Letters to the Editor

Determination of Serum Total Iron-binding Capacity

The paper by Leggate and Crooks (1972) on the problems in quality control of total iron-binding capacity (TIBC), determined by the magnesium carbonate method, has prompted us to report our experience in determining TIBC, using the method of Ramsay (1957) with that of Young and Hicks (1965) on the Technicon AutoAnalyzer I.

Initially our performance in the Wellcome Group quality control scheme was poor as can be seen from table I. Similarly poor results were obtained with other commercial quality control sera, our values often being as much as 100 μg above the stated figure.

It was noticed that the more acceptable results coincided with the introduction of fresh batches of magnesium carbonate and it was thought that the magnesium carbonate might be deteriorating on exposure to air. Atmospheric moisture was a possible cause of this deterioration through increasing the degree of hydration of the magnesium carbonate, so it was decided to heat the magnesium carbonate before use to drive off excess water.

Preliminary observations, using commercial sera, were encouraging. With Hyland special control serum, which had a stated value of 370 μg/100 ml (acceptable range 330-410 μg/100 ml), we obtained a result of 450 μg/100 ml when using the unheated magnesium carbonate and 345 μg/100 ml with the heated magnesium carbonate. With Behringwerke human control serum, of stated value 399 μg/100 ml (range 369-429 μg/100 ml), we obtained results of 465 μg/100 ml with unheated, and 435 μg/100 ml with heated, magnesium carbonate.

A further experiment was performed in which two batches of horse serum were analysed, one with unheated magnesium carbonate and one with magnesium carbonate heated at 100°C before use. There were 15 samples in each batch. The batch analysed using unheated magnesium carbonate gave a mean value of 347 μg/100 ml (SD $\pm$ 9·3), whereas that using the heated had a mean of 332 μg/100 ml (SD $\pm$ 9·5). The difference between the means was statistically highly significant ($t = 6{\cdot}5$, $P < 0{\cdot}001$).

We decided, therefore, to keep the magnesium carbonate in a draught-free oven at 100°C and remove sufficient for cooling just before each batch of sera was analysed.

Since we adopted this procedure we have obtained the improved performance figures for the Wellcome scheme, shown in table II.

These data show that the standard technique for determining TIBC (Ramsay, 1957; Young and Hicks, 1965) can give an acceptable degree of accuracy and precision provided that the magnesium carbonate has been stored previously at 100°C.

C. A. BETTS
B. STUART
Biochemistry Laboratory, Group Pathology Department, Manor Hospital, Moat Road, Walsall, WS2 9PS.

Sample No.	*TIBC*		
	Group Mean of Results for Magnesium Carbonate Method (μg/100 ml)	*Our Result (μg/100 ml)*	*Number of Standard Deviations from Method Mean*
1	400·1	285·0	−1·8
2	543·5	735·0	+2·5
3	485·3	540·0	+0·8
4	463·6	585·0	+1·5
5	509·3	495·0	−0·2
6	414·0	615·0	+3·6
7	480·6	460·0	−0·3
8	453·6	570·0	+1·9

Table I *Performance of TIBC determinations in the Wellcome quality control scheme without preheating of the magnesium carbonate*

Sample No.	*TIBC*		
	Group Mean of Results for Magnesium Carbonate Method (μg/100 ml)	*Our Result (μg/100 ml)*	*Number of Standard Deviations from Method Mean*
9	503·8	480·0	−0·3
10	506·4	495·0	−0·1
11	502·0	530·0	+0·5
12	498·5	470·0	−0·5
13	414·9	360·0	−0·8
14	504·2	435·0	−1·1
15	453·0	375·0	−0·9

Table II *Performance of TIBC determinations in the Wellcome quality control scheme when the magnesium carbonate was kept at 100°C before use*

References

Leggate, J., and Crooks, A. E. (1972). Problems in quality control in determinations of serum total iron-binding capacity by the magnesium carbonate method. *J. clin. Path.*, **25**, 905-906.

Ramsay, W. N. M. (1957). The determination of the total iron-binding capacity of serum. *Clin. chim. Acta.*, **2**, 221-226.

Young, D. S., and Hicks, J. M. (1965). Method for the automatic determination of serum iron. *J. clin. Path.*, **18**, 98-102.

Problems in the Determination of Serum Total Iron-binding Capacity

Good precision has not been achieved with methods for the determination of total iron-binding capacity (TIBC), although serum iron can be measured with high precision. It has been interestingly shown recently that the apparent TIBCs of some control sera are dependent on the amount of basic magnesium carbonate added to remove excess iron used to saturate the transferrin (Leggate and Crooks, 1972). The sera which showed this dependence all had a pH greater than 8·5. It has been clearly demonstrated, however, that regulation of pH at all stages of the procedure was very important when basic magnesium carbonate was used to remove excess iron (Williams and Conrad, 1972). It has also been suggested that magnesium carbonate does remove some bound iron from transferrin (Koepe, 1965).

One alternative method of removing excess added iron is by addition of anionic-exchange resin, as in the AutoAnalyzer method (Technicon method file N-62B).