

Youngstock Toolkit

Your essential guide to youngstock management

August 2020

GETTING THE BEST OUT OF COLOSTRUM

Genomic testing

How and why it should be done

Why concentrated whey protein is ideal for your calves



A Dairy Farmer publication in association with:



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Introduction

Maximising the genetic potential of your herd is reliant on piecing together every part of the calf rearing jigsaw; from breeding to colostrum, feeding, environment and health planning.

Survey flags colostrum as vital in rearing healthy calves

All farmers know the importance of calf rearing, but are you really ticking all the boxes when it comes to maximising their potential?

All participants in a recent social science PhD, carried out by Laura Palczynski at Harper Adams University, recognised the importance of colostrum in dairy calf rearing. In fact, everyone named colostrum as one of the most important factors in rearing healthy calves.

However, knowledge of the three main 'Qs' of colostrum management: Quickly, Quantity and Quality, did not guarantee implementation.

Under the guidance of Dr Philip Robinson, Ms Palczynski interviewed 40 dairy farmers and advisers in England to under-

stand what the barriers were to implementing best practice on-farm. For instance, why was calf mortality higher than we would like, and why were farmers not always adhering to advice?

Dr Robinson, who is now a senior lecturer in veterinary public health at the University of Glasgow Veterinary School, says colostrum management was one of the main areas flagged up.

Communicate

Feedback from those surveyed suggested more needed to be done to communicate the importance of 'sQueaky clean' and 'Quantification' as part of the 5Qs of colostrum management (see panel, below). This suggested 'a lack of focus on colostrum hygiene and measurement of successful antibody transfer'.



Colostrum has been named as one of the most important factors when it comes to rearing healthy calves.

Dr Robinson says: "It's like having a car and putting the wrong fuel into it; you're not going to get the performance you want. Colostrum is the fuel to get them started and allows them to achieve their potential."

Time and labour constraints were identified as some of the main reasons for not following advice. However, Dr Robinson says it is an area well worth making time for.

"The research helps to contextualise the environment farmers are operating in. They've got a lot going on. They're busy people," he says. "It is a challenge, but that care and attention pays dividends. They'll achieve target daily liveweight gains and age at first calving. If you don't get it right you'll have higher disease and calf mortality. It fits with the 'Colostrum is Gold' campaign," he says.

» See pages 10-12 for more on colostrum feeding.

The 5 Qs of colostrum management

1 Quickly: Speed of delivery to the calf is vital as the calf's ability to absorb immunoglobulins (IgG) from colostrum is a sliding door up to 24 hours. Colostrum quality also declines with time, so it is important to milk the dam immediately after calving

2 Quantity: Deliver four litres or 10% of body weight within the first four hours of birth

3 Quality: Test colostrum using a colostrometer or refractometer and only feed quality colostrum of >20g/litre of IgG

4 sQueaky clean: Ensure colostrum is collected

cleanly and refrigerated in a sealed vessel, otherwise bacteria will multiply and be absorbed by the calf

5 Quantify: Monitor your colostrum feeding programme by working with your vet to routinely monitor total blood proteins in calves as an indication of IgG absorption

Genomic testing

Genomic testing heifers and breeding replacements from the best should be a 'no-brainer' considering the potential improvements in genetic gain up for grabs.

Establish genetic potential of a heifer by genomic testing

All farmers have to tag calves so why not build routine genomic testing into the same process and use the information to speed up genetic gain?

According to Cogent's global business development manager Rudolph Linde, genotyping every female should be viewed as a 'no-brainer' considering the information it provides.

He says: "Don't just look at genomics as a cost, but also as an opportunity cost of not doing it."



Rudolph Linde

Table 1: Farm example - comparisons between parent average £PLI and genomic £PLI

GPLI	Breeding category	PA £PLI	Breeding category	Variance
352	Beef	519	Sexed	-167
362	Beef	485	Sexed	-123
311	Beef	468	Sexed	-157
418	Sexed	381	Beef	37
430	Sexed	368	Beef	62
424	Sexed	365	Beef	59

Genomics enable you to establish the genetic potential of a heifer from a young age (see 'Why genomic test?' panel, p5), thus allowing you to make informed, accurate breeding decisions. In this way, you only breed from the best; driving genetic gain and saving time and money associated with rearing lower value animals.

Better reliability and accuracy are some of the main advantages of basing decisions off

a calf's actual genetics, rather than parent average.

From Mr Linde's experience, genomic testing often re-ranks animals which are better than their parent average or sometimes worse (see table 1).

For example, females originally ranked on PA £PLI, with a genetic merit high enough to be served to sexed semen had a lower genetic merit upon genotyping, resulting in females being



Routine genomic testing can be built into the same process as tagging calves, which all farmers have to do.

served to beef. Conversely, females deemed genetic inferior on PA £PLI were, in fact, of a higher genetic merit upon receiving a more reliable, genomic evaluation and therefore were recommended to be served to sexed semen.

"Without genomics, you wouldn't know their true value," he says. "It's all about accuracy and reliability of decision-making."

Genomic testing – how it works

»Genomic testing enables an animal's genetic potential to be predicted from a young age by comparing its DNA to a 'key' which is representative of the national bovine population for a specific breed.

→An ear tissue sample is taken from a heifer calf using a device with a tissue sampling unit tube. A combined testing and management eartag can be used

→For Cogent's genomic testing service, 'Precision DNA', the tissue sample is sent to Cogent which will

send it to Genetic Visions in the US for testing

→The DNA from the ear tissue sample is extracted and broken down into more than 70,000 pieces

→This information is sent to AHDB Dairy which formulates the genomic evaluations in the UK by comparing an individual animal's DNA to the UK SNP chip (key). This takes about six weeks

→The farmer receives a genomic proof including genomic breeding indexes for the animal

Why genomic test?

67-70% reliability

Improves reliability: Genomic testing has a reliability of 67-70% versus 30-35% for parent average

?

Removes guesswork: Genomic evaluations provide you with hard facts about the genetic potential an animal will convey to her offspring

⌚

Selection pressure for identified traits: Knowing the genetic merit of your heifers allows you to increase selection pressure for a specific trait

✓

Validates parentage: Genomic testing has shown about 10-12% of recorded sires are not actually the tested animal's sire

How to do it

- Test all heifers; if you only test your 'best' heifers based on parent average you are defeating the object of genomic testing as you could miss some good animals
- Test heifers prior to breeding so breeding decisions can be made early
- Combining genomic testing with a sexed and beef strategy will increase selection pressure and speed generational gains in chosen traits (see table 2)
- Choose between a standard tissue sample genomic option
- Precision TAG and Test,



which combines the option of BVD

→Plan your strategy: How will you use the information?

→Choose the traits you want to improve (for example, milk fat and fertility) based on your milk contract and business requirements and select heifers and bulls accordingly

Genomic testing

Selecting the best females based on genomic testing has resulted in rapid gains at Grosvenor Farms, Cheshire, where top notch management is helping heifers fulfil their genetic potential.

Genomic testing yields impressive herd results

The ability to drive rapid genetic gain in specific traits is the main reason Grosvenor Farms'

dairy and resource manager David Craven would not be without genomic testing.

Mr Craven started genomically screening every heifer calf born at Grosvenor Farms two years ago in the knowledge the farm would hit expansion targets of 2,500 cows by 2019.

Having previously focused on upping cow numbers, rather than heavy selection, genomic screening would allow selection pressure to



David Craven

be increased, resulting in big gains in desirable traits.

A 'test' on 100 cows and their offspring in 2015 gave him the confidence to roll the strategy out across the herd.

He says: "That's where we saw the accuracy of genomic

Genetic gains achieved from genomic testing at Grosvenor Farms

Top 10 pre-calved heifers for £PLI

→2017-2018: Averaged £600 £PLI and 23kg of milk fat

→2018-19: Averaged £670 £PLI and 29kg of milk fat

Heifers aged one-two year's old (all animals tested in the last 12 months):

→Top milk: 1,010kg

→Bottom milk: 50kg

Heifers under one-year-old (for example, new calves produced from genomically selected females – all animals tested in the last 12 months):

→Top £PLI: £673

→Bottom £PLI: £140

→Top milk: 1,179kg

→Bottom milk: 62kg

testing. What we predicted those heifers to do, they did."

Having pushed for milk yield for many years, Mr Craven is

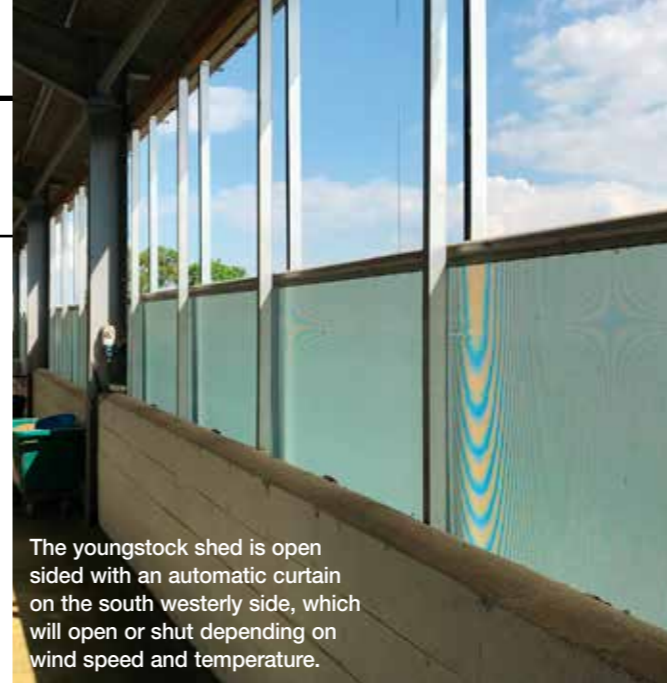
now breeding for kilos of fat while maintaining fertility and good stature. Udder conformation and teat placement are also crucial for fast milking on the three-times-a-day milking system. Cows average 12,500 litres at 4% fat and 3.5% protein.

Tagged

All heifer calves are tagged with a combined genomic test and management tag at birth (see page 4-5 for more on genomics) as part of Cogent's Precision DNA service. When the genomic proof is received, females will then be ranked for kg of milk fat, along with fertility, feet, stature and somatic cell counts.

Mr Craven says this is a more useful selection criteria than £PLI.

"Our herd is quite tight so £PLI is £380-£390 to £650-£700.



The youngstock shed is open sided with an automatic curtain on the south westerly side, which will open or shut depending on wind speed and temperature.

The core is in the middle of that. There are more outliers on kg of fat not £PLI," he says.

The process has proved particularly useful in identifying outliers which may have been 'average' on parent average, but have proved to be 'super heifers' or 'poor' when genomically tested.

Mr Craven says: "At least 60% don't move off their parent average, but what you do find is those that could be average on parent average turn out to be poor animals. You wouldn't pick that up without genomics."

Sexed semen

The bottom 25-30% of females will be sold at weaning, while the rest will be bred to Sexed ULTRA 4M semen. About 20% of the best first lactation and 20% of the best second lactation females are also put to sexed semen. Everything else is going to Aberdeen-Angus sires from Cogent.

A breeding programme is drawn together by Cogent, with about six bulls used across the heifers. To get the most from genomic testing, Mr Craven believes it is worth deselecting a relatively high number of females – just selecting out one or two females will not realise its full potential.

The benefits of genomically



A Volac Förster-Technik automated milk feeding system is used on-farm.

testing have been realised relatively fast at Grosvenor Farms (see 'Genetic gains achieved from genomic testing at Grosvenor Farms' panel), Mr Craven says: "By selectively breeding we saw a very big improvement in the first year, especially with fat. That has slowed down now, as we don't have as many outliers, but there are still improvements to make."

Moving forward, this will include selecting animals using EcoFeed – a new breeding index which evaluates feed intakes and how well an animal converts that into milk.

"In the next two-five years that's going to be a big selection pressure," says Mr Craven.

Environment maximises genetic potential

→Following herd expansion, Grosvenor Farms invested in a dedicated youngstock unit which has been designed to deliver the best possible environment underpinned by top notch management.

David Craven says: "It doesn't matter how good your genetic selection is, if you don't manage them correctly."

COLOSTRUM

"Colostrum management is absolutely key," says Mr Craven. "It's about making sure that once it's taken from the cow it's kept appropriately and not allowed to stand as bacteria can grow so quickly. And delivering that colostrum to the calf quickly," he adds.

The dedicated team follow strict colostrum protocols: →All colostrum is pasteurised →Colostrum is tested using a refractometer and will only be fed if it tests >23%

→Calves receive 10% of their bodyweight in colostrum within one-and-a-half hours of birth (for example, four litres for a 40kg calf) →A second colostrum feed is delivered eight hours later. This will be whatever the calf will drink, but is usually two-three litres

→Once calves have received colostrum, they are moved to the dedicated youngstock shed

BUILDING DESIGN AND ENVIRONMENT

The youngstock shed is open sided with an automatic curtain on the south westerly

side, which will open or shut depending on wind speed and temperature. Calves are managed in groups of 20.

Each group has access to an outside loafing area, which can be shut off with sheeted gates in inclement weather.

The farm is currently working with its vet Stuart Russell, of Nantwich Farm Vets, to reduce respiratory challenges in the calves. The plan is to install a positive pressure ventilation tube to aid air movement.

AUTOMATED MILK FEEDING

Calves are initially kept in pairs and fed three litres of Heiferlac calf milk replacer twice-a-day until they are strong and used to teat feeding. They then move onto a Volac Förster-Technik automated milk feeding system. The barn has eight feeders, with two groups of 20 calves sharing each machine.

Mr Craven says: "You have a feeding programme and you know the milk is mixed consistently. There's quite a lot of information that can help with the management of the calves. And it helps labour."

HYGIENE

The milking machine is maintained and cleaned regularly. When a pen is emptied it will be mucked out, steam cleaned, disinfected with a product which is effective against cryptosporidiosis. The pen will then be rested for two weeks if possible.

All heifer calves are tagged with a combined genomic test and management tag at birth.



Sexed semen

Since combining genomic testing with a sexed and beef strategy, rapid gain in £PLI has been achieved on the youngstock of £154 per head above the milking heifers.

Farmer pledges commitment to breeding strategy

In 2018 Devon dairy farmer Darren Furse adopted a sexed and beef strategy, alongside genomic testing, as part of a Cogent and Arla trial. The aim was to optimise the value of every animal produced on-farm.

Mr Furse says: "There's no way I'd stop genomically testing or using sexed semen – it's the only way forward."

Genomic testing allows the genetic status of an animal to be established at a young age (see pages 4-5). This ensures only the best heifers are served to dairy, meaning only the top performers produce replacements. Beef can then be put on the lower end.

Mr Furse says: "The rate of genetic gain by not breeding your worst cows and putting them to beef and only breeding replacements from your best is huge. Then if you put on top of that using your best bulls, you've got huge genetic

gain. And then you're also getting higher value beef too."

Mr Furse farms in partnership with wife Claire and his parents, Nigel and June, at Westcott Farm, Holsworthy. The family run the 305-cow Westcott herd of pedigree Holstein Friesians. Cows yield 9,974 litres per cow per year at 4.32% protein and 3.5% fat.

Breeding aims

Breeding decisions are focused around producing a sustainable, profitable, healthy herd, which are long-lived and productive. Emphasis is placed on good feet and legs, fertility and mastitis.

This has been helped by signing up to Cogent's Preci-

sion MATCH corrective mating programme.

The company's Precision Match Evaluator Amy Hall-Brown scores the cows for 18 Type traits, including stature, rump angle, udder depth and teat depth. Locomotion is also assessed.

Cogent genetic consultant David Wilcox works with the Furses to choose a selection of bulls to meet the farm's breeding aims. Moving forward this means selecting sires with a

£PLI of £700 or more and 65kg plus for combined milk fat and protein. A good score for health traits is also crucial. The programme will then select the best bulls to use on an individual female to correct the traits identified.

Mr Furse says: "I wanted more strength and longevity

Darren and Claire Furse adopted a sexed and beef strategy on their Devon dairy farm in 2018.

in the cows. MATCH looked at the cows in a much better way. I don't think I valued linear assessments before. I was just looking at fat and proteins as that is what you get paid for. But if the physical attributes are right, that is what makes a cow stay on the farm longer and be productive. The herd is also much more uniform."

Calves being born in the last 12 months are sired by Mr Rubi-Agronaut, B52, Torque, Sunview Fantastic and Endco Supreme.

Sexed and genomics

All heifers are genomically tested using PrecisionDNA. These females are then ranked on Cogent Custom Index (£CCI). This takes into account an individual herd's breeding aims and their specific milk contract requirements. About 90% will be put to SexedULTRA 4M semen, with the rest which 'were not good enough' put to Aberdeen-Angus.

Mr Furse had dabbled with sexed semen in the past but had

not had satisfactory results, causing him to stop using it. As a result, prior to the trial, all heifers would have been served by an Aberdeen-Angus stock bull.

"That meant my best genetics were going to waste as they were going to beef. The best genetics on-farm are always your youngest animals which genomic testing has shown us," Mr Furse adds.

The introduction of automated heat detection collars increased Mr Furse's confidence that bulling heifers would be picked up, which encouraged him to use sexed semen again.

SexedULTRA 4M also has double the number of semen cells per straw than traditional sexed semen, which can bring conception rates close to that of conventional semen.

Having used conventional dairy semen across cows in the past, sexed semen is now used on about a third of the best cows. This group will be chosen through PrecisionMATCH

Table 2: Improvements in genetic merits since adopting a sexed and beef strategy alongside genomic testing

Trait/Index	Lact 1	Youngstock	Genetic improvement
£CCI (Cogent Custom Index)	£247	£331	£84
£PLI (Profitable Lifetime Index)	£150	£304	£154
Milk (kg)	114	215	101
Combined milk fat and protein (kg)	19.54	28	8.46
Fertility	-0.64	3	3.64
Somatic cell count (negative = improvement)	-1.57	-7.8	-6.23

based on linear assessment, parent average and £CCI.

Generally, cows will get one chance to sexed and then go to beef. Usually there is a preference to serve younger cows to sexed as Mr Furse finds these animals tend to achieve better conception rates.

Conception rates

On average, conception rates across heifers and cows are approaching similar levels to those seen with conventional semen (see Table 1). By improving artificial insemination technique, timing and mineral strategy, the hope is to improve these results further.



Looking ahead, Mr Furse believes the breeding strategy is going in the right direction and he remains committed to every element.

Mr Furse hopes sexed will eventually outperform conventional and also recognises the benefits of increased beef value having stopped breeding black and white bull calves.

He says: "We know Aberdeen-Angus or Belgium Blue calves are much more saleable than Holstein Friesian calves. And if you get locked down with TB, when you come out, you can sell those bulls easier than a Friesian steer."

Now, beef calves are sold either privately or through the market at about four weeks old. As an example of price differentiation, a Friesian bull

would have sold for about £70 versus £300 for a British Blue bull and £240 for an Angus.

The farm has only just started using Blue sires on early lactation cows in an attempt to further raise calf value. However, this strategy may change, depending on the long-term effect having a larger calf has on the cow. Aberdeen-Angus sires are always used on heifers and later lactation cows.

Looking ahead, Mr Furse believes the breeding strategy is going in the right direction and he remains committed to every element.

"There's no looking back now," he says.

Table 1: Fertility performance with different semen types

Semen type	Pd+	Number of animals	Conception rate
Conventional	223	543	41%
SexedULTRA 4M	90	240	38%

*A 93% relative conception rate with SexedULTRA 4M.

Colostrum

There's more to colostrum than you think...



It is highly nutritious. It has:
5x more normal proteins
2x more fat
10x the level of minerals and vitamins compared to normal milk (Godden, 2008)

Leukocytes, growth factors, hormones, vitamins and minerals help newborns' immune system (Barrington and Parish, 2001)

Helps defence: Stimulates production of acid and digestion enzymes when it enters the abomasum. Acid kills many ingested bacteria.

Intestinal development: Colostrum aids the development of a healthy gut, boosting villus length and mucosal thickness.

Impacts metabolism: First colostrum intake effects neonatal metabolism.

Thermoregulation: Stimulates heat production to help calves adapt to new environmental conditions.

Epigenetic programming: Hormones and growth factors determine expression of certain genes involved in weight gain, mammary development and development of the digestive and reproductive tract.

Vaccinating dams and ensuring calves rapidly receive plenty of high quality colostrum is part of an 'immunity-led prevention' strategy which will help boost health and performance.

How to maximise colostrum quality

The health and future productive performance of every one of your heifers lies in your hands and starts with ensuring you get quality colostrum into them within four hours of birth.

It takes the calf three weeks to develop its own immunity, making it almost completely reliant on disease-fighting immunoglobulins available from its mother via her colostrum.

Vet Oliver Tilling, of Shepton Vets, says this highlights the importance of robust colostrum protocols on every farm.

"We're bridging that period before the calf's protection kicks in," he says.

"However, it's not all about stopping the calf from getting sick. There's a lot more goodies in there. Colostrum has a host of other important factors

“The concentration of antibodies reduces by 3.7% every hour post-calving”

OLIVER TILLING

Maximising colostrum quality

1 Vaccinate: Consider vaccinating the dam to boost colostrum immunoglobulin levels for specific diseases after identifying pathogens on-farm

2 Avoid colostrum pooling: Low antibody, high volume colostrum will be highly represented in pooled colostrum. Pooling increases the risk of failure of passive transfer by 2.2-fold

3 Get dry cow period length correct: Excessively short dry periods of less than 21 days or excessively long dry periods will reduce colostrum quality

4 Dry cow nutrition: Feed dry cows a balanced dry cow ration

5 Limit stress: Stress reduces colostrum quality. Ensure dry cows have plenty of feed and lying space

that aren't just short-term, but long-term." (See infographic, left).

Uptake of immunoglobulins
 Data collected by the South West Youngstock Group in 2016 suggests one-in-three calves are not receiving adequate colostrum demonstrated by insufficient uptake of immunoglobulin – known as failure of passive transfer (FPT).

This data-set was collected from hundreds of farms as part of an initiative run by vet practices across the South West, including Shepton Vets. The group was supported by MSD Animal Health.

Mr Tilling believes failure



Oliver Tilling

to adhere to the 5Qs of colostrum management (see page 3) is one of the main reasons FPT occurs. All of the Qs are important, but Mr Tilling highlights 'Quickly' as particularly vital.

"The concentration of anti-



The calf is born with no immunity, relying on colostrum to protect it until its own immune system starts to become functional at around three weeks of age.

bodies reduces by 3.7% every hour post-calving," he says.

"It's a ticking clock. You've got to get it out as quickly as possible. That's where we see it falling down on-farm as farmers wait eight to nine hours before the next milking. You need to get it out and into the calf as quickly as possible."

This is even more important considering the calf cannot absorb immunoglobulins after 24 hours and its ability to absorb gradually reduces up to this point.

Mr Tilling says: "That's a sliding door, especially from four hours onwards. That's why four hours is so important."

Boosting quality with vaccines
 Maximising colostrum quality

How successful is your colostrum management?

»The proportion of calves receiving adequate levels of immunoglobulins should be a number all farmers know instantly, in a similar way to bulk somatic cell counts and calving interval, says Oliver Tilling.

"This is a key aspect farmers need to know about. They need to know about the level of immunity to maximise health and welfare and long-term productivity," he says.

"As much as farmers are prepared to pay for milk recording, they need to know where they sit in terms of the calf's immune status."

To establish this, farmers should work with their vet to test a proportion of calves aged one to seven days old for total blood protein levels, at least once-a-month. This gives an indication of immunoglobulin uptake and hence colostrum management success.

→52g/litre of total proteins equates to a target 10g/litre of immunoglobulins
 →Ideally 85% of calves should have successful passive transfer of immunoglobulins
 →It costs about £4-£5/calf for a total blood protein test

Blood testing acts as a useful monitoring tool, allowing patterns to be established and actions to be taken accordingly.

is also a must. There are numerous ways to boost quality (see 'Maximising colostrum quality' panel), one of which is

vaccinating the dam against the main causal pathogens for scours. This boosts the level of immunoglobulins

for these pathogens in the colostrum.

Mr Tilling advises working with your farm vet to

Colostrum

Case study: Sam Chadfield, Grange Farm, Darley Moor, Ashbourne, Derbyshire

»Vaccinating cows with Rotavec® Corona has been part of a holistic approach which has boosted calf health and reduced stress levels for Derbyshire farmer Sam Chadfield.

Mr Chadfield runs 100 Holstein Friesians yielding 26 litres per cow per day at 4.1% fat and 3.2% protein. A few years ago, he felt like he was constantly treating calves for scours and battling to get calves off to a good start.

He says: “They went down like flies. They kept dropping as soon as they were born.

“When you looked at our animals you could see they didn’t have a good start. I believe the milk starts in the calf. If you keep a healthy calf from day one, I’ll get more out of her when she’s in-milk. We wanted to improve the health of the whole farm.”

With that in mind, Mr Chadfield undertook a Calf Health Checklist with vet Shrea Patel, of McMurty and Harding. In response, he overhauled the design of an existing calf building; ripping everything out and putting in a raised, slatted stock

board floor and splitting calves into groups.

Milk feeding rates were also increased to deliver 900g of milk solids instead of 500g and the team stuck with the policy of feeding four litres of quality colostrum immediately after a calf is born.

He was initially ‘pig-headed’ and reluctant to spend on vaccination, but the scour problems continued. It was then that Ms Patel tested the cows and found they were shedding E.coli K99 into the environment.

Vaccinating

As a result, Mr Chadfield started vaccinating all of the dams with Rotavec® Corona.

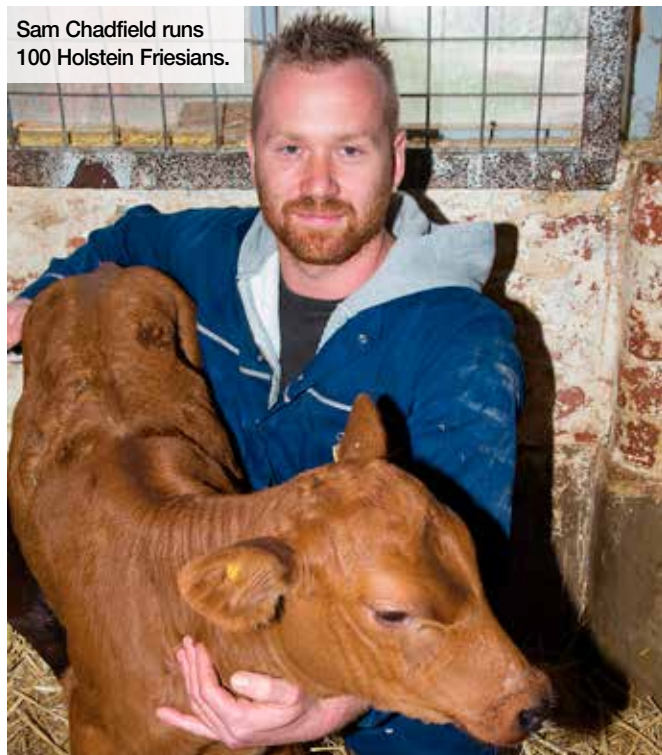
He says: “As soon as we vaccinated the cows pre-calving it stopped E.coli in its tracks. We haven’t had a case since.”

Good colostrum management ensures calves receive exactly what they need.

However, a few months later, scours became a problem again. A farm scours testing kit identified that calves were infected with rotavirus.

“I didn’t know you were

Sam Chadfield runs 100 Holstein Friesians.



supposed to keep the vaccine in the fridge,” says Mr Chadfield – which explains why the vaccine hadn’t provided adequate protection. Since then, the data sheet has been followed. The team is also keen to rest the shed between calves, although this is challenging on the all-year-round calving system.

Mr Chadfield is convinced the

vaccine is worth the investment. “I’ll carry on using it now. If I don’t it will start flaring up in the shed. As soon as a calf gets rotavirus you can add two weeks on to the rearing time,” he says.

“A lot of calf rearing gets overlooked, but it’s so important to focus on it. It gets big results at the end. It’s about building the immune system.”

establish if vaccination is applicable.

If calf disease is a problem, the decision to vaccinate should stem around identifying the causal pathogens on-farm and choosing an appropriate vaccination.

He believes more farmers should consider dam vaccination since more than 50% of calves

experience scour in the UK. A large number of these will be caused by rotavirus, coronavirus, E.coli K99 or salmonella.

For example, the APHA Veterinary Investigations Diagnosis Analysis Report 2018 showed that 41% of calves which had been tested for scours in 2011–2018 were

infected with rotavirus or coronavirus.

Mr Tilling says: “These pathogens are highly prevalent and vaccination would help prevent those poorly calves. It’s part of a package of measures. It shouldn’t be used on its own. And you have to up your game on colostrum management so

those antibodies are transferred to the calf to aid protection.”

Cryptosporidium is also a primary cause of scours, however as this is caused by a parasite, no vaccine is available. Instead the focus should be on hygiene and disinfecting gates, equipment and people with an effective disinfectant.

Rotavec® Corona contains inactivated rotavirus and coronavirus and E.coli K99 antigens. POM-VPS. Bovilis® INtranasal RSP Live contains live BRSV and Pi3. POM-V Bovilis® Bovipast® RSP contains inactivated BRSV (strain EV908), Pi3 virus (strain SF-4-Reisinger) and inactivated Mannheimia (Pasteurella) haemolytica (serotype A1). POM-V Further information is available from the respective SPC, Datasheet or package leaflets. MSD Animal Health UK Limited. Registered office Walton Manor, Walton, Milton Keynes, MK7 7AJ, UK. Registered in England & Wales no. 946942. Advice should be sought from the medicine prescriber.

Use Medicines Responsibly.

Pneumonia

Dr Kat Baxter-Smith, veterinary adviser for MSD Animal Health, provides answers around how vaccines can help combat pneumonia and reduce the disease's long-term impacts.

Vaccination use in the pneumonia fight



Dr Kat Baxter-Smith

Q What are the effects of pneumonia?

A The financial and welfare effects of pneumonia are significant. The cost per calf is variable, with work from 2002 suggesting pneumonia in dairy calves costs £30-£500 per calf, or £60 million a year to the whole industry.

In terms of performance, it can add 30 days onto the age at first calving, reduce body weight and lower first lactation milk production by 500kg.

Q What are the main causes of pneumonia in the UK?

A Mannheimia (Pasteurella) haemolytica is always the number one cause of pneumonia in calves which die (2012-18 APHA data). If there is anything there to bring down the immune system, such as a virus, stress or a poor environment, it is there to move

in (see panel, below). Viruses such as parainfluenza virus 3 (PI3) and bovine respiratory syncytial virus (BRSV) usually cause the initial damage and then the M. haemolytica bacteria comes in. This bacteria lives in the respiratory tract.

If you tested a live animal with signs of pneumonia, it is likely it will come back as PI3, BRSV or infectious bovine rhinotracheitis (IBR). However, by the time the animal is dead, those viruses have gone.

Q How can vaccination help?

A Vaccinating against a specific disease increases the animal's immune response against that virus or bacteria. If an animal has a primed immune system from vaccination, it has already seen these bacteria or viruses, so when it is exposed to them in the environment, the immune system is ready to react.

The speed of immune



Work from 2002 suggests pneumonia in dairy calves costs £30-£500 per calf, or £60 million a year to the whole industry.

response is quicker and the clinical signs are reduced. So if you vaccinate against

pneumonia early, you will vastly reduce the risk of lung disease.

Q How do you decide on the right vaccination?

A Vaccine choice will largely depend on risk, what pathogens are on-farm and when calves are being infected. If you are experiencing a disease outbreak, a vet can do nasal swabs to identify the cause. If you had problems a few months ago, then blood tests can be used to identify what challenge calves were exposed to.

Although traditionally farmers often vaccinated off the back of a problem, the risk of pneumonia is always there, so now

many forward-thinking farmers are realising a preventative vaccine strategy to protect the animals before disease hits is a much more cost-effective way of keeping the animals healthy.

If you are seeing problems

in young calves, Bovilis INtra-nasal RSP Live can be given up the nose from one-week-of-age. It is effective against BRSV and PI3. The calf will then be protected from two weeks of age, with coverage

Case study: Rerrick Park Farm, Dumfries, Scotland

»Vaccination has been part of a holistic approach which has seen pneumonia rates plummet at Rerrick Park Farm, Dumfries.

Around 10 years ago, the McDowall family invested in a high welfare, greenfield site dairy to allow them to expand to the current 1,200-cow herd. However, it took Katrina McDowall several years to convince father, Fergus to improve the youngstock rearing facilities.

Miss McDowall says: "For the number we have, we needed a dedicated shed. You need enough space to rest pens and not mix ages. And also a dedicated shed for the right airflow for calves."

In the old set-up, calves were housed in the 'spare old shed'. Calves were in the same air space as dry cows, which increased infection risk, while the sheer number of animals coming through did not allow pens to be rested. As a result, the farm was treating about 15% of calves for pneumonia.

"Any type of pneumonia is bad enough. It's a check and

it effects my weight gains. When you're trying to achieve 800g a day, you can't afford any check," says Miss McDowall.

Repeat cases

"We had repeat cases of pneumonia in heifers when they calved and in later lactation. We could often track that back to them having pneumonia as a calf."

As soon as calves moved into the purpose-built shed, pneumonia treatment rates dropped to 8%. This was also thanks to greater 'attention to detail', including increasing CMR rates from 660g per calf per day to 900g. In winter, calf coats were also put on calves at birth.

However, the main thing was the ability to steam clean and disinfect pens between calves, thanks to increased space. The team continued to feed four litres of quality, fresh colostrum within an hour of birth.

In a drive to further reduce pneumonia levels, vet Jimmy More, of The Galloway Vet Group, advised vaccinating calves against pneumonia. As

calves were going down with the disease at around two weeks old, using Bovilis INtra-nasal RSP Live was deemed the best option as this can be administered from one-week-of-age. Following vaccination, pneumonia treatment rates dropped even further to 2%. Average calf growth rates have subsequently increased from 700g a day to 800g a day.

Miss McDowall adds: "In general, the dairy industry is trying to reduce antibiotic use. If I can get a fit, healthy animal that means less drug use – that's my aim. And it means my calf rearer and I can spend our time rearing calves. It's the worst part of the job looking after sick animals."

“ You need enough space to rest pens and not mix ages. And also a dedicated shed for the right airflow for calves

KATRINA McDOWALL

M. haemolytica – a bacterial problem which lurks

»Creating a healthy, stress-free environment is essential to stop M. haemolytica bacteria from multiplying and causing long-term lung damage.

M. haemolytica is a normal bacteria which lives in the respiratory tract in low numbers. However,

if the respiratory tract is compromised, for example from a dusty environment or stress, this bacteria can multiply and create toxins which go into the lungs and body, causing illness and death.

APHA reported a peak in M. haemolytica cases in

March 2020. This could have been caused by a sudden fluctuation in temperature as the weather changed from cold to hot – leading to calf stress. As spring calvers are likely to have more stock on the ground at this time, stress from high stocking rates could also have been an influencer.

To prevent issues, Dr Baxter-Smith advises vaccinating youngstock at winter housing and ensuring young calves are vaccinated as early as possible after birth. Good hygiene, plenty of colostrum and keeping calves in smaller groups is also helpful.

Pneumonia

lasting 12 weeks. If you protect calves with an intranasal vaccine against the viruses, the secondary bacterial disease is less likely.

If you want longer, wider ranging protection which includes *M. haemolytica*, then Bovilis Bovipast RSP may be an option, especially if you are getting pneumonia from two months of age or older. This is active against BRSV, PI3 and also *M. haemolytica* and can be given from two weeks of age onwards. This is also licensed in pregnant animals, so it will reduce the infectious pressure that calves are born into.

Both Bovilis INtranasal RSP

Live and Bovilis Bovipast RSP could be given for a belt and braces approach.

Q How do you ensure the best possible response from a vaccine?

“Calves can now be vaccinated as young as one-week-of-age against BRSV and PI3

DR BAXTER-SMITH

A → Handle and store vaccines correctly in a working fridge at 2-8degC.
→ Avoid administering vaccines during periods of stress which will affect the animal's immune response, for example at castration or weaning.

→ Provide a healthy environment – avoid over-crowding or mixing age groups. Keep bedding and buckets clean

Providing a healthy environment is key to getting the best possible response from a vaccine.



to reduce the rate of infection.

→ Ensure adequate ventilation with plenty of fresh air.

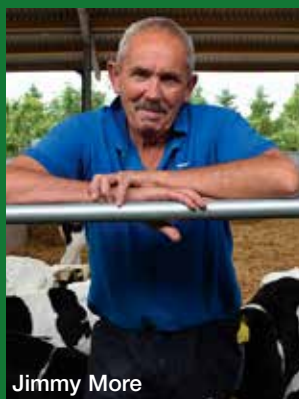
If these factors are not right,

the animal's response to the vaccine will be reduced as it is trying to deal with other problems.

Lung ultrasound flags up hidden disease

» Those coughing, sick calves you treat for pneumonia are just the tip of the iceberg, according to a calf lung ultrasound trial which identified much higher levels of subclinical disease below the surface.

As part of the trial, the lungs of 400, four- to six-week-old calves



Jimmy More

on six Scottish farms were scanned. Lung consolidation on the ultrasound was used to detect damage. Vet Jimmy More, of The Galloway Vet Group, says the results indicated a lot of subclinical disease.

“We found 2% was the treatment level for pneumonia, but, including those treated, we were seeing 15-17% with lung consolidation. So those treated animals were the tip of the iceberg,” he explains.

Following the initial scan, the farms introduced a number of management changes. As a result, when a similar age

group of calves were ultrasound scanned six months later, there was an average reduction in lung consolidation of 4%.

The management changes implemented included:

1 Vaccinating calves with an intranasal pneumonia vaccine
2 Increasing calf milk replacer (CMR) feeding rate: Daily CMR rates were raised to 900g of milk solids per calf per day. Initial feeding rates were variable, with some farms feeding 600g. Mr More says: “If you're starving the calf to death, the immune system won't be as good at

fighting whatever disease they're subjected to”

3 Improving hygiene: “If you wouldn't put it in your mouth don't put it in the calf's mouth,” says Mr More

4 Improving straw bed nesting score

5 Recording daily liveweight gains: If you can't measure it, you can't manage it

6 Ensuring an isolation pen was available for sick calves: Mr More says: “If you're following self-isolation for Covid-19, why don't we do it for calves? It's one thing we're bad at, but sick calves should be isolated and in a different air space”

Modern day concentrated whey protein-based milk powders can deliver top notch calf performance thanks to careful processing and delivery of essential bio-nutrients.

Debunking the myths around whey-based milk powders

It is time to debunk the myths around whey-based milk powders and take the time to select the right quality calf milk replacer

(CMR) to maximise the potential of your heifer replacements, says Ian Watson, global technical manager at Volac.

He believes there is much to

be gained from choosing modern-day, whey-based calf milk replacers.

He says: "Whey powders historically started

out with a poor reputation, but advances in processing and research means whey is now a go-to protein source."

There is still the perception among some farmers and advisers that skim milk powder is best as it forms a casein clot in the abomasum, which breaks down over a period of time. This is perceived as beneficial to calf performance.

However, recent research suggests there is no difference in growth and calf health when calves are fed high-quality skimmed or whey-based

“Advances in processing and research means whey is now a go-to protein source

IAN WATSON



Maximise the potential of heifer replacements by selecting the right quality calf milk replacer.

Whey vs skim trial

»Farmers can expect similar calf performance when feeding either high levels of whey-based or skimmed milk powder, according to recent research out of Agri-Food and Biosciences Institute, Hillsborough.

The trial aimed to bring historic calf milk replacer research from the 1990s into the 21st century by comparing performance of whey and skimmed milk powders fed at modern day feeding rates.

Eighty Holstein Friesian calves were fed up to 1,050g of milk solids per day and growth rates and disease incidence were monitored

up to 10 weeks of age. The results showed that the presence of the skim, and, therefore, the clotting effect of casein, was not needed for calf performance.

Volac research scientist Dr Jessica Cooke says: "There was no significant difference between the different milk replacer formulations. If the important milk components are processed at low temperatures and with careful manufacturing techniques, both skim and whey proteins will be highly digestible by the milk fed pre-weaned calf and will deliver good performance."

products (see 'Whey vs skim trial' panel).

This could be attractive to

farmers considering the fact skim products can be higher in price. Mr Watson says it is



Ian Watson

Whey

“Not all whey is the same. Always check the bag label

IAN WATSON

also important to recognise that skim products may not be the same as they once were. In some cases, skim powder inclusion rates have dropped from 60% to around 10%.

“There can be wide variation, so it’s always important to check the amount of skim included in the powder as this directly affects the clotting effect of the casein,” he says.

Why whey?

Whey also has a number of additional benefits not found in skim products. For example, the whey fraction of colostrum and whole milk contains valuable bioactive proteins, such as immunoglobulins and lactoferrin.

Volac filters and concen-

Key things to think about when selecting a milk powder

PROTEIN

→For dairy replacements opt for a product of around 23-26% crude protein

→If your cows are true Holstein and you want frame, choose a product at the higher end, although 23% crude protein can still achieve good results

→For dairy cross beef calves, 20-23% crude protein may be more economically viable

→A 23% crude protein CMR can work well for both dairy and beef

FATS AND OILS

→Oil acts as an energy source

→High oil products (>20%) are available but increasing the

oil and energy levels can make weaning onto dry feed more challenging as calves will not have the desire to eat hard feed.

This can be compounded by feeding high milk feeding rates of >900g of milk solids/day. To minimise growth checks on high oil products, and/or high milk feeding rates, a robust step weaning process is essential, ideally over a three-week period

FIBRE

→Fibre is an indication of vegetable protein inclusion (there is no fibre in whole milk). Ideally levels should be 0.1 or below

→High fibre will reduce digestibility

ASH

→Ash levels of 7-7.5% are ideal

→Do not go above 8% as this will reduce digestibility

SODIUM, PHOSPHORUS AND CALCIUM

→Sodium is an undesirable salt – you do not want levels higher than 0.5%

→High sodium suggests more ash and potassium which reduces digestibility and increases the risk of digestive upsets

→Phosphorus should be 0.5-0.6% and calcium 0.8-0.9%

trates up the liquid whey protein fraction of milk and retains the key proteins, fats, sugars and other bioactive components.

The resultant unique ingredient is Immunopro®, which is included in its CMR range. This concentrated whey protein and phospholipid base

material is packed with vital amino acids, lactoferrin and immunoglobulins.

While immunoglobulins are absorbed by the calf’s gut in the first 24 hours to provide immunity, they also help rapid gut development and lay a solid foundation for fast, efficient growth. Lacto-

ferrin is also important for the development of the immune system and has antibacterial properties in the gut.

Mr Watson says it is important to recognise that not all whey powders are produced in such a way and as such, not all wheys are created equal.

Table 1: Know your wheys

	Whey powder	Delactosed whey	Concentrated whey protein
What it is	Liquid whey from cheese which has been dried with little processing	A proportion of lactose extracted from whey by crystallisation	Ultra-filtrated whey processed at low temperatures (Volac products)
Protein levels (%)	12-12.5%	27%	35%
Fat/oil (%)	1%	1%	5.5%
Lactose (%)	70%	50%	50%
Ash (%)	6-7%	Up to 17%	6%
Key considerations	Relatively low in protein	The protein and ash are concentrated, high ash can reduce digestibility and increase digestive upsets	The ultra-filtration process produces a high fat, high protein raw material including key bioactives such as immunoglobulins and lactoferrin. Low ash and low temperature processing improves digestibility

Table 2: Growth and health of calves fed four milk replacers differing in sources of dairy protein (skim milk powder and/or whey protein concentrate) up to 10 weeks of age

	MILK REPLACER COMPOSITION			
	66% skim	44% skim	22% skim	0% skim
Number of calves	20	20	20	20
Body weight (kg) at birth	40.8	41.3	41.7	41.5
Body weight (kg) at weaning (day 56)	73.2	74.5	71.9	73.5
Daily liveweight gain (kg/day)				
Day 0-14	0.38	0.34	0.31	0.4
Day 14-56	0.64	0.66	0.61	0.63
Number of scour episodes	0.75	0.63	0.54	0.39
Number of respiratory episodes	0.44	0.71	0.67	0.57

Milk replacer (26% crude protein; 16% fat; mixed at 150g/litre) fed at five litres/day (day five-10), seven litres/day (day 11-34), five litres/day (day 35-49), two litres/day (day 49-55). Ad lib calf starter and water available from birth with the addition of chopped straw from day 56.

Source: AFBI, Hillsborough, Northern Ireland (2019)

He urges farmers to check with their CMR supplier as to how their products are processed.

“It’s important to understand that processing can

impact on the raw material and the digestibility of that material and the nutrition delivered,” he explains. For example, low temperature processing helps safeguard

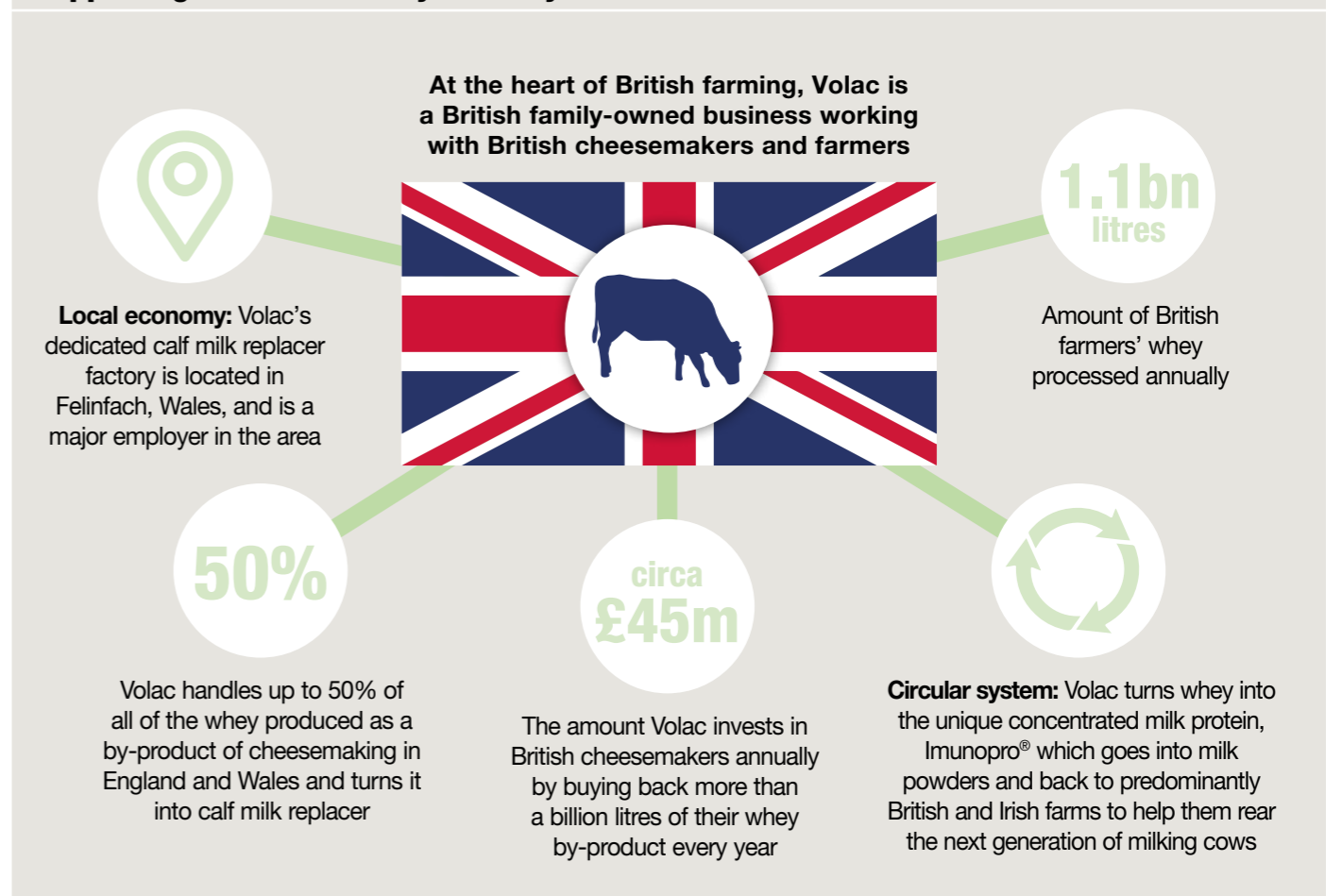
essential amino acids and aids digestibility.

Checking exactly what type of whey is included is also an important process.

“What is declared on the

label? Is it delactosed whey, whey powder or whey protein? All three originate from whey in cheese, but have been processed differently,” he says. (See Table 1, p18).

Supporting the British dairy industry



Automated milk feeding

Jason Short, northern business manager for Volac, runs through some of the key benefits of using automated milk feeders for calf rearing.



Top tips for automated milk feeding calves

Benefits



Saves time: Less time is needed to feed calves as the process is automated



More consistent: Milk mixing rate and feeding temperature are consistently the same



Little and often: Calves can feed little and often which matches their natural behaviour and encourages the calf to eat concentrate which aids rumen development



Feeding curves: Individual calves in the same pen can be on different feeding regimes; this allows beef and dairy calves to be run together



Improved hygiene: The machines automatically rinse themselves; some systems also rinse and disinfect teats between calves



Better management: Less time feeding calves means you can spend more time doing other tasks such as weighing and monitoring growth rates



Information: The computer will inform you which calves have drunk and which have not; you can view feeding curves and also calf weights on some models



Support: Volac offers technical support for the two machines it sells: Urban feeders and Förster-Technik feeders; it can discuss where to site feeders and set-up feeding programmes

“ From putting the calf on the system to weaning, the computer will give you data throughout

JASON SHORT

Jason's top tips



Good stockmanship: Calves still need to be checked visually; the computer can help to pinpoint calves which haven't had their full milk allowance so action can be taken



Space requirement for grouped calves: 1.5sq.m/calf is the minimum space requirement



Environment: Good drainage, ventilation and natural light are essential to maximise performance on any system

Automated milk feeding

Automated milk feeding enables Barber's Farmhouse cheesemakers to successfully rear 600 quality heifers per year from seven of their dairy herds.

Case study: Alfie Barber, Moor Lane Farm, Somerset

»When Barbers decided to start rearing all of its own replacements, a precise, automated system which would deliver consistent feeding programmes and save labour was the obvious choice.

Five years on and all of the heifers from seven of the business' 11 dairy herds are reared on Volac's Förster-Technik milk feeders on a dedicated calf rearing unit at Moor Lane Farm, Somerset.

The Barbers run 2,500 cows across all of the autumn block calving farms, with herds averaging around

8,500 litres a cow a year at 4.3% fat and 3.6% protein. All milk is used for Barber's Farmhouse cheese.

Colostrum

Calves are born on their specific farms where they receive four litres of colostrum 'as soon as they hit the ground'. Colostrum has

to test >25% on a refractometer to warrant feeding to calves. They are trained to feed from a teat and then move on to the automated milk feeders.

Alfie Barber believes consistently feeding plenty of quality calf milk replacer through an automated system

is essential for long-term performance.

He says: "You only get one chance and you're either going to make a good or bad animal. You can very quickly get a bad animal if you don't feed right."

Calves are run in groups of 20, with four to five groups on each machine.

Mr Barber opts to increase milk feeding rates per litre (see 'Milk feeding regime' panel). He thinks it is well worth the extra cost considering the good growth rates calves are achieving. From birth to weaning they are averaging daily liveweight gains of 1-1.2kg per day.

"I get the better growth from feeding a bit more. It's a cheap investment really. For an extra 60g a day of milk powder it is an extra 7p per day," Mr Barber adds.

Growth rates

He believes consistency of feeding also helps support growth rates. The automation also helps the team of five dedicated calf rearers focus their attention where it is needed.

Automatic weaning via the milking machine avoids growth checks at this time. Mr Barber also believes feeding a high quality, 20% protein pellet is key to performance.

All about hygiene

»Although the machines automatically clean themselves, the dedicated team of calf-rearers pay close attention to pen and teat hygiene to ensure the very best environment.

→Teats are manually disinfected and changed daily – two sets are on rotation for the same machine (one set is being disinfected while the other is used)

→The feeding crate is scrubbed and washed with soapy, warm water regularly. A specific cryptosporidium disinfectant is then applied

→The team manually checks feeding alarms on the computer first thing in the morning to identify calves which have not fed and identify calves which need attention

"You're looking for a good frame out of the calf rather than a fat dumpling. Giving them that high protein gives them frame growth. And I add biotin to help bone growth," he says.

"You only get one chance and you're either going to make a good or bad animal"

ALFIE BARBER

Milk feeding regime

HEIFERS

→Calves are run on a 72-day milk feeding programme

→Gradually built up from four litres per day to eight litres per day by day 14

→CMR fed at a rate of 150g/litre up to 160g/litre

→As of autumn 2020, calves will be fed Volac ImunoGard® CMR to day 10. They will then move on to Heiferlac

→Day 14-54 - Calves are held at eight litres per day

→From day 54 to 60, feeding levels are reduced to three litres

→Then milk is reduced to zero

BEEF

→Dairy cross British Blue calves are sold either privately or at market at three weeks of age

→They are on an ad lib feeding programme and receive 175g/litre of Volac Enerlac CMR

"I get the better growth from feeding a bit more"

ALFIE BARBER

Installing an automated milk feeder has been part of one Lancashire dairy farm's drive to future-proof the business.

Case study: David Kidd, Booth Hall Farm, Quernmore, Lancaster

»The ability to feed higher volumes of milk safely and not being tied to a set feeding time were some of the reasons the Kidd family moved to an automated milk feeding system.

Three years ago, David Kidd decided to upgrade the existing calf rearing set-up at Booth Hall Farm, Quernmore, Lancaster, as part of a general move to future-proof the family business.

He says: "Our first major investment was a new parlour, which was followed by improved cubicle housing for the cows. But our latest project is a new relocated, totally bespoke calf rearing building, which is already transforming the way we rear our herd replacements.

Feeding programme

→Calves in individual pens for 14 days where they are trained to drink from a teat. Receive three litres, twice-a-day

→Start on six litres per day on the automated feeder across three feeds

→Increases to eight litres per day across four feeds until 42 days

→Feeding rates gradually reduced from 42 days to weaning at 72 days

→Feed rate of 150g/litre of CMR

Going forward, investment will be channelled into projects like this that save us time. We do not really see ourselves getting much bigger, so it's all about efficiency."

All-year-round

Mr Kidd runs 170 all-year-round calving Holsteins with brother Neil and parents, Edwin and Maureen. Milk is sold

to the Co-op. The herd yields 10,000 litres per cow per year at 4% fat and 3.3% protein.

The youngstock building was specifically designed for calves, with 7ft eaves and a curtain down each side.

A specially-designed raised ridge was also installed to help draw air out. The new six-pen set-up enables different aged calves to be kept separately. It has also allowed pens to be rested between batches.

The shed has two Urban Alma Pro computerised calf feeders from Volac. Each machine has three feeding stations with one feeding station serving a pen of 10 calves.

Having bucket-fed calves three litres of milk twice-a-day on the old system, the automated set-up has allowed Mr Kidd to raise milk feeding rates (see panel, above). Calves now receive up to 1,200g of milk powder versus 600g previously.

The fact calves can drink little and often throughout the day helps to feed these higher volumes, safely. That has been reflected in average growth rates from birth to weaning of 0.9kg per day. Mr Kidd was also attracted to the Urban Alma Pro because three calves can parallel feed at the same time.

He says: "The calves look better. They shine more and they're fitter. And I'd like to say they grow quicker and put better frame on."

The automated system is saving Mr Kidd up to an hour per day, but the flexibility

of not being tied to set feeding times has been the main benefit.

He adds: "It's less time consuming, but it's not like you don't have to bother

with them. You've still got to clean the teats. We wash the teats every morning."

The information available on the system has also proved valuable, with Mr Kidd analysing the data at the end of every day.

"The information is good. It shows you a graph of the last few days of what they've drunk against what they should have drunk. You've got a lot of information to see how the calf has been drinking."

"The calves look better. They shine more and are fitter"

DAVID KIDD



David Kidd decided to upgrade the existing calf rearing set-up at Booth Hall Farm three years ago.