother's milk (Chang et al., 2012). Reduction in fat and protein concentration is a serious concern as it can affect the growth rate of preterm infants (Jarjour et al., 2015).

Milk fat globule membranes (MFGMs) in mother's milk are broken by freeze, thawing procedures (García-Lara et al., 2011; Ogundele, 2002). The triglycerides released with rupturing of MFGMs can come in contact with the lipase enzymes in mother's milk (Ogundele, 2002), which are observed to be active at freezing temperature (–20°C), and room temperatures (5°C, 25°C and 38°C) (García-Lara et al., 2011; Hamosh et al., 1996; Ogundele, 2002). The lipase catalyzes the hydrolysis of triglycerides (also known as lipolysis) into diglycerides, monoglycerides, and free fatty acids (Bitman et al., 1983). Triglycerides are esters derived from glycerol and three fatty acids. In a diglyceride, its glycerol is ester-linked to two fatty acids, whereas in a monoglyceride, its glycerol is ester-linked to only a fatty acid. The fatty acids produced by this hydrolysis have antimicrobial activity (Hernell et al., 1986; Isaacs and Thormar, 1991; Thormar et al., 1994). On the other hand, rupturing of MFGM may reduce the bactericidal properties of mother's milk as MFGMs have bacterial sequestration abilities (Ogundele, 2002). However, at –20°C, a significant reduction in bactericidal activity of mother's milk is not observed after one month (Ogundele, 2002). Freezing at –70°C should be optimal as fat hydrolysis does not occur at this temperature (Berkow et al., 1984).

Another matter of concern is lipid peroxidation. Lipid peroxidation is the process in which free radicals (most commonly reactive oxygen species) remove electrons from lipids producing reactive intermediates (Lipid Peroxidation | IntechOpen, n.d.). Turoli et al. observed lipid peroxidation in fresh and frozen mother's milk (–20°C), and formula milk (Turoli et al., 2004). They observed highest lipid peroxidation in frozen mother's milk. This finding may be related to the higher contents of free fatty acids in frozen mother's milk due to hydrolysis activity of lipase. Lipid peroxidation is also observed in mother's milk at 4°C (Miranda et al., 2004) and –80°C (Silvestre et al., 2010). However, lipid peroxidation is minimal in frozen mother's milk (–20°C and –80°C) compared to that stored in refrigerator (4°C) (Miranda et al., 2004; Silvestre et al., 2010). To minimize lipid peroxidation, freezing temperature of –80°C is preferable over –20°C (Silvestre et al., 2010). Presence of lipid peroxidation products in infant feeds may play roles in development of diseases including necrotizing enterocolitis and bronchopulmonary dysplasia (van Zoeren-Grobben et al., 1993). Studies to determine the effect of consuming lipid peroxides in infants including preemies are needed.

The antioxidant activity of mother's milk, which could protect against the effects of lipid peroxidation, also decreases with storage at refrigeration (4°C) and freezing temperatures (–8°C, –20°C, –80°C) (Hanna et al., 2004; Silvestre et al., 2010; Xavier et al., 2011). The complete list of antioxidant components in mother's milk and their contribution to this variation are unknown. However, the carotenoid (major antioxidants in mother's milk) contents in frozen mother's milk were reported to be stable at -18°C for 28 days (Tacken et al., 2009). Storage at –80°C for a period of less than 30 days is recommended to maximally preserve antioxidant activity (Silvestre et al., 2010).

Freezing (–20°C/–70°C) and heat treatment have little effects on concentration of vitamins A, D and E in mother's milk (Hanna et al., 2004; Moffatt et al., 1987; Van Zoeren-Grobben et al., 1987). On the other hand, storage for more than one month in a freezer (–16°C) or 24 hours in a refrigerator (4°C-6°C) may substantially reduce vitamin C concentration (Buss et al., 2001). Holder pasteurization may affect the vitamin B6 concentration in mother's milk (Van Zoeren-Grobben et al., 1987).

Many protective immunologic components of frozen mother's milk kept at –20°C remain stable for a duration of up to 365 days while lactoferrin and live cells amounts are affected by storage container, freezing and/or thawing (Lawrence, 2001). Mother's milk lactoferrin significantly decreases after 3 months of freezing (–20°C) (Raoof et al., 2016). Cycles of freezing and thawing can rupture cells in mother's milk (Chantry et al., 2006) and longer storage time reduces the cell function (Lawrence, 2001). Frozen mother's milk kept at –20°C has lower number of cells and functions of surviving cells than fresh mother's milk does (Lawrence, 2001). Cells in mother's milk can also adhere to the surface of the storage container particularly Pyrex glass container (Lawrence, 2007).

Duration of mother's milk intake

In an Australian study, only 45.9% of babies received any mother's milk at age 6 months; 19.2% at age 12 months (Scott et al., 2006). Maternal attitudes are among factors lengthening the duration of mother's milk intake (Casal et al., 2017; Mehta et al., 2017; Scott et al., 2006). Opposing factors include early breastfeeding difficulties (Scott et al., 2006), inadequate mother's milk (Kimani-Murage et al., 2011), lack of family support (Lauwers and Swisher, 2005), early introduction of pacifier (Scott et al., 2006), smoking (Scott et al., 2006), social stigma (Kendall-Tackett and Sugarman, 1995) and short maternity leave (Scott et al., 2006). Since duration and exclusivity of mother's milk intake are influencing health benefits (Supplementary), lactation counseling can promote breastfeeding exclusivity and its total duration (Morrow et al., 1999). A USA study comparing exclusive mother's milk intake for 6 months/more versus 4-<6 months, found that the former has lower respiratory tract infections (Chantry et al., 2006). Breastfeeding beyond 6 months can better protect against respiratory and gastrointestinal tract infections (Tromp et al., 2017).

Besides studies supporting World Health Organization (WHO)'s recommendations of *exclusive* breastfeeding for the first six months (Dewey, 2001; Lessen and Kavanagh, 2015) and continued breastfeeding up to 2 years/beyond along with complementary foods, some studies suggested that exclusive breastfeeding may be insufficient for 6-month-old infants (Fewtrell et al., 2007; Reilly et al., 2005). However, early introduction of complementary foods may negatively affect infants (Cohen et al., 1994; Gupta et al., 2017). Prolonged breastfeeding after 6 months along with complementary foods is beneficial for mother-child bonding (Weaver et al., 2018), healthy dietary patterns at age 6 (Perrine et al., 2014), and decreasing asthma risk (Lodge et al., 2015).

After infants turn 6 months old, complementary foods are essential, because zinc, calcium, vitamin B6 and vitamin C levels in mother's milk subsequently decrease (Garza et al., 1983; Karra et al., 1986), whereas mother's milk continues providing vitamin A (first 3 years) (Onyango et al., 2002; Persson et al., 1998) and fat (first 2 years) (Mandel et al., 2005; Onyango et al., 2002). In the second lactating year, mother's milk provides significantly more protein, lactoferrin, immunoglobulin A and lysozyme (Perrin et al., 2017).

Conclusion

Mother's milk protects against various diseases in infancy, childhood and later life, by promoting proper and long-term immunity. More future studies are needed to understand the molecular mechanisms of how mother's milk influences maternal hormonal levels and renders immunity to infants. A strategy that builds on our current work, will be exhaustively mining the literature on mother's milk and hormones including estrogen, prolactin, and oxytocin. Infants, including infected ones, require mother's milk. Knowledge of mother's milk compositions, storage and intake duration can help mothers to make better efforts in breastfeeding and lactation.

Supplementary information

Supplementary materials are available from https://tinyurl.com/mothersmilksupplementary.

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References

Allen LH (2012) B vitamins in breast milk: relative importance of maternal status and intake, and effects on infant status and function.*Advances in nutrition* 3(3): 362–369.

Andreas NJ, Al-Khalidi A, Jaiteh M, Clarke E, Hyde MJ, Modi N, Holmes E, Kampmann B, Mehring Le Doare K (2016) Role of human milk oligosaccharides in Group B Streptococcus colonisation. *Clinical & translational immunology* 5(8): e99.

Angelsen NK, Vik T, Jacobsen G, Bakketeig LS (2001) Breast feeding and cognitive development at age 1 and 5 years. *Archives of disease in childhood* 85(3): 183–188.

Anothaisintawee T, Wiratkapun C, Lerdsitthichai P, Kasamesup V, Wongwaisayawan S, Srinakarin J, Hirunpat S, Woodtichartpreecha P, Boonlikit S, Teerawattananon Y, Thakkinstian A (2013) Risk factors of breast cancer: a systematic review and meta-analysis. *Asia-Pacific journal of public health / Asia-Pacific Academic Consortium for Public Health* 25(5): 368–387.

Arage G and Gedamu H (2016) Exclusive Breastfeeding Practice and Its Associated Factors among Mothers of Infants Less Than Six Months of Age in Debre Tabor Town, Northwest Ethiopia: A Cross-Sectional Study. *Advances in Public Health* 2016.Hindawi.DOI: 10.1155/2016/3426249.

Ares Segura S, Arena Ansótegui J, Díaz-Gómez NM, en representación del Comité de Lactancia Materna de la Asociación Española de Pediatría (2016) The importance of maternal nutrition during breastfeeding: Do breastfeeding mothers need nutritional supplements?. *Anales de pediatria* 84(6): 347.e1–7.

Azad MB, Vehling L, Chan D, Klopp A, Nickel NC, McGavock JM, Becker AB, Mandhane PJ, Turvey SE, Moraes TJ, Taylor MS, Lefebvre DL, Sears MR, Subbarao P, CHILD Study Investigators (2018) Infant Feeding and Weight Gain: Separating Breast Milk From Breastfeeding and Formula From Food. *Pediatrics* 142(4). DOI: 10.1542/peds.2018-1092.

Ballard O and Morrow AL (2013) Human milk composition: nutrients and bioactive factors. *Pediatric clinics of North America* 60(1): 49–74.

Berkow SE, Freed LM, Hamosh M, Bitman J, Wood DL, Happ B, Hamosh P (1984) Lipases and lipids in human milk: effect of freeze-thawing and storage. *Pediatric research* 18(12): 1257–1262.

Bitman J, Wood DL, Mehta NR, Hamosh P, Hamosh M (1983) Lipolysis of triglycerides of human milk during storage at low temperatures: a note of caution. *Journal of pediatric gastroenterology and nutrition* 2(3): 521–524.

Boquien C-Y (2018) Human Milk: An Ideal Food for Nutrition of Preterm Newborn. *Frontiers in pediatrics* 6: 295.

Brenmoehl J, Ohde D, Wirthgen E, Hoeflich A (2018) Cytokines in milk and the role of TGF-beta. *Best practice & research. Clinical endocrinology & metabolism* 32(1): 47–56.

Buss IH, McGill F, Darlow BA, Winterbourn CC (2001) Vitamin C is reduced in human milk after storage. *Actapaediatrica* 90(7): 813–815.

Casal CS, Lei A, Young SL, Tuthill EL (2017) A Critical Review of Instruments Measuring Breastfeeding Attitudes, Knowledge, and Social Support.*Journal of human lactation: official journal of International Lactation Consultant Association* 33(1): 21–47.

Cederlund A, Kai-Larsen Y, Printz G, Yoshio H, Alvelius G, Lagercrantz H, Strömberg R, Jörnvall H, Gudmundsson GH, Agerberth B (2013) Lactose in human breast milk an inducer of innate immunity with implications for a role in intestinal homeostasis. *PloS one* 8(1): e53876.

Chang Y-C, Chen C-H, Lin M-C (2012) The macronutrients in human milk change after storage in various containers. *Pediatrics and neonatology* 53(3): 205–209.

Chantry CJ, Howard CR, Auinger P (2006) Full breastfeeding duration and associated decrease in respiratory tract infection in US children.*Pediatrics* 117(2): 425–432.

Chatterton DEW, Nguyen DN, Bering SB, Sangild PT (2013) Anti-inflammatory mechanisms of bioactive milk proteins in the intestine of newborns.*The international journal of biochemistry & cell biology* 45(8): 1730–1747.

Cohen RJ, Brown KH, Canahuati J, Rivera LL, Dewey KG (1994) Effects of age of introduction of complementary foods on infant breast milk intake, total energy intake, and growth: a randomised intervention study in Honduras. *The Lancet* 344(8918): 288–293.

Conradi S, Malzahn U, Paul F, Quill S, Harms L, Then Bergh F, Ditzenbach A, Georgi T, Heuschmann P, Rosche B (2013) Breastfeeding is associated with lower risk for multiple sclerosis. *Multiple sclerosis* 19(5): 553–558.

Cramer DW (2012) The epidemiology of endometrial and ovarian cancer. *Hematology/oncology clinics of North America* 26(1): 1–12.

Dawodu A and Wagner CL (2012) Prevention of vitamin D deficiency in mothers and infants worldwide - a paradigm shift.*Paediatrics and international child health* 32(1): 3–13.

deHalleux V and Rigo J (2013) Variability in human milk composition: benefit of individualized fortification in very-low-birth-weight infants. *The American journal of clinical nutrition* 98(2): 529S–35S.

Dewey KG (2001) Nutrition, growth, and complementary feeding of the breastfed infant.*Pediatric clinics of North America* 48(1): 87–104.

Domellöf M, Lönnerdal B, Dewey KG, Cohen RJ, Hernell O (2004) Iron, zinc, and copper concentrations in breast milk are independent of maternal mineral status. *The American journal of clinical nutrition* 79(1): 111–115.

Dorea JG (2000) Iron and copper in human milk. *Nutrition* 16(3): 209–220.

Dror DK and Allen LH (2018) Overview of Nutrients in Human Milk.*Advances in nutrition* 9(suppl_1): 278S–294S.

Dunstan JA, West C, McCarthy S, Metcalfe J, Meldrum S, Oddy WH, Tulic MK, D'Vaz N, Prescott SL (2012) The relationship between maternal folate status in pregnancy, cord blood folate levels, and allergic outcomes in early childhood. *Allergy* 67(1): 50–57.

Fewtrell MS, Morgan JB, Duggan C, Gunnlaugsson G, Hibberd PL, Lucas A, Kleinman RE (2007) Optimal duration of exclusive breastfeeding: what is the evidence to support current recommendations? *The American journal of clinical nutrition* 85(2): 635S–638S.

García-Lara NR, Escuder-Vieco D, García-Algar O, De la Cruz J, Lora D, Pallás-Alonso C (2011) Effect of Freezing Time on Macronutrients and Energy Content of Breastmilk.*Breastfeeding medicine: the official journal of the Academy of Breastfeeding Medicine* 7(4). Mary Ann Liebert, Inc., publishers: 295–301.

Garza C, Johnson CA, Smith EO, Nichols BL (1983) Changes in the nutrient composition of human milk during gradual weaning.*The American journal of clinical nutrition* 37(1): 61–65.

Golan Y, Kambe T and Assaraf YG (2017) The role of the zinc transporter SLC30A2/ZnT2 in transient neonatal zinc deficiency. *Metallomics: integrated biometal science* 9(10): 1352–1366.

González HF and Visentin S (2016) Micronutrients and neurodevelopment: An update. *Archivosargentinos de pediatria* 114(6): 570–575.

Grunewald M, Hellmuth C, Demmelmair H, Koletzko B (2014) Excessive weight gain during full breast-feeding. *Annals of nutrition & metabolism* 64(3-4): 271–275.

Gupta A, Dadhich JP and Suri S (2013) How Can Global Rates of Exclusive Breastfeeding for the First 6 Months Be Enhanced?*ICAN: Infant, Child, & Adolescent Nutrition* 5(3). SAGE Publications: 133–140.

Gupta S, Agarwal R, Aggarwal KC, Chellani H, Duggal A, Arya S, Bhatia S, Sankar MJ, Sreenivas V, Jain V, Gupta AK, Deorari AK, Paul VK, Investigators of the CF trial (2017) Complementary feeding at 4 versus 6 months of age for preterm infants born at less than 34 weeks of gestation: a randomised, open-label, multicentre trial. *The Lancet. Global health* 5(5): e501–e511.

Håberg SE, London SJ, Nafstad P, Nilsen RM, Ueland PM, Vollset SE, Nystad W (2011) Maternal folate levels in pregnancy and asthma in children at age 3 years. *The Journal of allergy and clinical immunology* 127(1): 262–4, 264.e1.

Hamosh M, Ellis LA, Pollock DR, Henderson TR, Hamosh P (1996) Breastfeeding and the working mother: effect of time and temperature of short-term storage on proteolysis, lipolysis, and bacterial growth in milk. *Pediatrics* 97(4): 492–498.

Hanna N, Ahmed K, Anwar M, Petrova A, Hiatt M, Hegyi T (2004) Effect of storage on breast milk antioxidant activity. *Archives of disease in childhood.Fetal and neonatal edition* 89(6): F518–20.

Hassiotou F, Beltran A, Chetwynd E, Stuebe AM, Twigger A-J, Metzger P, Trengove N, Lai CT, Filgueira L, Blancafort P, Hartmann PE (2012) Breastmilk is a novel source of stem cells with multilineage differentiation potential. *Stem cells* 30(10): 2164–2174.

Hernell O, Ward H, Bläckberg L, Pereira ME (1986) Killing of Giardia lamblia by human milk lipases: an effect mediated by lipolysis of milk lipids. *The Journal of infectious diseases* 153(4): 715–720.

Hollingsworth JW, Maruoka S, Boon K, Garantziotis S, Li Z, Tomfohr J, Bailey N, Potts EN, Whitehead G, Brass DM, Schwartz DA (2008) In utero supplementation with methyl donors enhances allergic airway disease in mice. *The Journal of clinical investigation* 118(10): 3462–3469.

Institute of Medicine (US) Committee on Nutritional Status During Pregnancy and Lactation (1991) *Milk Composition*. National Academies Press (US).

Isaacs CE and Thormar H (1991) The Role of Milk-Derived Antimicrobial Lipids as Antiviral and Antibacterial Agents. In: Mestecky J, Blair C, and Ogra PL (eds) *Immunology of Milk and the Neonate*. Boston, MA: Springer US, pp. 159–165.

Islami F, Liu Y, Jemal A, Zhou J, Weiderpass E, Colditz G, Boffetta P, Weiss M (2015) Breastfeeding and breast cancer risk by receptor status--a systematic review and meta-analysis. *Annals of oncology: official journal of the European Society for Medical Oncology / ESMO* 26(12): 2398–2407.

Jarjour J, Juarez AM, Kocak DK, Liu NJ, Tabata MM, Hawthorne KM, Ramos RF, Abrams SA (2015) A Novel Approach to Improving Fat Delivery in Neonatal Enteral Feeding. *Nutrients* 7(6): 5051–5064.

Jenness R (1979) The composition of human milk. *Seminars in perinatology* 3(3): 225–239.

Jordan SJ, Siskind V, C Green A, Whiteman DC, Webb PM (2010) Breastfeeding and risk of epithelial ovarian cancer. *Cancer causes & control: CCC* 21(1): 109–116.

Kalliomäki M, Ouwehand A, Arvilommi H, Kero P, Isolauri E (1999) Transforming growth factor-beta in breast milk: a potential regulator of atopic disease at an early age. *The Journal of allergy and clinical immunology* 104(6): 1251–1257.

Karimi M, Haghighat M, Dialameh Z, Tahmasbi L, Parand S, Bardestani M (2016) Breastfeeding as a Protective Effect Against Childhood Leukemia and Lymphoma. *Iranian Red Crescent medical journal* 18(9): e29771.

Karra MV, Udipi SA, Kirksey A, Roepke JL (1986) Changes in specific nutrients in breast milk during extended lactation. *The American journal of clinical nutrition* 43(4): 495–503.

Kendall-Tackett KA and Sugarman M (1995) The social consequences of long-term breastfeeding. *Journal of human lactation: official journal of International Lactation Consultant Association* 11(3): 179–183.

Kimani-Murage EW, Madise NJ, Fotso J-C, Kyobutungi C, Mutua MK, Gitau TM, Yatich N (2011) Patterns and determinants of breastfeeding and complementary feeding practices in urban informal settlements, Nairobi Kenya. *BMC public health* 11: 396.

Klein LD, Breakey AA, Scelza B, Valeggia C, Jasienska G, Hinde K (2017) Concentrations of trace elements in human milk: Comparisons among women in Argentina, Namibia, Poland, and the United States. *PloS one* 12(8): e0183367.

Kominiarek MA and Rajan P (2016) Nutrition Recommendations in Pregnancy and Lactation.*The Medical clinics of North America* 100(6): 1199–1215.

Kumpulainen J, Salmenperä L, Siimes MA, Koivistoinen P, Perheentupa J (1985) Selenium status of exclusively breast-fed infants as influenced by maternal organic or inorganic selenium supplementation. *The American journal of clinical nutrition* 42(5): 829–835.

Kuratko CN, Barrett EC, Nelson EB, Salem N Jr (2013) The relationship of docosahexaenoic acid (DHA) with learning and behavior in healthy children: a review. *Nutrients* 5(7): 2777–2810.

Lauritzen L, Brambilla P, Mazzocchi A, Harsløf LBS, Ciappolino V, Agostoni C (2016) DHA Effects in Brain Development and Function. *Nutrients* 8(1). DOI: 10.3390/nu8010006.

Lauwers J and Swisher A (2005) *Counseling the Nursing Mother: A Lactation Consultant's Guide*.Jones & Bartlett Learning.

Lawrence RA (2001) Milk banking: the influence of storage procedures and subsequent processing on immunologic components of human milk. *Advances in nutritional research* 10: 389–404.

Lawrence RA (2007) Storage of human milk and the influence of procedures on immunological components of human milk.*Actapaediatrica* 88: 14–18.

Le Huërou-Luron I, Blat S and Boudry G (2010) Breast- v. formula-feeding: impacts on the digestive tract and immediate and long-term health effects. *Nutrition research reviews* 23(1): 23–36.

Lemons JA, Schreiner RL and Gresham EL (1980) Simple method for determining the caloric and fat content of human milk.*Pediatrics* 66(4): 626–628.

Lessen R and Kavanagh K (2015) Position of the academy of nutrition and dietetics: promoting and supporting breastfeeding. *Journal of the Academy of Nutrition and Dietetics* 115(3): 444–449.

Li C, Solomons NW, Scott ME, Koski KG (2016) Minerals and Trace Elements in Human Breast Milk Are Associated with Guatemalan Infant Anthropometric Outcomes within the First 6 Months. *The Journal of nutrition* 146(10): 2067–2074.

Lipid Peroxidation | IntechOpen (n.d.). DOI: 10.5772/2929.

Lipkie TE, Morrow AL, Jouni ZE, McMahon RJ, Ferruzzi MG (2015) Longitudinal Survey of Carotenoids in Human Milk from Urban Cohorts in China, Mexico, and the USA. *PloS one* 10(6): e0127729.

Lipworth L, Bailey LR and Trichopoulos D (2000) History of breast-feeding in relation to breast cancer risk: a review of the epidemiologic literature. *Journal of the National Cancer Institute* 92(4): 302–312.

Liu J, Leung P and Yang A (2013) Breastfeeding and active bonding protects against children's internalizing behavior problems. *Nutrients* 6(1): 76–89.

Lodge CJ, Tan DJ, Lau MXZ, Dai X, Tham R, Lowe AJ, Bowatte G, Allen KJ, Dharmage SC (2015) Breastfeeding and asthma and allergies: a systematic review and meta-analysis. *Actapaediatrica* 104(467): 38–53.

Lönnerdal B, Erdmann P, Thakkar SK, Sauser J, Destaillats F (2017) Longitudinal evolution of true protein, amino acids and bioactive proteins in breast milk: a developmental perspective. *The Journal of nutritional biochemistry* 41: 1–11.

Lozoff B, Jimenez E, Hagen J, Mollen E, Wolf AW (2000) Poorer behavioral and developmental outcome more than 10 years after treatment for iron deficiency in infancy. *Pediatrics* 105(4): E51.

Lozoff B, Beard J, Connor J, Barbara F, Georgieff M, Schallert T (2006) Long-lasting neural and behavioral effects of iron deficiency in infancy.*Nutrition reviews* 64(5 Pt 2): S34–43; discussion S72–91.

Lucas A, Gibbs JA, Lyster RL, Baum JD (1978) Creamatocrit: simple clinical technique for estimating fat concentration and energy value of human milk. *British medical journal* 1(6119): 1018–1020.

Lucas A, Morley R, Cole TJ, Lister G, Leeson-Payne C (1992) Breast milk and subsequent intelligence quotient in children born preterm. *The Lancet* 339(8788). Elsevier: 261–264.

Mandel D, Lubetzky R, Dollberg S, Barak S, Mimouni FB (2005) Fat and energy contents of expressed human breast milk in prolonged lactation. *Pediatrics* 116(3): e432–5.

Martin CR, Ling P-R and Blackburn GL (2016) Review of Infant Feeding: Key Features of Breast Milk and Infant Formula. *Nutrients* 8(5). DOI: 10.3390/nu8050279.

McStay CL, Prescott SL, Bower C, Palmer DJ (2017) Maternal Folic Acid Supplementation during Pregnancy and Childhood Allergic Disease Outcomes: A Question of Timing? *Nutrients* 9(2). DOI: 10.3390/nu9020123.

Mehta AR, Panneer S, Ghosh-Jerath S, Racine EF (2017) Factors Associated With Extended Breastfeeding in India. *Journal of human lactation: official journal of International Lactation Consultant Association* 33(1): 140–148.

Miranda M, Muriach M, Almansa I, Jareño E, Bosch-Morell F, Romero FJ, Silvestre D (2004) Oxidative status of human milk and its variations during cold storage. *BioFactors* 20(3): 129–137.

Moffatt PA, Lammi-Keefe CJ, Ferris AM, Jensen RG (1987) Alpha and gamma tocopherols in pooled mature human milk after storage. *Journal of pediatric gastroenterology and nutrition* 6(2): 225–227.

Moradkhani S, Jafarzadeh A, Bazargan-Harandi N, Baneshi MR, Mohammadi MM (2018) Association of reduced count of interleukin-13-producing cells in breast milk with atopic dermatitis in infancy. *The Indian journal of medical research* 148(3): 317–322.

Morrow AL, Guerrero ML, Shults J, Calva JJ, Lutter C, Bravo J, Ruiz-Palacios G, Morrow RC, Butterfoss FD (1999) Efficacy of home-based peer counselling to promote exclusive breastfeeding: a randomised controlled trial. *The Lancet* 353(9160): 1226–1231.

Munblit D, Boyle RJ and Warner JO (2015) Factors affecting breast milk composition and potential consequences for development of the allergic phenotype. *Clinical and experimental allergy: journal of the British Society for Allergy and Clinical Immunology* 45(3): 583–601.

Munblit D, Treneva M, Peroni DG, Colicino S, Chow LY, Dissanayeke S, Pampura A, Boner AL, Geddes DT, Boyle RJ, Warner JO (2017) Immune Components in Human Milk Are Associated with Early Infant Immunological Health Outcomes: A Prospective Three-Country Analysis. *Nutrients* 9(6). DOI: 10.3390/nu9060532.

Mwiru RS, Spiegelman D, Duggan C, Peterson K, Liu E, Msamanga G, Aboud S, Fawzi W W (2011) Relationship of exclusive breast-feeding to infections and growth of Tanzanian children born to HIV-infected women. *Public health nutrition* 14(7): 1251–1258.

Neerven RJJ van and Savelkoul H (2017) Nutrition and Allergic Diseases.*Nutrients* 9(7). DOI: 10.3390/nu9070762.

Nommsen LA, Lovelady CA, Heinig MJ, Lönnerdal B, Dewey KG (1991) Determinants of energy, protein, lipid, and lactose concentrations in human milk during the first 12 mo of lactation: the DARLING Study. *The American journal of clinical nutrition* 53(2): 457–465.

Nyaradi A, Li J, Hickling S, Foster J, Oddy WH (2013) The role of nutrition in children's neurocognitive development, from pregnancy through childhood. *Frontiers in human neuroscience* 7: 97.

Nyuar KB, Min Y, Ghebremeskel K, Khalil AKH, Elbashir MI, Cawford MA (2010) Milk of northern

Sudanese mothers whose traditional diet is high in carbohydrate contains low docosahexaenoic acid. *Actapaediatrica* 99(12): 1824–1827.

Ogundele MO (2002) Effects of storage on the physicochemical and antibacterial properties of human milk.*British journal of biomedical science* 59(4): 205–211.

Okamura C, Tsubono Y, Ito K, Niikura H, Takano T, Nagase S, Yoshinaga K, Terada Y, Murakami T, Sato S, Aoki D, Jobo T, Okamura K, Yaegashi N (2006) Lactation and risk of endometrial cancer in Japan: a case-control study. *The Tohoku journal of experimental medicine* 208(2): 109–115.

Omotobara-Yabe T, Kuga S, Takeguchi M, Ihara K (2018) Vitamin D deficiency associated with dilated cardiomyopathy in early infancy caused by maternal cholestasis. *Clinical pediatricendocrinology : case reports and clinical investigations : official journal of the Japanese Society for Pediatric Endocrinology* 27(3): 187–192.

O'Neill EF, Radmacher PG, Sparks B, Adamkin DH (2013) Creamatocrit analysis of human milk overestimates fat and energy content when compared to a human milk analyzer using mid-infrared spectroscopy. *Journal of pediatric gastroenterology and nutrition* 56(5): 569–572.

Onyango AW, Receveur O and Esrey SA (2002) The contribution of breast milk to toddler diets in western Kenya. *Bulletin of the World Health Organization* 80(4): 292–299.

Pereira PF, Alfenas R de CG and Araújo RMA (2014) Does breastfeeding influence the risk of developing diabetes mellitus in children? A review of current evidence.*Jornal de pediatria* 90(1): 7–15.

Perrine CG, Galuska DA, Thompson FE, Scanlon KS (2014) Breastfeeding duration is associated with child diet at 6 years. *Pediatrics* 134 Suppl 1: S50–5.

Perrine CG, Nelson JM, Corbelli J, Scanlon KS (2016) Lactation and Maternal Cardio-Metabolic Health. *Annual review of nutrition* 36: 627–645.

Perrin MT, Fogleman AD, Newburg DS, Allen JC (2017) A longitudinal study of human milk composition in the second year postpartum: implications for human milk banking. *Maternal & child nutrition* 13(1). DOI: 10.1111/mcn.12239.

Persson V, Greiner T, Islam S, Gebre-Medhin M (1998) The Helen Keller International Food-Frequency Method Underestimates Vitamin A Intake Where Sustained Breastfeeding is Common. *Food and nutrition bulletin* 19(4): 343–346.

Pons SM, Bargalló AC, Folgoso CC, López Sabater MC (2000) Triacylglycerol composition in colostrum, transitional and mature human milk. *European journal of clinical nutrition* 54(12): 878–882.

Prado EL and Dewey KG (2014) Nutrition and brain development in early life.*Nutrition reviews* 72(4): 267–284.

Ram KT, Bobby P, Hailpern SM, Lo JC, Schocken M, Skurnick J, Santoro N (2008) Duration of lactation is associated with lower prevalence of the metabolic syndrome in midlife--SWAN, the study of women's health across the nation. *American journal of obstetrics and gynecology* 198(3): 268.e1–6.

Raoof NA, Adamkin DH, Radmacher PG, Telang S (2016) Comparison of lactoferrin activity in fresh and stored human milk. *Journal of perinatology: official journal of the California Perinatal Association* 36(3): 207–209.

Reilly JJ, Ashworth S and Wells JCK (2005) Metabolisable energy consumption in the exclusively breast-fed infant aged 3--6 months from the developed world: a systematic review. *The British journal of nutrition* 94(1): 56–63.

Saure C, Armeno M, Barcala C, Giudici V, Mazza CS (2017) Excessive weight gain in exclusively breast-fed infants. *Journal of pediatric endocrinology & metabolism: JPEM* 30(7): 719–724.

Schaefer-Graf UM, Hartmann R, Pawliczak J, Passow D, Abou-Dakn M, Vetter K, Kordonouri O (2006) Association of Breast-feeding and Early Childhood Overweight in Children From Mothers With Gestational Diabetes Mellitus. *Diabetes care* 29(5). American Diabetes Association: 1105–1107.

Schwarz EB, Ray RM, Stuebe AM, Allison MA, Ness RB, Freiberg MS, Cauley JA (2009) Duration of Lactation and Risk Factors for Maternal Cardiovascular Disease. *Obstetrics &Gynecology* 113(5): 974–982.

Scott JA, Binns CW, Oddy WH, Graham KI (2006) Predictors of breastfeeding duration: evidence from a cohort study. *Pediatrics* 117(4): e646–55.

Silprasert A, Dejsarai W, Keawvichit R, Amatayakul K (1987) Effect of storage on the creamatocrit and total energy content of human milk. *Human nutrition. Clinical nutrition* 41(1): 31–36.

Silvestre D, Miranda M, Muriach M, Almansa I, Jareño E, Romero FJ (2010) Frozen breast milk at -20 degrees C and -80 degrees C: a longitudinal study of glutathione peroxidase activity and malondialdehyde concentration. *Journal of human lactation: official journal of International Lactation Consultant Association* 26(1): 35–41.

Stuebe AM, Rich-Edwards JW, Willett WC, Manson JE, Michels KB (2005) Duration of lactation and incidence of type 2 diabetes. *JAMA: the journal of the American Medical Association* 294(20): 2601–2610.

Tacken KJM, Vogelsang A, van Lingen RA, Slootstra J, Dikkeschei BD, van Zoeren-Grobben D (2009) Loss of triglycerides and carotenoids in human milk after processing. *Archives of disease in childhood.Fetal and neonatal edition* 94(6): F447–50.

Thompson JMD, Tanabe K, Moon RY, Mitchell EA, McGarvey C, Tappin D, Blair PS, Hauck FR (2017) Duration of Breastfeeding and Risk of SIDS: An Individual Participant Data Meta-analysis. *Pediatrics* 140(5). DOI: 10.1542/peds.2017-1324.

Thormar H, Isaacs CE, Kim KS, Brown HR (1994) Inactivation of visna virus and other enveloped viruses by free fatty acids and monoglycerides. *Annals of the New York Academy of Sciences* 724: 465–471.

Torner L (2016) Actions of Prolactin in the Brain: From Physiological Adaptations to Stress and Neurogenesis to Psychopathology. *Frontiers in endocrinology* 7: 25.

Tromp I, Kiefte-de Jong J, Raat H, Jaddoe V, Franco O, Hofman A, de Jongste J, Moll H (2017) Breastfeeding and the risk of respiratory tract infections after infancy: The Generation R Study. *PloS one* 12(2): e0172763.

Takkinen HM, Niinistö S, Veijola R, Virta LJ, Knip M, Simell O, Ilonen J, Virtanen SM (2016) Maternal dietary folate, folic acid and vitamin D intakes during pregnancy and lactation and the risk of cows' milk allergy in the offspring. *The British journal of nutrition* 116(4). Cambridge University Press: 710–718.

Turoli D, Testolin G, Zanini R, Bellù R (2004) Determination of oxidative status in breast and formula milk. *Actapaediatrica* 93(12): 1569–1574.

Valdés V, Pérez A, Labbok M, Pugin E, Zambrano I, Catalan S (1993) The impact of a hospital and clinic-based breastfeeding promotion programme in a middle class urban environment. *Journal of tropical pediatrics* 39(3): 142–151.

Valentine CJ and Wagner CL (2013) Nutritional management of the breastfeeding dyad.*Pediatric clinics of North America* 60(1): 261–274.

vanOdijk J, Kull I, Borres MP, Brandtzaeg P, Edberg U, Hanson LA, Høst A, Kuitunen M, Olsen SF, Skerfving S, Sundell J, Wille S (2003) Breastfeeding and allergic disease: a multidisciplinary review of the literature (1966-2001) on the mode of early feeding in infancy and its impact on later atopic manifestations. *Allergy* 58(9): 833–843.

Van Zoeren-Grobben D, Schrijver J, Van den Berg H, Berger HM (1987) Human milk vitamin content after pasteurisation, storage, or tube feeding. *Archives of disease in childhood* 62(2): 161–165.

van Zoeren-Grobben D, Moison RM, Ester WM, Berger HM (1993) Lipid peroxidation in human milk and infant formula: effect of storage, tube feeding and exposure to phototherapy. *Actapaediatrica* 82(8): 645–649.

Venkatramanan S, Armata IE, Strupp BJ, Finkelstein JL (2016) Vitamin B-12 and Cognition in Children. *Advances in nutrition* 7(5): 879–888.

Vieira AA, Soares FVM, Pimenta HP, Abranches AD, Moreira MEL (2011) Analysis of the influence of pasteurization, freezing/thawing, and offer processes on human milk's macronutrient concentrations. *Early human development* 87(8): 577–580.

Wang CD, Chu PS, Mellen BG, Shenai JP (1999) Creamatocrit and the nutrient composition of human milk. *Journal of perinatology: official journal of the California Perinatal Association*19(5): 343–346.

Weaver JM, Schofield TJ and Papp LM (2018) Breastfeeding duration predicts greater maternal sensitivity over the next decade. *Developmental psychology* 54(2): 220–227.

Williams AM, Chantry CJ, Young SL, Achando BS, Allen LH, Arnold BF, Colford JM Jr, Dentz HN, Hampel D, Kiprotich MC, Lin A, Null CA, Nyambane GM, Shahab-Ferdows S, Stewart CP (2016) Vitamin B-12 Concentrations in Breast Milk Are Low and Are Not Associated with Reported Household Hunger, Recent Animal-Source Food, or Vitamin B-12 Intake in Women in Rural Kenya. *The Journal of nutrition* 146(5): 1125–1131.

Wise J (2016) Rheumatic diseases should be actively treated in pregnancy, new guidelines say. *BMJ* 532: i312.

Xavier AM, Rai K and Hegde AM (2011) Total antioxidant concentrations of breastmilk--an eye-opener to the negligent. *Journal of health, population, and nutrition* 29(6): 605–611.