

STUDY OF VITAMIN E
IN
FULL TERM & PRETERM NEWBORN INFANTS.

Thesis

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in
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Introduction

and

aim of the work.

There has been a considerable evidence that vitamin E level is a potent antiperoxidant at the cellular level (Tappel, 1973) . There is a general agreement on the significance of low plasma vitamin E level in the etiology of clinical condition such as anaemia and hyperbilirubinemia in the newborn (Leonard et al, 1972).

In this study, we intended to demonstrate the effect of some demographic factors such as age of the mother, parity, birth weight and gestational age of the newborns on the cord plasma vitamin E level.

In addition to ,we studied vitamin E level in normal full term newborns versus premature ones and its relation to vitamin E level in their corresponding mothers, so as to guard against the incidence of such hemolytic anaemia in the newborn.

NORMAL BLOOD VALUES IN THE NEWBORN PERIOD.

Hemoglobin concentration.

Values for the normal mean hemoglobin concentration of cord blood have ranged from 15.7 gm/dl (Sturgeon,1956) to 17.9 gm/dl (Dochain et al.,1952). The bulk of recent studies has placed the normal value in the range of 16.6 to 17.1 gm/dl (Table 1). The value for the mean cord hemoglobin concentration is 16.8 gm/dl. Approximately 95% of all values fall between 13.7 and 20.1 gm/dl.

Sisson (1958) has suggested that 13.5 gm/dl be considered the lowest normal value, which agrees well with Mollison's (1961) figure of 13.6 gm/dl.

Hemoglobin values for umbilical artery blood tend to be about 0.5 gm/dl higher than samples obtained from the umbilical vein (Chaplin,1961).Studies performed by Smith(1959) showed average values that range from 16.6 to 23.4 gm/dl for normal hemoglobin of capillary blood at the time of birth.

Walker and Turnbull (1953) concluded that the mean hemoglobin concentration of cord blood increase during the last two weeks

Table 1: The normal cord blood hemoglobin(Oski and Niaman,1972).

Authors	Mean hemoglobin (gm/dL)	Range (gr/dL)	Number of observations
Mollison(1951)	16.6		134
Dochain et al(1952)	17.9	14.4-21.6	40
Walker et al.(1953)	16.5		145
Marks et al.(1955)	16.9	12.3-22.0	221
Guest et al.(1957)	17.1	13.0-25.0	59
McKay. (1957)	17.4		60
Rooth et al.(1957)	16.7	11.2-26.6	414
Mean	16.8		

of gestation and continues to increase in infants born after the fortieth week of pregnancy as of progressive oxygen lack. They found the mean hemoglobin concentration at 38 weeks to be 15.2 gm/dl; at 40 weeks, 16.5 gm/dl; and at 42 weeks, 18.0 gm/dl. The data of Mollison (1961), do suggest , however , that the hemoglobin value does increase by approximately 1.3 gm/dl between the thirty-eighth and fortieth week of pregnancy.

Hemoglobin values during the first week of life.

Wegelius (1948) performed a detailed study of the blood changes that occur during the first few hours of life and noted that the hemoglobin value increases by 17 to 20 per cent of the initial value during the first two hours of life, but then falls slightly during the next two hours. In (Table 2) are listed the results of serial hemoglobin determinations performed during the first two weeks of life. A decreasing hemoglobin during the first week of life indicates either red cell destruction or blood loss. Mollison has suggested that any venous hemoglobin value below 13.0 gm/dl in the first two weeks should be regarded as evidence of anemia.

Table 2: Normal hematologic values during the first two weeks
of life in the term infants. Oski and Naiman, 1972.

Value	Cord blood	Day 1	Day 3	Day 7	Day 14
Hb(gm/100 dl)	16.8	14.8	17.8	17.0	16.8
Hematocrit(%)	53.0	58.0	55.0	54.0	52.0
Red cell(cu.mm.X10 ⁶)	5.25	5.8	5.6	5.2	5.1
MCV (u ³)	107	108	99.0	98.0	96.0
MCH (yy)	34	35	33	32.5	31.5
MCHC (%)	31.7	32.5	33	33	33
Reticulocytes(%)	3-7	3-7	1-3	0-1	0-1
Nuc.RBC/(cu.mm.)	500	200	0-5	0	0
Platelets(1000's/cu.mm)	290	192	213	248	252

MCV mean corpuscular volume.

MCH mean corpuscular hemoglobin.

MCHC mean corpuscular hemoglobin concentration.

The hematocrit.

Reports of normal values have ranged from a mean of 51.3 per cent (Wauth et al.,1939) to 56.0 per cent (Gairdner et al,1956) Hematocrit value, just as the hemoglobin value, shows an abrupt increase during the first few hours of life and then slowly declines so that by the end of the first week of life it is very near the original cord blood value. Guest and Brown (1957) recorded a mean cord blood hematocrit of 52.3 per cent; on the first day of life the hematocrit was 58.2 per cent, at three days of age the hematocrit was 54.5 per cent, and at the end of seven days the hematocrit value was 54.9 per cent (Table 2).

The red cell count and red cell indices.

Wegelius (1948) and Guest and Brown (1957) reported the mean red cell count to be approximately 4,600,000/cu.mm. Marks et al., (1955) found the mean value to be 5,100,000/cu.mm. While Lippman (1924) reported a value of 5,200,000/cu.mm. The red cell count also rises rapidly during the first hours of life to a level that is approximately 500,000/cu.mm. more than the cord blood value. By the end of the first week of life; the red cell count is near 5.200.000/cu.mm.(Table 2).

The mean corpuscular volume of erythrocytes, at birth, has been estimated to range from 104 to 118 cu.u (Marks et al.,1955; and Walker et al.,1953), compared to the normal adult value of 82 to 92 cu.u . The mean corpuscular hemoglobin is also increased with reported value ranging from 33.5 to 41.4 uug as compared with the normal adult value of 27 to 31 uug. The value of the mean corpuscular hemoglobin concentration in the newborn is quite similar to that in the normal adult. The mean corpuscular hemoglobin concentration has been estimated to range from 30 to 35 per cent in the newborn and 32 to 36 per cent in the adult (Table 2).

Matoth et al,(1971) employing an electronic cell sizer and counter, and using capillary blood samples, recorded sequential values in a group of healthy term infants during the first 12 weeks of life. Their results (Table 3) differ slightly from those obtained using manual methods.

Reticulocyte count and nucleated red cell.

Values for the average percentage of reticulocytes at birth have ranged from 1.6 (Kato,1932) to 6.2 per cent (Seyfarth and Jurgens, 1927). Seip (1955) found the mean reticulocyte count

Table 3: Normal hematologic values during the first week of life
in term infant as determined by an electronic cell counter.
(Oski and Naiman, 1972).

Age	No. of cases	HB GM% ± S.D.	RBCx10 ⁶ ± S.D.	HCT % ± S.D.	MCV cu.U ± S.D.	MCHC% ± S.D.	RETIC % ± S.D.
Days							
1	19	19.0±2.2	5.14±0.7	61±7.4	119±9.4	31.6±1.9	3.2±1.4
2	19	19.0±1.9	5.15±0.8	60±6.4	115±7.0	31.6±1.4	3.2±1.3
3	19	18.7±3.4	5.11±0.7	62±9.3	116±5.3	31.1±2.8	2.8±1.7
4	10	18.6±2.1	5.00±0.6	57±8.1	114±7.5	32.6±1.5	1.8±1.1
5	12	17.6±1.1	4.97±0.4	57±7.3	114±8.9	30.9±2.2	1.2±0.2
6	15	17.4±2.2	5.00±0.7	54±7.2	113±10.0	32.2±1.6	0.6±0.2
7	12	17.9±2.5	4.86±0.6	56±9.4	118±11.2	32.0±1.6	0.5±0.4

to be 5.1 per cent on the first day in term infants. Normal values ranged from 4.1 to 6.3 per cent ,approximately 300.000 reticulocytes per cu.mm. Zinkham's (1963) figure of 5.5 per cent with a range of 4.2 to 7.2 per cent is in close agreement with that of Seip (1955).

Infants born prematurely have higher reticulocyte count. Values between 6 and 10 per cent are frequently observed in infants born between the thirtieth and thirty-sixth week of gestation. The percentage of reticulocytes increass slightly during the first two to three days after birth (Wegelius,1948;Seip,1955 and De Marsh et al.,1948). Evidence of very active erythropoiesis, as reflected in the elevated reticulocyte count, persists for the first three days of life. Then the reticulocyte count drops abruptly to a value of about 1 per cent by the seventh day of life (Table 3). More rapid falls are seen in infants who are small for gestational age (Humbert et al.,1969). Persistent reticulocytosis suggests the presence of a hemolytic process , blood loss or hypoxia.

Nucleated red blood cells may be observed in the blood of almost all infants at the time of birth and during the first day of life (Lippman,1924). The term infant has approximately 500

nucleated red cells/cu.mm. of blood at birth, or 0.1 per cent of his red cell population. By the time the newborn is 12 hours old this number has decreased by about 50 per cent. By the end of 48 hours, 20 to 30 nucleated red cell/cu.mm. may be observed, and by the fourth day of life it is unusual to see any nucleated red cells in the peripheral blood of the term infant.

In the premature infant, 1000 to 1500 nucleated red cells/cu.mm. may be present at the time of birth. The younger the infant is the greater the number. These values also decrease rapidly during the first week of life. Increased numbers of nucleated red cells are observed in hemolytic disease, after hemorrhage and during hypoxia (Merenstein et al., 1970) .

The white cell count.

The white cell count at birth ranges from 9000 to 30.000/cu.mm. with the mean count generally in the range of 15.000 to 20.000/cu.mm. for the term infant. The premature infant has a slightly lower total white cell count (Lichtenstein, 1917 and Burrell, 1952). During the first hours of life, a small increase in the white count is frequently observed. After this initial peak, the total white count gradually falls to a mean level of approximately 12.000/cu.mm.

by the end of the first week of life (Lucas, 1921; Bakwin and Morris, 1923; Lippman, 1924; Washburn, 1935; and Wegelius, 1948).

Platelets.

During the first days of life, platelet counts of approximately 100,000 to 300,000/cu.mm. are considered normal for term infant (Ablin et al., 1961). Platelet count may range from 84,000 to 478,000. Platelet counts generally fall into the normal adult range of 150,000 to 450,000 with a mean approximately of 250,000/cu.mm. after the first week of life. Although the platelet count of healthy premature infants is essentially the same as that of term infants during the first week of life, it was observed by Medoff (1964) that, in infants weighing less than 1700 gm at birth, the mean platelet count on the seventeenth day was 35,000/cu.mm. and reached 100,000/cu.mm by the end of the fifth week. In premature infants weighing more than 1700 gm., Medoff recorded a mean platelet count of 118,000 during the first two weeks of life. The platelet count increased to 285,000/cu.mm. by day 21. In contrast, Fogel et al., (1968), performing serial platelet counts at four days intervals on 73 premature infants, found only four of 36 infants weighing less than 1700 gm. at birth whose platelet count fell below 100,000/cu.mm. All four infants reached platelet count of 100,000/cu.mm. by one month of age and none bled. The result of