

THE SERUM CHOLINESTRASE ACTIVITY IN THE UMBILICAL CORD AND IN THE MOTHER

by

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In obstetrics and gynaecology considerable knowledge concerning the cholinesterase activity in the foetus and in the mother has accumulated over the past decade. Cholinesterase activity in human maternal blood serum is considered to be the same as that present in the serum of umbilical cord blood and the normal non-pregnant woman's blood (Balaquer, 1947). The present study was undertaken to note, (1) the cholinesterase activity in the serum of both multi and primiparous women at full term; (2) the corresponding foetal cord blood serum of either sex after normal delivery. A search of the literature reveals that a similar study has not been undertaken among South Indian women.

Various experiments have shown that on administration of estrogen, cholinesterase activity of various organs increased

1962) but cholinesterase content of plasma decreased. Cholinesterase elevating effect of estrogen may be influenced by some factors during pregnancy. This decrease in cholinesterase during pregnancy may be partly due to hemodilution as shown by Tourtellotte and Odell (1950) or partly due to decrease in the hepatic activity (Hall *et al*, 1971) where cholinesterase production from the liver is reduced.

A unit of cholinesterase activity corresponds to hydrolysis of one micro mole of acetylcholine bromide per c.c. of serum per hour.

Estimation of serum cholinesterase activity in primi and multiparous women.

In 12 primiparous and 15 multiparous women at full term aged between 18-25 years, all clinically healthy, 3 cc. of blood was drawn from anticubital vein. The

TABLE I
Cholinesterase Activity Units per ml. of Serum

Mother's Venous Blood Serum		Cord Blood Serum	
Primiparous women	Multiparous women	Male foetus	Female foetus
160 ± 12	162 ± 10	120 ± 6	119 ± 9

considerably. During pregnancy the estrogen content increased with advancement of pregnancy (Roy & Mackay,

serum was separated by allowing blood to clot. The cholinesterase activity in serum was estimated by the hydroxylamine method described by de la Huegra, Yesinick, and Popper (1952) using Lumitran photoelectric colorimeter.

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Estimation of serum cholinestrase activity of cord blood

The 27 women chosen for study delivered normally. Their foetuses were clinically healthy with weight ranging between 7 to 10 lbs. Fifteen of the foetuses were males and twelve were females. Immediately after delivery the cord was severed and blood from the foetal side was collected before ligation. From the serum of the collected blood, cholinestrase activity was determined as in the case of maternal blood described above.

Results

Cholinestrase activity of the cord blood of the male foetus on an average was 119 units/ml. and that of female foetus was 120 units/ml. showing that there was no difference in the cholinestrase activity in the sera of cord blood of female and male foetuses (Table 1).

Similarly, there was not much of a difference between the cholinestrase activity of the serum of the full term multiparous women and primiparous women. The level of cholinestrase activity of the mother's serum at term as compared to cord blood serum was higher (Graph I).

Discussion

The above data indicates that the level of serum cholinestrase activity was depressed significantly in the serum of cord blood. The serum cholinestrase activity has been reported to be associated with certain factors like the condition of the liver, plasma proteins, nutritional state of the individual (Sheila Sherlock, 1963; Mukherjee and Sarcar, 1958). Recent study of the influence of estrogen on the foetal brain cholinestrase activity by Abdul Karim *et al* (1970) indicated an increase in the enzymatic activity. They suggested that the effect of estrogen on

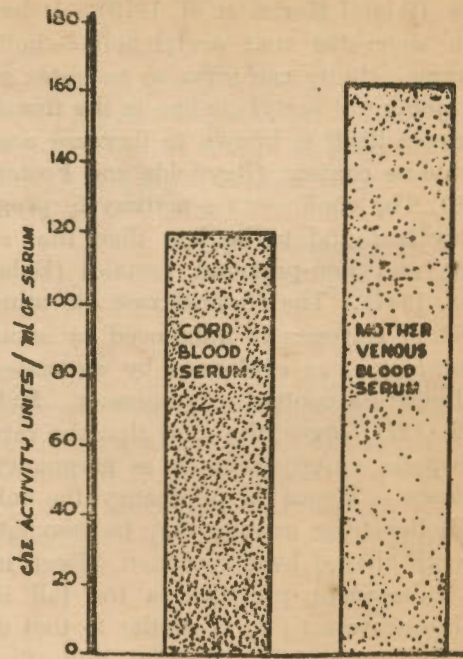


Fig. 1

the acetylcholine cholinestrase system was specific and not a reflection of any change in the protein content of the brain. Pregnancy in human species is characterised by a gradual increase in estrogen level in the maternal blood (Roy and Mackay, 1962; Smith and Arai, 1963; Manner *et al*, 1963; Smith, 1965), in the amniotic fluid (Diczfalusy and Magnusson, 1958) and in the cord blood (Roy, 1962; Manner *et al*, 1963; Toren *et al*, 1961). The foeto-placental unit of placenta is considered to be the site of steroidogenesis during pregnancy (Diczfalusy and Mancuso, 1969). The placental estrogen is released more to the maternal than to foetal side. Available evidence indicates that in pregnant rabbits, ovaries are the main, if not the only, source of estrogen (Keytes, and Armstrong, 1968) and whatever may be the source of estrogen production in the mother or the foetus, it does increase the content of cholinestrase

trase (Abdul Karim *et al*, 1970). It has been suggested that acetylcholine-cholinestrase activity can serve as an index of the amount of acetyl choline in the tissue. Estrogen itself is known to increase acetylcholine content (Reynolds and Foster, 1940). The cholinestrase activity in pregnancy is found to be less than that of adult and non-pregnant females (Balaquer, 1947). The cholinestrase elevating effect of estrogen is influenced by some other factors as evidenced by decreased cholinestrase content in pregnancy. Hall *et al* (1971) are of the view that the rate of hepatic activity declines as pregnancy advances. Hence in pregnancy the fall in cholinestrase activity may be associated with altered liver condition. Even in the subsequent pregnancies the fall in cholinestrase activity is similar to that of the first pregnancy, thereby indicating that the altered liver function may be to the same extent as in the first pregnancy. In the serum of the cord blood of the foetus, it was observed that the cholinestrase activity on an average was 120 units/ml. in either sex. This, when compared to that of the mother's venous blood serum is definitely low unlike the findings of Balaquer (1947). Hall *et al* (1971) are of the opinion that hepatic activity of the normal newborn infant is approximately one thousandth of that of the normal adult human female, while in our study we found that the amount of cholinestrase activity observed in the cord blood was less than that of the mother's venous blood, though not lowered to the same extent as the hepatic activity of the foetus. Although many factors may be put forward to explain this finding, estrogen may be one of the factors. Since the sex of the foetus has no influence on the level of cholinestrase activity in the serum of the cord blood,

the nature of estrogen (Goebelsmann *et al*, 1966) present in the foetus may be a necessary factor in controlling cholinestrase content in the serum of the cord blood.

Summary

Serum cholinestrase levels in the mother's blood were estimated colorimetrically. There was no difference between the serum cholinestrase levels in the primigravida and the multigravida at term. The serum cholinestrase level in the cord blood was definitely low when compared to the mother's blood. There was no difference between the cholinestrase levels in the serum of the cord blood of either sex.

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