CHAPTER IV

DISCUSSION

Human Milk.

1. Human milk. Vitamin B_{12} content of 220 human milk samples was in accordance with results reported previously by various authers as shown in table 15. Results in the present study also showed that the colostrum, i.e., the milk collected from second to fifth days after parturition, contained more vitamin B_{12} (710.8 pg./ml.) than the transitional milk (244.6 pg./ml.). This study confirmed results of other animal species, such as cow (Gregory, 1954), goat (Gregory, 1954) and sow (Ford, 1974).

It has been shown that vitamin B_{12} intake in developing countries was quite low with a range from 0.64 ug./day to less than 3.0 µg./day (FAO/WHO Expert group, 1970). The mean vitamin B_{12} level of human milk in economically advanced countries was similar to or a little lower than the mean level of serum vitamin B_{12} 450 pg./ml. (FAO/WHO Expert Group, 1970). Finding a mean value of vitamin B_{12} in human milk as 502 pg./ml. in present study indicated that Thai mothers had higher vitamin B_{12} content in milk than those of other countries mothers. This was probably due to the fact that fish sauce and fermented fish, the tradition Thai diet, supplied a considerable amount of vitamin B_{12} (Areekul et. al., 1975)

Table 15. Vitamin B_{12} content in human milk.

Country	Vitamin B_{12} content (pg./ml.)		Reference.
	Mean	Range	
	410	100-1500	Collins et. al.(1951)
India	80	55-160	Srinivasatal (1953)
USA.	300	-	Gregory and Holdsworth (1955)
France	300	-	Karlin (1956)
India	97	-	Deodhar and Ramakrishnan(1959)
Russia	400	200-600	Davidov and Kruglova (1960)
India	-	100-480	Lancet (1965)
USA	1100	-	Lampkin et. al. (1966)
India	75	51-150	Srikantia and Reddy (1967)
India	100	40-390	Jathar et. al. (1970)
England	605	-	Craft et. al. (1971)
Thailand	520	200-900	Hemindra et. al. (1971)
Thailand	410	20-2290	Areekul et. al. (1977)
Thailand	502	63-3477	Present study.

Results in the present study showed that breast milk contained vitamin B_{12} about 502 pg./ml. Therefore, an infant with a daily consumption of 700 ml. of breast milk would get 0.35 µg. of vitamin B_{12} per day. This amount is quite adequate for daily requirement as manifested by lack of evidence of any vitamin B_{12} deficiency in these infants (FAO/WHO Expert Group, 1970).

There was no relationship between vitamin B_{12} content in breast milk and the party in the present study. The mean value of vitamin B_{12} content in milk samples collected from mothers with different parities showed no significantly difference ($P > 0.05$) as shown in table 3.

.2. Vitamin B_{12} content in the supplemented human milk. Even though vitamin B_{12} level in breast milk of the 15 control subjects seemed to increase from the fourth day (359.3 pg./ml.) to the ninth day (543.4 pg./ml.) after delivery, this increase was not significantly different from these values of 220 mother group. ($P > 0.05$). There were also no significant difference between vitamin B_{12} level in milk collected on the fourth day and on the other days in the control group ($P > 0.05$).

150 and 300 µg. of vitamin B_{12} were supplemented daily to two groups of mothers for 3 to 5 days. These two supplemented groups showed no significant increases of vitamin B_{12} in breast milk than that of the control group ($P > 0.05$). There were also no significant difference of vitamin B_{12} content between each day of supplemented groups.

Cow's Milk.

Milk may be recommended in all diet especially in these of children because its proteins are the best biological value for supplementing than other proteins and are easily digested. Vitamin B_{12} in milk is vulnerable to oxidation during cooking, when boiled for 2 to 5 minutes it loses about 30% (FAO/WHO Expert Group, 1970).

1. Fresh cow's milk. In the present study, vitamin B_{12} content of fresh cow's milk was found to be 1.52 µg./l. Pasteurization of these fresh milk lowered the vitamin B_{12} level to 1.35 µg./l. ($P > 0.05$)

This result was in accordance with results of other reports (Collins et.al., 1953; Hartman et. al., 1956; FAO/WHO Group, 1970). The sterilization destroyed vitamin B_{12} content in milk to a level of 0.85 µg./l. which was significantly lower than those of fresh and pasteurized milk ($P < 0.05$).

Results in the present study showed that the pasteurized cow's milk bought from the market contained 1.64 µg./l. of vitamin B_{12} . These values of fresh and pasteurized milk were lower than those reported by other workers as shown in table 16.

Vitamin B_{12} content of human milk was lower than that of cow's milk. This finding was in accordance with results reported by many authors (Collins et. al., 1951; Gregory and Holdsworth, 1955; Chanarin, 1969; Williams, 1971).

2. Powdered milk. The mean value of vitamin B_{12} content in the powdered milk bought from the market was 20.8 µg./kg. This figure was in accordance with results reported by many authors (as shown in

table 16.). The higher vitamin B_{12} content in the powdered milk was probably due to the vitamin B_{12} fortification in these samples. An average daily consumption of 125 grams of powdered milk by an infant would supply 2.6 µg. of vitamin B_{12} against a daily 0.35 µg. of vitamin B_{12} from breast-fed baby. The Joint FAO/WHO Expert Group (1970) recommended 0.3 µg. of vitamin B_{12} daily as the intake on artificial feeding.

3. Condensed milk. Vitamin B_{12} content of sweetened condensed milk (3.33 µg./l.) was also in the same order of magnitude as results reported by other authors. This value was higher than those of human milk and fresh cow's milk. If condensed milk is diluted to its originally volume, it produces a sweet milk with the same amount of vitamin B_{12} content as in fresh cow's milk.

4. Evaporated milk. A mean value of evaporated milk (0.26 µg./l.) was lower than those of human milk, fresh cow's milk and the evaporated milk. When it is diluted as recommended on the label, there is a gerat reduction of the vitamin B_{12} content. This was possibly due to the process of heating in preparation of the evaporated milk.

5. Cheese and butter. The mean values of vitamin B_{12} of cheese and butter were 1.07 and 0.31 µg./kg. in this study which were lower than the results reported by other authers.

Recommended daily intake of vitamin B_{12} for infant (0 to 12 months) is 0.3 µg./day (FAO/WHO Expert Group, 1970). Results in the present study showed that the intake of vitamin B_{12} in breast-fed

or bottle-fed (powdered milk) infant was adequate for daily requirement (0.35 µg. and 2.6 µg. per day, respectively). When 1 part of condensed milk was diluted with 3 to 4 parts of water, it contained adequate vitamin B_{12} for infant (0.55 µg. per day). While evaporated milk, by diluting one part of milk in one part of water, would supply inadequate vitamin B_{12} for an infant feeding on this kind of milk alone (0.1 µg. per day).

Table 16. Vitamin B_{12} content of cow's milk and its preparations.

Materials.	Vitamin B_{12} (µg./l.)		Reference.
	Mean	Range	
Cow's milk,	6.6	3.2-12.4	Collins et. al. (1951)
fresh,		2.0-6.0	Smith (1965)
	3.2	-	Gregory and Holdsworth(1955)
	7.1	5.5-9.4	Hartman et. al. (1956)
	-	3.0-5.0	Merck (1958)
	3.0	-	Chanarin (1969)
	6.5	3.6-10.4	Adams et. al. (1973)
	1.1	0.1-2.2	Areekul et. al. (1977)
	1.5	0.3-3.4	Present study.
Cow's milk,	4.0	-	Collins et. al. (1951)
pasteurized.	3.6	-	Rosenthal (1968)
	3.6	-	Chanarin (1969)
	3.0	-	Chanarin (1969)
	1.5	-	Hemindra et. al. (1971)
	3.9	2.7 -5.9	Adams et. al. (1973)
	1.5	-	Areekul et. al. (1977)
	1.6	1.1-2.4	Present study.
Cow's milk,	1.01	0.05-2.09	Areekul et. al. (1977)
sterilized.	0.85	0.02-2.13	Present study.

Table 16. Vitamin B_{12} content of cow's milk and its preparations (Cont.)

Materials.	Vitamin B_{12} (ug./l.)		Reference
	Mean	Range	
Condensed milk		3.0-5.0	Merck (1958)
	3.1	-	Rosenthal (1968)
	5.0	-	Chanarin (1969)
	3.08	-	Chanarin (1969)
	3.8	-	Areekul et. al. (1977)
	3.3	2.3-4.9	Present study.
Evaporated		1.0-3.0	Merck (1958)
milk.	1.3	-	Rosenthal (1968)
	1.32	-	Chanarin (1969)
	5.6	-	Hemindra et. al. (1977)
	1.5	0.9-1.8	Adams et. al. (1973)
	0.32	-	Areekul et. al. (1977)
	0.26	0.01-0.54	Present study.
Powdered	-	37.0-42.0	Hartman et. al. (1956)
milk.	-	36.0-39.0	Hartman et. al. (1956)
	-	10.0-26.0	Merck (1958)
	-	25.0-40.0	Merck (1958)
	37.6	-	Rosenthal (1968)
	49.2	-	Rosenthal (1968)

Table 16. Vitamin B_{12} content of cow's milk and its preparations (Cont.)

Materials	Vitamin B_{12} (µg./l.)		Reference
	Mean	Range	
Powdered milk	20.0	-	Chanarin (1969)
	-	31.1-40.1	Chanarin (1969)
	20.8	6.7-79.0	Present study
Cheese,			
Cheddar	9.9	-	Rosenthal (1968)
	28.0	-	Rosenthal (1968)
	11.7	-	Rosenthal (1968)
	20.0	-	Chanarin (1969)
	-	9.9-14.0	Chanarin (1969)
	7.7	4.3-10.4	Adams et. al. (1973)
Processed	8.3	4.4-14.0	Adams et. al. (1973)
Cottage	5.9	-	Rosenthal (1968)
	5.8	-	Chanarin (1969)
Swiss	9.0	-	Merck (1958)
	20.8	-	Rosenthal (1968)
	17.1	-	Rosenthal (1968)
	-	8.5-11.1	Chanarin (1969)
Gruyere	16.0	-	Rosenthal (1968)
American	6.0	-	Merck (1958)
Cheese	13.2	-	Hemindra et. al. (1971)
Cheese	1.07	0.02-6.89	Present study.