THE EFFICIENCY OF AN IRON-MOLYBDENUM PREPARATION AS EVALUATED BY MEANS OF IRON ABSORPTION TESTS

By Sten Gullberg, M.D., and Bo Vahlquist, M.D.

FOLLOWING oral administration of soluble iron compounds, the serum iron exhibits a transient rise with highest levels after two to four hours. In healthy subjects the shape of the curve during the first few hours is mainly governed by the rate of absorption, since the rate of removal from the plasma under these conditions is known to be slow.[1, 2]

Even in subjects who have been "saturated" with iron by means of iron treatment over many weeks, some uptake of iron can still be demonstrated by the absorption test.[3]

Recently it has been claimed[4–7] that the therapeutic effect of iron in combination with molybdenum is greater than that obtained with iron alone. The results thus far presented are purely clinical. In order to establish whether the presence of molybdenum enhances the absorption of iron we have performed a series of iron absorption tests in healthy female adults.

Material

The iron preparation used was "Mol-Iron" (White Laboratories, Inc., Newark, N. J.). This preparation contains ferrous sulfate in an amount corresponding to 10 mg. ferrous iron per ml. of drug, and in addition, molybdenum sesquioxide in an amount corresponding to 1 part of molybdenum to 15 parts of iron. A control preparation with exactly the same composition except for the absence of molybdenum was also used.

The absorption tests were performed on healthy student nurses. In a few cases the same subjects volunteered in both series of tests, the interval between the two absorption tests being at least one week.

Preliminary experiments showed that in many subjects a dosage of Mol-Iron corresponding to 5 or even 2.5 mg. of iron per Kg. of body weight resulted in curves bordering the saturation level.[8] Therefore, in the experiments reported below, a dosage of 1.0 mg. of iron per Kg. of body weight was used throughout.

The iron preparation was administered in the morning under fasting conditions. Blood samples were collected immediately before iron administration as well as two and four hours later. The serum iron was determined according to Vahlquist's[9] modification of the method of Heilmeyer and Plötner.

Results

The results of the iron absorption tests are shown in table 1 and figure 1. The serum iron fasting values were on an average somewhat lower in the control group but all were within normal limits.

Discussion

Individual responses in iron absorption tests vary considerably, probably due to such factors as individual variations in the rapidity of passage of the contents in the gastro-intestinal tract, the pH of the intestine, etc. Nevertheless, the mean values from two groups as large as these form a sufficient basis for analysis.

From the Pediatric Clinic of the Caroline Institute at Norrtulls Hospital, Stockholm, Sweden.

TABLE 1.—*Iron Absorption Tests in Healthy Female Adults (1.0 milligram ferrous iron/Kg. bodyweight). I. Iron and molybdenum ("Mol-Iron") II. Iron alone (control group)*

Subject	I Serum iron γ-per cent			Subject	II Serum iron γ-per cent		
	Fasting	2 hrs	4 hrs		Fasting	2 hrs	4 hrs
T. E.	115	451	431	B. B.	98	305	330
R. W.	150	349	319	T. J.	91	195	230
S. M.	92	283	461	G. P.	100	205	233
T. Y.	139	253	226	K. E.	88	281	303
K. S.	147	283	297	A. D.	120	241	243
U. N.	152	240	263	A. H.	182	321	344
T. H.	159	189	261	H. J.	119	260	265
N. C.	143	277	364	G. K.	99	254	226
G. K.	126	250	281	G. R.	64	320	379
B. N.	61	146	137	K. L.	85	169	205
L. A.	132	224	249	T. F.	84	238	242
T. S.	78	168	196	E. E.	91	207	223
G. R.	149	431	463	M. L.	125	200	184
K. L.	118	201	213	G. B.	154	322	345
E. L.	118	237	254	K. H.	139	246	247
Mean	*125*	*265* (+140)	*294* (+169)	*Mean*	*109*	*251* (+142)	*267* (+158)

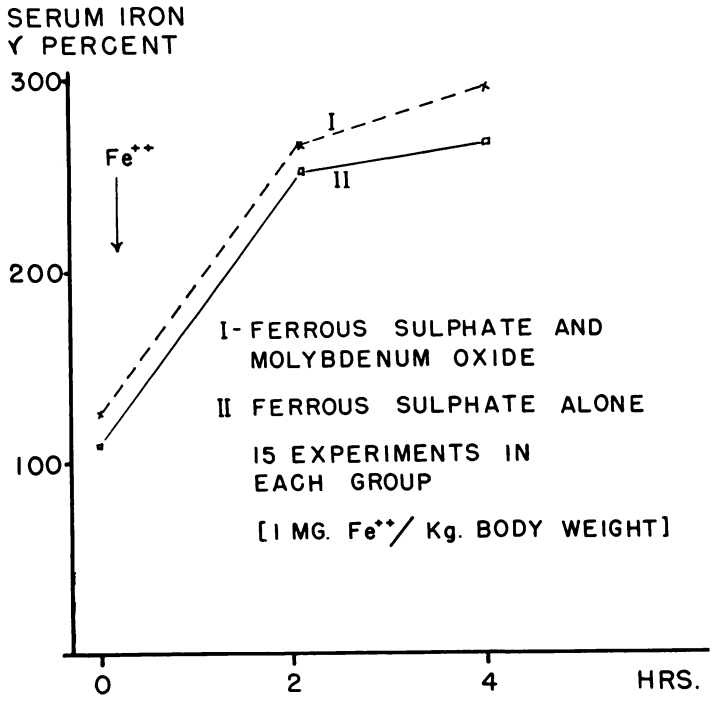

FIG. 1.—Iron absorption tests in healthy female adults

The results of the absorption tests as shown in table 1 and figure 1 indicate an iron absorption which is superior to that obtained with certain other iron preparations tested by one of the authors,[10] e.g., ferrous pyrophosphate, ferrous-ferric hydroxide, ferric citrate. The essential observation is, however, that the serum iron response was almost exactly the same whether or not molybdenum was present in the preparation. The slight difference in the rise after four hours (11 gamma per cent) is well below any statistical significance. There is no reason to believe that these observations would not apply in cases of iron deficiency anemia, although obviously it would be of interest to make appropriate examinations in such cases.

Conclusion

The iron absorption tests reported do not indicate that molybdenum improves the absorption of iron (in these tests, Mol-Iron was used). If there is a better effect in clinical trials, it must be explained by other mechanisms.

REFERENCES

[1] Moore, C. V., Arrowsmith, W. M. R., Welch, J., and Minnich, V.: Studies in iron transportation and metabolism. IV. Observations on the absorption of iron from the gastro-intestinal tract. J. Clin. Investigation *18:* 553, 1939.

[2] Waldenström, J.: Järnbelastningar och vad de lära oss om järnomsättningen. Monography "Om järn och järnterapi" AB Ferrosan, 1944.

[3] Vahlquist, B.: Hormonala faktorers inverkan på järnomsättningen. *Ibid.* 1944.

[4] Neary, E. A.: The use of molybdenized ferrous sulfate in the treatment of true iron deficiency anemia of pregnancy. Am. J. M. Sc. *212:* 76, 1946.

[5] Healy, J. C.: Hypochromic anemia: Treatment with molybdenum-iron complex. J. Lancet *56:* 218, 1946.

[6] Cheseley, R. F., and Annitto, J. E.: Evaluation of molybdenized ferrous sulfate in the treatment of hypochromic anemia of pregnancy. Bull. Margaret Hague Maternity Hosp. *1:* 68, 1948.

[7] Dieckmann, W. J., and Priddle, H. D.: Anemia of pregnancy treated with molybdenum-iron complex. Am. J. Obst. & Gynec. *57:* 541, 1949.

[8] Holmberg, C. G., and Laurell, C. B.: Studies on capacity of serum to bind iron. Contribution to our knowledge of regulation mechanism of serum iron. Acta physiol. Scandinav. *10:* 307, 1945.

[9] Vahlquist, B.: Das Serumeisen. Thesis. Acta paediat. *28:* Suppl. 5, 1941.

[10] d'Avignon, M., and Vahlquist, B.: Biverkningar vid järnterapi. Nord. med. *44:* 1988, 1948.