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Serum Volume Index Studies on Newborn Children.

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(Introduced by Richard Ashman.)

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Although reports differ in detail,[1-5] it has been fully established that a hypoprothrombinemia occurs in infants shortly after birth, that its duration is brief, and that normal values are usually reëstablished by the fifth day of life. That this deficiency is related to hemorrhagic disease of the newborn is suggested by the fact that the hemorrhagic state coincides with the period of hypoprothrombinemia and by its prompt correction by vitamin K therapy.[3-6]

Previous studies have been made by the prothrombin titration technic of Quick,[7] the two-stage titration technic of Warner, Brinkhous and Smith,[8] the bedside test of Ziffren, Owen, Hoffman and Smith,[9] and the coagulation deficiency test of Dam and Glavind.[10] The studies herewith reported were made by the serum volume test,[11, 12] which was devised to predict the hemorrhagic diathesis in jaundice and has been used with entire satisfaction for this purpose for the last 5 years.

The studies were made on 6 white and 5 colored mothers and their full-term babies. The maternal blood was secured from the antecubital vein. The first samples in the children were secured from the

1 Brinkhous, K. M., Smith, H. P., and Warner, E. D., *Am. J. M. Sc.*, 1937, **193**, 475.

2 Quick, A. J., and Grossman, A. M., PROC. SOC. EXP. BIOL. AND MED., 1939, **41**, 227

3 Hellman, L. M., and Shettles, L. B., *Bull. Johns Hopkins Hosp.*, 1939, **65**, 138.

4 Waddell, W. W., Jr., and Guerry, DuP., *J. A. M. A.*, 1939, **112**, 2259.

5 Shettles, L. B., Delfs, E., and Hellman, L. M., *Bull. Johns Hopkins Hosp.*, 1939, **65**, 419.

6 Dam, H., Tage-Hansen, E., and Plum, P., *Lancet*, 1939, **2**, 1157.

7 Quick, A. J., Stanley-Brown, M., and Bancroft, F. W., *Am. J. M. Sc.*, 1935, **190**, 501.

8 Warner, E. D., Brinkhous, K. M., and Smith, H. P., *Am. J. Physiol.*, 1936, **114**, 667.

9 Ziffren, S. E., Owen, C. A., Hoffman, G. R., and Smith, H. P., PROC. SOC. EXP. BIOL. AND MED., 1939, **40**, 595.

10 Dam, H., and Glavind, J., *Acta med. Scandinav.*, 1938, **96**, 108.

11 Boyce, F. F., and McFetridge, E. M., *J. Lab. and Clin. Med.*, 1937, **23**, 202.

12 Boyce, F. F., and McFetridge, E. M., *New Orleans M. and S. J.*, 1939, **91**, 357.

cord, and the second and third from the jugular vein or the anterior fontanel. The serum volume index is determined as follows:

Five cc of blood is allowed to stand at room temperature in a graduated tube for 4 hours, at the end of which time the serum volume expressed from the clot is read. A red blood cell count is also made. In normal individuals the serum expressed is 50% of the blood volume. The index equals the serum volume of the patient studied over half the volume of blood withdrawn for the test; a correction is made for anemia if it exists. One (1) is the standard of normal. The highest index at which a jaundiced patient has bled is .71.

The maternal values (Table I) in these 11 patients are rather lower than are normally found, the decreases perhaps being due to the loss of blood at delivery. Some confirmation of this supposition is furnished by the almost uniform rise in the second and third maternal indices. The infant indices parallel the observations made by other tests in all respects: They are considerably lower than the maternal indices, the lowered values found immediately after delivery are still further decreased on the third day of life, and there is a uniform rise, usually with a return to the initial values or higher values, on the fifth day of life. The values reported are paralleled by values in other, less complete, maternal and fetal studies by the serum volume index and also by values in studies by the bedside test[9] to be reported elsewhere.

In 4 instances the fetal indices immediately after birth fell within the range at which bleeding would be expected in the adult, and 9 fetal indices on the third day were well below the safe level. Bleeding did not occur in any of these children, nor does it seem to have occurred in other instances[1, 2] in which the prothrombin values were well

TABLE I.
Studies by the Serum Volume Index (for the Hemorrhagic Diathesis) in Parturient Women and Newborn Children.

Mother			Child		
At delivery	Third day	Fifth day	At delivery	Third day	Fifth day
.76	.67	.87	.76	.77	.82
.87	.91	.91	.70	.65	.64
.87	.88	.80	.86	.57	.73
.80	.86	.88	.71	.65	.72
.88	.94	.91	.66	.60	.63
.71	.80	.80	.65	.61	.81
.81	.94		.96	.47	
.75	.80	.81	.99	.88	.98
.83	.81	.80	.71	.62	.73
.87	.89	.92	.89	.51	.75
.89	.89	.92	.69	.61	.57

below normal. Whether children bleed at a lower level than adults, so that a fresh set of standards must be devised for them, it is not now possible to say. A partial explanation of the lower maternal and fetal values may be that all of these tests were run during the winter, when the intake of foodstuffs containing vitamin K is less than in the summer months.[5]

Summary. A serial study of 11 parturient women and their infants by the serum volume index confirmed the findings of others, by other tests, that a definite tendency to hemorrhage exists in infants for a short time shortly after birth.

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Fleas as Acceptable Intermediate Hosts of the Dog Heartworm, *Dirofilaria immitis.*

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The method of natural transmission of the dog heartworm, *Dirofilaria immitis,* is still incompletely elucidated. The larvae of this parasite have been shown to develop in many species of mosquitoes and, thus, mosquitoes have been believed to be incriminated in the natural transmission, but substantial proof of this is lacking. The possibility that other blood-sucking arthropods serve as transmitters was overlooked until 1921, when Breinl[1] reported finding the microfilarial embryos of *Dirofilaria immitis* in the fleas, *Ctenocephalides canis* and *Ctenocephalides felis,* collected from heartworm infected dogs in Australia. He also observed the advanced stages of development of this parasite in the Malpighian tubules of the fleas and the infective stage larvae in the hemocelic cavity. Recently, Brown[2] has observed the microfilariae and partially developed larvae of this parasite in *Ctenocephalides canis* collected from heartworm-infected dogs in the eastern United States.

In November of 1938, the writer, in examining dogs for heartworm infection in New Orleans, observed the typical microfilariae of *Dirofilaria immitis* in *Ctenocephalides canis.* The early developmental stages and the infective larvae were also seen in the hemocelic

1 Breinl, A., *Ann. Trop. Med.,* 1921, **14**, 389.

2 Brown, H. W., *The North Amer. Veterinarian,* 1939, **20**, No. 1.