regulation, and in the formation of hydrochloric acid that is important to digestion in the abomasum.

The chlorine content of feedstuffs is quite variable. When sodium is supplied in the form of sodium bicarbonate or a similar source of sodium, it may be necessary to add a source of chlorine to meet the chlorine requirement. Salt is generally the cheapest source of chlorine. Coppock et al. (JDS 62:723) have suggested that a diet of 0.18% chlorine is adequate for lactating dairy cows. The NRC (1989) has recommended 0.18% sodium and 0.25% chlorine to be included in the total ration dry matter. Work at Florida by Beede shows a greater need for sodium than suggested in the NRC update, especially under heat stress conditions. As a result of the Florida Studies, we recommend the total diet dry matter contain 0.3 to 0.4% sodium under normal Florida conditions and 0.5 to 0.6% under heat stress conditions.

Salt deficiency causes an intense craving for salt, lack of appetite, poor growth, haggard appearance, lusterless eyes, a rough haircoat and lowered milk production. Recovery is rapid with the addition of salt to the diet.

TRACE MINERALS

The addition of trace minerals to dairy cattle rations is usually considered to be good nutritional insurance. The question that arises, however, is which trace minerals to add and how much of each mineral? The trace minerals as recommended in the 1989 NRC update are shown in Table 3.

Table 3. Trace mineral needs of high-producing dairy cattle (NRC 1989),

Total Ration	
Mineral	DM Basis
Iron	50.0 ppm
Manganese	40.0 ppm
Copper	10.0 ppm
Zinc	40.0 ppm
Cobalt	.1 ppm
Iodine	.6 ppm
Selenium	.3 ppm
DM = Dry Matter	

Dairy animals need trace minerals only in very small quantities. For this reason, salt is sometimes used as a carrier for all the trace minerals.

Trace minerals should not be added to dairy rations indiscriminately. Many rations will contain adequate levels without their addition. If a trace mineral problem is suspected, have your ration tested and make adjustments in the mineral mixture accordingly. Too much of a particular mineral could further antagonize the situation.

Iron

The role of iron in the body is mainly as part of the processes of cellular respiration, as a component of hemoglobin, myoglobin and cytochrome, and in certain enzymes. About 60 to 70% of the iron in the body is found in hemoglobin and 3 to 5% in myoglobin. Traces of copper are required for the utilization of iron in hemoglobin formation.

The need for iron in the diet of the adult dairy cow is estimated at about 100 mg/day. Minimum iron requirement for healthy dairy calves is about 30 mg per day. Calf requirements for dietary iron depends on the iron status of their dam and the calf's body stores. Calves with high iron stores appear to use those stores in preference to dietary iron, while those with lower stores have a higher requirement for dietary iron. Calves fed an exclusive whole milk diet (milk is low in iron) will develop iron deficiency anemia within 2 to 3 months. This practice is desirable in growing veal calves.

Iron deficiency in most dairy cattle rations has rarely been observed. Deficiency symptoms reported in calves include reduced weight gains, listlessness, inability to withstand circulatory strain, reduced appetite and anemia.

Studies at the University of Florida show that iron was available to dairy cattle from ferrous sulfate, ferrous carbonate and ferric chloride in decreasing order of availability. Ferric oxide iron was only about 12% as available as the iron from ferric chloride.

Iron deficiency seldom occurs in older dairy cattle unless as a result of severe loss of blood caused by parasitic infestations, injury or disease.