RELATIONSHIP OF MATERNAL AND FOETAL PLASMA AMINOACIDS IN NORMAL PREGNANCIES AND PREGNANCIES ASSOCIATED WITH ANAEMIAS

by

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There is good evidence that levels of aminoacids in foetal plasma are higher than in maternal plasma (Christenson and Streicher, 1948; Crumpler, *et al*, 1950; Glendening, Morgolis and Page, 1961) in cases of normal pregnancies. The differences have been explained differently by the different workers.

No work is available in the literature about the relationship of maternal and foetal plasma aminoacids in pregnancies associated with iron deficiency and megaloblastic anaemias.

Material and Methods

Twenty-six pregnant women near term were studied at Medical College & Hospital, Rohtak. The patients were divided into three groups:

(a) Nine normal cases having haemoglobin above 10 gm%.

(b) Ten cases with iron deficiency anaemia.

(c) Seven cases with megaloblastic anaemia.

The diagnosis of megaloblastic and iron deficiency anaemia was based on examination of peripheral blood smear. The diagnosis of megaloblastic anaemia was confirmed by bone marrow smear as well.

Maternal blood samples were collected at the end of the second stage of labour. For the study of foetal plasma aminoacids, cord arterial blood samples were collected.

Estimation of Plasma Aminoacids

This was done by the technique already reported by the authors (1977).

Observations

In all the three groups plasma aminoacids levels were higher on foetal side as compared to the maternal side exceptions being the levels of alanine in the normal and megaloblastic groups and the complex I i.e. glycine and glutamine in iron deficiency group. Most of the previous workers also found uniform rise of plasma aminoacids on foetal side. The higher levels of foetal plasma aminoacids were explained by postulating active placental transfer by Nehinny (1930-31), Naeslund

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TABLE I

Maternal and Foetal Plasma Aminoacids in Normal Pregnancy (Conc. in mg%)

S. No.	Aminoacids	Maternal plasma aminoacids			Foetal plasma aminoacids		
		Mean	S.D.	Range	Mean	S.D.	Range
*1.	Leucine	2.26	1.21	1.21- 4.28	3.62	3.13	1.12-11.43
**2.	Methionine	5.65	2.77	3.06- 8.57	7.28	3.98	1.82-12.38
3.	Tyrosine	1.88	1.33	0.36- 2.86	9.34	12.33	1.07-31.43
4.	Alanine	10.33	9.97	3.50-27.86	5.84	2.66	2.71-11.04
5.	Threonine	4.16	—	—	5.38	1.52	3.75- 7.92
6.	Serine	3.52	3.22	0.62- 8.12	4.01	2.18	1.70- 7.50
7.	Complex I (Glycine and (glutamine)	5.98	4.22	2.53-12.86	8.83	8.57	1.10-26.43
8.	Complex II (Histidine and lysine)	3.74	4.09	0.97-11.81	5.75	3.34	1.00-12.50

* Composite spot of leucine and isoleucine.

** Composite spot of methionine and valine.

(1931), Levy-Solal *et al* (1934). Christenson and Streicher (1948), Crumpler *et al* (1950) suggested that increased concentrations of taurine and alpha aminobutyric acid seen in some of foetal plasma were probably synthesised by the foetuses from other aminoacids.

Levels of the most of the aminoacids in foetal plasma were lower in the iron deficiency group and were higher in the megaloblastic group compared to the normal group. Notable exceptions were leucine and complex I i.e. glycine and glutamine in the iron deficiency group

TABLE II

Maternal and Foetal Plasma Aminoacids in Iron Deficiency Anaemia (Conc. in mg%)

S. No.	Aminoacids	During delivery			Foetal plasma		
		Mean	S.D.	Range	Mean	S.D.	Range
*1.	Leucine	3.25	2.62	0.39- 8.47	4.26	2.31	1.33- 8.00
2.	Ph. alanine	2.35	1.55	0.81- 4.28	3.28	2.25	0.61- 6.07
**3.	Methionine	2.96	2.97	0.50- 8.57	4.63	8.57	0.48-22.10
4.	Tyrosine	4.08	5.72	0.57-14.28	5.51	7.71	0.88-22.80
5.	Alanine	2.60	1.19	0.71- 4.44	3.24	1.76	0.36- 5.87
6.	Threonine	2.22	1.42	0.71- 3.33	2.91	1.41	1.25- 5.41
7.	Serine	0.88	0.38	0.21- 1.14	1.79	0.95	0.31- 3.12
8.	Complex I (Glycine and glutamine)	10.66	15.58	1.38-38.6	9.60	9.55	0.91-27.14
9.	Complex II (Histidine and lysine)	0.03	2.90	1.53- 4.55	3.42	0.96	1.53- 4.55

* Composite spot of leucine and isoleucine.

** Composite spot of methionine and valine.

and alanine, serine and complex III i.e. histidine and lysine for the megaloblastic group.

The low foetal plasma aminoacid levels in foetuses born to the mothers with iron deficiency anaemia is understandable from the results of our previous study (Sandhu, *et al*, 1977). In that study it was found that predelivery plasma aminoacid levels were lower in iron deficiency group compared to the normal group. Thus it simply means that in both groups maternal pattern is reflected in foetal pattern. The higher levels of plasma aminoacids in foetuses born to the mothers suffering from megaloblastic anaemia is not easy to explain as we failed to find rise in plasma aminoacid levels in mothers suffering from megaloblastic anaemia (Sandhu, *et al*, 1977). Although Jacob and Fleming (1970) reported higher levels of plasma aminoacids in megaloblastic anaemia compared to the normal control group which they attributed to failure of protein synthesis in megaloblastic anaemia. Placental function is however, to be impaired in folic acid deficiency and this fact would make it still more difficult to explain higher plasma aminoacid levels in the foetuses born to these mothers.

TABLE III

Maternal and Foetal Plasma Aminoacids in Megaloblastic Anaemia (Conc. in mg%)

S. No.	Aminoacids	Maternal plasma aminoacids			Foetal plasma aminoacids		
		Mean	S.D.	Range	Mean	S.D.	Range
*1.	Leucine	3.72	1.28	2.5 - 5.24	4.82	2.30	1.60- 8.57
2.	Ph. alanine	—	—	—	4.08	1.66	0.86- 5.31
**3.	Methionine	10.91	7.53	7.55-14.28	11.79	13.64	2.14-21.43
4.	Tyrosine	9.53	12.89	2.64-16.43	10.58	11.69	2.85-24.28
5.	Alanine	5.84	2.91	3.16-10.48	4.81	4.80	0.71-14.29
6.	Threonine	2.36	1.07	1.25- 3.33	7.88	7.04	2.77-18.14
7.	Serine	3.42	2.73	0.68- 7.5	3.97	3.78	1.59- 8.75
8.	Complex I (Glysine and glutamine	5.36	5.25	2.86-18.57	10.91	12.54	1.53-31.43
9.	Complex II (Histidine and lysine)	3.07	2.55	1.17- 8.10	4.49	3.39	2.35-10.95

* Composite spot of leucine and isoleucine.
** Composite spot of methionine and valine.

Reports about folic acid status of the foetus of mothers suffering from folic acid deficiency anaemia are controversial. (Pritchard, *et al*, 1969; Robert, *et al*, 1969; Vanier and Tyas, 1966). However, the present findings of higher foetal plasma aminoacid levels would be easy to explain on the basis of failure of protein synthesis due to folic acid deficiency of the infant. In the present study, however, folic acid status of the mothers or their foetuses was not worked out.

TABLE IV

Foetal Plasma Aminoacids in Normal Pregnancies and Pregnancies Associated With Iron Deficiency Anaemia and Megaloblastic Anaemia (Conc. in mg%)

S. No.	Aminoacids	Normal foetal plasma aminoacids			Iron deficient foetal plasma aminoacids			Megaloblastic foetal plasma aminoacids		
		Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
*1.	Leucine	3.62	3.13	1.12-11.43	4.26	2.31	1.33- 8.00	4.82	2.30	1.60- 8.57
2.	Ph. alanine	—	—	—	3.28	2.25	0.61- 6.07	4.08	1.66	0.86- 5.31
**3.	Methionine	7.28	3.98	1.82-12.38	4.63	8.57	0.48-22.10	11.79	13.64	2.14-21.43
4.	Tyrosine	9.34	12.33	1.07-31.43	5.51	7.71	0.88-22.80	10.58	11.69	2.85-24.28
5.	Alanine	5.84	2.66	2.71-11.04	3.24	1.76	0.36- 5.87	4.81	4.80	0.71-14.29
6.	Threonine	5.38	1.52	3.75- 7.92	2.91	1.41	1.25- 5.41	7.88	7.04	2.77-18.14
7.	Serine	4.01	2.18	1.70- 7.50	1.79	0.95	0.91-27.14	3.97	3.78	1.59- 8.75
8.	Complex I (Glysine and glutamine	8.83	8.57	1.10-26.43	9.60	9.55	0.31- 3.12	10.91	12.54	1.53-31.43
9.	Complex II (Histidine and lysine)	5.75	3.34	1.00-12.50	3.42	0.96	1.53- 4.55	4.49	3.39	2.35-10.95

* Composite spot of leucine and isoleucine.

** Composite spot of methionine and valine.

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