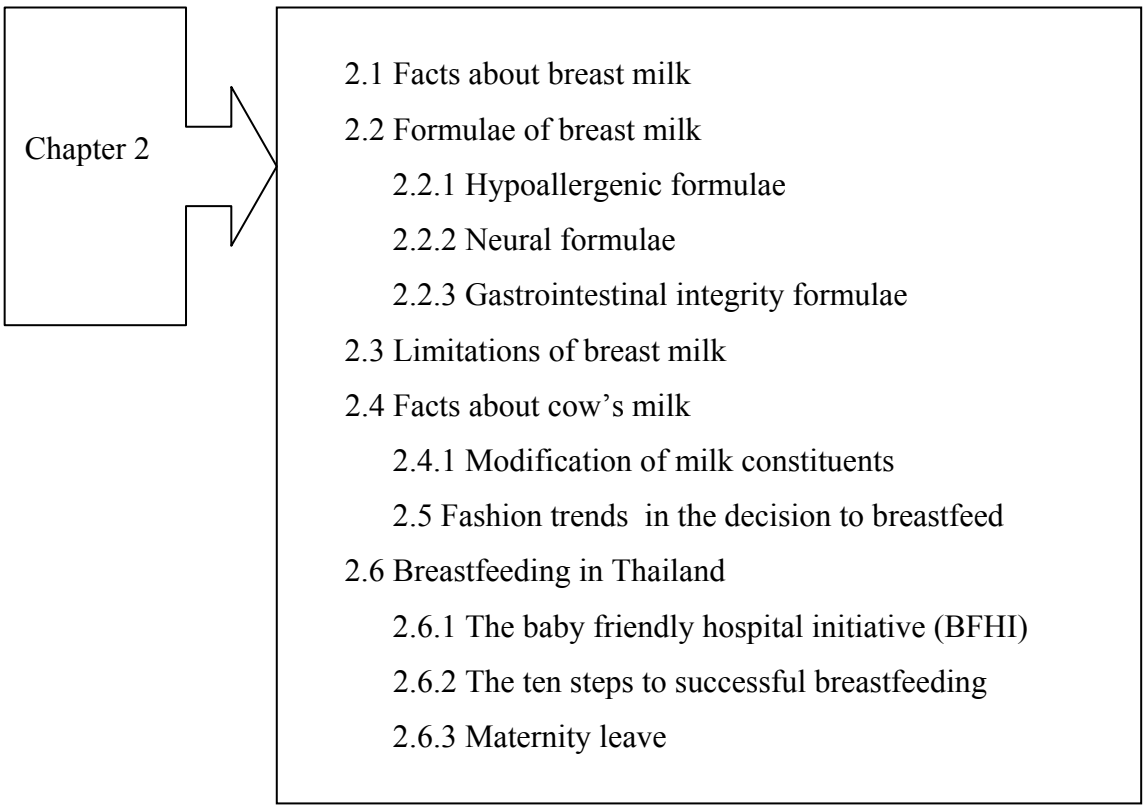
CHAPTER TWO
REVIEW OF LITERATURE

Chapter Two provides detailed information related to the project. In this chapter, the researcher will examine the background information related to breastfeeding. Moreover, an analysis of a new mother's behavior will be made to better understand the project's objectives and requirements in Chapter 1. An outline of this chapter is shown in Figure 2.

Figure 2. Outline of Chapter 2**.**



2.1 FACTS ABOUT BREAST MILK

During early infancy, human infants should ideally be nursed with mother's milk, which is considered superior over other modified infant formulae owing to its various inherent attributes and advantages. No artificial food can substitute mother's

milk (Anokwulu, 2002) and WHO recommends breastfeeding during the first four to six months of the infant's life (K.B.Simondon & F.Simondon, 1977). A progressive decline in the incidence of breastfeeding has been noticed worldwide (Kneebone, 1976), and more so in Western countries than in developing countries. Reasons for the cessation of breastfeeding by mothers may be due to:

1. Lack of education
2. Industrialization and urbanization
3. Inconvenience
4. Social status (Misra, 1982)
5. Insufficient lactation of milk
6. Illness of mother or child
7. Refusal of infant to suckle
8. Lack of mother's interest in breast feeding (Satto Escobar & Castaneda, 1974).

In the absence or in the case of insufficient production of breast milk, various modified infant formulae developed may be offered, which are nutritionally adequate but still do not offer any protection to the infants from infective agents in a new environment.

Therapeutic properties of probiotic and other beneficial starter cultures have led to the suggestion of their incorporation to enhance the therapeutic features of modified infant formulae. A number of cultured milk products intended for infant feeding have already been developed and found suitable for feeding both normal and sick infants. Here, an endeavor has been made to update the recent literature relating to the developments in cultured milk products intended for infant feeding in absence of breast milk.

2.2 FORMULAE OF BREAST MILK

Breastfeeding is recognized as the most preferred method of infant feeding by numerous organizations such as the American Academy of Pediatrics, American Dietetic Association, American College of Obstetrics and Gynecology, American

Public Health Association and National Healthy Mothers/Healthy Babies Coalition, US Department of Health and Human Services (Wilson, 1998). It was emphasized that nutritional factors during early development besides exhibiting short-term effects on growth, body composition and body function also exerts long-term effects on health, disease and mortality risk in adulthood, as well as development of the neural function and behavior (Koletzko et al., 1998). Poor feeding practices, such as inadequate breastfeeding, offering the wrong food, providing insufficient quantities and not ensuring that the child gets a balanced diet, and infectious diseases, or their combination may affect physical growth and the mental development of young children (LSRO, 1990, FAO, 1999).

Considerable effort has been made to mimic the health-promoting benefits of breast milk in modified infant formulae with the inclusion of probiotics, oligosaccharides (OS) and proteins, which could beneficially modify the composition of the gut micro flora in formula-fed infants (Wolfram, 2004). Since no modified milk can substitute a mother's milk (Anokwulu, 2002), therefore infant food is designed as medicinal nutritional food for infants. Various infant formulae have been developed worldwide and can be categorized into the following groups (Thompkinson and Mathur, 1995).

1. First generation formulae, which includes bovine milk-based dried formulations containing optimum ratios of protein : fat : carbohydrate, minerals and vitamins.
2. Soy-based formulae, in which bovine protein has been replaced by either soy flour or water soluble soy protein isolates.
3. Specialized formulae, in which protein and carbohydrate are pre-digested or hydrolyzed.
4. New generation formulae, which are chemically and bio-chemically closer to human milk.

Schmidt (1975) found that full adaptation of cow's milk to the composition of human milk is not feasible owing to a discordance in the molecular structure of protein and fat. Thompkinson and Mathur (1995) concluded that technological innovations

made term of commercial infant milk powder have not yet been able to meet the critical nutritional and physiological needs of infants. Carver (2003) noted that modification of infant formulae is constantly being carried out with the characterization of the components of human milk and identification of the nutritional needs of infants, resulting in formulation of special humanized milk with specific functions.

2.2.1 Hypoallergenic Formulae

An infant's intestinal antigen-exclusion, elimination and immune regulation mechanisms are immature after birth, predisposing it to aberrant antigen uptake (Sanderson & Walker, 1993). Infants may exhibit sensitivity to cow's milk within a few days of the first introduction of cow's milk-based formulae during infancy (Vander Horst, 1976) and may damage the jejuna mucosa (Kuitunen et al., 1975). Anti-allergenic formulae have been developed where protein has been heated and hydrolyzed with the objective of cleaving the antibody binding structure, making them suitable for fighting infant allergies to cow's milk (Cantani & Micera, 2001). Application of extensive hydrolyzed casein formulae and partially hydrolyzed whey formulae (Hays & Wood, 2005) or L-amino acid-based formulae in case of failure of protein hydrolyzed formulae are commended for allergy prevention (Garcia-Careaga & Kerner, 2005). Whey proteins are constituted of approximately 80% lactoglobulin and lactalbumin, which contain 53.8 and 52.1 g essential amino acids per 100g protein, respectively, and thus their addition in infant formulae may be advantageous (Puranik & Ramachandra Rao, 1996).

Incorporation of whey protein concentrate enhances the biological value of milk and milk products, resulting from the regulatory role of ∞-lactalbumin in the biosynthesis of lactose (Shewale et al., 1984) and binding of calcium (Stuart et al., 1986), but their inclusion induced lowering of peptic digestion in the stomach (Sharma & Datta Roy, 1996). Further, β lactoglobulin, casein and ∞-lactalbumin have been reported as the major allergen affecting more than 50% of patients with milk allergies (Taylor, 1986) and allergenicity of lactoglobulin is mainly dependent on protein

molecules (Tokita & Otani, 1981). Pahud et al. (1985) reported that allergens in bovine milk protein can be decimated by enzymatic hydrolysis. Allergenicity of both β lactoglobulin and ∞-lactalbumin could be reduced with the hydrolysis of whey protein with soybean trypsin inhibitors (Jost et al., 1987). Smitha and Murthy (2002) mentioned a reduction in allergenicity by 77.74, 52.61 and 41.09 %, respectively, due to enzymatic hydrolysis with trypsin, neutrase and chemotropism.

Efforts have been directed at production of non-sensitive milk based or protein hydrolysate and formulae based on soya protein (Lee & Lorenz, 1979; Finberg, 1980). Infants allergic to cow's milk or who do not exhibit an adverse reaction at the start of feeding on soya formulae can tolerate it well (AAP, 1998) and can be offered to infants with immunoglobulin E (IgE) associated symptoms of milk allergy after six months of age (Bellioni-Businco et al., 1999) but supplementation of soy-based formulae with methionine is suggested to improve its amino acid profiles (Garin et al., 1979). A soy-based milk substrate has been found suitable for infants with an apparently idiopathic intolerance to cow's milk or inability to digest it due to neonatal jaundice. Few infants are able to return to cow milk (Colombo & Dogliani, 1974). Recently, American Academy of Pediatrics and United States Food and Drug Administration have recommended that soy-based infant formulae are safe and effective alternative for normal growth and development in term of infants, whose nutritional requirements are not fulfilled using human milk or cow's milk-based infant milk formulae (Chapman, 2004).

2.2.2 Neural Formulae

Neural formulae are those which are responsible for normal physiological functions of infants. Human milk contains sialic acid at a concentration of 0.3-1.5 mg/ml and is important for physiological functions like expression and development of the brain and nervous system as well as the inhibition of toxins, bacteria and viruses and promotion of the growth of bifidobacteria and lactobacilli (Nakano et al., 2001). The sialic acid level of most formulae was <25% of that noted in mature breast milk and approximately 70% of them are bound to glycoprotein whereas in human milk the

highest proportion is bound to free OS (Wang et al., 2001). They further reported that the highest concentration of sialic acid in formulas intended for pre-term infants (0.63-0.12mmol/L) than in follow-up formulas (0.43-0.03mmol/L) or soy-based formulas (0.05-0.003mmol/L). Iodine, essential for normal growth and mental development in infants is present in breast milk and the recommended intake is 110g/day for 7-12 months old infants (Semba & Delange, 2001). The concentration of £ lactalbumin, which is a source of tryptophan, required for physiological functions is present in relatively low concentration in infant food than in human milk (Lien, 2003) and therefore with the objective of compensating the amino acid content, the protein level in infant foods is kept higher (>15 vs. 9-11 g/L) than in human milk (Rudloff & Kunz, 1997).

It has been pointed out that long-chain polyunsaturated fatty acids (LCPUFA), such as decosahexaenoic acid (DHA) and arachidonic acid (ARA), are highly concentrated in the lipid layer of brain, retinal neural membrane and are important for photo-transduction and neuronal function (Koo, 2003). Dietary supplementation with LCPUFA during infancy is associated with lower blood cholesterol in later childhood (Forsyth et al., 2003) and development of the brain, visual and neural system (Auestad et al., 2003). Presence of ARA and DHA in human milk and not in modified infant food suggested their supplementation in infant formulae (Forsyth et al., 2003). Recently, infant formulae containing LCPUFA at a concentration identical to those present in breast milk are available in the USA (Carver, 2003) and contains 0.3-0.6 % ARA and 0.2-0.4 % DHA (Klein, 2002). Infant feeding trials revealed that inclusion of DHA in infant formulae induced an improvement in visual development in pre-term infants (Carlson et al., 1996) without any adverse effect on growth (Vanderhoof et al., 2000). FDA has approved supplementation of DHA and ARA in formulas intended for full-term infants (USFDA, 2002) and concluded that application of ω-3-fatty acids is a safe provide of a daily intake of essential fatty acids and DHA do not exceed 2 g/day (USFDA, 2003).

Recently, it has been narrated that dietary supplementation of 3-fatty acids for pre-term and term infants is necessary for optimum visual development and may act as a therapeutic agent for pathologies of the retina and lens (Hodge et al., 2006).

2.2.3 Gastrointestinal Integrity Formulae

It has been stated that a healthy intestinal micro biota is considered to be vital for the priming of the infant's mucosal and systemic immunity (Haarman & Knol, 2005) and any disturbance in the balance between beneficial and potentially harmful bacteria in the intestine may pose initiation of acute or chronic diseases (Manning and Gibson, 2004). Breast milk ensures protection of infants by preventing proliferation of pathogenic organisms due to presence of various antimicrobial compounds such as Secretory IGA (Mc Clelland et al., 1978), lysozyme, which degrades the peptidoglycan of bacterial cell wall (Reiter, 1978) or lactoferrin, which inhibits bacteria, fungi and viruses (Andersen et al., 2001) by chelating iron, making them unavailable for their growth (Reiter, 1985). A-lactalbumin and lactoperoxidase (Herlea, 1983) and antagonism enhanced with their interactions with each other (Reiter, 1985). An enhanced antibacterial activity of lysozyme in association with Bifidobacterium infantis (Thompkinson et al., 1995), lactoferrin (Carlsson & Bjorck, 1987) and lactoperoxidase (Hulea et al., 1989) have been reported.

In term of the nutritional and therapeutic qualities of fermented milk products (Sarkar, 2002), it was indicated that infant foods containing beneficial bacterial cultures could be formulated with the objective of enhancing their antimicrobial activity (Acharya & Shah, 1998; Sarkar & Misra, 1996). Recent innovations in cultured milk products for infants have been reviewed (Sarkar, 2003) and could be successfully employed for feeding weaned and lactose-intolerant infants (Sarkar, 1993). Milk intended for the manufacture of milk products for infants must be modified with the application of a protein ingredient with a whey : casein ratio of 40:60 or 50:50, partially hydrolyzed milk protein for enrichment of cystine and methionine, ω-6 and ω -3 polyunsaturated fatty acids for fat enrichment, and the

addition of lactose or maltodextrin, minerals and vitamins (Krashenin & Shamanova, 1994).

Considerable attention has been paid to incorporating probiotic cultures in fermented milk intended for infant feeding with the objective of implanting these organisms in the infant's intestinal tract. Probiotics are defined as live bacterial preparation with clinically documented health effects in humans (Salminen et al., 2005) and probiotic therapy appears to alleviate allergic inflammation demonstrated as control of clinical symptoms and reducted local and systemic inflammatory markers (Isolauri et al., 2001; Majimaa and Isolauri, 1997). Bifidobacteria supplementation is efficacious to modify the gut micro biota of infants, thereby recovering antibiotic associated diarrhea (Colombel et al., 1987) and sustaining healthy intestinal flora of the infants during and after weaning (Fukushima et al., 1997).

Cultured milk based on bifidobacteria such as Antoshka-L, Zdorove-2 and Gnomik-2 were found suitable for the treatment of convalescent children and children suffering from lactose-intolerance, intestinal diseases, imbalance in intestinal flora and food allergies (Lipatov et al., 1998). Whey based infant formulae containing Lactobacillus GG (Isolauri, 1996) and milk cultured with Lactobacillus casei (Reinert et al., 2000) were found suitable for the treatment of gastrointestinal diseases in infants. Introduction of cultured milk products containing Bifidobacteria and Streptococcus thermophilus to pre-mature, low-birth weight neonates proved to be beneficial as higher levels of hydrogen exhaled by them indicating earlier colonization of intestinal tract (Leke et al., 1999). An increase in faecal lactobacilli and bifidobacteria and a decline in the incidence of faecal coliform were also recorded in infants offered with dietetic yoghurt containing Bifidobacterium bifidum (Sarkar & Misra, 2002) or Propiono-Acido-Bifido milk containing Lactobacillus acidophilus in addition to B. bifidum (Sarkar & Misra, 1998).

With the advancement in the detection of nutritional components in breast milk, it was established that breast-fed infants, unlike bottle-fed infants have intestinal microbial flora characterized by a marked predominance with bifidobacteria and lactic

acid bacteria, which could be attributed to pre-biotic effect of OS in human milk (Coppa et al., 2002). Pre-biotic may be defined as non-digestible food ingredients that benefit the host by selectively stimulate the growth and/or activity of one or a limited number of bacteria in the colon (Gibson & Roberfroid, 1995). Earlier studies revealed that human milk contains 5-8g/L of complex OS (Gnoth et al., 2000), consisted of approximately 60-90% galacto-oligosaccharide (GOS) and 10-40% fructooligosaccharide (FOS) during the first few months of lactation (Ben et al., 2004), but recent research reported it to consisted of 75-85% neutral OS (FOS and GOS) and 15-25% acidic OS (Farano et al., 2005).

Pre-term infants fed with a standard powder formulae supplemented with 10 g/lt (90% GOS + 10% FOS) induced a significant increase in bifidobacteria population but no change in counts of Bacteroides, Clostridium sp., E. coli, Enterobacter, Proteus, Klebsiella and Candida (Boehm et al., 2002). Decsi et al. (2005) mentioned that feeding of infant formulae containing 0.4g/100 ml (9:1 GOS+FOS) induced a rapid growth in the bifidobacteria population ($9x10^{12}$ vs. $5x10^{10}$ cfu/ml faeces) in contrast to breast-fed infants. Lactulose, a ketoses disaccharide is also known as bifidus factor as it is not digested in upper gastrointestinal tract and passes to the large intestine, where it plays an important role in the proliferation of bifidobacteria (Basantia et al., 1997). Incorporation of 0.5% lactulose in infant formulae is considered optimum for growth stimulation of bifidobacteria, identical to breast-fed infants without any change in blood composition (Nagendra et al., 1995) and also induced lowering of pH as well as inhibition of the proliferation of Gram and putrefactive bacteria (Grutte and Haenel, 1968). Various studies displayed that infants fed with infant formulae containing 0.8g/dl long chain inulin/GOS mixture had normal growth without significant side effects, which suggested their safe inclusion in infant formulae by European Commission in 2001 (Veereman-Wauters, 2005).

In the absence of breast milk, humanized mammalian milk may be an attractive alternative but it would not be as nutritionally and therapeutically adequate as breast milk. It has been mentioned that technological innovations made in the commercial infant milk powder have not yet been able to meet the critical nutritional and

physiological needs of infants. Supplementation of infant formulae with sialic acid, LCPUFA such as DHA and ARA, probiotic cultures such as Bifidobacterium bifidum, Lactobacillus acidophilus, Lactobacillus GG and Lactobacillus casei and pre-biotic such as GOS and FOS are recommended, to make it more similar to breast milk.

2.3 LIMITATIONS OF BREAST MILK

Breast milk is a well-balanced mixture of protein, fat, carbohydrate, minerals and vitamins and is considered nutritionally and therapeutically adequate for infant feeding. Benefits claimed by breast feeding include better nutrition, fewer illnesses due to the transfer of maternal antibodies, no microbial contamination, prevention of allergies, promotion of jaw development by suckling, mother-infant bonding, cost and contraception (Williams & Stehlin, 1997). Besides its various advantages, breast milk has certain limitations. Recent reports suggest that exclusive breastfeeding may pose more of a risk of human immunodeficiency virus (HIV-1) transmission than practice of mixed feeding (Smith & Kuhn, 2000). Further, infants exclusively fed on breast milk are also at the risk of breastfeeding jaundice, allergies and drug transmissions in breast milk from pregnant mothers after therapy for sterility (Maeda et al., 2001) They may also have an elevated cholesterol level because breast milk is a rich source of cholesterol (Kallio et al., 1992) and found to be nutritionally inadequate for low birth weight infants (Sanchez-Hidalgo et al., 2000).

In case of ill health of mothers or insufficient production of breast milk, babies may be offered human milk from human milk banks. Breast milk contains no infectious micro-flora and its microbiological quality is influenced by the methods of its collection and storage conditions. Breast milk at human milk banks is supplied either manually or using pumps. Contamination of breast milk with Gram(-)ve bacteria and Staphylococcus through the hands of employees involved in supplying milk (de Salles & Goulart, 1997) or breast milk pumps (Boo et al., 2001) was noted. Breast milk at banks may be either refrigerated or boiled prior to feeding infants to ensure any risk of health hazards. Reports revealed that the protective properties of human

milk are lost due to refrigerated storage (Kliegman et al., 1979) and boiling results in reduced effect of immunoglobulin A and secretory immunoglobulin A (Lawrence, 1999). Hence, human milk should be fed to infants in a fresh condition (Chou et al., 2001). Limitations of breast milk coupled with its insufficient production led to the development of modified infant formulae for infant feeding.

2.4 FACTS ABOUT COW'S MILK

In the absence of breast milk, infants may be offered cow or buffalo milk after dilution. Infants faced problems digesting untreated cow or buffalo milk due to higher contents of protein and buffer salts. The large amount of casein present in animal's milk form a dense curd in the stomach of infants when acted upon by pepsin and further the pepsin digestion is retarded by the neutralization of the hydrochloric acid present in the gastric juice by buffer salts (Swaminathan, 1998). While feeding infants with milk powder, the quantum to be used for reconstitution is very important. Anokwulu (2002) concluded that malnutrition in infants occur if the amount of powder used is below the recommended level, whereas excess amounts cause obesity, hypernatraemia and hypertonic dehydration. Microbiological quality of infant formulae is influenced by the type and number of microorganisms initially present and on the duration and temperature of storage.

As dried infant formulae predominate in Bacillus licheniformis and Bacillus subtilis, subsequent reconstitution and storage resulted in dominance of B. cereus (Rowan et al., 1997). Feeding of infants with modified infant formulae in the absence of breast milk may pose some risks during its preparation. Microbiological and chemical quality of water used for the reconstitution of dried infant formulae and preparation of feeding equipment are of grave importance. Bottlefed infants are more likely to have Campylobacter jejuni bacterial infection due to use of unboiled water for reconstitution (Muhammad et al., 1996). Use of nitrate contaminated water causes methaemoglobinaemia in infants and affected infants may develop blue-gray skin color and may become irritable (Knobeloch et al., 2000). Higher chance of

contamination of reconstituted infant formulae due to faulty methods of sterlization of feeding equipment was also suspected. Higher incidence of coliform in feeding bottles (Morais et al., 1998) and plastic teats (de Salles and Goulart, 1997) were reported.

It was concluded that full adaptation of cow's milk to the composition of human milk is not possible because of the disparity in the molecular structure of protein and fat (Schmidt, 1975) and composition of breast milk also varies greatly among individuals and from feed to feed and day to day (Barrie et al., 1975). Technological innovations made in the commercial infant milk powder have not been able to meet the critical nutritional and physiological needs of infants (Thompkinson and Mathur, 1995). In the absence of nutritionally and therapeutically competent formulae, cultured milk products could be a suitable and practical substitute for infants owing to its nutritional and therapeutic properties. Suitability of cultured milk products for infant feeding a number of cultured milk products have already been developed world-wide and have established themselves in the market in recent years to make the use of starter cultures different from classical bacterial cultures.

Cultured milk products prepared using specially selected strains of lactobacillus and bifidobacteria play an important role in infant nutrition. Literature on the acidophilus milk, bifidus milk, yoghurt, kefir and other related products and their suitability for normal and sick infants have already been reviewed (Acharya & Shah 1998; Sarkar & Misra, 1996). This paper focuses on the recent developments in the elite world of cultured milk products for infant feeding. During the manufacture of cultured milk products, modification in milk composition and selection of starter cultures are of prime importance to exhibit desirable dietetic characteristics.

2.4.1 Modification of Milk Constituents

During the preparation of cultured milk products intended for infant feeding, the raw ingredients of milk may be modified by supplementation of the following ingredients (Krashenin and Shamanova, 1994):

- Use of protein ingredients with a whey: casein ratio resembling that of human milk (40:60 or 50:50);
- Use of partially hydrolysed milk protein for enrichment of cystine and methionine;
- Addition of v-3 and v-6 polyunsaturated fatty acids for fat enrichment;
- Introduction of lactose or maltodextrin;
- Addition of minerals and vitamins. Starter cultures selected for the manufacture of cultured milk products should fulfill the following criterion (Bianchi-Salvadori, 1996; Sarkar and Misra, 1998a):
- Ability to grow in milk and to acidify it; ability to resist the developed acidity in cultured milk products during storage for their viability;
- Ability to tolerate gastric juices, bile salts;
- Ability to colonise in the intestinal tract;
- Ability to utilize endogenous and exogenous nutrients;
- Must possess considerable proteolytic and lactase activity;
- Ability to produce predominantly L(+) lactic acid;
- Ability to elaborate antibacterial compounds for exhibiting antagonism against undesirable flora.

Recent innovations in cultured milk products Bifidokefir is a newly developed kefir containing physiologically active cells of Bifidobacterium proved to be effective in eliminating Salmonella and Shigella within 7- 11 days and restored normal faecal flora after 4:8 ^ 0:8 days in children with severe intestinal infection (Murashova et al., 1994).

Infants offered with a cow milk follow-up formula containing Bifidobacterium bifidum, induced an increase in faecal bifidobacteria, decrease in lecithinase (-) ve clostridia, faecal putrefactive organisms producing NH3 and indole and assisting in maintaining the healthy intestinal conditions during and after weaning (Fukushima et al., 1997). Other cultured milk products based on bifidobacteria such Antoshka-L, Zdorove-2 and Gnomik-2 were found suitable for the treatment of convalescent children and children suffering from lactose-intolerance, intestinal diseases, imbalance

in intestinal micro flora and food allergies (Lipatov et al., 1998). Introduction of cultured milk products containing Bifidobacteria and Streptococcus thermophilus to premature, low-birth weight neonates proved to be beneficial as higher levels of hydrogen were exhaled by them indicating earlier colonization of the intestinal tract (Leke et al., 1999).

A cultured milk drink obtained by culturing pasteurized milk with Streptococcus faecium and Streptococcus thermophilus was recommended as therapeutic or dietetic food for children (Libets & Segeeva, 1995). Tarhana, a dried soup preparation obtained by culturing a mixture of yoghurt, wheat, flour, vegetables, herbs and spices (Actac, 1996) and Mahewu, traditional formulated and malted sour, non-alcoholic cereal gruel (Simango, 1997) were recommended for feeding infants as weaning foods. Whey-based infant formula containing Lactobacillus GG (Isolauri, 1996) and milk cultured with Lactobacillus casei (Reinert et al., 1999) were found suitable for the treatment of gastrointestinal diseases in infants. Feeding of infants with yoghurt containing Lactobacillus casei induced an increase in faecal lactobacilli and decrease in potentially harmful enzyme activity of b-glucuronidase and b-glucosidase (Guerin-Danan et al., 1998).

An increase in faecal lactobacilli and bifidobacteria and a decline in the incidence of faecal coliforms were also annotated when infants were given dietetic yoghurt obtained by conjugated use of Bifidobacterium bifidum and Propionibacterium with yoghurt cultures (Sarkar & Misra, 2000) and Propiono-Acido-Bifido (PAB) milk obtained when employed in association with Lactobacillus acidophilus (Sarkar & Misra, 1998b).

2.5 FASHION TRENDS IN THE DECISION TO BREASTFEEDING

In recent history, breastfeeding has become subject to fashion within particular cultures. Advances made in medical science and technology, along with the increasing interest of the medical profession in the late nineteenth century, led to new “perfect” baby milk formulae being developed. The commercial products made to these

formulae were seen by many doctors as superior to breast-milk and by the beginning of the twentieth century were readily available to mothers (Ebrahim, 1991; Jelliffe and Jelliffe, 1978; Minchen 1985). Middle class women in the 1930s saw the bottle as a symbol of freedom and many chose the bottle in preference to the breast. This resulted in the decline of breastfeeding from 90% in the 1920s, to 50% by the late 1930s (Emery et al., 1990; Jelliffe & Jelliffe, 1978; World Health Organization, 1981).

By the late 1960s and early 1970s, breastfeeding rates in Great Britain reached an all time low, reflecting the trend throughout the Western world (Emery et al., 1990; Heiberg et al., 1995; Silverton, 1985; Winikoff and Baer, 1980; World Health Organization, 1981). The breastfeeding rate in England was 29%, falling to 14% by four weeks of age (Shulka et al., 1972). The Scottish rate showed a similar trend with 31% falling to 16% during the same period (Arneil, 1967). Moreover, in 1968 at the time of discharge from the maternity hospital in one district of Edinburgh, the rate was as low as 14% (Howie et al., 1980).

The mid-1970s saw a reversal of this decline as it once again became fashionable among middle class women to breastfeed. The resurgence of popularity has been attributed to three forces: the rejection of all things artificial with a "return to nature"; the activity of breastfeeding support groups, and the growing appreciation and support of breastfeeding by some health professionals (Winikoff & Baer, 1980). However, the extent of the recovery can be overstated and figures published in The Scottish Diet Report (1993) for the four major Scottish cities indicated Glasgow had a prevalence rate of 27% (with some areas being as low as 7%), Dundee 38%, Edinburgh 43% and Aberdeen 50%. A reason given for low prevalence was lack of support by health professionals.

What other factors are associated with a women's decision to breastfeed? Numerous studies (Eastham et al., 1976; Fitzpatrick et al., 1994; Hally et al., 1984; Jones, 1987; Martin, 1978; Martin & Monk, 1982; Martin & White, 1988; Newson & Newson, 1965; Wright et al., 1983) undertaken over the past 30 years have shown that the women who are most likely to breastfeed tend to be older, primiparae, with a

higher level of education, belonging to a high social class and more likely to live in the south-east of England. They are also more likely to be married or cohabiting and to be non-smoking.

Clearly, socio-economic factors, with their often complex linkages to individual attitudes and behaviours, operate to produce cultural and sub-cultural trends of this kind. While there is a considerable legacy of research in the field, aspects of this were investigated as an undergraduate project designed to provide a "snapshot" of pregnant women, the feeding intentions they had, and the influences on that decision.

2.6 BREASTFEEDING IN THAILAND

The National Breastfeeding Project began in 1992. Its objective is the "empowerment of all women to breastfeed their children exclusively for the first 4-6 months and to continue breastfeeding with complementary food well into the second year and beyond". In cooperation with the United Nations Children's Fund (UNICEF), the government drew up goals for the promotion of breastfeeding to be achieved by 1995. The aim of the goals was to ensure that:

1. All mothers are able to exclusively breastfeed their infants for at least 4 months, and subsequently breastfeed with the addition of appropriate complementary food until the infant is two years of age.

2. Relevant information and training is provided to ensure that all hospitals reach Baby- Friendly Hospital status.

3. By June 1993 there was an end to the donations and sale of infant formula in all government hospitals to ensure strict adherence to the 1995 Code of Marketing of Breast Milk Substitutes and other related products by both the public and private sectors.

4. The WHO indicators were used to assess national breastfeeding promotion. A target for exclusive breastfeeding was set at 15% of infant for 1995 (the date for the achievement of this goal has now been extended to 2001.

The main activities planned to meet these goals were: the promotion of the Baby-Friendly Hospital Initiative; legislation on maternity leave; and the Code of Marketing of Breast Milk Substitutes.

2.6.1 The Baby Friendly Hospital Initiative (BFHI)

The BFHI addresses a major factor that has contributed to the erosion of Breastfeeding; that is, health care practices that interfere with breastfeeding. Implementing the best practice in a healthcare system is an important part of any program to promote breastfeeding, as it will help ensure that the health services are able to support mothers who choose to breastfeed. The Ten Steps to Successful Breastfeeding are recognized as best practice standards for the care of mothers and babies by the maternity services.

2.6.2 The Ten Steps To Successful Breastfeeding

Every facility providing maternity services and care for newborn infants should:

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help mothers initiate breastfeeding within a half-hour of birth.
5. Show mothers how to breastfeed, and how to maintain lactation even if they should be separated from their infants.
6. Give newborn infants no food or drink other than breast milk, unless medically indicated.

7. Practice “rooming-in” allow mothers and infants to remain together for 24 hours a day.

8. Encourage breastfeeding on demand.

9. Give no artificial teats or pacifiers (also called dummies or soothers) to breastfeeding infants.

10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

Thailand has established a policy on promoting breastfeeding, which follows the WHO/UNICEF’s the Ten Steps to Successful Breastfeeding, laid down in 1995. The major activity has been the Baby – Friendly Hospital Initiative. In 1997, 772 hospitals under the Ministry of Public Health including provincial hospitals and one university hospital were designated “BFHI”. At present Thailand has achieved baby friendly status for all of its government hospitals under the Ministry of Public Health. The number of BFHI is 792 hospitals (98.4%). After three years of implementing BFHI (1997) evaluation of the sustainability of baby friendly hospitals undertaken by the Center for Breastfeeding Promotion, Mahidol University Faculty of Public Health, found success in the initiating of breastfeeding and in the promotion of the prolongation of breastfeeding. The impact has been so positive that the mandatory implementation of BFHI in all hospitals, both public and private, is strongly recommended.

2.6.3 Maternity Leave

In parallel with this readjustment in health facilities, promotion campaigns aimed at the general public have strengthened recognition of the importance of exclusive breastfeeding for 4-6 months and of breastfeeding for up to two years. Outside the health sector, the inclusion of maternity leave in national law since 1993 is helping to create a supportive environment for breastfeeding. Under this legislation, mothers have the right to 90 days of paid leave. The whole salary is paid during this period by the government for government officials, while in the case of women

employed in private sectors; the burden is shared between the employer (50%) and the National Social Security Fund (50%).

2.7 RELATED RESEARCH

Erlichman, J. (1995) found in his research that with a particular sample of pregnant women, that only some women who have had experience with breastfeeding made the decision to breastfeed. The level of knowledge concerning the advantages of breastfeeding among respondents was high, with specific advantages being cited by a high proportion of respondents; however, this did not prevent 48 per cent of women expressing their intentions to bottle feed. Two factors which did not show any significant relationship here were how the woman was fed as a baby herself and her mother's views on feeding.

Sloper (1975) indicated the significance of the 'education' factor in breastfeeding. Professional influence via parent education classes, or advice from midwives at an antenatal clinic, did not emerge as a significant factor in the women's decision making. Arguably it is a cause for some concern that this influence is so limited. Midwives indicated that women were generally not interested in feeding at this time, but more concerned with the event of pregnancy itself. They added that the topic of breast-feeding was best left to parent education classes. In as much as attendance has been found more likely by women who were already inclined to breastfeed, this creates a structural gap in the possibility of discussion with those who were intending to bottle-feed. The situation here is complex.

Beeken and Waterson (1992) suggested that one reason why breastfeeding was not promoted was the fear that it would make those women who had decided to bottle-feed feel guilty. Also, while midwives were aware of the beneficial effects of breast feeding, their attitudes varied.

Bruce (1991) discovered that when interviewing midwives, he found over 60 per cent favored a neutral infant feeding policy. The Health Education Board for

Scotland (1994) also found that midwives are adopting an informative rather than a proactive role. Notwithstanding this dimension of the situation, it would appear appropriate that non-conflicting advice and support be offered, and for this not only is it necessary to consider advice intervention points, it is also necessary for continuing education provision for health professionals to be available. In Sweden, for example, a lactation midwife is able to provide support and teaching for other health professionals.

Palmer (1993) stated that negative attitudes towards breastfeeding need to be tackled nationally through education and health promotion. The importance of breastfeeding should be taught in schools to girls and boys, preferably beginning in primary schools when children are less likely to have developed negative attitudes. This involvement should continue throughout secondary school before the age of 16, when a large number of children leave school. Teachers and health professionals, particularly health visitors, school nurses and health promotion officers should be involved in conveying positive breast-feeding messages to schoolchildren to overcome what appears to have become a culture of embarrassment.

Marchant and Morrow (1994) conducted research which highlighted the problem of understanding how babyfeeding intentions are socially constructed. These social barriers must be addressed if there is to be the revolution that would echo the success of Sweden where the breastfeeding rate at four months is around 60 percent as compared with 20 per cent in Scotland.