

## Dairy Tech Incorporated

# DT PLATINUM SERIES PASTEURISERS

The DT Platinum Series Pasteurisers use a process to heat treat colostrum that inactivates and kills the major pathogens in colostrum while maintaining immunoglobulins (antibodies) so that passive transfer of immunity is not affected.

Research has shown that calves fed heat-treated colostrum have better transfer of immunity at 24 hours of age compared to calves fed fresh, raw colostrum. This is likely due to the reduced bacteria in heat-treated colostrum that can interfere with absorption of immunoglobulins. The same calves had a significantly reduced risk of scours or any other illness in the pre-weaning period.

### Introduction

It is widely known that the feeding of good quality colostrum to calves as soon as possible after birth helps provide protection from disease in the first 4-6 weeks of life, along with other long term benefits. Colostrum not only provides immunity to the newborn calf, it is also a very nutritious feed. Despite these benefits, colostrum can also be a source of some major infectious diseases to calves. These diseases include Bovine Johne's Disease, Mycoplasma, E. coli and Salmonella. These pathogens can be shed directly into colostrum from an infected udder or can be a result of contamination during the collection and storage process. These diseases can result in septicaemia and scours and also have long term implications. It is also thought that bacterial contamination interferes with the absorption of colostrum immunoglobulin (IgG) by the calf, thus reducing the immunity transferred from colostrum.

### What do Dairy Tech pasteurisers do?

Despite the name these pasteurisers are not used to actually pasteurise colostrum but instead a cycle is selected to heat-treat colostrum at a specific temperature for a specific time. The heat-treatment of colostrum has been researched in depth and scientists have now refined the process to ensure that this method not only inactivates and kills the major pathogens in colostrum but also maintains immunoglobulins (antibodies) in colostrum so that passive transfer of immunity is not affected.

### What bacteria are killed by heat-treatment?

Independent research has shown that heat-treatment of colostrum offers a superior ability to kill Salmonella species, E. coli, Mycoplasma species, Bovine Johne's disease (Mycobacterium avium paratuberculosis) and Listeria species. There were no viable bacteria present in colostrum after heat treatment at 60oC for 60 minutes.



## **Have there been any proven benefits by heat-treating colostrum?**

Calves fed heat-treated colostrum had better transfer of immunity at 24 hours of age compared to calves fed fresh, raw colostrum. This is likely due to the reduced bacteria in heat-treated colostrum that can interfere with absorption of immunoglobulins. The same calves had a significantly reduced risk of scours or any other illness in the pre-weaning period.

## **Who would use a Dairy Tech pasteuriser?**

Heat-treatment of colostrum would provide benefit on all dairy farms. Obviously some farms will have a higher risk of colostrum contamination and the presence of virulent pathogens will vary from farm to farm. These systems are particularly suitable for farms where there are known virulent pathogens, such as Salmonella and Mycoplasma, causing disease in calves. They are also very useful for large enterprises where there are multiple people involved in the rearing of calves and collection and storage of colostrum.

## **What is the capacity of the pasteurisers?**

The DT Platinum series DT60G (227 litre) is available in NZ.

## **How does heat treatment compare with UV pasteurisation?**

From the only independent research comparing heat-treatment of colostrum and waste milk with ultra-violet light pasteurisation, it can be concluded that heat-treatment has a superior ability to kill pathogens and less impact on valuable immunoglobulins. In this study the heat treated colostrum had significantly lower bacterial counts compared to UV treated colostrum.

Not surprisingly there was a lower immunoglobulin concentration in both heat treated and UV treated colostrum when compared to raw colostrum. However, the negative impact on colostrum antibody from heat treatment was nearly half that of UV treatment. This clearly demonstrates that, contrary to popular belief, heat-treatment has less of a negative effect on colostrum antibody content compared to UV treatment.

## **What about colostrum quality?**

There is an estimated 12.5% loss of immunoglobulins (antibodies) with heat-treatment using these pasteurisers. This is significantly lower than with the UV method and is considered acceptable. However, as a result of this, every effort should be made to only heat-treat the best possible colostrum i.e. measure with a Brix prior to heat treatment. If poor quality colostrum is used then the resulting heat-treated colostrum will be even poorer quality (original antibodies less 12.5%). The use of a Brix refractometer for the measurement of colostrum quality prior to treatment is an essential part of any heat-treatment program.

## **How do the DT Platinum series pasteurisers work?**

Colostrum or milk can be added to the vat of the pasteuriser and heat-treated this way. There is an internal agitator to ensure even mixing of colostrum /milk during the heat treatment process. Alternatively colostrum can be dispensed into Perfect Udder bags and heat treated in the bag. A Bag Guard is required for this method to ensure the bags are not damaged by the stirring propeller during the heat treatment process.

## **Can these pasteurisers heat-treat milk as well as colostrum?**

The DT Platinum series pasteurisers are capable of heat-treating waste milk, as well as colostrum. It should be noted that the cycles for milk are different from those for colostrum. Heat-treatment of waste milk is useful on farms where there are known pathogens, such as Salmonella and Mycoplasma.

## What are the cycles for colostrum and milk?

There are a few cycles available with the Dairy Tech pasteurisers. It should be noted that the time shown is the time period at that temperature. It does not include the time required to reach that temperature or cooling period. This will vary, depending on the batch size to be treated.

### Colostrum

#### Colostrum normal

This is the RECOMMENDED cycle. It involves heating colostrum to 60 oC and holding it at that temperature for 60 minutes (the time to reach this temperature depends on the volume of the batch). This is followed by a cool down to 32 oC (again, the cooling period depends on the volume of the batch). If the treated colostrum is not fed immediately, it is optimal to reach 15 oC in 30 mins (pre-chilling) and then 4 oC in the next 1.5-2 hours.

#### Colostrum heat only

This cycle heats to 60 oC and maintains this temperature for 60 mins. There is no active cooling, thus this cycle is NOT routinely recommended as any remaining bacteria will double in population size every 20 minutes at temps >32 oC. This cycle may be appropriate where another source of active cooling is available.

#### Colostrum reheat

This cycle warms colostrum to feeding temperature after it has been cooled post-heat treatment. This cycle would be suitable for colostrum which has been collected, heat-treated, cooled, refrigerated, not fed immediately and then needs to be warmed before being fed. This cycle can also be used to defrost frozen colostrum in the Perfect Udder bags.

### Milk

Whilst there are currently separate cycles for the heat-treatment of milk, it is the manufacturer's recommendation that the Colostrum Normal cycle is used (60oC for 60 minutes, plus cooling cycle). This is to preserve any immunoglobulin which may be secreted into the milk whilst maintaining the ability to inactivate pathogens.

## When should colostrum be treated?

- Colostrum should be heat-treated within 2 hours of collection from the cow. Otherwise it needs to be refrigerated immediately and should be heat-treated within 1-2 days. Hygienic collection is essential.
- It is more energy efficient to heat-treat the colostrum/milk as quickly as possible after collection to take advantage of the heat already in the colostrum/milk. This will also prevent the immediate heavy growth of bacteria in this fresh product.
- Colostrum should not be allowed to ferment prior to heat-treatment. This is why prior refrigeration is so important if it is not heat treated immediately (within 2 hours). Fermentation lowers pH to ~4.5 which allows changes in milk protein structure- this will coagulate when it is heat-treated and you will be left with a curd in the pasteurizer. It is common to think that this curd formation is due to over-heating but it is actually due to spoilage of raw colostrum prior to treatment.

## When should heat-treated colostrum be fed?

- Heat-treated colostrum should be fed immediately after the heat-treatment process. If this is not possible, then refrigeration is necessary to prevent bacterial re-growth. If left to stand at room temp or to cool down slowly (without the cooling cycle), heat-treated colostrum can quickly re-grow bacteria to levels that are the same if not higher than raw colostrum.

## Post-treatment procedure

- All the pasteurisers come fitted with an interchangeable tap that fits directly onto the Perfect Udder bags, which helps promote a 'closed system'.
- After the cooling cycle, it is recommended that colostrum is further cooled to 15oC in 30 minutes (this can be achieved by putting the bags in a large cold water bath) and then 4oC by 1.5-2 hours (i.e. fridge temperature).
- Refrigeration capacity must be seriously evaluated when considering the purchase of a pasteuriser. Without adequate refrigeration, bacterial levels can quickly reach those of raw, un-treated colostrum.
- Colostrum will keep in the fridge for 5 days post-heat treatment. Filling Perfect Udder Colostrum management bags allows for a disposable system that makes it easy to keep track of dates and colostrum quality. These bags also allow the product to be warmed quickly when they are needed and can then be fed without recontamination of the product.
- For long term storage, colostrum can be frozen in either the Perfect Udder bags or other suitable containers. By using the Perfect Udder bags, colostrum can be thawed using the reheat cycle and then fed to calves directly without the need to transfer colostrum from container to tube feeder. These bags also thaw four times faster than conventional bottles allowing colostrum to be available and ready to feed when it is required.
- Potassium sorbate added post-heat treatment will help inhibit bacterial re-growth. It is important to add this AFTER heat treatment as it will lower the pH of colostrum, if added prior to treatment and curd formation will occur during the heat treatment process.

## Where should the pasteuriser be located?

- Choose an indoor spot that will be protected from the elements year round. Extreme heat will allow milk spoilage and freezing temperatures will damage the unit.
- Cold water is required to be connected to the unit for water cooling the milk or colostrum, and a nearby hot water source is necessary for proper cleaning.
- Floor drains will allow for proper cleaning and rinsing of the product as well as to clean up milk spills.
- Floor space requirements are approximately 1m2 .
- Avoid placing the unit in an area of high drafts to prevent convection heat losses while pasteurizing.
- Always have 2 people lift and carry the unit grasping with both hands on the sides of the unit. The supports of the legs can be used for lifting. Never attempt to move the unit while it is full of milk or water.

## What are the running costs of the pasteurisers?

The estimated running costs are as follows (assuming 'average' cycle is 1.5 hours [60 minutes heat treatment plus heat up and cool down periods]):

- DT60G (227L): 175.7 cents per cycle.

These costs are based on the DT60G being 3900W with an average kWh price being 30 cents. Machines require a 15 Amp 240 V plug and must be installed in a clean, dry area.

## How might I use a pasteuriser on my farm?

Every farm is different. Procedures and protocols need to accommodate the individual requirements of the farm, taking into account herd size, calving pattern, number of calves to be reared and the staff involved in rearing calves. A suggested protocol for the use of the DT Platinum Series pasteurisers to pasteurise colostrum is detailed below.

1. Milk freshly calved cows separately.
2. Wash the barrel of all teats with clean water. Ensure all mud and manure has been removed.
3. Thoroughly dry all teats with fresh paper towel.
4. Briefly inspect teats for any damage.
5. Inspect the udder for any hot swollen quarters.
6. Pre-strip all quarters to remove any teat-sealant and/or casein plug. Inspect the colostrum for clots/evidence of mastitis.
7. Apply cups to clean, dry teats.
8. Collect first milking colostrum into clean (see cleaning regime) stainless steel test bucket (plastic buckets get small cracks which can harbour pathogens).
9. Test colostrum with Brix refractometer.
10. If  $\geq 22\%$  Brix ("Grade 1"), either dispense directly into cleaned pasteuriser and run the cycle within 1 hour of collection. Or dispense into a "Grade 1" lidded bucket for heat-treatment at a later time.
11. If  $< 22\%$  Brix dispense into "Grade 2" lidded bucket. Ensure all lids are on buckets before proceeding with the next cow. This helps prevent contamination with manure. Refrigerate after collection. NB. Ordinarily, Grade 2 colostrum ( $< 22\%$  Brix) is not ideal for heat-treatment and should be fed to 2 day old calves or older.
12. Only mix colostrum of similar quality with each other i.e. "Grade 1 with Grade 1" and "Grade 2 with Grade 2".
13. Refrigeration of Grade 1 colostrum may not be necessary at this stage if the time period between collection and heat-treatment is  $< 1$  hour, providing the bucket is lidded. This will depend on how many new fresh cows are being milked that day.
14. Once all the Grade 1 colostrum is in the pasteurizer, run 'Colostrum Normal' cycle. This will take 1-1.5 hours.
15. Once finished dispense directly into Perfect Udder bags using the specifically designed tap and either use immediately ( $32^{\circ}\text{C}$ ) or pre-chill in a cold water bath before refrigerating. If colostrum is refrigerated after heat-treatment, it is ideal that it is warmed again prior to feeding (in warm water bath or using the Colostrum Reheat cycle). NB. If potassium sorbate is to be used to prolong storage life of heat-treated colostrum, it is best to add this after the cooling cycle before dispensing into Perfect Udder bags.
16. It would be beneficial to always have some heat-treated colostrum stored in the refrigerator and ready to go.

## There is no silver bullet...

Heat-treatment of colostrum contributes to just one area of the calf rearing system. Installation of a heat pasteuriser alone will not fix all the issues. Other areas of calf rearing such as pre-calving management, colostrum management, calf nutrition, environment, records, health management and weaning need to be reviewed and any areas for improvement identified and acted upon.