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C reactive protein concentrations in neonates: determination by a latex enhanced immunoassay

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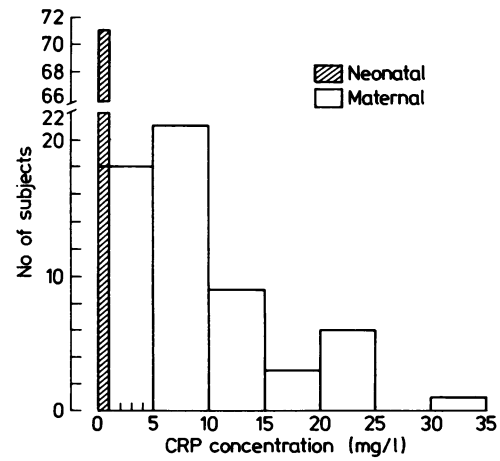
SUMMARY A latex enhanced immunoassay on a centrifugal fast analyser was used to compare serum C reactive protein concentrations in maternal and neonatal blood. In the neonate the C reactive protein concentration at birth was less than 1·0 mg/l; the concentration rose slightly during the first two weeks of life. There was no correlation between C reactive protein concentrations in maternal and neonatal sera. No significant difference was found between the C reactive protein concentrations in blood obtained by either heel prick or venepuncture.

C reactive protein (CRP) is metabolised by the fetal liver[1] and has been shown, using semiquantitative latex agglutination[2] and electroimmunodiffusion techniques,[3] to be present in the serum of both capillary and cord blood obtained from full term neonates. Increases in serum CRP concentrations during infections in neonates have also been recorded, and it has been suggested that the measurement of CRP may be a useful test in the assessment of neonatal infection.[3] Obtaining venous blood from neonates can be difficult and heel pricks are therefore commonly performed. We have compared the CRP concentrations in serum obtained from neonates by both methods using a recently developed rapid latex enhanced immunoassay. This method was also used to determine the range of normal values in the newborn, which could be compared with concentrations in natural blood taken simultaneously.

Patients and methods

Serum samples from 60 neonates, of full term gestation, born by normal vaginal delivery at the University Hospital, Nottingham, were examined. Informed consent was obtained from all mothers before venesection. Venous blood samples were obtained from each of the babies after birth by venepuncture of veins on the dorsum of the hand. A second sample of blood was obtained shortly afterwards by heel prick. None of the neonates had clinical or microbiological evidence of infection. Maternal venous blood samples for CRP estimation were also obtained by venepuncture within 1 h of birth. Further samples of blood for CRP estimation were subsequently obtained from the neonates during the first two weeks of life.

The method used a latex enhanced immunoassay on a centrifugal fast analyser. Twenty millilitres of 0·5% wt/vol washed, polystyrene beads (mean diameter 0·109 μm) were coated by adsorption with antihuman CRP (IgG fraction) at a ratio of 120 μg per milligram dry weight of latex in glycine buffered saline (GBS), pH 8·2. The coated latex was washed



C reactive protein concentrations in maternal venous blood and umbilical cord blood obtained at birth.

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to remove any non-absorbed antibody by centrifugation (12 000 *g* for 45 min) and resuspended in 20 ml fresh GBS. Bovine serum albumin was added to the suspension at a final concentration of 0·1% wt/vol to block any remaining uncoated sites on the latex particles. Latex coated in this manner is stable for many weeks at 4 °C.

For use in the centrifugal analyser, 400 μl of stock coated latex was diluted to 12 ml with GBS at pH 10. To stabilise the working reagent 0·5 ml of 20% bovine serum albumin was added. Five microlitres of a 1/20 dilution of the patients' serum in GBS, pH 10, or 5 μl of known CRP standards together with 50 μl of GBS were added to 350 μl of the coated latex. Changes in optical density were monitored for 150 s using an on line computer, which calculated the CRP concentrations. Reactions showing evidence of antigen excess were repeated using serum diluted 1/40. Routine use of this technique in a one year trial showed a between batch imprecision of 5% or less.

Results

All the cord CRP concentrations in blood samples taken within 1 h of birth were <1·0 mg/l, with 31 of 60 neonates having values of <0·1 mg/l (Figure). The corresponding maternal serum CRP concentrations, also taken within 1 h of birth, were overall higher than the values in neonates, with a mean (±SD) of 9·6 mg/l (±7·6). There was no correlation between CRP concentrations in maternal serum and those in the neonate. The CRP concentrations in serum obtained either by heel prick or venepuncture from 48 neonates up to the age of two weeks were in the range <0·1 mg/l to 11·55 mg/l; 95% were <5·0 mg/l. There was no significant difference ($0·2 < p < 0·3$) between the CRP values in the heel prick capillary blood and the blood samples obtained by venepuncture.

Discussion

Previous studies have indicated that CRP estimations may be of value in the early diagnosis of neonatal and infant infection.[4–7] As kits are being produced to determine serum CRP concentrations on medical wards, this estimation may be used more extensively in the initial management of various neonatal disorders. The present study showed that in neonates there was no significant difference between serum CRP concentrations in blood obtained either by heel prick or by venepuncture. Therefore blood obtained by the simple heel prick method can be freely used for CRP estimations. A lack of correlation between maternal and fetal CRP concentrations was reported by Kindmark *et al*,[8] and we have now confirmed this in a much larger study.

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