Autumn 2012

# Out of the Bag

COMPLETE FEED SOLUTIONS

## Our News

The last couple of months have been particularly busy but incredibly interesting and I have had the opportunity to visit dairy farms and processing operations in both Bangladesh and China. The incredible number of people in both countries means that even slight increases in the per capita demand for milk products translate into significant volumes which hopefully will have a positive spin-off for New Zealand producers.

Based on the farms I visited and people I spoke to in Bangladesh, the majority of dairy farms are small family run operations with about 10 - 20 cows, although there are also some larger 75 - 100 cow operations, and although about 25% of the dairy cow population is cross bred with either American or Dutch genetics, the vast majority of cows are still local breeds.

On the poultry front, Bangladesh faces incredible disease challenges but the industry is growing and I was told that prior to the most recent avian influenza outbreak broiler production was approaching 8 million broilers a week!

In contrast, there has been considerable investment by the Chinese dairy industry in high production genetics and all of the dairy operations which I visited were using improved genetics. Cows are housed in systems more similar to those seen in Europe or the US and are fed TMR type diets, with cows producing around 8 000l per lactation.

*Dairy cows in Bangladesh*

I also had the opportunity to attend the Australian Poultry Science Symposium in Australia and the recent Massey Technical Update. Both conferences were well worth attending and I have covered some of the information from the Massey Technical Update in this newsletter.

It seems hard to believe, but the start of spring calving is only two months away and getting cows ready for the next lactation is going to be an important focus for many over the next few months. Remember, nutrition of the cow in those first few weeks after calving is extremely important if we are to get her back in calf and maximise her milk production.

I hope you find this edition of interest .

Natalie

### In This Issue:



## Drinking Water: Quality and Quantity

My recent travels and discussion with a layer producer from one of the Pacific Islands has recently highlighted the importance of drinking water quality for our livestock.

The quality and quantity of water available to an animal, regardless of species, is extremely important for both health and productivity, with total daily water intake often much greater than one would expect. However, this is often taken for granted or overlooked when assessing factors affecting performance.

### An essential nutrient

Water is essential for many body functions, including the movement of feed through the digestive tract, as a solvent in which many nutrients (amino acids, glucose, minerals and vitamins), gases (carbon dioxide and oxygen) and hormones are transported about the body and in which waste products are excreted. Many chemical reactions which occur in the body and which are facilitated by enzymes also take place in solution and involve hydrolysis.

Although we tend to assume that water intake is more important in the hot summer months, water also plays an important role in insulation during the cold winter months

# Drinking Water: Quality and Quantity … continued

“Recent research carried out in New Zealand indicated that the average daily water intake of a cow on pasture in mid lactation was 60l.”

- the high heat capacity of body water acts as insulation thus helping to conserve body heat. At the same time, the water content of the body acts as a buffering agent to help regulate the pH of body fluids.

The animal obtains water from three sources, the water they drink (also known as free water), the water contained in the food they eat and the water formed during metabolism of organic nutrients. Factors affecting water intake include

- **Animal factors**
  (genetics, age, sex, growth rate or production and physiological state)
- **Environmental conditions**
  (ambient and water temperature, sun or shade and rainfall)
- **Diet**
  (diet ingredients, dry matter and nutrient content)
- **Availability**
  (drinking time, drinking space, flow rates).
- **Water quality**
  (pH, mineral content, presence of chemical contaminants and bacterial contamination).

The high moisture content of our pasture is one of the reasons why the free water intake of New Zealand dairy cows is relatively low compared to that of cows on TMR type rations. Recent research carried out in New Zealand (Morris *et al.*, 2010) indicated that the average daily water intake of a cow on pasture in mid lactation was 60l.

Water intake in layers and broilers is typically in the region of 1.8 to 2.0 times the feed intake. Consequently, a daily intake of 200ml would be typical for a laying hen, while the daily intake of broiler birds increases with age, as daily feed intake increases.

In most domestic animal species, the pattern of water consumption is closely associated with feed intake and consequently any factor which results in a decrease in water intake results in a drop in feed intake and subsequently production (Figure 1).

## Ensure adequate space

The ability of an animal to consume sufficient water is affected by a combination of the number of times the animal accesses the watering point and the amount consumed at each visit. Ensuring adequate space at the drinker or trough is essential if adequate water intakes are to be achieved. Similarly, the design of the water delivery system is key and must ensure that water pressure and pipe diameter are sufficient to supply the quantities of water required in the appropriate time frame.

Too high or too low a pressure in poultry drinker lines can inhibit water intake or result in wet litter and must be actively managed.

In the case of dairy cows, research has shown that consumption rates can be in the region of 15 - 20l per minute and so consideration must be given to the pipe size and water pressure of the delivery system must be sufficient to rapidly supply large quantities of water.

Dairy cows consume a significant proportion of their daily water intake after milking and consequently water troughs should be located in an area readily accessible once the cows have left the milking parlour. Ideally water should always be readily available as cows tend to alternate feeding and drinking. However, New Zealand authors (Holmes *et al.*, 2007) reported that, in studies carried out at Massey University and also in Australia, cows offered water twice daily at the dairy produced the same amount of milk as cows given continual access to water in the paddock. It is worth noting that one group of Australian researchers (Cowan et al, 1978) suggested that cows could adapt to the provision of water at milking time only if this was a continual practice and that recurring adjustments to deprivation may well have a long term effect on milk production. Similarly, the second group of

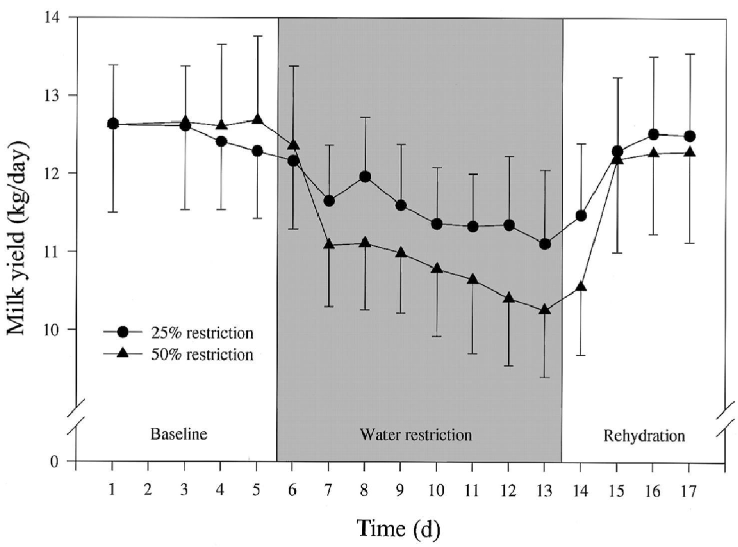


*Figure 1: Milk production of dairy cows during baseline, 25% and 50% drinking water restriction (relative to baseline intake), and rehydration (from Burgos* et al., *2001).*

# Drinking Water: Quality and Quantity … continued

Australian researchers (King and Stockdale, 1981) observed that higher yielding cows than those in their trial (13l/day) may not be able to adjust to water restrictions as readily.

## Would you drink it?

The cleanliness of water is an important factor which affects the intake of water and dairy cows in particular are sensitive to poor water quality. Simply cleaning out water troughs once a week or flushing drinker lines between runs in the case of broilers can have a significant effect on water intake and quality. A good question to ask yourself is whether you would drink the water you are asking your animals to.

## Bacterial contamination

High bacteria levels (>100/ml) indicate contamination of the water source and efforts should be made to rectify this. The presence of faecal coliform results of greater than 0/100ml are a significant concern and should be investigated and addressed as a priority.

Even low bacterial counts are a concern as some bacteria can proliferate in water and consequently livestock could be exposed to high levels of bacterial contamination.

Although cattle tend to have a greater tolerance to high bacteria counts, excessive bacteria levels can interfere with rumen metabolism by competing with the normal flora essential for forage digestion, leading to reduced feed intake, while severe bacterial or microbial contamination can result in infections such as diarrhoea, abscesses, ulcers, mastitis and *Salmonella*.

The Ontario Ministry of Agriculture, Food and Rural Affairs reported that total coliform counts over 1/100 ml can cause scours in calves, while counts over 15 - 20/100 ml can result in diarrhoea and depressed feed intake in adult cows.

For optimum performance of poultry a maximum level of 0 faecal coliform bacteria per ml and a maximum of 50 coliform per 100/ml is recommended.

Implementing a regular water sanitation and line cleaning program for poultry sheds is essential if the build up of microbial contamination is to be minimized. Work reported in 1997 by Macari and Amaral clearly illustrates how bacteria can proliferate in drinker lines in poultry sheds and demonstrates the importance of ensuring effective water disinfection through the whole length of the drinker line (Table 1).

*Table 1: Effect of drinker type on water bacterial contamination (from Macari and Amaral, 1997).*

| | Nipple drinkers | | Bell drinkers | |
|---|---|---|---|---|
| | Entrance | End | Entrance | End |
| Total coliforms | 640 | 3 300 | 1 600 | 1 700 000 000 |
| Faecal coliforms | 130 | 230 | 1 000 | 80 000 000 |
| *E. coli* | 110 | 900 | 900 | 36 000 000 |

## pH

Water with a pH of less than 6 leads to low water intake in poultry. Conversely high pH reduces the effectiveness of chlorination. In such cases treatments with commercially available organic acid preparations should be considered to help reduce water pH and improve performance.

The results of a trial using Kemira's organic acid water treatment product at a rate of 0.5ml/l for broilers from 0 - 35 days of age were presented at APSS 2012. These researchers reported a significant improvement in both weight gain and FCR over the period for the treated birds.

It has been suggested that drinking water pH can have a more direct physiological effect on ruminant animals. A pH of under 5.5 may increase problems related to chronic or mild acidiosis, while a high pH (over 8.5) may result in problems related to chronic or mild alkalosis. High levels of minerals in water (i.e. sodium, potassium, chloride and sulphur) can also upset the normal electrolyte balance of the animal and this is of particular concern for transition cows which may be susceptible to milk fever. Local data from New Zealand farms shows just how variable water can be (Figure 2).

The presence of nitrate and nitrites in drinking water adversely affect animal performance. Nitrite levels above 10 mg/l for dairy cows and 4 mg/l for poultry adversely affect reproductive performance and growth rate respectively.

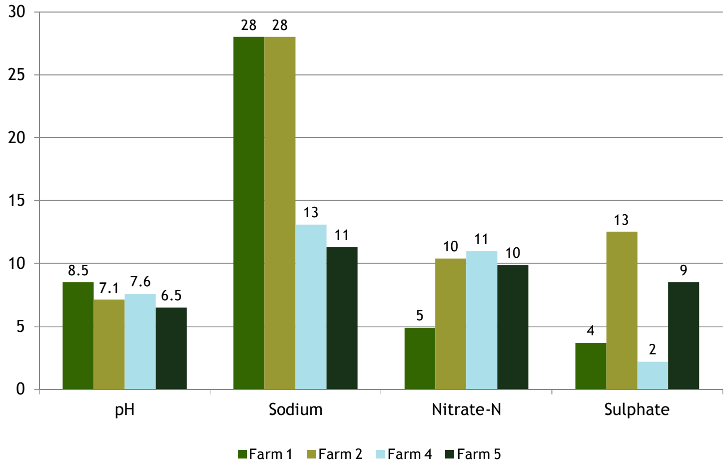


*Figure 2: Variation in water quality on New Zealand farms.*

## Often overlooked

Water is an essential nutrient for all animal species, but we often take the complex issues associated with quality and quantity for granted. Take the time to get your water tested - there may be more value in it than you think. Please contact us if you have any questions - we are here to help.

# Physical Processing of Feed in the Avian Gizzard: Implications for Whole Grain use in Layer Feeds.

In avian species, the gizzard plays an important role in reducing the size of ingested feed particles and it is generally accepted that larger particles are retained in the gizzard until such time as they have been sufficiently reduced in size to leave the gizzard. However, despite the fact that the gizzard has the ability to grind feed to a very consistent particle size range regardless of the original particle size of the feed, research has also shown that larger particles do occasionally pass out of the gizzard. This, according to Professor Roger Lentle of Massey University, suggests that the gizzard does not simply act as a sieve but rather that selective retention of larger feed particles depends on a probabilistic sorting action generated during a specific contractile sequence of the gizzard.

"World leading research carried out at Massey University and explained by Professor Roger Lentle at the recent Massey Technical Update has clearly shown the sequence of contractions in the avian gizzard."

## Mechanics of gizzard action

Until recently, the sequence of contractions occurring spontaneously in the gizzard have not been well described, but world leading research carried out at Massey University and explained by Professor Lentle at the recent Massey Technical Update has clearly shown the sequence of contractions in the avian gizzard.

Essentially, the front and back parts of the gizzard are surrounded by thin muscles with little residual muscle tone, while the central lumen is surrounded by a thick muscle (the *crassus*) with significant tone.

Contractions of the front part of the gizzard propel feed particles between the two thick pads of the *crassus* muscle, while the almost simultaneous contraction of the back part of the gizzard tends to drive feed particles towards the pyloric opening, or exit from the gizzard, through which the liquid phase and any fine particles may escape.

The subsequent contraction of the thick *crassus* muscle results in the grinding of larger particles, at the same time expelling the liquid phase and finer particles into the relaxed front and back ends of the gizzard.

The continued tone (partial contraction) of the thick *crassus* muscle means that larger particles and gizzard stones remain trapped central lumen while finer particles are expelled from the gizzard by subsequent contractions of the muscles at the front and back of the gizzard.

## Better understanding

Professor Lentle and his team hope that the work they have done so far will contribute to a better understanding of the effect of the physical characteristics of feed and gizzard stones on gizzard transit and reduction in particle size and subsequently feed efficiency.

## Whole grain for laying hens

In an attempt to improve gut health in meat birds, where diets contain small grains (such as wheat, barley or sorghum) it has become relatively common to include some whole grain in the diet. Typically the inclusion of whole grain in broiler diets leads to an increase in gizzard size and frequently an improvement in performance.

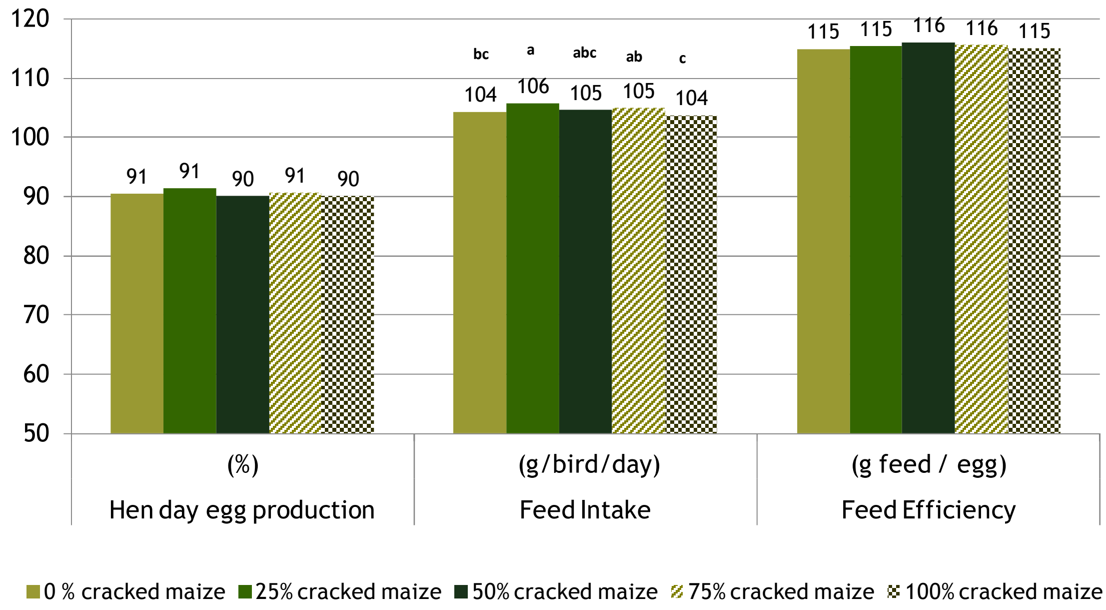


*Figure 3: Effect of increasing the proportion of cracked maize in diets for laying hens (from Singh et al., 2012).*

# Physical Processing of Feed in the Gizzard ... continued

There is less data available on the effects of whole grain on gizzard development of laying hens, but the effect of whole grain appears to be less dramatic than that observed in broilers. This is possibly a result of the lower feed intake of or higher levels of granular limestone in diets for layers.

## Cost savings

Fine grinding of grains for inclusion in poultry feeds represents a significant cost in terms of energy consumption and consequently opportunity exists to reduce total diet costs if a coarse grind or some whole grain can be used.

In addition increasing particle size of the ground grain will help reduce dustiness of the feed and also improves flowability in silos. A potential disadvantage of using more coarsely ground grain is the risk of separation although it is likely that this would be outweighed by the benefits of a coarser grind.

## New research

Results of an experiment looking at the effect, on laying hen production, of replacing up to 100% of ground maize with cracked maize was reported by Yashpal Singh at the Massey Technical Update. Ground maize was produced using a hammer mill with a 6mm sieve, while the cracked maize was produced using a 10mm sieve, leaving between 2 and 3% of the grain whole.

39 week old white leghorn layers were fed the experimental maize / soya based diets until 62 weeks of age.

The inclusion of cracked maize at 100% of the maize component of the diet had no significant effect on egg production, egg weight, feed efficiency, egg mass or body weight. However, there was a significant quadratic effect on feed intake with birds on the higher levels of cracked maize eating slightly less feed. This is shown in Figure 3.

Although there was no significant difference in the determined AME values of the feed, there was a tendency for AME to increase as the proportion of cracked grain in the diet increased. This may have been a factor in the slightly reduced feed intake seen in the birds fed the highest level of cracked grain.

## Optimum particle size distribution for laying hens

The optimum feed particle size for laying hens irrespective of the source of grain components is well described by ISA Poultry who advise that at least 75 to 80% of the feed particles should be between 0.5 and 3.2mm with no more than 15% below 0.5mm and/or 10% above 3.2mm. Very fine feed will depress feed intake and reduce egg output (Table 2).

| Particle Size | Recommended | Fine grind | Difference |
|---|---|---|---|
| < 0.5 mm | 9% | 31% | |
| 0.5 - 1.6 mm | 16% | 48% | |
| 1.6 - 3.2 mm | 65% | 21% | |
| > 3.2 mm | 10% | 0% | |
| Laying % | 93.9 | 90.7 | -3.40% |
| Egg weight (g) | 63.3 | 62.7 | -0.90% |
| Egg mass (g/d) | 59.41 | 56.85 | -4.30% |
| Feed Consumption (g/d) | 118.1 | 114.2 | -3.40% |
| Hen weight at 33 wks (kg) | 1.93 | 1.883 | 0.90% |

*Table 2: Influence of feed particle size on performance of laying hens between 23 and 51 weeks of age (from ISA, 1999).*

Using coarsely ground grain or some whole grain in your layer diets could help reduce milling costs and may have the added bonus of improving gut health.

## Complete Feed Solutions
## Optimising Nutrition

The consultants at **Complete Feed Solutions Ltd.** publish **Out of the Bag**. The newsletter serves both as a source of information for those involved in animal agriculture as well as a means for us to maintain contact with our clients.

**Complete Feed Solutions** provides a professional technical service to the livestock and animal feed industries. Our aim is to ensure that our clients use optimal production and feeding systems in order to maximise the return on investment. If you have any questions or would like to get in touch with us, please contact us using one of the contact details below.

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