PLACENTAL TRANSPORT OF CHELATED IRON

DOWNEE ASHMEAD, PH.D., AND DARRELL GRAFF, PH.D.
ALBION LABORATORIES, INC.
CLEARFIELD, UTAH, USA

INTRODUCTION
The placenta anatomically separates the circulatory systems of the mother from her fetus. As the sole purveyor of fetal nutrients, it is both active and selective in how it channelizes maternal-origin molecules. Recent research has shown that maternal iron is actually placenta iron. It is transferred from maternal blood through the chorionic villi of the decidua to nutritive sites, where iron has been synthesized by the placenta to specifically transport iron from the mother to the fetus.

Structurally, it appears that the microvilli formed by the placenta are similar to those found in the intestinal lumen. Consequently, the intestinal transport role of certain placenta-formed proteins may be identical to the role of carrier proteins in the intestinal absorption of iron. It is thus necessary for iron uptake to require interaction with specific molecular configurations of proteins.

In the intestinal tract, there are two main absorptive mechanisms. One is for the uptake of iron. The other is to absorb mineral nutrients, such as iron, that have been cleft with amino acids. These two heterocyclic ring molecules have the molecular weight of a polypeptide with a mineral (≤1000) and a neutral, double labeled radioisotope with 55Fe and 14C. Double labeling studies with 55Fe and 14C have indicated that this iron is absorbed from the maternal iron which acts as an intact molecule.

CONCLUSIONS
If fetal uptake of iron from maternal plasma was due solely to placental-produced carrier proteins, then the iron from both the placenta and the chorion would have had equal affinity for the carrier for iron uptake regardless of the form of iron administered. In this case, increased uptake from the placenta group would have been due solely to increased maternal intestinal absorption of that form of iron, but when the results of the placenta and chorion groups are compared, the uptake addition, the increased fetal uptake of iron is not proportional. If these comparisons were proportional, a similar placental pathway for both forms of iron, dependent upon the same number of carrier proteins, would be indicated. The dissymmetry suggests a secondary, more efficient iron absorptive placental pathway when amino acid chelates of iron are consumed. This rational explains the increased iron levels in piglet tissues as a function of time as described above.

REFERENCES

a. Albion Laboratories, Inc.

b. Weber State College