

MOTHER LIQUOR FOR DAIRY COWS

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What is Mother Liquor?

Mother liquor is a delactosed whey byproduct from the Clondeboye plant. Fed correctly, Mother Liquor can lift per cow production and / or help cows gain condition later in lactation. Similar whey based products 'Vilac' (Edendale) and 'Proliq' (Taranaki) have been fed for a number of years.

Is Mother Liquor a good feed for my cows?

Mother Liquor is a high energy supplement which can be a very useful feed for your cows. The high feed value results from the high content of the milk sugar, lactose. Lactose is quickly and completely broken down in the rumen to provide energy for rumen microbes. Feeding the rumen microbes means they can better use other nutrients in the diet.

There are a couple of important practical issues that we must remember when considering to feed Mother Liquor to cows

1. Looking after gut function
2. Avoiding potential metabolic (magnesium and calcium) problems.

A. LOOK AFTER THE COW'S GUT!

If cows eat large quantities of Mother Liquor, we run the risk of gut upsets. When cows drink Mother Liquor, the lactose drops into the 'rumen' – the big fermentation vat in the cows gut. In the rumen, microbes (bugs) ferment the lactose, a bit like when you add sugar to a home brew vat. If we add too much Mother Liquor too quickly, the fermentation speeds up, and produces lots of acids. Acid production is normal (acids are used by the cow for energy and for making milk). The production of too much acid can increase the acidity and lower the pH of the rumen = a condition called 'rumen acidosis'.

We don't want your cows to get rumen acidosis because it can cause the following problems:

- Reduced appetite and low feed intake
- Scouring cows which may end up dehydrated (sunken eyes) and off milk
- Pockets of bugs and infection in the liver and lungs of cows
- Lameness and rumen acidosis. When the rumen pH drops to below normal levels, certain types of rumen bugs die, and other new types grow. It's this shift of bug types that we think causes lameness. Dead bugs release toxins, and new unfriendly types of bugs produce stuff called histamine that passes into the cows' blood. Histamine changes the flow of blood to the feet and causes a problem called 'Laminitis'. Changed blood flow means parts of the feet don't get enough blood = Laminitis. Laminitis might show up as two sorts:
 - Acute laminitis – cows go lame within 24 hours of too much Mother Liquor (or other rich feeds, like grain). Feet are hot and the cows can be sore and shuffle on all four feet.
 - Chronic laminitis – cows might go lame anywhere from 4 – 8 weeks after feeding a rich feed like Mother Liquor. All you might find is more white line disease, or soft easily bruised feet.

AVOIDING RUMEN ACIDOSIS AND FEET PROBLEMS:

1. Keep cows fully fed and content on other feeds.

Mother Liquor was never designed to be fed as a large part of a cow's diet. If we offer Mother Liquor to hungry cows, they'll binge on it, and are more likely to get rumen acidosis. Hungry cows may take in 12 – 15 L or more of Mother Liquor per cow per day. This could mean intakes of more than 3 kg of lactose. From a carbohydrate point of view, this is similar to a cow eating over 6 kg of molasses or 5 kg of cereal grains! Make sure cows are fully fed on grass, silage or hay so that Mother Liquor only forms a small part of the total daily diet.

2. Other 'carbo' feeds in the diet? Take extreme care if you are feeding other high carbohydrate feeds in addition to Mother Liquor. This includes high carbohydrate feeds like molasses and rolled cereal grains. The combination may be too rich for the cow and her rumen, no matter how careful we are.

3. Acidic silages. Be careful too if you are feeding lots of an acidic feed like maize silage. Maize silage is very acidic and can reduce rumen pH in its own right. This makes cows more susceptible to the effects of lactose fermenting in the rumen.

4. Keep fibre levels up. Cows can better cope with rich, quickly fermentable carbohydrate feeds if the rumen is full of fibre. Fibre with a long chop length keeps the rumen pH higher, helping the gut to keep functioning and to keep cows chewing their cuds. Long chop fibre includes **barley or ryegrass straw, hay or some longer chop length baleage**. Rumen acidosis is most likely when cows eat Mother Liquor plus lush nitrogen boosted regrowth following topping or silage harvest, and where no other fibre source is fed.

5. Rumen buffers and Rumensin. Both can help maintain rumen pH, but are not as effective as looking after the rumen as outlined in recommendations 1 – 4. Buffers include sodium bicarb and magnesium oxide. If you try Rumensin, this **must** be fed with silage or grain. NEVER try mixing the Rumensin Premix or the Rumensin drenching liquid with liquid products such as Mother Liquor.

B. METABOLIC PROBLEMS – MILK FEVER AND GRASS TETANY

Feeding Mother Liquor can put cows at increased risk of metabolic problems – wobbly and downer cows, or grass staggers

Upset guts and metabolic problems

Rumen acidosis can cause cows to go down, as if they had milk fever. This is caused by the rumen and intestines not working properly. When the level of acidity (pH) of the rumen is normal, the cows' gut contracts continuously, allowing calcium to be absorbed. If a cow gets rumen acidosis, the guts don't contract as much as normal. Guts that don't contract can cause milk fever – wobbly and downer cows that look just like ordinary milk fever. Affected cows respond to calcium in the vein or under the skin, just like normal milk fever. You'll need to get your vet involved to help you figure out what is going on – acidosis or normal milk fever or even a bit of both.

Low blood magnesium

Mother liquor makes cows more susceptible to the effects of low magnesium because of:

1. High potassium. Mother liquor contains high concentrations of potassium. High potassium reduces the cows' ability to absorb magnesium from her gut. The potential for Mother Liquor to cause metabolic problems is worse if your ryegrass pastures also contain lots of potassium (which is a common problem).

As a rule of thumb, don't feed Mother Liquor to springer cows (cows 2-3 weeks before calving) as they are especially susceptible to metabolic problems from high potassium.

2. Low magnesium. There is not much magnesium in the Mother Liquor product. Combined with high potassium levels, low magnesium puts the cow at greater risk of metabolic problems.

3. Liquid feeds and magnesium. All feeds that contain lots of water (Mother liquor, lush grass, wet silage) cause feed to pass through the cows' gut very quickly. Trace minerals like magnesium simply don't have enough time to get taken up by the gut. Feeding a drier feed like hay or straw, or topping paddocks in front of cows can help reduce the water intake and give more time for magnesium to be taken up by the cow.

Magnesium and potassium 'fixits' when feeding Mother Liquor

Consult with your veterinarian or nutritionist to develop a magnesium supplementation and feeding plan for the feeding of Mother Liquor. You will need to supplement with some magnesium, possibly at higher rates than normal. You should also look for a fibre source to offer cows while they are on the Mother Liquor. Fibre slows down the flow of feed through the gut enough for magnesium to be taken up more efficiently. Fibre requirements will depend on the quality of grass and other feeds in the diet.

What else do I need to think about when I am feeding Mother Liquor to my cows?

High salt content. Mother liquor contains lots of potassium, sodium and chlorine. The cow can excrete these minerals OK provided she has access to plenty of fresh water at all times. Never allow water troughs to run dry while you are feeding Mother Liquor.

Mother Liquor is a useful supplementary feed for your cows, but will require some planning to avoid gut upsets and metabolic problems, especially when fed to cows at peak milk production.

Talk with your veterinarian or nutritionist to develop a plan for the successful feeding of Mother Liquor.

The Feeding Value of Mother Liquor

Mother Liquor is a delactosed whey byproduct from the Clondeboye plant. The unique high energy, low protein feed profile of Mother Liquor offers some excellent benefits for the feeding of cattle. Mother Liquor can offer substantial production benefits for dairy cattle, provided some key feeding tips are followed. See the accompanying sheet 'Mother Liquor for Dairy Cows' that outlines some important feeding guidelines for feeding Mother Liquor to lactating dairy cows.

Metabolisable Energy (MJME)

- The ME of Mother Liquor can test out as low as 9.5 MJME per kg of dry matter (DM).
- A common comment is that the ME value of Mother Liquor appears very low for a purchased in feed, compared with other feeds such as barley and good quality grass silage. The problem with using ME to describe Mother Liquor is that the ME system does not adequately define the potential feed value for this type of feed.
- Metabolisable energy underrates Mother Liquor because ME is a calculated value only. The low ME value of Mother Liquor reflects the way that feed testing labs calculate the ME value for whey based products. Most calculations are based on the fat, protein and ash contents of concentrate feeds. The characteristics of Mother Liquor, including the low protein and fat contents and a high ash (mineral) content will mean a low calculated ME value. Some labs won't offer an ME rating for whey based products for this reason.
- The ME value does not adequately value the potential benefits from the lactose in Mother Liquor.
- Using calculated values for ME for Mother Liquor can under value the potential benefits of Mother Liquor as a feed for dairy cows. It is inappropriate to compare Mother Liquor to other feeds on an ME basis. For example, spring grass can test with an ME of over 12.0 MJME per kg of dry matter, compared with Mother Liquor at only 9.5 MJME. However, the value of the Mother Liquor could arguably be better for the cow due to the high sugar levels and low protein levels of the product (see below). Grass apparently contains more ME on a dry matter basis than Mother Liquor, however the grass is high fibre, high protein and low sugar, a very different type of feed compared to Mother Liquor. The ME system is not 'comparing apples with apples' when comparing feeds Mother Liquor with other forage or starchy types of feeds.
- The ultimate way to better define ME is to measure ME in a feeding trial. Animals are fed the feed to be tested, and losses of feed energy as faecal, urine and methane energy are measured. The balance of feed energy not lost as faecal, urinary or methane energy is presumed to be available for the animal to use – for maintenance, liveweight gain, foetal growth or for milk production = 'metabolisable energy'. Finding out the ME of feeds in this way is time consuming and costly. As a result, most feed testing labs will use equations using other feed characteristics to estimate the ME of a feed.

Crude Protein

The crude protein (CP) of Mother Liquor ranges from 6.7 – 11.7 % CP. The protein in Mother Liquor is 100% rumen degradable – in other words, all the protein is broken down in the rumen, no protein bypasses to the intestines. For most Canterbury farms using pasture as the main component of the feedbase, the low CP of Mother Liquor is a positive feature of this feed. Early lactation dairy cows need approximately 18% CP in their diet. Most Canterbury pastures contain very high levels of protein, frequently in excess of 30% CP. Feeding low protein feeds such as Mother Liquor, cereal grain, maize and cereal silages and molasses can dilute the total intake of CP and in some cases benefit cow production and reproductive performance.

Lactose

Lactose is potentially the most valuable component of Mother Liquor. Lactose is the carbohydrate found in milk and whey by-products. Mother Liquor contains between 39 – 44% lactose on a dry matter basis. Lactose is quickly and completely degraded in the rumen to form volatile fatty acids (VFA). The cow uses VFA for energy, liveweight gain and for milk production. Increased production of VFA, particularly of the VFA called 'propionate' can help increase milk production and / or improve cow condition.

The high lactose component of Mother Liquor can potentially cause ruminal acidosis if the diet of the cow is not managed correctly, particularly if fed with other 'hot' feeds such as rolled cereal grain, maize silage and

lush second round spring grass. Some tips to help avoid ruminal acidosis while feeding Mother Liquor are included in the accompanying fact sheet 'Mother Liquor for Dairy Cows'

Fat

Total fat levels of Mother Liquor are relatively low at less than 0.2% of dry matter. This level of fat won't upset rumen function in cows. These levels are actually much lower than fat levels that we find in lush green spring grass (levels of fat in grass range as high as 10% on a dry matter basis).

Minerals

Mother Liquor contains high levels of some minerals and lower levels of others

1. Potassium

- Potassium levels in Mother Liquor can reach levels of between 6.6 to 7.7% of dry matter. These levels are very high compared with a cow's daily requirement for potassium – about 1.0 % of DM. High levels of potassium are not of major concern to the cow directly – provided she has good access to drinking water, she will excrete excess potassium not required. The important potential issue with the high levels of potassium is the reduced bioavailability of dietary magnesium.
- Magnesium is taken up from the diet in the rumen of the cow. When the ratio of potassium to sodium is very high (as can happen when we feed Mother Liquor), the efficiency of magnesium absorption from the diet is reduced. This is particularly a problem when cows are fed Mother Liquor AND graze pastures that contain high levels of potassium at the same time, for example, paddocks that receive effluent from the shed.
- Adding extra magnesium to the diet will only partly compensate for the high levels of magnesium in the Mother Liquor. Including an extra fibre source such as hay or straw in the diet of cows fed Mother Liquor will improve the uptake of magnesium from the rumen.
- Work with your nutritionist or veterinarian to devise a specific magnesium monitoring and management plan that will ensure an adequate magnesium status for the herd while feeding Mother Liquor.

2. Sodium

Mother Liquor also contains relatively high levels of sodium. Levels range from 1.5 to 2.3 % on a DM basis. Sodium does not interfere with magnesium uptake and is not thought to cause any major problems for cows, provided cows have free choice access to a palatable source of drinking water.

High sodium and potassium levels for springing (pre-calving) dairy cows

Mother Liquor should NOT be fed to springing cows before calving. High levels of sodium and potassium will increase the total dietary cationic anionic difference (DCAD) of the diet and will predispose cows to milk fever.

3. Magnesium

Magnesium levels in Mother Liquor are relatively low – between 0.18 to 0.34% of dry matter. These levels are similar to levels of magnesium found in spring pasture. These levels combined with high levels of potassium will necessitate the development of a magnesium supplementation strategy with your nutritionist or veterinarian.

4. Calcium

Mother Liquor calcium levels range from 0.83 to 1.35% of DM. These levels are on average higher than calcium levels in Canterbury spring grass, and higher than levels found in supplements such as cereal grains and cereal silage. However, some additional calcium supplementation as limeflour may still be required for high producing dairy herds.

5. Phosphorus

Phosphorus levels range from 1.86 – 2.22% DM. These levels are very high and the calcium to phosphorus ratio of this feed is low. Supplementation with limeflour to lift the calcium to phosphorus ratio may be required, particularly where low calcium feeds such as cereal grains and silages are also being fed.