There are several reasons why a trace element supplementation program, based on the feed only, cannot optimize trace element status in dairy cows:

1. **Dairy cows** in general are not well supplemented with trace minerals in the early dry period. Heifers, in general, are also not well-supplemented from pregnancy until the close-up period. Therefore, most cows and heifers calve in a sub-optimal trace element status.

2. **Dairy feeds contain** relatively high levels of calcium, which can decrease the absorption and utilization of zinc, manganese, copper and selenium. Higher than required sulphur and/or iron content of diets (and very often drinking water) can also result in a significant decrease in the absorption of zinc, manganese, copper and selenium. The varying antagonistic effect of calcium, sulphur, molybdenum, iron and other minerals in total diet or drinking water could cause variation in essential trace element availability.

3. **The low dry matter intake** of cows during the transition period, especially in the close-up and fresh periods, makes it more difficult for dairymen to rely only on trace elements in feed.

In this field study, the effect of injecting a mixture of trace minerals containing zinc, manganese, copper and selenium four weeks before calving and again four weeks before breeding was investigated as a possible means of enhancing trace element functions at calving and at breeding.

The objective of the two injections was to increase blood and tissue trace element status four weeks before the optimum trace element-dependent function was required.

### Field trial

A well-managed dairy in Tulare County, California, (1,000 cows, 24,000+ RHA, 2X milking) with no serious cow health or reproduction problems, was selected for the field study. The herd averaged a heat detection rate of 57% and a pregnancy rate of 18%, which was already higher than the California averages of 52% and 16.6% respectively. The feeding regime and supplementary trace mineral/vitamin program was adequate. The initial estimate was that no response would be expected from increasing the trace element status of the dairy cows. Dairy Comp 305 was used to collect and analyze the data and compare the performance of the two groups in a field setting.

Cows were injected starting mid-August 2000 until end-August 2001 and data was collected from September 1, 2000, to June 2002. Cows with even numbers were injected subcutaneously in the neck area with 5mL of the injectable trace mineral solution at moving into the close-up group and again at six weeks fresh. The 5mL injectable trace mineral solution supplied 100mg zinc, 100mg manganese, 50mg copper and 25mg selenium. Control cows were considered to be odd-numbered cows who freshened in the same period of time. In total, 615 cows were treated with injectable trace minerals and 635 cows were in the control group.

The question posed was whether increased trace mineral status (with two trace mineral injections), and therefore increased trace mineral-dependent functions at calving and breeding, could have a positive effect on the natural resistance and reproduction efficiency of a dairy herd already performing above average. Parameters recorded were: mastitis based on clinical incidence; somatic cell counts based on DHIA test counts; reproduction based on pregnancy and conception rates.

### Results

There was no difference in somatic cell count (SCC) between the trace mineral and control groups. The SCC of both...
The strong positive relationship between trace mineral status and immune response is well-known. Research has shown a correlation between high blood selenium and reduced mastitis incidence. Recent University of Missouri research showed that organic zinc supplementation increased production of keratin in the teat. Keratin acts as a physical barrier to bacteria and as a bactericidal plug to the teat, decreasing the incidence of mastitis and SCC. Copper and manganese also play key roles in immune function. Increasing (topping-up) the trace element status of dairy cows with an injectable product four weeks before calving could increase immune function at and just after calving and thus decrease mastitis infections.

The conception rate (cows pregnant as a percentage of cows bred within a specific time frame) of all trace mineral injected cows was significantly (P<0.05) higher than the conception rate of control cows at 70-79, 80-89 and 90-99 days in milk (Figure 2). The strong positive relationship between trace mineral status and immune function at and just after calving and before calving could increase immune response.

**Economic evaluation**

It is important to express the decreased mastitis and increased pregnancy rates during early lactation in economic terms. The strong tendency of trace mineral-injected cows to have less mastitis during early lactation (more than 10%) is estimated as a possible savings of $7 per cow in the herd per annum. (Assume the cost of a case of clinical mastitis is $150 to $250.)

The most important financial benefit in this study lies in the increased conception rate and overall increased pregnancy rate that resulted from the supplementation of dairy cows with two trace mineral injections. It has been reported that a 1% increase in pregnancy rate results in approximately $35 per cow per year. This means that the use of two trace mineral injections increasing the pregnancy rate from 18% to 20% in this study could result in an additional income of $70 per cow per year.

**Conclusion**

This field study shows conclusively that the efficiency of trace element functions in dairy cows on an adequate feed trace element program can be increased significantly by the additional supplementation of two trace mineral injections — one given four weeks before calving and the other four weeks before breeding. In the trace mineral-injected group, there was a strong tendency for reduced mastitis during early lactation. Conception rate was increased significantly (P<0.05) during early lactation (up to 90 days in milk), resulting in an overall higher pregnancy rate.

The financial benefit of two trace mineral injections in this study represented ±$77 per cow per annum, which is a payback of approximately 19:1 (two trace mineral injections/cow @ ± $2 per injection). These benefits could conceivably be magnified in herds with sub-optimal nutritional supplementation due to overcrowding, poor feed delivery, lack of mineral supplements, poorly balanced rations or other causes of inadequate nutritional intake or absorption of trace minerals.

The trace mineral nutritional supplementation program can be “topped-up” three times annually by injecting trace minerals subcutaneously four weeks before the critical events of drying up, calving and breeding.

For a copy of the complete study, contact Multimin at 559-791-1000.