

The bovine liver, not just a filtering organ

Let's 'look under the hood' of the modern dairy cow and examine a crucial and sometimes overlooked organ that is hugely responsible for both her success and yours. The bovine liver not only serves in the more obvious role of a filtering organ: eliminating toxins, mineral storage, and immune function, among many other functions. In addition, the liver is the epicentre of energy metabolism!

Without the liver, any and all forages you feed that are first processed by microbes in the rumen, are not able to be used by the cow. It is the liver that processes these metabolites further into useable energy that cows need for maintenance, growth, and production.

It is well established that cows typically experience negative energy balance during the transition period. It is primarily the liver that is responsible for 'making up the difference'. During periods of reduced dry matter intake and the increased demands of lactation, a well-functioning liver is an important asset. The liver is working some major overtime during this period,

Where can things go wrong? In simple terms, the liver's capacity can be overwhelmed by the demands of the body system.

The most obvious example is fatty liver syndrome (also known as hepatic lipidosis). This is when the liver gets 'plugged up' with excess fat. This excess fat comes from the body sending signals that it needs more available energy and so it mobilizes fat stores. If this process proves too demanding to keep up, fat accumulates in the liver.

A normal healthy liver in a cow not subject to the metabolic demands of a transition cow contains less than 1% fat by weight. An affected fatty liver in a fresh cow can have 10-15% or sometimes more than 20% fat by weight. A large percentage of dry cows have around 3%. Some elevation is expected and considered normal, but if it is excessive, it will affect the liver's ability to do its job.

The liver is responsible for the production of ketones (ketosis) in response to negative energy balance. This process is the body doing what it must to meet her needs to both survive and produce some milk. The liver must rise to the occasion. Additionally, when we give oral propylene glycol treatments, as is common to treat ketosis, the liver once again is needed to process the glycol to make it available to the cow.

What can you do to support the liver? Focus on the transition period. It is often stated that our modern dairy cows run a marathon every day of lactation. Let's ensure their body systems are ready for the impending marathon. Anything that decreases stress such as heat abatement, stocking density, cow comfort, and limiting re-grouping is helpful. Plan to make feed changes gradually/appropriately and ensure a properly balanced ration is fed with special attention to diets for each group on the farm - especially the dry cow ration(s).

Make maintaining the ideal body condition score (BCS) a priority. It is well documented that a cow that is dried off with a BCS of 3.0-3.25, and most importantly maintained at that same BCS through the dry period, has a much better chance of transitioning well. This is in large part due to not placing unrealistic demands on the liver. Aim to prevent cows getting fat during late lactation and over the dry period. It is difficult if not impossible to be perfect but keeping as many cows as

possible into the ideal range will pay dividends in transition health. A solid reproduction plan that prevents cows from becoming too long in days in milk helps. Cows in an excessively extended lactation produce less milk per day yet still eat the same high energy milk ration and can easily become over-conditioned. In the dry cow pen, a controlled energy ration is helpful to prevent putting on excess back fat while supporting good healthy rumen fill.

Recent studies have shown that water access in dry cow areas has a measurable effect on successful transition cow health. The recommendation is a minimum of 4 linear inches of clean water trough per dry cow in the close-up pen specifically. Perhaps a well hydrated cow leading to better functioning organs, including the liver, could help explain this finding.

The liver is an essential organ, with an incredible capacity to work overtime when needed, but it does have limits. Bottom line: you need a happy liver to have a happy cow.

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