

## NITROGEN BALANCE STUDY IN LACTATION\*

by

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The work arose out of general studies on protein metabolism in pregnancy and lactation. Coons and Blunt (1930) and Hazari, *et al* (1965) have shown that in pregnant women nitrogen retention increases with increasing intake of nitrogen and on the same intake of nitrogen there is wide variation in the nitrogen retention in some of the cases. Narasinga Rao, *et al* (1958) had similarly carried out nitrogen balance studies in lactating women and recommended an intake of 15.2 g. nitrogen per day for lactating women. In the present communication the nitrogen balance studies were made in 9 lactating women and three of these cases the metabolic studies were made both during pregnancy and lactation. The effect of nitrogen intake on milk secretion were also studied.

### Material and Method

#### Selection of Cases

Nitrogen balance was determined in 9 lactating women and their Hb% was above 60.%. The nitrogen balance studies

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were done between 17th and 52nd day following delivery. The interval between nitrogen balance studies at two levels of protein intake has varied from 7 to 14 days (Table I and II) which is close to the general methodology of recommendation of 10 days. The subjects were admitted to the hospital during the entire period of study. The proper feeding of the mother for nitrogen balance was started after the babies regained their birth weight. Four subjects (Case Nos. 13, 14, 15 and 18) had normal delivery and another five (Case Nos. 16, 17, 19, 20 and 22) were of caesarean section. In all operated cases, the experiments were begun 14-32 days after the operation. Each woman was stabilized on a diet for seven days and the nitrogen balance was studied in the following three days. The weight of the subjects were also recorded at suitable intervals. The principle of feeding was that of Hazari, *et al* (Loc. Cit.).

The composition of diet, collection and preservation of urine and faeces, estimation of total nitrogen and creatinine has been based on the technique of Hazari, *et al* (Loc. Cit.).

#### Collection of milk

The mother expressed 10 ml. milk from each breast before feeding the infant and again 10 ml. milk after the feeding was over. The two samples were mixed and 5 ml. of the mixed sample was taken for the estimation of total nitrogen.

Results

Nos. 13, 14 and 15 are recorded in Table I.

Nitrogen balance in pregnancy and lactation

Nitrogen balance in lactation: The results of nitrogen balance studies in lactation in Case Nos. 16, 17, 18, 19, 20 and 22 are recorded in Table II.

The results of nitrogen balance studies in both pregnancy and lactation in case

TABLE I  
Nitrogen balance in pregnancy and lactation at different levels of nitrogen intake

Case	Age	Weeks of pregnancy	No. of days after delivery	Nitrogen intake g.	Nitrogen output				Nitrogen balance g.
					Urine g.	Faeces g.	Milk g.	Total g.	
13	31	26	..	11.29	6.55	2.70	..	9.25	2.03
		27-28	..	14.86	8.94	3.46	..	12.14	2.45
		29-30	..	17.60	9.30	2.84	..	12.14	4.66
		..	30	14.86	8.38	3.26	0.51	12.15	2.71
		..	37	17.60	11.86	2.79	0.73	15.38	2.22
14	20	28-29	..	11.29	5.63	3.13	..	8.81	2.37
		30	..	14.86	7.66	2.67	..	10.33	4.52
		31-32	..	14.86	8.11	2.72	..	10.83	4.02
		..	26	14.86	10.27	2.43	2.39	15.09	-1.23*
		..	39	17.60	11.18	3.14	1.15	15.47	2.13
15	35	24-25	..	11.29	7.46	2.40	..	9.86	1.46
		26-27	..	14.86	9.26	2.27	..	11.53	2.99
		27-28	..	17.60	9.69	2.69	..	12.38	5.63
		31-32	..	11.29	5.77	3.82	..	9.59	2.02
		34	..	14.86	7.71	3.33	..	11.04	3.81
		36-37	..	17.60	8.60	4.75	..	13.35	4.24
		37	..	11.29	7.57	3.06	1.80	12.43	-1.14*
		44	..	14.86	8.03	3.72	1.87	13.62	1.14
52	..	17.60	10.00	4.18	1.89	16.07	1.53		

\* " - " denotes negative nitrogen balance.

TABLE II  
Nitrogen balance in lactation at different levels of nitrogen intake

Case No.	Age	No. of days after delivery	Nitrogen intake	Nitrogen output				Nitrogen Balance g.
				Urine g.	Faeces g.	Milk g.	Total g.	
16	22	32	17.60	8.99	2.31	1.73	13.03	4.57
17	35	22	17.60	8.73	2.23	1.22	12.28	5.32
18	20	27	11.29	6.87	1.53	0.80	9.20	2.09
		41	14.86	8.10	1.71	1.79	11.60	3.26
		49	17.60	8.12	2.32	2.08	12.52	5.08
19	23	14	11.29	5.59	2.66	1.34	9.59	1.70
		25	14.86	7.14	3.44	1.15	11.73	3.13
20	28	6	11.29	6.66	2.64	1.46	10.76	0.43
		15	14.86	8.23	3.67	1.81	13.71	1.15
22	28	21	11.29	8.49	2.15	1.33	11.93	-0.68
		28	14.86	10.39	2.78	1.42	15.59	-0.73
		36	17.60	10.90	2.49	1.53	14.92	2.68

*Nitrogen retention and milk secretion:* Table III shows the effect of different levels of nitrogen intake on nitrogen retention and milk secretion.

Body weight during nitrogen balance studies. Table IV shows the body weight during nitrogen balance studies during pregnancy and lactation.

#### Discussion

The nitrogen balance studies in pregnant women have demonstrated that nitrogen retention increases with increasing intake of nitrogen and on the same intake of nitrogen there is wide variation in the nitrogen intake (Coons & Blunt, Loc. Cit.; Hazari, et al, loc cit.)

The nitrogen balance studies in lactating women also showed that nitrogen

retention increases with increasing intake of nitrogen (Narasinga Rao et al, loc. cit.).

The present communication points a number of interesting differences in nitrogen retention between pregnancy and lactation. The nitrogen retention markedly dropped in case nos. 13, 14 and 15 during lactation compared with pregnancy (Table I). Moreover, the nitrogen retention in pregnancy had shown that at a mean nitrogen intake of 11.3, 14.60 and 17.60 g/day, the mean value of retention was 1.53, 3.69 and 7.11 g./day respectively (Hazari, et al, loc. cit), whilst in lactation, at a mean nitrogen intake of 11.29, 14.86 and 17.6 g./day the mean nitrogen retention was 0.68, 2.12 and 3.92 g./day respectively. These observations suggest that the ability of the body to retain

TABLE III  
*Nitrogen retention and milk secretion at different levels of nitrogen intake*

Total No. of estimations	Nitrogen intake g.	Retention of nitrogen		Volume of milk secreted in 24 hours	
		Range of retention	Average retention (g)	Range of secretion (ml.)	Average (ml.)
5	11.29	-1.15* to 2.35	0.68	401.6 to 669.7	584.3
7	14.86	-0.25* to 5.43	2.12	261.4 to 745.2	577.7
7	17.60	1.57 to 8.00	3.92	203 to 792.4	587.6

\* " - " Denotes negative nitrogen balance.

TABLE IV

Case No.	Body weight (lbs.) and weeks of pregnancy						Body weight (lbs.) and number of days after delivery				Time of delivery
	10-15	16-20	21-25	26-30	31-35	36-40	Days	Weight (lbs.)	Days	Weight (lbs.)	
13			91	103	111	..	26	106			36th week
14			98	101	106		17	101			36th week
15	125		136		141	143	10	138			39th week
16						84	6	75	35	79	38th week by case.
17					123		9	116	14	116	39th week
18			114				12	106	48	108	28th week
19							74	70			40th week
20							76				38th week
22						120	10	121	33	127	40th week

nitrogen markedly drops following delivery.

Case No. 15 was in negative nitrogen balance at an intake of 11.29 g./day, and Case No. 14 and 22 were at negative nitrogen balance even at an intake of 14.86 g./day. All cases were in positive nitrogen balance at an intake of 17.6 g./day. Therefore, it is apparent that a nitrogen intake between 14.86 and 17.6 g./day (an average of 16.23 g.) will induce positive balance in most of the cases of lactation. Similar observations were made by Narasinga Rao, *et al* (Loc. Cit.).

The milk secretion does not seem to be related to nitrogen intake (Table III) and apparently seems to be an individual characteristic which corroborates the work of Bourne and William (1953) in animals who stated that there is not much variation in the composition of milk even after harsh nutritional condition.

#### Summary

The work incorporates nitrogen balance studies in 9 lactating women, out of which the nitrogen balance was determined, both during pregnancy and lactation, in 3 cases. The nitrogen retention markedly drops during lactation compared with pregnancy. The milk secretion does not seem to be related to nitrogen intake.

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