10579

Icteric Index in the Newborn.

SAMUEL B. WEINER AND MIRIAM REINER. (Introduced by Harry Sobotka.)

From the Laboratories and Pediatric Service of the Mount Sinai Hospital and the Newborn Division of the Pediatric Service of the Harlem Hospital, New York City.

The icterus index and the van den Bergh reactions of 49 specimens of cord blood and 50 sera of normal new-born infants were studied in an effort to determine the type of icterus in icterus neonatorum.

In unhemolysed sera Newburger[1] showed that the icteric index by the acetone method of Ernst and Förster[2] gave values approximately one-third those obtained by Meulengracht.[3] When hemolysis was present the icteric index values by acetone and water methods showed wide discrepancies. Every precaution was taken to prevent hemolysis but this was present in 30% of our specimens, probably due to the polycythemia and greater fragility of red cells in the new-born.

All of the infant sera were taken from normal healthy infants, 90% of whom were negroes and varied in weight from 5 to 9 pounds. The bloods were drawn from the deep jugular vein and were taken between the third and sixth day after birth when the icterus is at its highest level. The cord bloods were collected in wide mouth test tubes immediately after birth from the placental end of the severed cord.

In all of the non-hemolysed specimens, in cord blood, as well as in blood from the new-born, the icteric index values determined by water and acetone methods were equal. (Table I.) In the hemolysed specimens (Table II) slightly higher values were obtained by the water method, although the differences were much smaller than those obtained by Newburger in his series of cases.

The direct van den Bergh reaction was *negative* in all cases even when the amount of circulating bilirubin was very high. We obtained essentially the same ratio between milligrams of bilirubin determined by the indirect van den Bergh, and the icteric index by the acetone method, as Newburger found in his series. In all except 2 infants, hyperbilirubinemia was present (icteric index higher than 5 units by the acetone method). Among the cord bloods there was

[1] Newburger, R. A., *J. Lab. Clin. Med.*, 1937, **22**, 1192.

[2] Ernst, Z., and Förster, J., *Klin. Wchnschr.*, 1924, **3**, 2386.

[3] Meulengracht, E., *Arch. f. Klin. Med.*, 1920, **132**, 285.

TABLE I.
Non-hemolysed Specimens.

Icteric Index Units Cord (29 cases)		Icteric Index Units Infant (35 cases)	
Water	Acetone	Water	Acetone
6	6	4	4
7.5	6	6	4
7.5	7.5	10	7.5
8	6	10	10
8	8	12	12 (2×)
10	10 (4×)	14	12
12	10 (4×)	15	12.5
12	12 (8×)	15	14
12.5	10	17.5	17.5
14	14	20	16
15	14	20	20
15	15 (3×)	24	22
16	14	27	25
18	18	27.5	27.5
		28	28
		30	25
		30	30 (2×)
		32	28
		36	36 (2×)
		39	36
		40	39
		45	45 (2×)
		45	40
		50	40
		52	45
		55	50
		75	70
		75	75
		96	90
		112	90
Avg Ratio: $\frac{\text{Water}}{\text{Acetone}} = 1.06 \pm 0.02$		Avg Ratio: $\frac{\text{Water}}{\text{Acetone}} = 1.09 \pm 0.02$	

only one specimen which showed a normal amount of bilirubin.

In the few cases of congenital hemolytic icterus in adults which we have studied to date we obtained similar results to those in the new-born; no direct van den Bergh reaction and identical icterus values by the 2 methods.

There was no direct or linear correlation between the icteric index of the cord blood and the birth weight or length of the infants; nor between the height of the infants' icteric index and the birth weight. In this relation it was interesting to note that in a set of identical twins with only a few ounces difference in weight, the icteric indices were 20 and 55 units respectively. However, in our series, 4 small infants weighing under 6 pounds had an average index of 46, whereas in 5 large infants over 8 pounds, the average was only 19.6 units. This is in agreement with the clinical observation that usually small

TABLE II.
Hemolysed Specimens.

Icteric Index Units Cord (20 cases)			Icteric Index Units Infant (15 cases)		
Water	Acetone		Water	Acetone	
10	5		8	5	
10	6		10	5	
12	6		14	10	
12	8		16	10	
14	8	(2×)	16	12	(2×)
15	7		17.5	10	
15	10	(2×)	20	10	
16	10	(2×)	24	18	
16	12	(4×)	24	20	
20	10		40	25	
20	12		40	35	
20	16		48	40	
20	15	(2×)	60	50	(2×)
Avg Ratio: $\frac{\text{Water}}{\text{Acetone}} = 1.6 \pm 0.06$			Avg Ratio: $\frac{\text{Water}}{\text{Acetone}} = 1.46 \pm 0.07$		

infants become intensely jaundiced while few large infants show any clinical signs of icterus.

That bilirubinemia is present at birth[4, 5] has lately not been sufficiently stressed. Schick[6] pointed out that this was related to the destruction of maternal red cells into an iron-containing fraction and bilirubin. The iron is utilized by the foetus while the bilirubin is excreted via the placental circulation.

Summary. 1. The icteric index determined by the water and acetone methods gave equal values in a series of 49 normal cord bloods and 50 normal new-born infants. 2. Hyperbilirubinemia was present in all but one of the cord bloods and 2 of the new-born infants. 3. All specimens gave a negative direct van den Bergh reaction even when the sera showed marked hyperbilirubinemia. 4. In several cases of congenital hemolytic icterus the same findings were present: the direct van den Bergh was negative and the icteric index gave the same values by both the water and acetone methods. 5. These methods may be used to differentiate hemolytic icterus from other types of icterus. The results support the hemolytic theory of icterus neonatorum.

[4] Hirsch, A., *Z. f. Kinderh.*, 1913, **9**, 196.
[5] Yllpö, A., *Z. f. Kinderh.*, 1913, **9**, 208.
[6] Schick, B., *Z. f. Kinderh.*, 1920, **27**, 231.