

## Identification of early sepsis by serial serum phosphate determination in critically ill newborns

by

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In 78 newborn full-term and premature babies under intensive care, the serum phosphate level has been estimated daily. According to the results, in contrast with earlier suggestions, the phosphate level is not a suitable diagnostic test for the early identification of septicaemia. In gravely ill respiration newborns, hypophosphataemia is not a specific sign of sepsis and septicaemia may exist in spite of normal values for serum phosphate.

Looking at the efforts to find a simple and rapid auxiliary laboratory test for the early detection of septicaemia, one can find some papers referring to hypophosphataemia [4, 5, 6, 7, 11]. Their authors claim that bacterial infections and septicaemia are very often correlated with low serum phosphate values. In the difficult diagnosis of sepsis in critically ill and ventilated newborns [9] such a simple and rapid diagnostic test would be most valuable.

### MATERIAL AND METHODS

A prospective study was performed in 78 newborn and premature babies who were treated at the Intensive Care Unit of the University Children's Hospital, Düsseldorf, from January to October, 1978. As a routine test, serum phosphate estimations were performed daily by photometry, determining the complex of phosphate and

ammonium molybdate and ammonium vanadate (Biochemica Test-Combination, Boehringer Mannheim GmbH, No. 15920) and blood from a peripheral vein was drawn and sent for bacteriological examination every second to third day.

### RESULTS

According to our sepsis criteria [9], 9 full-term and premature babies were considered to have sepsis; another 10 babies had positive blood cultures sometimes during treatment, but these were assumed to represent contamination or transient bacteraemia (Table I).

Corresponding to data in the literature [8, 10] serum phosphate values less than 4 mg/dl for newborns with a gestational age of more than 36 weeks, and less than 5 mg/dl for premature babies with a gestational age of less than 36 weeks, were regarded-

TABLE I  
Bacteria of positive blood cultures in 19 children

Bacteria	No. cases	Bacteria	No. cases
<i>E. coli</i>	2	<i>E. coli</i>	1
<i>Listeria</i>	2	<i>Staph. aureus</i>	2
<i>Staph. aureus</i>	2	<i>Staph. epiderm.</i>	5
<i>Serratia</i>	2		

Spectrum of organisms with sepsis.

Spectrum of organisms considered to represent contamination or transient bacteraemia.

TABLE II  
Results of serial serum phosphate determinations in 78 full-term and premature babies

Normal serum phosphate	59 cases
Chronic hypophosphataemia	16 cases
Sudden drop of serum phosphate within 24 hours	13 cases

ed as reference values for hypophosphataemia. The values for serum phosphate were divided into three groups, *viz.*

1. normal serum phosphate;
2. chronic hypophosphataemia;
3. sudden drop of serum phosphate within 24 hours.

Table II shows the results. There were only two cases of chronic hypophosphataemia and a sudden drop of serum phosphate, respectively, associated with sepsis.

#### DISCUSSION

As this study demonstrates, the previously described correlation of hypophosphataemia and septicaemia

has not been corroborated by practical experience with critically ill newborns. Evaluating the correlation of hypophosphataemia with a positive blood culture and the first clinical manifestation with a sudden drop of serum phosphate, we even found this drop to occur on the third day after a positive blood culture.

The question arises of the causality between hypophosphataemia and septicaemia. Is the drop in serum phosphate the result of septicaemia or is septicaemia a result of hypophosphataemia? The latter sequence seems to be obvious in view of the observed disturbances of leucocyte function (impaired phagocytosis, chemotaxis, bactericidal activity) associated with hypophosphataemia [1, 2, 3].

Our conclusions for intensively cared newborns are, therefore,

1. neither sporadic nor serial serum phosphate determinations are a reliable diagnostic test for the early detection of neonatal septicaemia;

2. hypophosphataemia in critically ill and ventilated newborns is too unspecific to be associated with septicaemia;

3. normal serum phosphate values do not exclude septicaemia.

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