Frequently-Asked Questions: Nutrition

What does the Nutrition Section do?

The mission of the Nutrition Section is to provide laboratory support for the assessment of animal nutritional and metabolic status. The objectives are to help veterinarians diagnose nutritional deficiencies and metabolic diseases, and to help animal nutritionists and animal owners formulate optimal diets for healthy livestock and pets. Analytical services provided by the laboratory include a wide variety of minerals, vitamins, other nutrients, and metabolites. These assays are performed on feeds, blood and blood sera, and animal tissues.

How do I contact the Nutrition Section?

During regular business hours, Monday through Friday 7:30 a.m. to 5:30 p.m., call 517-353-1683. For animal health emergencies outside of normal operating hours, please call 517-353-5275 for an automated answering system.

How should I handle blood samples for mineral testing?

Minerals are very stable in blood or blood serum. For serum mineral analysis the most important consideration is to remove the clot from the serum in a timely manner (see below for details). Blood serum for mineral analysis does not have to be shipped on ice, but should be protected from extreme heat. Whole blood samples for mineral analysis should be collected into tubes with anticoagulant and shipped on ice by overnight courier. Failure to do so may result in the sample becoming clotted, which will affect the analytical results.

Should I separate the serum from the clot prior to submitting serum samples for mineral or vitamin testing?

The most common sample handling mistake leading to invalid mineral results is leaving the clot in contact with the serum too long. Mineral concentrations within the red cells are different from those in the serum. With prolonged contact after sample collection, the red cells begin to die and minerals begin to equilibrate across the cell membrane. This especially leads to artificially high serum concentrations of potassium and phosphorus, and potentially to artificially high concentrations of selenium and manganese. Optimally, the clot should be separated from the serum within four hours of sample collection.

How should I handle and ship blood samples for vitamin E or vitamin A testing?

There are some popular misconceptions about the requirements of shipping serum for vitamin testing, especially vitamin E testing. Both vitamins A and E are stable enough so that accurate assessment of original serum concentrations can be achieved through the use of samples that have been shipped via overnight courier services. Samples for vitamin A or E determination should be protected from
prolonged exposure to direct sunlight. They should be packed and shipped with ice in insulated shipping containers. It is not necessary that the samples be frozen initially, or that they arrive frozen at the laboratory, although freezing does not harm the samples.

I have animals that I think may have a nutrition-related problem. What kind of feed testing should I ask for?

Routine feed tests typically include moisture, crude protein, fat, some assessment of carbohydrate and fiber concentrations, and some macro mineral determinations, such as calcium and phosphorus. These determinations provide some basic information about the feed, but do not provide all of the information that may be required. Our feed submission sheet conveniently groups feed tests into panels that are designed with different feed testing objectives in mind. If you have questions about which of the panels is best for your needs, please call the laboratory.

Are serum or blood sample analyses really good indicators of mineral nutritional status in animals?

The answer here depends on the mineral. Serum selenium concentration is a good measure of selenium status, and whole-blood selenium concentration appears to be even better. Serum magnesium concentration is a good measure of magnesium nutritional status. Serum iron concentration can be a good indicator of iron status, but serum iron is subject to metabolic as well as nutritional influences. Evaluation of iron status should include other tests in addition to serum iron concentration. Serum copper concentration is intermediate among the other minerals in its usefulness for assessing nutritional status. Low serum copper concentration is a meaningful indicator of copper deficiency. However, marginal deficiencies in copper intake may exist even though the serum copper concentration is adequate. Serum zinc concentrations are fairly insensitive measures of zinc status, but as with serum copper, low serum zinc concentrations are associated with dietary zinc deficiency. Serum manganese and cobalt concentrations are more difficult to interpret than other minerals, but determination of their serum concentrations may still be useful as screening tools.

Are liver biopsy samples better than serum samples for the assessment of trace mineral nutritional status?

Liver biopsy samples are an especially good means of assessing copper status. They are also very useful in assessing selenium status, but not necessarily better than blood or serum samples. We can measure trace mineral concentrations in very small liver biopsy samples that can be quickly, safely, and easily taken using a “Tru-Cut” type biopsy instrument. Please see the accompanying fact sheet for instructions in taking biopsy samples from bovine liver.

What samples should I take for blood non-esterified fatty acid (NEFA) testing in dairy cows?

Non-esterified fatty acid (NEFA) concentrations reflect the energy status of the animal, with high concentrations indicating negative energy balance. Negative energy balance and high serum NEFA concentrations are risk factors for metabolic disease in dairy cows. Testing serum NEFA concentrations is particularly useful in evaluating dry cow management and nutrition in dairy herds, but is also valuable in assessing energy status of cows in early lactation. Samples for NEFA testing may be either serum or EDTA plasma. They should be collected from a minimum of seven animals from each feeding or gestation/lactation group. The results are most useful if the samples are taken just before fresh feed is offered. Blood NEFA concentrations are elevated by excitement, so cows should be agitated as little as possible during the sample collection process. When gang locks are available, a
useful protocol is to lock up the animals immediately after fresh feed is offered and to collect the samples before they’ve had a chance to consume much feed.

How does evaluation of serum beta-hydroxybutyric acid (BHB) concentration compare to evaluation of serum NEFA concentrations in dairy cows?

Serum BHB concentrations are very seldom elevated in cows before calving, so BHB is of little usefulness in the evaluation of dry cow nutrition or metabolic status. Use serum NEFA when evaluating dry and close-up cow groups. After calving, both serum BHB and NEFA can be useful in evaluating nutritional status. Serum NEFA is a direct indication of energy balance with NEFA concentrations increasing as negative energy balance becomes more severe. Serum BHB concentrations are indicators of the metabolic response cows are making to negative energy balance. High serum concentrations of serum BHB in clinically normal cows indicate subclinical ketosis, which is associated with reduced fertility and milk production, as well as increased risk for clinical ketosis and displaced abomasum.