

the presence of urea⁶ does not appear to account for the above finding since disaggregation in acetamide is unaccompanied by exposure of sulfhydryl groups,⁶ and denaturation of hemoglobin also occurs in the presence of the latter amide.

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Prothrombin Concentration in Newborn.

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The concentration of prothrombin in the blood of babies 3 to 7 days old has been found to be essentially the same as in adult blood.¹ Curiously, however, a profound fluctuation has been observed to occur during the first 48 hours of life, as shown in Table I.

It should be noted that the prothrombin level of babies 6 hours old is relatively high and not strikingly different from cord blood. At the end of 24 hours, however, it may drop to an exceedingly low level as shown by babies 5 and 6. After 48 hours the prothrombin concentration usually has begun to return to normal. In one baby

TABLE I.

	Age	Clotting Time, Quick's Prothrombin Method		Prothrombin Concentration, %	
		Undiluted plasma	Diluted plasma, 50%		
Cord blood	1	13	18	71	
	2	13	18½	67	
	3	13	18½	67	
Baby	1	6 hr	12	80	
	2	6 "	12½	75	
	3	6 "	12	71	
	4	1 day	12½	75	
	5	1 "	53	7	
	6	1 "	55	7	
	7	2 days	13	18½	67
	8	2 "	13½	21	54
	9	2 "	17	30	35
	10	2½ days	29	47	16
	3½ "	30	48	15½	
	5½ "	13	17½	75	

⁶ Greenstein, J. P., *J. Biol. Chem.*, 1938, **125**, 501; 1939, **128**, 233.

¹ Quick, Armand J., and Grossman, Arthur M., *PROC. SOC. EXP. BIOL. AND MED.*, 1939, **40**, 647.

(No. 10) the return was definitely delayed since 5½ days elapsed before the concentration had reached 75% of normal.

These results offer a solution to the perplexing problem of the hemorrhagic disease of the newborn. Apparently no reserve of prothrombin is built up in the fetus, and in the first 24 hours of life this clotting factor may be reduced to a distinctly hemorrhagic level. Were it not for the prompt restoration of the prothrombin, many babies would bleed. Any delay in this recovery will naturally give rise to a bleeding diathesis, and this is very probably the cause of the hemorrhagic disease of the newborn. Potentially all newborns are in jeopardy of hemorrhage, and this undoubtedly accounts for the insistence of the mosaic law that circumcision be not performed before the eighth day.

The fact that the hemorrhagic disease of the newborn responds promptly to vitamin K therapy, as Waddell, *et al.*,² have reported, indicates definitely that a deficiency of this factor is the basic cause. The question remains: why the abrupt recovery? The small amount of food taken during the first 48 hours obviously can furnish little vitamin K. A new source must become available. It is well known that vitamin K is produced by bacterial action, and Greaves³ has demonstrated that rats fed a vitamin K-free diet excrete significant amounts of the substance in the feces. Logically it follows that as soon as the baby ingests food or water, it infects its intestinal contents, which at birth are sterile. With the establishment of an intestinal flora the synthesis of vitamin K begins, which with the aid of bile is absorbed, thus ending the danger of bleeding due to prothrombin deficiency.

² Waddell, W. W., Jr., Guerry, D., Bray, W. E., and Kelley, O. R., *Proc. Soc. Exp. Biol. and Med.*, 1939, **40**, 432.

³ Greaves, Joseph D., *Am. J. Physiol.*, 1939, **125**, 429.