

CHAPTER III

RESULTS



Human Milk.

1. Human milk. Results of vitamin B₁₂ in human milk collected on day second to twelfth after delivery are shown in table 2. A mean value \pm one SD. of vitamin B₁₂ in 220 samples human milk was found to be 501.9 \pm 530.4 pg./ml., ranged from 63.4 to 3476.9 pg./ml. The vitamin B₁₂ content in human milk decreased progressively after delivery, i.e., from a mean value of 1623.3 pg./ml. on the second day to 292.5 pg./ml. on the ninth to twelfth day after parturition as shown in Fig. 4.

Table 2. Relationship between the vitamin B₁₂ content in human milk and the postpartum period.

Postpartum days	No. of Sample	Vitamin B ₁₂ content (pg./ml.)	
		Mean \pm SD.	Range
2	11	1623.3 \pm 887.2	457.5 - 3476.9
3	42	668.7 \pm 562.1	65.4 - 2696.7
4	86	433.8 \pm 400.7	70.3 - 2166.5
5	48	398.0 \pm 406.1	63.4 - 1845.4
6	16	258.0 \pm 199.0	73.4 - 694.8
7	7	152.2 \pm 86.1	64.0 - 305.5
8	6	284.9 \pm 141.2	168.4 - 547.9
9 - 12	4	292.5 \pm 398.0	70.6 - 889.1
Total	220	501.9 \pm 530.3	63.4 - 3476.9

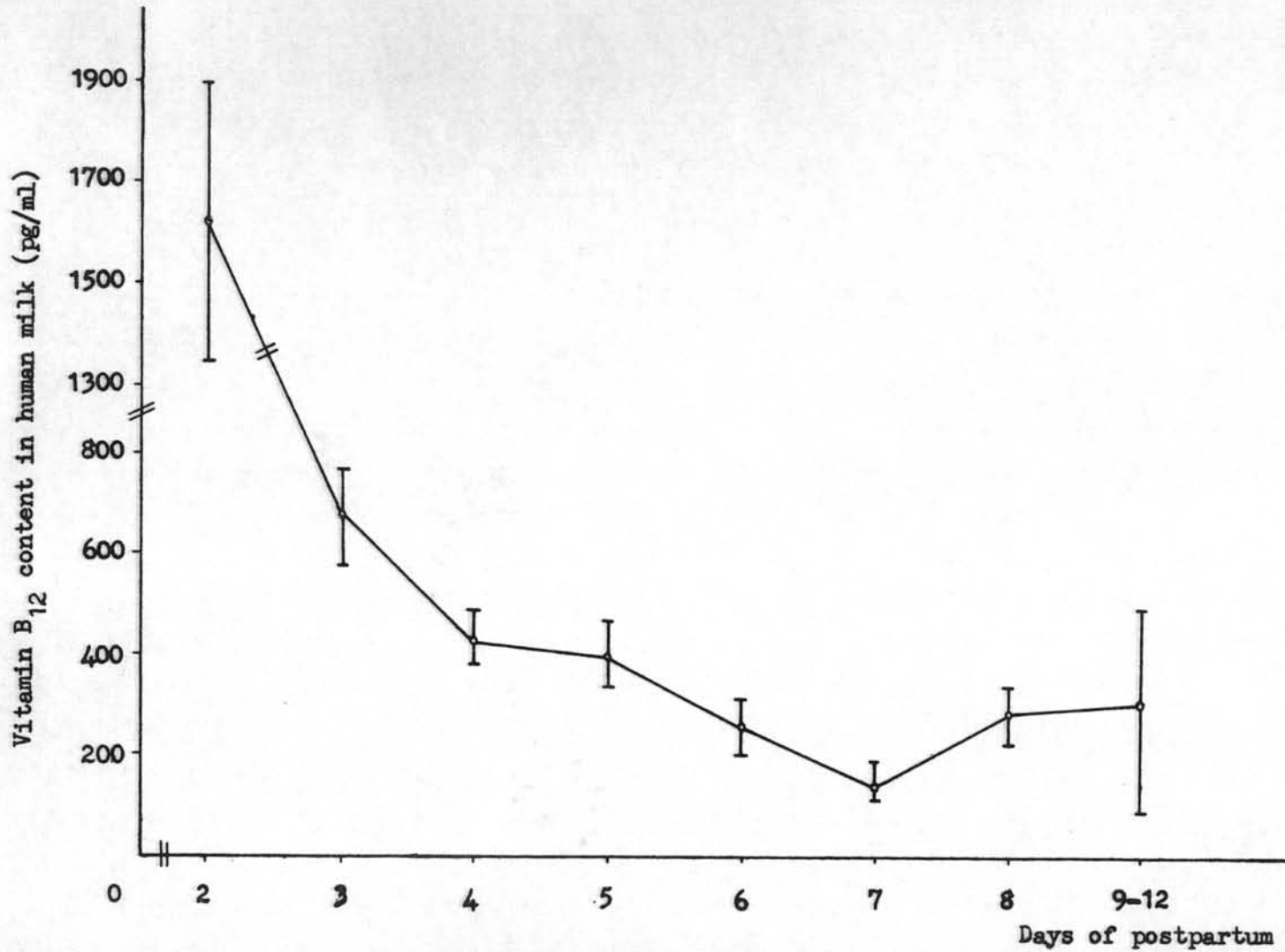


Figure 4 Relationship between vitamin B₁₂ Content (pg/ml, Mean \pm S.E.) of human milk and the postpartum period

There was no relationship between vitamin B₁₂ content in milk samples and the parity as shown in table 3. There were no statistically significant differences between these values in these parities.

Table 3. Relationship between vitamin B₁₂ content in human milk and the parity.

Parity	No. of samples	Vitamin B ₁₂ content (µg./ml.)	
		Mean \pm SD.	Range
1	53	527.3 \pm 544.5	69.8 - 2166.5
2	48	422.6 \pm 350.5	70.3 - 1635.7
3	60	467.7 \pm 609.6	63.4 - 3476.9
4	29	578.7 \pm 659.6	64.0 - 2609.1
5	19	543.7 \pm 480.8	97.1 - 1589.0
6-11	11	637.9 \pm 367.2	100.6 - 1199.6
Total	220	501.9 \pm 530.4	63.4 - 3476.9

2. Vitamin B₁₂ supplemented human milk. Results of vitamin B₁₂ content collected from 15 mothers whom were served as the control group are shown in table 4. Vitamin B₁₂ content in milk collected from two groups of mothers receiving vitamin B₁₂ 150 and 300 µg. per day are shown in table 5 and 6, respectively.

There seemed to be the increased vitamin B₁₂ content in milk samples from all three groups of subjects as shown in Fig. 5. However, the increased milk vitamin B₁₂ in those two vitamin B₁₂ supplemented groups were not higher than the control group as shown in table 7. This finding indicated that there was no effect of vitamin B₁₂ supplement on the vitamin B₁₂ content in milk samples in this study.

Table 4. Vitamin B₁₂ content in human milk in the control group.

No.	Vitamin B ₁₂ content (pg/ml.)					
	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
1.	206.9				65.3	68.2
2.	175.7	126.3	110.3	110.2		
3.			861.5	429.6	1107.8	639.1
4.		397.5	979.2	1351.9	966.9	
5.		348.6	139.1		108.5	
6.	774.7	652.0	269.5			
7.	537.6	340.5	328.2		438.9	550.2
8.		200.5	204.2	111.1	168.4	
9.		584.9	630.6	399.0	427.7	456.4
10.	218.3	201.9	247.6	534.5	204.5	
11.		547.1	904.3	470.0	1230.1	1003.2
12.		1019.2	152.5	363.2	512.3	
13.		159.0	246.1	338.8	364.3	
14.	242.6	61.7	87.7	106.9		
15.		121.7	69.5	110.3		
Mean	359.3	366.2	373.5	393.2	508.6	543.4
SD.	242.8	273.5	325.0	356.6	410.6	336.8
SEM.	99.1	75.8	86.8	107.5	123.8	150.6
Range	175.7- 774.7	61.7- 1019.2	69.5- 979.2	110.2- 1351.9	65.3- 1230.1	68.2- 1003.2

Table 5 Vitamin B₁₂ content in human milk of a group supplemented with vitamin B₁₂ 150 µg. per day.

No.	Vitamin B ₁₂ content (pg/ml.)					
	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
1.			731.3	1801.7	1773.7	1554.7
2.		173.4	851.7			430.7
3.		4807.0		1354.8	1630.4	1993.4
4.	156.4	61.0		77.7	127.8	
5.	595.9	681.9	744.9	1025.7		
6.	88.4	101.8	178.6	171.1	113.7	
7.	68.4	65.0	124.5	171.1		
8.	729.9	1022.7	1797.4	2294.5	1230.2	
9.	88.8	99.6	324.6	147.7	311.8	
10.	1210.3	513.1	1056.8	794.6	756.4	303.5
11.	1169.4	408.3	785.8	956.9	1458.9	2061.8
12.	704.2	633.4	715.7	708.2	599.0	
13.	613.9	434.3	188.5		240.5	464.7
14.	1333.4	931.4	1697.9	1790.5	1654.1	
15.	466.7	339.5	200.7		513.9	
16.	333.5	253.0	234.8	93.4	152.7	
17.	739.5	134.7	280.3		450.8	
18.	1429.8			335.7	321.8	
19.	207.4	88.8		415.9	765.1	
20.			105.5		804.3	280.2
21.	706.2		201.1	215.3		

Table 5 Vitamin B₁₂ content in human milk of a group supplemented with vitamin B₁₂ 150 µg. per day (Cont.).

No.	Vitamin B ₁₂ content (pg/ml.)					
	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
22.		1228.2	1282.1	763.8	1059.4	
23.	330.2	565.1	694.7	1012.6		
24.	1303.6		1337.3	2032.0		
25.	1434.0	420.3		243.3		
Mean	685.4	648.1	676.7	820.3	775.8	1012.7
SD.	478.1	1035.4	530.3	704.0	564.2	820.0
SEM.	106.9	231.5	118.5	157.4	132.9	309.9
Range	68.4- 1434.0	61.0- 4807.0	105.5- 1794.4	77.7- 2294.5	113.7- 1773.7	280.2- 2061.8

Table 6 Vitamin B₁₂ content in human milk of a group supplemented with vitamin B₁₂ 300 µg. per day.

No.	Vitamin B ₁₂ content (pg/ml.)					
	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
1.	693.4	354.7	688.8	769.2	401.5	
2.	1002.6		520.3		1196.9	1052.9
3.	985.5	882.4	668.0	529.9		
4.	226.4		127.4	137.8	179.4	
5.		1219.8	740.5	1037.7	2396.5	1777.0
6.	1672.7	1084.7		1602.2	1140.9	1506.1
7.	1312.7	174.7	385.3	112.9		
8.	905.3		236.6	213.4	132.4	216.2
9.	1129.8		1933.7	3362.2	2577.3	
10.	416.9	583.6	1323.9	347.2		540.5
11.	880.8		311.0		723.7	
12.	199.6	271.3	326.4		66.8	230.5
13.	1243.7	217.6	604.1		1480.6	1970.8
14.	1569.9			313.6	147.3	
15.	252.1	132.6		560.7	698.6	520.3
16.	271.7	418.4	908.3		1144.6	
17.	619.3	223.2	440.6	437.1	262.7	
18.	567.7	106.1		151.1	159.7	
19.	1801.3	1569.5	868.2	836.0		
20.	534.0		288.5	841.9	1154.5	
21.	195.2	297.8	251.4	997.8		

Table 6 Vitamin B₁₂ content in human milk of a group supplemented with vitamin B₁₂ 300 μ g. per day (Cont.) .

No.	Vitamin B ₁₂ content (pg/ml.)					
	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
22.	435.9		156.2	172.7	108.3	
23.	1121.9	482.9		149.4	142.5	167.2
24.	795.1	201.2	213.4		700.3	
25.	308.2	242.5	1182.3	2121.3	2163.7	2372.1
Mean	797.5	497.8	608.7	773.3	848.9	1035.3
SD.	486.6	432.0	458.6	824.5	797.6	817.6
SEM.	99.3	104.7	102.5	189.1	173.3	258.5
Range	195.2- 1801.3	106.1- 1569.5	127.4- 1933.7	112.9- 3362.2	66.8- 2577.3	216.2- 2372.1

Table 7. The mean values \pm one SD. and percentages of vitamin B₁₂ content in human milk of the control and the vitamin B₁₂ supplemented groups.

Group	Day 4		Day 5		Day 6		Day 7		Day 8		Day 9	
	Mean \pm SD.	%	Mean \pm SD.	%	Mean \pm SD.	%	Mean \pm SD.	%	Mean \pm SD.	%	Mean \pm SD.	%
Control	359.3 \pm 242.8	100	366.2 \pm 273.5	101.9	373.5 \pm 325.0	103.9	393.2 \pm 356.6	109.4	508.6 \pm 410.6	141.5	543.4 \pm 366.8	151.2
150 ug. per day	685.4 \pm 478.1	100	648.1 \pm 1035.4	94.5	676.7 \pm 530.3	98.7	820.3 \pm 704.0	119.7	775.8 \pm 564.2	113.1	1012.7 \pm 820.0	147.7
300 ug. per day	797.5 \pm 486.6	100	497.8 \pm 432.0	62.4	608.7 \pm 458.6	76.3	773.3 \pm 824.5	96.9	848.9 \pm 797.6	116.3	1035.3 \pm 817.6	141.9

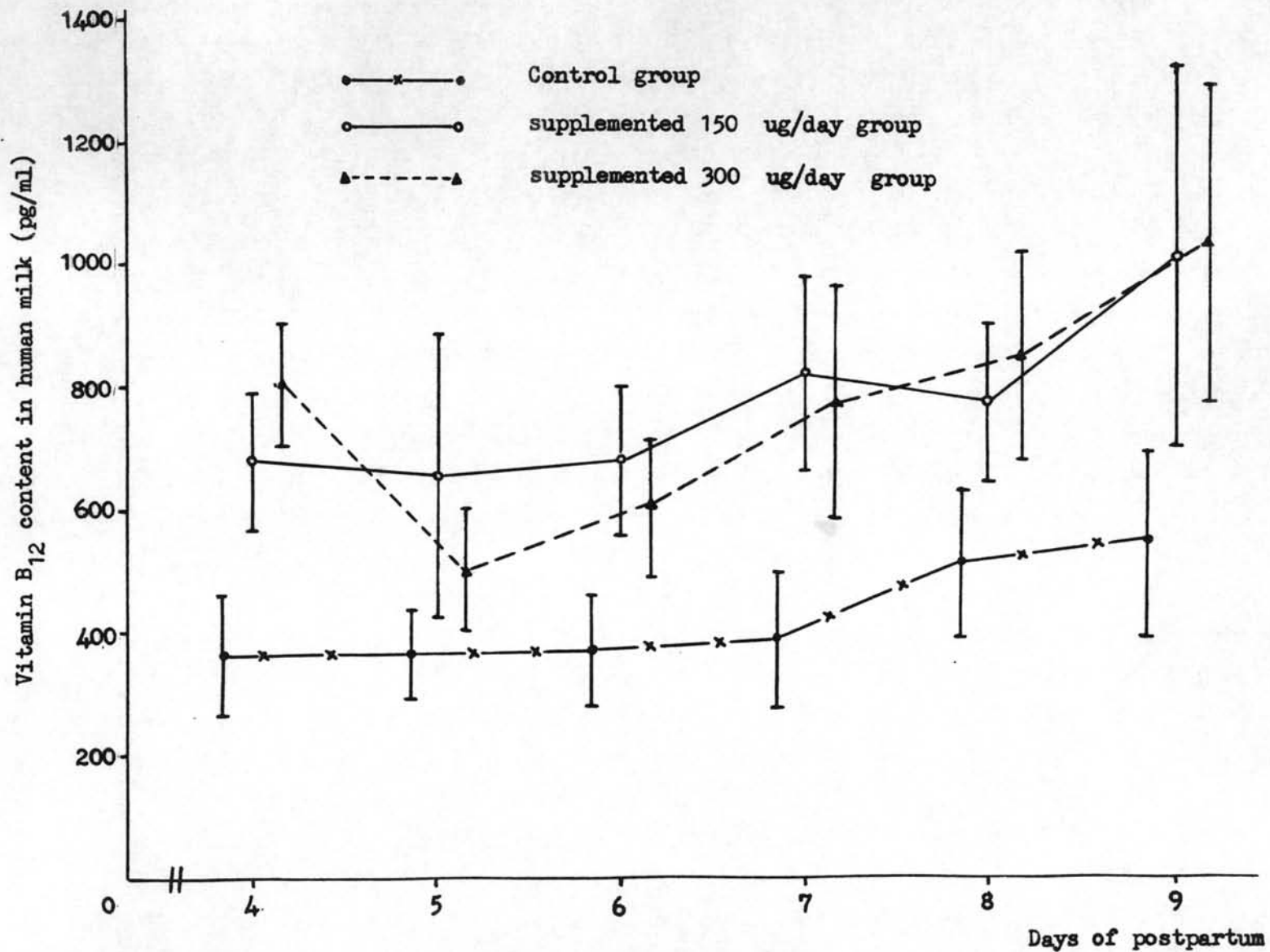


Figure 5 Vitamin B₁₂ content (pg/ml, Mean \pm S.E.) in human milk of control and supplemented groups.

Cow's Milk.

1. Pasteurized cow's milk. Vitamin B₁₂ concentrations of pasteurized cow's milk bought from the market are shown in table 8. A mean value \pm one SD. of vitamin B₁₂ content was found to be 1640.2 ± 432.9 pg/ml. with the range of 1066.0 to 2377.6 pg/ml.

Table 8. Vitamin B₁₂ content in pasteurized cow's milk.

Commercial name	Vitamin B ₁₂ content (pg/ml.)
Denmark, sweetened	1066.0
Denmark, unsweetened	2079.7
Dusit	1593.3
Pure	1393.6
Kaset	1185.0
Foremost, blueseal	1734.8
Nong Phoe, sweetened	2377.6
Nong Phoe, unsweetened	1691.6
N.	8
Mean	1640.2
SD.	438.9
SEM.	155.1
Range	1066.0 - 2377.6

2. Powdered milk. The results of vitamin B₁₂ in 25 samples of powdered milk is shown in table 9. The range of vitamin B₁₂ content was between 6.7 to 79.0 ng/g. with a mean value \pm one SD. of 20.8 \pm 17.8 ng/g.

Table 9. Vitamin B₁₂ content in powdered milk.

No.	Commercial name	Vitamin B ₁₂ (ng/g.)	Remark.
1.	Bear, sweetened	79.0	No. 1 to 15 were infant food formular in powdered form.
2.	Bear, full-protein	75.9	
3.	Nan	21.2	
4.	Dumex	7.9	
5.	Dumilk, full-protein	19.0	
6.	Lactogen	17.0	
7.	Lactogen, full-protein	24.0	
8.	Alacta-NF.	10.9	
9.	S-26	12.5	
10.	Pelargon	11.7	
11.	Snow-P7f.	19.8	
12.	Mamex	21.1	
13.	Meiji	17.6	
14.	Enfamil with iron	13.8	
15.	Similac with iron	20.4	
16.	Dusit, sweetened	19.0	No. 16 to 18 were instant nonfat powdered milk.
17.	Dusit, unsweetened	28.9	
18.	Alluwrie	14.9	

Table 9. Vitamin B₁₂ content in powdered milk. (Cont.)

No.	Commercial name	Vitamin B ₁₂ (ng/g.)	Remark.
19.	Dumilk, sweetened	14.5	No. 19 to 25 were full cream powdered milk.
20.	Klim	10.9	
21.	Nespray	14.6	
22.	Dusit, sweetened	7.1	
23.	Dusit, unsweetened	14.4	
24.	Molly	18.6	
25.	Oak.	6.7	
	N	25	
	Mean	20.8	
	SD.	17.8	
	SEM.	3.5	
	Range	6.7 - 79.0	

3. Condensed milk. Vitamin B₁₂ content in 11 samples of condensed milk are shown in table 10. A mean value \pm one SD. of these samples was 3332.4 ± 712.8 pg/ml. and ranged from 2329.7 to 4925.2 pg/ml.

Table 10. Vitamin B₁₂ content in condensed milk.

No.	Commercial name	Vitamin B ₁₂ (^{pg/ml.} ng/g.)	Remark.
1.	Bear	3581.5	No. 1 to 3 were recombined condensed fullcream sweetened milk.
2.	Family	4925.2	
3.	Child	3732.0	

Table 10. Vitamin B₁₂ content in condensed milk (Cont)

No.	Commercial name	Vitamin B ₁₂ (pg/ml.)	Remark.
4.	Mali	3870.1	No. 4 to 11 were sweetened condensed skimmed milk with non-milkfat.
5.	Ship	2329.7	
6.	Alaska	3166.8	
7.	Disa	3085.5	
8.	Rose	2435.6	
9.	Birdwings	3106.3	
10.	Falcon	3379.0	
11.	Lobster	3045.2	
	N	11	
	Mean	3332.4	
	SD.	712.8	
	SEM.	214.9	
	Range	2329.7 - 4925.2	

4. Evaporated whole and skimmed milk. The vitamin B₁₂ content of 12 samples of evaporated whole and skimmed milk are shown in table 11. The vitamin B₁₂ content ranged from 12.3 to 542.6 pg/ml. with a mean value \pm one SD. of 265.2 ± 152.6 pg/ml.

Table 11. Vitamin B₁₂ content of evaporated whole and skimmed milk.

No.	Commercial name	Vitamin B ₁₂ (pg/ml.)	Remark.
1.	Denmark, sweetened	164.3	Sterilized milk.
2.	Denmark	149.1	Sterilized milk.
3.	Bear	12.3	Reconstituted sterilized milk.
4.	Carnation	263.3	No.4 to 6 were recombined unsweetened condensed whole milk, evaporated, pasteurized and sterilized
5.	Mali	290.3	
6.	Dutchbaby	145.6	
7.	Falcon	542.9	No. 7 to 10 were unsweetened condensed skimmed milk with non-milkfat.
8.	Alaska	291.3	
9.	Lobster	137.9	
10.	Birdwings	369.9	
11.	Eagle	471.9	Unsweetened sterilized and homogenised milk.
12.	Fram	344.7	Unsweetened and homogenised milk.
	N	12	
	Mean	265.2	
	SD.	152.6	
	SEM.	44.0	
	Range	12.3 - 542.6	

5. Cow's milk. Vitamin B₁₂ content of 20 samples of fresh, pasteurized and sterilized cow's milk are shown in table 12. The mean values \pm one SD. of fresh, pasteurized and sterilized cow's milk were 1517.9 ± 874.5 , 1353.6 ± 775.3 , and 855.1 ± 648.4 pg/ml., respectively.

Table 12. Vitamin B₁₂ content of fresh, pasteurized and sterilized cow's milk.

No.	Age (yrs.)	Lactation (months)	Vitamin B ₁₂ content(pg/ml.)			Remark.
			Fresh	Pasteurized	Sterilized	
1.	11	6.0	1885.4	1872.7	943.9	No. 1. to 12 were <u>Holstein</u> <u>Fresian</u> cow's strain.
2.	7	4.5	2546.0	2077.7	1638.9	
3.	5	3.5	720.6	715.3	392.0	
4.	4	5.5	291.5	171.1	48.7	
5.	4	6.0	2497.8	2418.3	1162.5	
6.	4	7.0	343.3	233.7	21.1	
7.	4	3.5	660.4	563.0	82.3	
8.	4	6.5	1156.0	928.4	166.2	
9.	4	8.5	2646.5	2557.2	1674.8	
10.	4	0.5	3400.6	2762.1	2133.6	
11.	3	10.0	1341.6	1257.0	710.4	No. 13 to 20 were <u>Brown-</u> <u>Swiss</u> cow's strain.
12.	9	10.5	1846.9	1684.7	1587.0	
13.	2	7.5	784.0	710.7	195.7	
14.	2	3.0	827.6	805.0	223.9	
15.	3	0.5	2267.6	1928.2	1359.1	
16.	3	1.0	1772.3	1695.8	769.6	
17.	6	11.0	718.3	665.7	519.0	
18.	5	11.0	928.6	865.8	775.9	
19.	6	0.5	2155.2	1794.6	1560.1	
20.	5	1.0	1567.7	1374.0	1159.9	

Table 12. Vitamin B₁₂ content of fresh, pasteurized and sterilized cow's milk. (Cont.)

	Vitamin B ₁₂ content (pg/ml.)		
	Fresh	Pasteurized	Sterilized
N	20	20	20
Mean	1517.9	1353.6	855.7
SD.	874.5	775.3	648.4
SEM.	195.6	173.3	146.0
Range	291.5- 3400.6	171.1- 2762.1	21.1- 2133.6

There was no significant difference between the vitamin B₁₂ content in the fresh and pasteurized cow's milk ($P > 0.05$). However, these values in the fresh and pasteurized cow's milk were significant higher than that of the sterilized cow's milk ($P < 0.05$).

6. Cheese and butter. The content of vitamin B₁₂ in 16 samples of cheese and 4 samples of butter are shown in table 13 and 14, respectively. The mean values \pm one SD. of vitamin B₁₂ were 0.107 ± 0.159 and 0.031 ± 0.013 ug. per 100 g., with the range from 0.020 to 0.689 and 0.011 to 0.040 ug. per 100 g., respectively.

Table 13. Vitamin B₁₂ content of the cheese.

Commercial name	Vitamin B ₁₂ (ug/100g.)
Havati Galaxy Cheese (New Zealand)	0.022
Gourmandise Petit (French)	0.105
Samsøe cheese (Denmark)	0.106
La Bonne Vache cheese (French)	0.050
Swiss Knight cheese (Switzerland)	0.177
Chesdale cheese(New Zealand)	0.043
Anchor cheese (New Zealand)	0.061
Goulde cheese (Netherland)	0.076
Edams cheese (Netherland)	0.048
Alluwrie cheese (Australia)	0.058
Gruyere cheese (Switzerland)	0.689
Saint Pauline cheese (Denmark)	0.045
Danbo Galaxy cheese (New Zealand)	0.075
Kraft (USA)	0.064
Ruff Slices cheese (Austria)	0.080
Thai-German Dairy (Thailand)	0.020
N	16
Mean	0.107
SD.	0.159
SEM.	0.039
Range	0.020 - 0.689

Table 14. Vitamin B₁₂ content of butter.

Commercial name	Vitamin B ₁₂ (ug/100 g.)
Orchid (Thailand)	0.011
Lurpek (Denmark)	0.040
Violet (Thailand)	0.040
Dannie (Thailand)	0.034
N	4
Mean	0.031
SD.	0.013
SEM.	0.006
Range	0.011 - 0.040