

Erythrocyte Phospholipids in the Newborn Infant.* (27864)

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The human erythrocyte has been shown to contain a large amount of phospholipid which is located primarily in the stroma(1). No synthesis of these lipids occurs in the erythrocyte except perhaps in the youngest cell(2,3), and as the red cells age there is a change in both total(4) and individual phospholipids (5). Although the fatty acid side chains vary with the diet(6), the phospholipids show very little individual variation in the human cells(1,7,8). However, both the fatty acid side chains(9) and the individual phospholipids of the erythrocyte are characteristic of the animal species(5,10).

The erythrocyte phospholipids have not been investigated in the human newborn infant, although determinations have been made in older children(8). Transport mechanisms(11,12) and cell longevity(13) are equal in newborn infants and in adults. Since these characteristics are possibly dependent on phospholipids, we have undertaken the identification and measurement of these phospholipids in erythrocytes from newborn infants and to compare these values with those of red blood cells from human adults.

Methods. Five ml of blood were drawn from hematologically normal adult controls and newborn infants of 1 to 2 days of age. This was placed in 0.5 ml of ethylenediamine tetraacetic acid (EDTA) 1 mg % solution and analyzed immediately.

The erythrocytes from 9 newborn infants and 7 adults were prepared and extracted by the method of Reed *et al.*(8). For column chromatography of the infant red cells, blood from 4 infants was pooled to give a 20 cc volume.

Erythrocyte stroma from 29 newborn infants and 26 adults was prepared and extracted by the method of Dawson *et al.*(14), except that the stroma was collected after centrifugation at 16,000 g.

Phosphorus determinations were performed

TABLE I. Micrograms of Lipid Phosphorus from One ml of Infant and Adult Erythrocytes.

	Erythrocyte stroma		Total erythrocyte	
	Infant	Adult	Infant	Adult
Mean	119.6	115.6	130	122.9
Range	120-150	120-148	126-157	122-145

by the method of Marinetti(15).

Silicic acid chromatography was performed using 2,6 di-methyl-4-heptanone, n-butyl ether, acetic acid and water as a solvent(8). Quantitative determinations of the individual phospholipid was done by the method of Marinetti(15). Recovery of phospholipid was always greater than 95% of the total amount applied.

Column chromatography was carried out on silicic acid columns(1) and silicic acid, silicate, water columns(16).

Plasmalogen determinations were not performed since they have been shown to be present in only trace amounts(1).

Results. Table I shows the comparison of the total phospholipid values of the 2 groups of erythrocytes. There is no significant difference in either. The data show that in the infant 92% of the mean total phospholipid is located in the red cell stroma and 94% in the adult. This is similar to the differential value found by Hanahan *et al.*(1).

Fig. 1 shows the elution pattern of both adult and infant red cells on a silicic acid column. Both are identical. Peak A contains lysolecithin, B phosphatidyl serine and phosphatidyl ethanolamine, C inositol phosphatide, D lecithin and E lecithin and sphingomyelin.

Fig. 2 shows the chromatographic separation of the lipids in Peak B from Fig. 1 on silicic acid, silicate, water column. Identical values are shown with Peak 1 containing phosphatidyl ethanolamine and Peak 2 containing phosphatidyl serine.

Silicic acid paper chromatography demonstrated 6 phospholipids in both infants and

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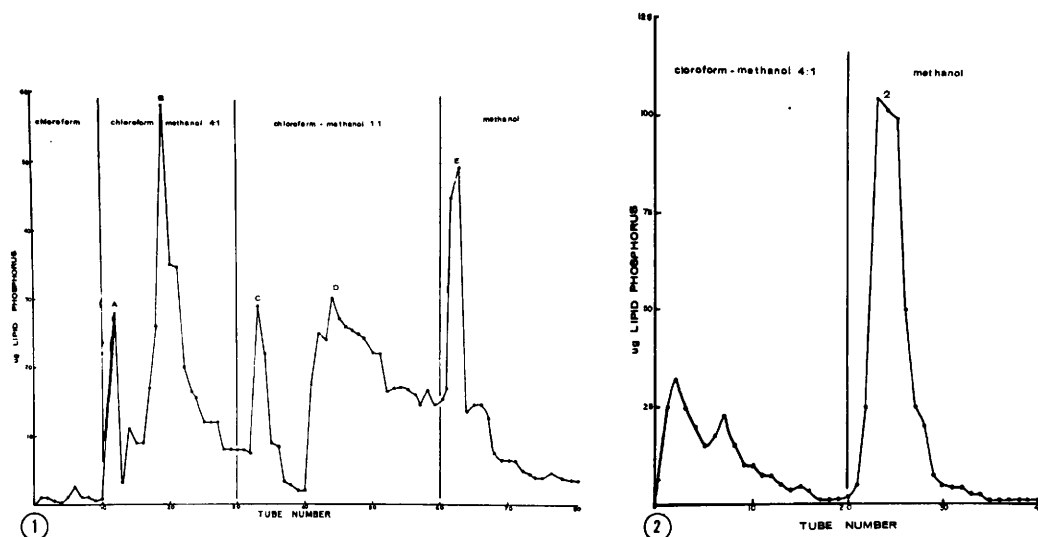


FIG. 1. Silicic acid chromatography pattern of the phospholipids from the erythrocytes of human adults and newborn infants.

FIG. 2. Silicic acid, silicate, water chromatography pattern of Peak B in Fig. 1.

adults. Table II shows the values for the percentage of the individual phospholipids obtained on silicic acid paper chromatography. The values are not significantly different between the two groups.

TABLE II. Percentage of Individual Phospholipids from Entire Erythrocytes of Infants and Adults.

	Newborns		Adults	
	Mean	Range	Mean	Range
Inositol				
phosphatide	4.5	2.6-6.5	4.2	3.0-5.4
Sphingomyelin	30.3	27.2-32.2	28.9	26.5-30.4
Lecithin	34.2	31.9-38.4	36.0	31.7-37.2
Lysolecithin	2.7	1.0-3.6	1.7	1.0-3.0
Phosphatidyl				
serine	8.5	5.0-10.0	7.1	4.8-10.5
Phosphatidyl				
ethanolamine	19.9	16.0-24.0	24.8	17.5-25.5

Conclusions and summary. The total phospholipids from both the entire erythrocyte and the erythrocyte stroma of the newborn infant have been shown to be equal to the adult. The individual phospholipids from the entire red cell have been shown to be identical to the adult, both in identity and in quantitative determination.

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