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Stimulating Effect of C-reactive Protein on Phagocytosis in the Newborn

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Newborns with C-reactive protein (CRP) in their serum were found to possess a higher phagocytosis index than newborns without CRP in their serum. The difference was significant statistically. The mechanism of action of CRP and its role in the defence system are discussed.

Phagocytosis is considered a major component of the defence system which protects the organism against infections [2, 5, 15]. Several authors have postulated an interrelationship of phagocytosis and immunity [9, 12]. These data were supported by results of experiments in which hydrocortisone [9] or X-rays were used [4, 12]. Similarly, a predisposition to infections was observed in chronic granulomatous disease in childhood, characterized by a disturbance of leukocyte functions [3, 13].

It would obviously be useful to find substances capable of stimulating phagocytosis. Najjar and Nishioka [10] isolated from granulocytes a substance which they termed Tuftsin; it is a peptide which they found to stimulate phagocytosis in vitro and in vivo. Tullis and Surgenour [16] described a protein with beta-globulin mobility having a similar activity, the leukocyte phagocytosis-stimulating factor [14]. Surgenour [14] suggested that this protein was identical with C-reactive protein (CRP).

In infections the appearance of CRP is correlated with an increase in the leukocyte count and recently Ganrot and Kindmark have shown the stimulating effect of CRP on phagocytosis in vitro [6].

The aim of the present study was to investigate the connection between the phagocytosis index and the appearance of CRP in the serum of the human newborn.

Materials and Methods

The studies were carried out on 34 normal term newborns and 30 small-for-dates term newborns.

The phagocytosis test was performed according to Jacobs [8], with *Staphylococcus aureus* strain Oxford 209 P. The bacterium leukocyte ratio was 3–8 : 1.

Heparin was diluted immediately before use to a final concentration of 2 units in 0.1 ml of 0.6 M phosphate buffer, pH 7.0. Bacteria and blood were incubated in a water bath at 37 °C with gentle mixing

for 20 minutes. Smears from the mixture were stained as usual. The phagocytosis index was calculated from the number of bacteria in 100 leukocytes.

CRP was determined using the ANDERSON—MCCARTHY method [1], with Bacto C Protein Antiserum (Difco Laboratories, USA).

RESULTS

Fig. 1 shows that CRP was lacking in the serum of all the 30 small-for-dates newborns. In addition, this group displayed a mean phagocytosis index as low as 5.05. In contrast, CRP was present in the serum of 10 out of the 34 normal newborns. As to the value for the phagocytosis index, there was a distinct difference between the normal newborns possessing CRP and those having no CRP. In the latter, the mean phagocytosis index was 7.54, while in the normal newborns possessing CRP the mean phagocytosis index was 8.82. The difference was significant statistically ($p < 0.05$) (see Table I).

DISCUSSION

It is difficult to explain the difference in the phagocytosis index between the small-for-dates and the normal newborns without CRP in their sera. In both groups there might be a difference in the serum CRP concentration which cannot be estimated by means of the method applied which only allows to detect amounts of CRP surpassing 1.2 mg per 100 ml [11]. It is assumed that in the serum of small-for-dates newborns there are only traces of CRP which cannot stimulate phagocytosis.

The question, however, arises concerning the mechanism of action of CRP. It is known to affect certain bacteria and may thus damage the

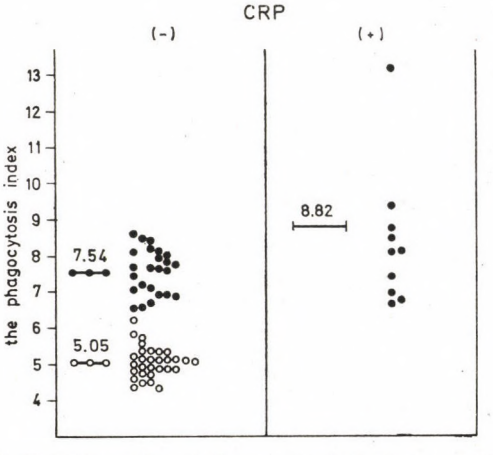

FIG. 1. Relationship of phagocytosis index and CRP:
● — normal newborns, o — small-for-dates newborns, o—o—o mean value, ●—●—● mean value

TABLE I

Statistical evaluation of the data

Term newborns				
normal			small for dates	
CRP			CRP	
	(—)	(+)	(—)	(+)
No. of cases	24	10	30	0
Phagocytosis index	6.51—8.57 7.54	6.78—13.16 8.82	4.26—6.22 5.05	—
S. D	0.59	1.96		
e	0.12	0.62		
t	2.03			
	$p < 0.05$			

surface structure of microorganisms. In this way the attacked bacteria become susceptible to phagocytosis.

Clinically, some connection has been observed between CRP and leukocytosis. In the cases lacking CRP, the infection is probably serious or recurring often [16]. GAY and GEILER [7] suggested that CRP was responsible for initiating aspecific immune reactions similarly as in the case of properdin, lysozyme, complement, interferon or transferrin.

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