

Bactericidal capacity of plasma and granulocytes in small-for-dates newborns

By

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The bactericidal activity of plasma and granulocytes as measured against a *Staphylococcus aureus* strain was significantly lower in small-for-dates than in normal newborn infants.

The increased susceptibility to infections of newborn infants is well-known [3]. Most of their infections are staphylococcal [1]. The present study was aimed at investigating the bactericidal capacity of plasma and granulocytes against *Staphylococcus aureus* in normal newborn infants and in small-for-dates newborns.

MATERIALS AND METHODS

Thirty-two small-for-dates newborns and twenty-one normal newborn infants were studied. Phagocytic cells were removed from a gravity sedimented heparinized whole blood sample containing dextran. The 209P Oxford strain of *Staphylococcus aureus* was obtained from a 20-hour broth culture. The bactericidal capacity of plasma and granulocytes was tested according to Balch et al. (2). The incubation mixture (final ratio of 8 bacteria per phagocyte) was shaken gently in a water bath at 37 °C for 90 minutes to allow phagocytosis to occur, after which the tubes were centrifuged at 600 r.p.m. for 10 minutes, distilled

water was added to lyse the cells and the mixture was plated. The number of viable bacteria was determined by colony counts after incubation overnight. The bactericidal capacity of plasma was estimated in the supernatant.

RESULTS

Fig. 1 shows the bactericidal capacity of plasma and granulocytes expressed as the number of surviving bacteria. There was a nearly 7-fold difference between small-for-dates (2%) and the normal newborns (14%) (Fig. 2). This result was significant statistically, $p < 0.001$.

In the plasma the number of surviving bacteria was about 3.5-fold higher in the small-for-dates (25%) than in the normal newborns (7%) (Fig. 2). This result was also significant statistically, $p < 0.001$.

In the bactericidal activity of the granulocytes there was a twofold difference between small-for-dates new-

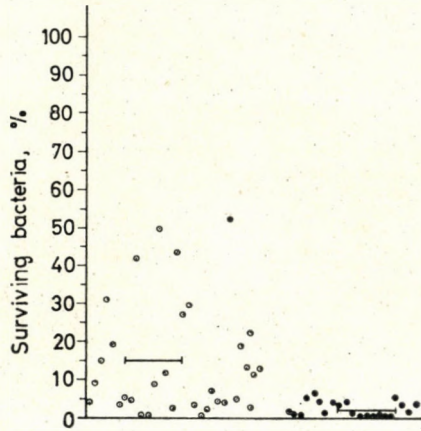


FIG. 1. Bactericidal capacity of suspension of plasma and granulocytes: normal newborn infants ○, small-for-dates newborns ●

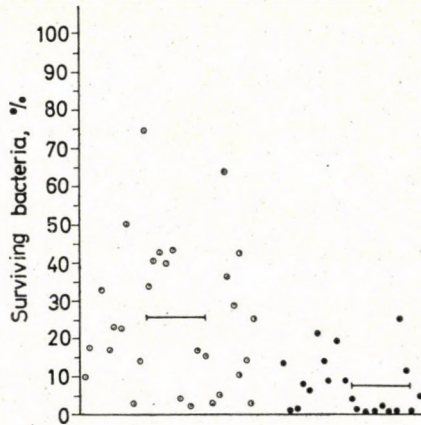


FIG. 2. Bactericidal capacity of plasma: normal newborn infants ○, small-for-dates newborns ●

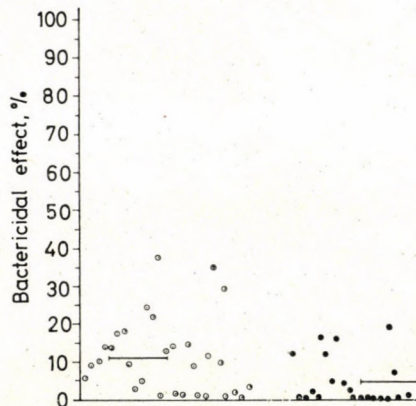


FIG. 3. Bactericidal capacity of granulocytes: normal newborn infants ○, small-for-dates newborns ●

borns (5%) and normal newborn infants [10] (Fig. 3). This result too was significant statistically, $p < 0.001$.

DISCUSSION

The data presented indicate that the bactericidal capacity of the plasma and granulocytes of small-for-dates newborns is very low in comparison to that of normal newborn infants.

The scattering was, however, very wide; some small-for-dates displayed nearly normal values. In normal infants, the bactericidal capacity of plasma and granulocytes ranged from 0.1% to 6.2% while in the small-for-dates, from 0.1% to 52%. Similar differences were observed for both plasma and granulocytes by themselves. The bactericidal capacity of the granulocytes was low in comparison to that of the plasma in both the normal and the small-for-dates infants. This may have been due to the bactericidal properties of multi-enzyme systems contained in the granules of the granulocytes. JEMIELIN et al. [7] observed a decreased nitro-blue tetrazolium reduction in newborn blood.

Small-for-dates newborns may be regarded as newborns with malnutrition, and it has been shown that phagocytosis was reduced in protein-calorie malnutrition. This points to a decreased phagocytosing activity or to a metabolic defect in the leukocytes [8].

In certain aspects, the newborn is similar to the non-immune animal. The bactericidal capacity of plasma is associated with many factors such as

immunoglobulins, lysozyme, unspecific antistaphylococcal factors, CRP, etc. Infants have deficient opsonins for Gram-negative and Gram-positive organisms. For opsonization of Gram-positive bacteria, the IgG is responsible and the level of this protein is low in the newborn infant and thus the antistaphylococcal agglutinins and precipitins, being located in IgG, are also deficient.

Some authors observed in addition a decreased lysozyme activity in plasma of small-for-dates newborns [4] and also a low level of CRP [4], a factor known to represent an unspecific stimulator of phagocytosis [6].

The present findings together with the previously observed low phagocytic index [5] may at least in part elucidate the diminished bactericidal capacity of the blood of small-for-dates infants. These tests may help in identifying infants at particular risk of infection, so that early antibiotic therapy can be instituted as soon as an infection is suspected.

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