Letter to the Editor: Estimation of Body Iron Stores from Serum Ferritin Concentration

MARTTI A. SIIMES AND JUKKA RAJANTIE

Children's Hospital, University of Helsinki, Finland

Three methods have thus far been developed to convert a serum ferritin value to the absolute amount of storage iron. Walters *et al.* (4) noted in 1973 that 1 ng/ml of serum ferritin was equivalent to 8 mg of iron stores. Cook *et al.* (2) found a similar correlation where 1 ng/ml equalled 10 mg of storage iron. Saarinen and Siimes discovered a linear correlation between the logarithmic value of serum ferritin and the iron stores expressed as mg/kg body weight (3).

Table 1 shows the differences between these methods in converting the average serum ferritin values in adult male and female, in children weighing 15 and 30 kg, as well as in the newborn. Strikingly, the methods differ from each other, particularly in the newborn where the methods of Walters *et al.* and Cook *et al.* result in marked overestimation: about 30 times as high values as estimated by chemical analyses (5). We agree with Caballero *et al.* (1) that the estimation in the preschool child is the lowest by the Saarinen and Siimes method. Caballero *et al.* state that a child weighing 14 kg may have 468 mg of storage iron. This value seems to be unusually high compared to those that are obtained by any other methods. Further, it is unfortunate that they do not give data on the serum ferritin concentration in that particular child because it would have been the first time when a direct comparison between serum ferritin and iron stores has been given. It would also be the real way to compare these three methods.

We are confident that none of the three methods fit well all circumstances and all age-groups because critical experiments are

Fig. 1. Body iron stores at different ages estimated from the serum ferritin curve presented by Caballero *et al.* (1) by using the methods of Walters *et al.* (A) and Saarinen and Siimes (B).

still lacking particularly among children, in whom the physiologic changes in the amount of iron stores are rapid at certain ages and also quantitatively large at others. For further clarification of this point we calculated the developmental curves of body iron stores from the serum ferritin values which were shown in the Figure of Caballero *et al.* (Fig. 1) We used both the Walters *et al.* method and the Saarinen and Siimes method.

Table 1. Estimation of body iron stores from serum ferritin concentration by using three different methods (1-3).

	Male	Female	Children		Newborn
Body weight (kg)	70	60	30	15	3
Serum ferritin (ng/ml)	100	35	35	35	160
Iron stores (mg)					
Method 1 (4)	800	280	280	280	1280
Method 2 (2)	1000	350	350	350	1600
Method 3 (3)	1040	270	140	70	60

REFERENCES AND NOTES

1. Caballero, B., Solomons, N. W., and Torún, B.: Letter to the Editor: Inapplicability of the Logarithmic Regression Equation for the Factorial Calculation of Total Body Iron in Preschool Children. *Pediatr. Res.*, 17: 519 (1983).
2. Cook, J. D. and Finch, C. A.: Assessing iron status of a population. *Am. J. Clin. Nutr.*, 32: 2115 (1979).
3. Saarinen, U. M. and Siimes, M. A.: Iron absorption from breast milk, cow's milk, and iron-supplemented formula: an opportunistic use of changes in total body iron determined by hemoglobin, ferritin, and body weight in 132 infants. *Pediatr. Res.*, 13: 143 (1979).
4. Walters, G. O., Miller F., and Worwood, M.: Serum ferritin concentration and iron stores in normal subjects. *J. Clin. Pathol.*, 26: 770 (1973).
5. Widdowson, E. M. and Spray, C. M.: Chemical development in utero. *Arch. Dis. Child.*, 26: 205 (1951).