Metabolic Profiling in Dairy Cattle

Metabolic profiles are used in dairy cattle to help identify nutrition and management problems. In addition, these profiles are used to assess animals which are clinically healthy, but are not meeting milk production potential or reproduction efficiency.

A representative number of animals from each stage of lactation should be sampled and the mean values for each analyte are determined for cows in each stage of lactation and compared to reference means established by TVMDL. Reference values were derived from healthy dairy cattle reaching expected production potentials. It is desired that means for each analyte be within one standard deviation (SD) of the reference mean.

Metabolic profiles in dairy cows are used for two main reasons. The first is to assess the nutritional status of healthy cows performing at an acceptable level in an attempt to identify and thereby recognize any nutritional problems before they surface as a production or health related issue. The second reason is to identify nutritional issues in cows or herds with poor performance records, i.e., high incidence of transition problems, low milk production, poor pregnancy rates, etc.

A high prevalence of periparturient diseases may be associated with overall nutrition (net energy and/or mineral deficits). Some metabolic problems may not be readily apparent utilizing only a metabolic profile, therefore it may be necessary to add other tests such as vitamin A and E, trace minerals, or routine chemistry panels.

The metabolic profile measures glucose, urea, albumin, cholesterol, beta-hydroxybutyrate (BHBA) and non-esterified fatty acids (NEFA) as well as some minerals (Na, K, Cl, Ca, Mg, P). These parameters can help assess total protein and energy intake, the balance between protein and energy, and the net energy balance. Utilizing a metabolic profile also allows screening for production limiting nutrients. Following the procedures outlined below for sample collection will significantly decrease the chance of artifactual results. Providing more reliable results will make it easier for dairy veterinarians and nutritionists to more accurately interpret results, identify and eliminate any potential nutritional problems affecting a herd. TVMDL’s Amarillo Laboratory offers the metabolic profile as a routine diagnostic service as well as other tests which can be added as needed.
Tips on Collecting Blood Samples for Metabolic and Mineral Profiles in Cattle

It is essential to collect blood and harvest serum appropriately and timely to avoid sample hemolysis and artifactual results.

**Materials Needed**
- 16-20 gauge sterile disposable collection needle
- Plastic needle holder or 10cc syringe
- New evacuated red top collection tubes (plain tube)
- Permanent marker

**Methods**
Clean and disinfect the bleeding site before collecting the blood. Collect blood into an evacuated red top tube, labeled with the appropriate animal identification, by puncture of the external jugular vein or the tail vein using a 16 - 20 gauge sterile disposable collection needle and a plastic needle holder. If using a syringe to collect the blood, place the blood gently into a red top tube immediately after blood collection.

After blood is collected, set the samples aside at room temperature out of direct sunlight for 30 to 60 minutes to allow clot formation. Spin and harvest the serum as soon as possible. Almost any delay in harvesting serum from the clot results in an artifactualy elevated serum potassium (released from red blood cells) and artifactualy low blood glucose (utilized by red blood cells). If serum cannot be harvested shortly after clot formation, the samples need to be refrigerated (not frozen) until separation can be accomplished. However, allowing the serum to set on the clot for any significant period of time, such as over night or during shipment to TVMDL, will result in varying degrees of hemolysis. This should be avoided as hemolysis will increase phosphorous, potassium, albumin and magnesium levels and may contribute to unreliable NEFA and BHBA results.

Serum should be stored at refrigeration temperature until shipment. If there will be a significant delay in shipment to TVMDL, clean serum samples should be frozen until shipment. Serum is the required specimen for metabolic profiling, and most of the supplemental trace mineral and vitamin testing.

**For more information on diagnostic testing, please contact:**

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For questions regarding blood collection or other issues related to your herd, consult your local veterinarian.