

Technical Information Sheet

EM® Agriton System.

Sustainable agriculture for profitable farming

Ostrea Sea Shell Powder

Understanding the prevention of rumen acidosis

Understanding how Sea Shell flour and Oyster Shell flour works.

Firstly, it is important to understand that a change in pH is the result in a change in the quantity of free H⁺ ions in the rumen. Most products used are based on calcium carbonate. For all calcium carbonate based products the reaction is as follows:



The next reaction will neutralise the rumen pH.



The free H⁺ is neutralised and the pH will rise.

The second thing to understand is something about the behaviour of organic acids. In contrary to most inorganic acids, the organic acids are never dissociated 100 %. Their dissociation degree is almost always significantly lower than that of inorganic acids.

This means that an organic acid keeps a part of its acidity in buffer. It is more or less in balance with its environment. As soon the environments pH rises, the organic acid will release a little of its H⁺ and the pH will go down again.

A measurement tool for this buffering capacity is called pKa value. A low pKa value means that all the H⁺ ions are dissociated.

Such an acid we call a strong acid. An acid with a high pKa is an acid which is not in full dissociation and will have a buffering capacity.

Nature copes easily with organic acids and the most are due to the presence of inorganic acids.

As there are pKa values for acids there are also such values for bases too. For these bases it is exactly the same concerning buffering. They either have no buffering effect at all and go immediately 100 % into solution or they have a buffer capacity.

And now to the rumen of the cow.

When a cow is eats organic material, most of it will be pre-digested in the rumen.

Microbial activity here is high and many of which make organic acids from the feed they get. These acids cause the pH to go down in the rumen. This is not a problem so long the pH does not decline under the value of 6.

Below a pH of 6 not only does the digestion of cellulose become prohibited but also health problems will occur.

So a pH drop should always be prevented.

The cow itself has a beautiful pH regulation system controlled by a gland producing Na HCO₃ (Sodium bicarbonate)

As this product is an organic product, it has a certain buffering capacity. The most important regulating factor is not the pKa but the feed back system from the rumen to the producing gland. If the pH is getting too low the gland is reacts by producing more sodium bicarbonate, which is transported via the saliva to the mouth. Here it is mixed with the food while a cow is chewing the cud. If the pH is gets too high the gland reacts and stops the production of sodium bicarbonate and also less saliva. Saliva does not only contain sodium bicarbonate but also a lot of important enzymes, which improves the fermentation speed in the rumen.

A normal functioning rumen will perform the best if the pH value is between the 6 and 7. Under natural circumstances as in free nature a pH rise above the 7 is almost impossible.

The problems start occurring when man starts to interfere in this system.

We are feeding our herds with feeds that are rapidly degraded and which contain little fibre. This rapidly degraded feed is digested primarily by acids in the rumen. This will therefore lower the pH. Due to the fact that many modern feed contain little fibre, there is less cud to chew, which means automatically there will be less saliva produced. If the pH goes down, the gland wants to respond, but there is not enough cud for saliva production to deliver the sodium bicarbonate to the rumen.

We try to solve this problem by giving our herds sodium bicarbonate with the feed. This is a good idea as long as the pH does not go above the 7. As soon the pH goes above the 7 the feed back system of the cow will tell the gland to stop producing sodium bicarbonate. So we have to be very cautious with the amount of acid buffering components adding to the feed.

An even more severe problem can occur when we feed our cows buffering agents with a very high pKa value. In such cases the pH in the rumen will rise rapidly to very high values. High pH values in the rumen will immediately disturb the whole rumen function. It will even block out lactic acid bacteria. With the disturbance of the rumen flora, the effectiveness of the rumen will decline. This will lead to several kinds of effects on production and health of the animals.

The most suitable product to solve this problem is a calcium carbonate source with a slow release factor, because its pKa value is lower than that of sodium bicarbonate. Due to this it will raise the pH in the rumen but will not easily exceed a pH of 7. This means the saliva producing gland will still have its feed back and the bacteria in the rumen are not inhibited and because of the pKa value there is a constant new source of carbonate available.

Ostrea Sea shells and Oyster shells have a slow constant release because of their particle size. This means that even if you feed your animals this product only twice a day, a part of the flour will stay in the rumen and can immediately buffer any surplus of free H⁺ ions.

This is the reason you will not easily make a mistake with feeding Ostrea. If you feed an average herd with both high and low producing animals, the acid production between the groups will be considerable.

With Ostrea products this is not a problem because of their pKa value. This means in practice it won't show a lot of buffering capacity when the pH is high and will work slowly and steadily when the pH is low. This is how microbes in the rumen like it.

Another important fact is that the Ostrea products are very rich in minerals. All these minerals are bound in an organic structure with carbonate. It is this organic formation what makes the minerals in Ostrea products so successful. Many farmers have cut their mineral supply by half or more since using the Ostrea products. And if the pH in the feed is OK there won't be a lot of activity from Ostrea in the rumen but in the Abomasum instead where with its very low pH, all the minerals will be set free and taken up by the microbes in the colon.

EM Effective Micro-organisms Limited



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