AgriSearch NI
Farmer Funded Research

Effective Footbathing of Dairy Cows

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mdc

Effective Footbathing of Dairy Cows

Contents

This work has been commissioned by MDC on behalf of farmers in England, Scotland and Wales with a financial contribution being made by AgriSearch for Northern Ireland farmers.

We gratefully acknowledge the support given to this project by suppliers of footbaths and footbathing products, particularly Int racare BV for the split footbath. We are also grateful for the time and effort taken by all the farmers visited in the course of the study and to the MDC project manager Dr Alison Gibbs for her input and support throughout this project.

How good is your footbathing system and layout?

An honest appraisal of your existing system will help to identify areas where there is scope for improvement, as well as confirming aspects which are satisfactory. Regular footbathing is beneficial to cows' health. Every effort should be made to do the job as effectively as possible, with minimum disruption to the daily milking routine. In this way both staff and cows can accommodate footbathing into the system, on a long-term basis, which is often the approach required to combat a problem as persistent as digital dermatitis.

Be totally honest throughout and give yourself a score of one for 'yes' and zero for 'no'.

For questions requiring an answer ranging from excellent to poor, give yourself a score of three for 'excellent', two for 'good', one for 'average', and zero for 'poor'.

This is summarised as: Yes = 1, No = 0, Excellent = 3, Good = 2, Average = 1, Poor = 0.

Management Awareness	
Do you know accurately, and monitor how many lame cows you have?	
Do you know what the main causes of lameness in your herd are?	
Has infectious lameness in the herd decreased over the past year?	
Do you think that your chosen footbathing system works?	
Is your routine consistent, without missing days or weeks, when footbathing was required?	
Do you trim cows' feet regularly, at least once a year?	
Has your foot trimmer been trained in claw trimming?	
Do you inspect the feet of, and footbath, all animals introduced to the herd?	
Do you footbath dry cows?	
Do you footbath youngstock?	
Do you footbath all year round, even if cows are at grass?	
Are acute cases treated topically with a spray or a bandage?	
Do you wear personal protective equipment against hazardous chemicals, such as formalin?	

Overall layout and ease of working	
How comfortable are your cubicles for cows to lie in – excellent, good, average or poor?	
Do you clean all cubicle access and feed passages at least twice a day?	
How clean are cows' feet prior to the treatment bath – excellent, good, average or poor?	
Is the state of repair of all access passages, including slats – excellent, good, average or poor?	
Is footbathing carried out under cover, with no rainwater entering the treatment bath?	
Is lighting above the footbath[s] excellent, good, average or poor?	
Is ventilation of the footbath[s] area excellent, good, average or poor?	
Can the footbath[s] be quickly filled with water from a convenient tap and hose?	
Can the treatment bath[s] be readily, accurately and safely filled with the appropriate chemical?	
Has the system been checked for accuracy of treatment quantities?	
Is the footbath far enough from the parlour so as not to disrupt cow flow?	
Is the footbath access gating arrangement well-funnelled for good cow flow?	
If the gating arrangement is not permanent, can it be readily set up and dismantled?	
Do cows have access to a clean standing/ lying area after footbathing?	

The footbath itself	
Is a pre-wash footbath included within the arrangement?	
Do cows walk calmly through the footbath[s]?	
Are steps into, or down into, the footbath[s] safe and easy for cows to negotiate?	
Are all footbaths 3m long or greater?	
Is your footbath capacity at least 1 litre per cow?	
Are footbath floors comfortable and non-slip for cows, without pronounced ridging?	
Is the footbath walkthrough safe for cows, without tempting them to 'straddle' the bath or exit early to one side?	
Are the footbaths wide enough for all cows to readily pass through without injury risk?	
Is the treatment solution depth at least 80mm at the end of footbathing?	
Is spillage loss minimised by generous kerbs or high walls at the sides of the footbath, or by sloping the surround to return spillage for an inset footbath?	
Can the footbaths be quickly emptied and cleaned out, without risking an injury, such as that created by lifting up the corner of a heavy plastic bath?	
Can temporary footbaths be readily stored convenient to their locations when in use?	
Are blockages in permanent footbaths avoided by a good drainage system with generous outlet pipes?	
Is footbath drainage straightforward into a convenient slurry tank?	
Are the footbaths big enough to suit cow groups, and refilling as required, so as to remain effective throughout, from first cow to last?	

How well did you score? In a recent MDC funded study on footbathing we visited 41 farms and assessed lameness and footbath design and use on each farm. Twelve farms were selected at random from those visited, giving the overall scores ranging from 34 to 41.

Farm number	1	2	3	4	5	6	7	8	9	10	11	12	Maximum Possible score
Management awareness	9	11	7	8	7	10	9	11	9	9	11	9	13
Overall layout and ease of working	18	18	17	18	18	16	19	13	18	18	16	17	24
The footbath itself	10	12	11	12	10	11	10	10	14	11	11	11	15
Total	37	41	35	38	35	37	38	34	41	38	38	36	52

A total score of 52 can be attained by gaining the target scores for the 3 components described below. This represents a very high level of stock management within a very workable footbath arrangement and layout. Farmers should strive to attain this level, or at the very least a score over 40. A total score in the low 30's or below indicates that there is considerable scope for improvement. Sometimes dramatic improvements can be achieved by a radical re-think of the existing system, without necessarily incurring significant additional costs.

Management awareness

Scores ranged from 7 to 11, with a total achievable score of 13. The main areas of underachievement are: not knowing accurately the number of lame cows, not footbathing young stock and dry cows, and not wearing protective equipment against hazardous chemicals. Farmers should strive hard to achieve a management awareness score of 12 or over, since good, attentive management is such a vital part of good foot care.

Overall layout and ease of working

Scores ranged from 13 to 19, with a total achievable score of 24. The main areas of underachievement are: a lack of cubicle comfort because cubicles are too small, poor repair of badly laid floors, poorly ventilated, badly lit footbath areas, footbaths too close to parlour exits, and a failure to check concentrations of footbath treatment solutions. Farmers should strive to improve their footbathing arrangements to achieve a score of at least 20 in this category.

The footbath itself

Scores ranged from 10 to 14, with a total achievable score of 15. The main areas of underachievement are: no pre-wash footbath, footbaths too small and too short, insufficient treatment solution left for the last cows going through, poor drainage and general inconvenience cleaning out the footbath. Farmers should replace their inadequate footbaths as appropriate to strive for a score of at least 13 in this category.

Checklist for possible improvements

- Knowing accurately the number of, and monitoring lame cows.
- Being consistent long enough with your chosen footbath routine to evaluate its effectiveness.
- Inspecting the feet of all stock brought onto the farm, and treating accordingly.
- Paying attention to treating the feet of dry cows and youngstock as required.
- Treating acute cases topically, in addition to regular footbathing.
- Wearing suitable personal protective equipment against hazardous chemicals.
- Ensuring that cubicles are very comfortable and that all access passages are clean, and in good repair, so that cows enter the footbath with clean legs and feet.
- Checking any treatment system for accuracy to ensure that the correct amounts of chemicals are being used.
- Returning the cows to a clean standing/lying area.
- Including a pre-wash bath in the arrangement.
- Putting in a longer, more effective footbath
- Measuring treatment depth after the last cow has passed through.
- Minimising spillage to keep the footbath effective throughout the treatment period.
- Improving drainage to ensure that footbaths are easily and thoroughly cleaned out.
- Gearing the footbath size to herd and group size.
- Keep cows cleaner by good slurry management see MDC publication 'Minimising Slurry Pooling in Dairy Housing', 2005.

REMEMBER!

- Minimise the risk of introducing DD by isolating all cattle coming on to the farm
- Monitor the extent and causes of lameness in your herd
- Keep cows clean and comfortable at all times
- Have a decent footbathing set up
- Use it effectively and safely

Do you know accurately how many lame cows you have? And do you monitor them?

- Knowing the level of lameness in the herd is the first step in tackling the problem, which most farmers tend to underestimate. Use a consistent scoring system, which at its most basic consists of watching each cow walk on an even, non-slip surface and deciding if she is sound or lame. The scoring system can be as simple as sound, uneven/slow and lame as long as you use the same system each time. Lame cows tend to walk more slowly, with shorter and maybe uneven strides, they tend to arch their backs in an attempt to redistribute body weight away from the source of pain and may nod their head as they walk. Severely lame animals find difficulty in turning corners and walking up and downhill.

Fig 1a Cow walking soundly

Fig 1b Cow walking lame

- Identification of lame cows is needed so that the cause of lameness can be determined and the individual can be treated promptly, however, even knowing the number of cows lame in the herd gives an overall view of lameness and is useful in assessing if lameness control strategies are working.
- If lameness monitoring is done regularly (for example quarterly), the success of lameness management can be assessed and if necessary changed to match the lameness challenge in the herd. Records of which cows are lame, and any lameness treatments, are valuable management tools. An example of a lameness record sheet is included in Figure 2 and an additional sheet which can be copied for your own use can be found in Appendix 1.

Cow	Date	Foot		Foul		*DD/ IDD		IDG		SH		Heel Erosion		Ulcer		Abscess		Wall/ WL lesion		Double sole		Over grown		Blocked		Bandaged		Outcome / action
111	06/06/2004	LF	RF																									
		LH	RH							2																		
236	24/06/2004	LF	RF																									
		LH	RH		1																							
285	24/06/2004	LF	RF																									
		LH	RH		1																							
254	04/06/2004	LF	RF																									
		LH	RH															1										
111	28/06/2004	LF	RF																									To be seen again
		LH	RH							3				2										x				
698	08/06/2004	LF	RF																			1	1					
		LH	RH																									
691	08/08/2004	LF	RF																									increase footbathing??
		LH	RH			1																						
125	08/08/2004	LF	RF																									removed, healed 11/08/04
		LH	RH			2																				x		
354	12/08/2004	LF	RF																									nothing found
		LH	RH																									
245	12/08/2004	LF	RF																									
		LH	RH														2											
111	15/08/2004	LF	RF																									still blocked
		LH	RH							1				2										x				but improving

1	Mild	3	See again	DD/IDD	Digital or interdigital dermatitis	SH	Sole haemorrhage/bruising
2	Major	4	See vet	IDG	Interdigital growth	WL	White line damage

Fig 2 Example of lameness records

Are you aware of the extent of lameness in your herd?

- Lameness can be split into 3 main causes; infections of the skin around the hoof horn such as digital dermatitis (DD) and foul in the foot, claw horn problems such as sole ulcers and white line damage, and other problems such as calving damage or joint problems. Tackling the levels of infectious lameness is one of the most effective ways of reducing overall herd lameness, especially if severe cases are treated promptly.
- To help keep lameness to a minimum, cows need clean, dry feet, a safe walking surface and a clean comfortable place to lie down.

Fig 3 Correct diagnosis of the causes of lameness is needed so that the appropriate changes in lameness management can be made.

Claw horn lesions

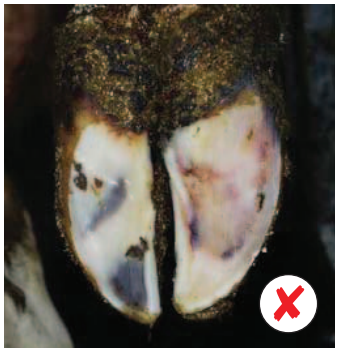

Fig 3a Sole haemorrhage.

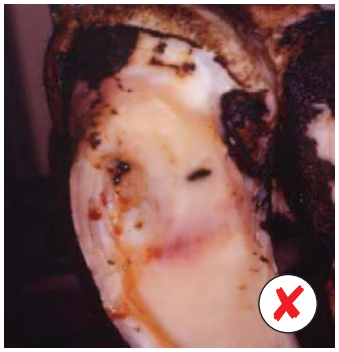

Fig 3b White line abscess.

Fig 3c Sole ulcer.

Skin lesions

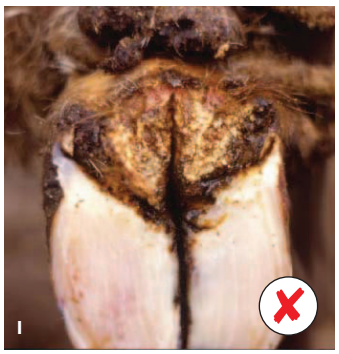

Fig 3d Digital dermatitis can appear quite different as erosive lesions (1), chronic lesions (2) or 'hairy warts' (3)

Fig 3e Interdigital dermatitis.

Fig 3f Interdigital growth.

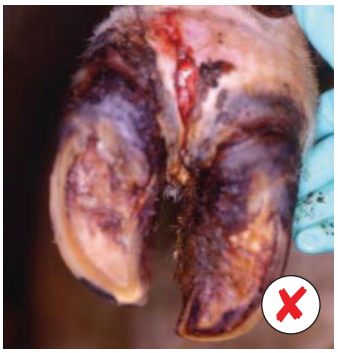

Fig 3g Foul in the foot.

Do you know what the main causes of lameness in your herd are?

- Lame cows should be checked out by lifting their feet. This will determine the strategy taken to reduce herd lameness. If lameness assessment is done just before the routine herd foot-trimming, there are two benefits; trimming can be targeted at those cows which need it most, and the main causes of lameness can be identified.
- If the main problem is infectious skin conditions, such as DD, then priority attention needs to be given to hoof hygiene. Claw horn problems are more difficult to reduce as they are influenced by many different factors, such as calving, housing, feeding and breeding.

Has infectious lameness in the herd increased or decreased over the past year?

- Better footbathing routines and avoiding slurry pooling are the two main factors which need to be considered if levels are increasing, see MDC publication 'Minimising Slurry Pooling in Dairy Housing', 2005.

Do you think that your chosen footbathing system works?

- The only way to know if the footbathing system used is effective is to regularly assess levels of infectious lameness. If levels are increasing then consider footbathing cows more frequently or changing the solution used. For example some farmers use an antibiotic footbath occasionally (under veterinary direction) to good effect when DD is increasing in the herd.
- The response to 'how often do I need to footbath my cows?' is 'as often as you need to'. The frequency of footbathing has to meet the challenge of infectious lameness in the herd, which varies widely from farm to farm and from year to year.
- Reducing the frequency of footbathing should be done gradually and with care. It is false economy to stop footbathing completely in summer when cows are out at grass, and DD levels tend to fall, as this can lead to worse DD once the cows are re-housed.

Is your footbathing routine consistent?

- Routine footbathing, to suit the chosen frequency, needs to be consistent if it is to be effective. Making the footbath procedure easy to set up, operate and clean out encourages this.

Do you trim cows feet regularly, at least once a year?

- Regular foot trimming of all cows at least once a year helps to reduce herd lameness. It is particularly important where claw horn lesions, such as sole ulcers, are a problem. It is also the ideal opportunity to assess the prevalence of DD.
- Many farmers employ a contract foot trimmer throughout the year to ensure that feet can be trimmed at least annually. This gives an opportunity to assess the herd and the causes of lameness at different times of year, and treat accordingly.

Fig 4 Regular foot trimming by a trained foot trimmer reduces lameness and improves cow welfare

Has your foot trimmer been trained in claw trimming?

- Good professional foot trimmers will leave a record of any problems they have found in the cows' feet whilst trimming.
- Farm staff must be trained to claw trim and to leave accurate records on which cows have been done and what was found. Such records can be used to identify problem areas such as any chronic cases. Good records will assist the farm vet in timely, effective treatment.

Do you inspect the feet of, and footbath, all animals introduced to the herd?

- Few dairy herds in the UK are free from DD and tight herd biosecurity is the only way to remain free from the disease.
- The main way that DD is introduced into herds is by buying in infected stock , including youngstock and bulls. The feet of any purchased cattle should be inspected and treated by footbathing or spraying on arrival. This should include all cattle whether youngstock, dry or milking cows, or bulls. They should be quarantined for at least a fortnight and feet checked regularly to ensure they are free from DD. If clear, they should be footbathed again before mixing with other stock.

- DD can also potentially be spread by foot trimmers and vets unless all possible hygiene measures are taken to clean and disinfect knives and other equipment.
- The same organism that is responsible for DD in cattle may cause contagious ovine digital dermatitis (CODD) in sheep too, so co-grazing and overwintering sheep on cattle pasture could potentially spread DD.

Do you footbath dry cows?

- Farmers who are most effective at footbathing and controlling DD footbath their dry cows regularly. Allowing the organism to thrive in the dry cow yards and then introducing heavily infected, freshly calved cows back into the milking herd is a sure way of increasing DD throughout the herd.

Do you footbath youngstock?

- Few farmers do this even though the average age at which farmers on the study were first seeing DD in the youngstock was 12 months. This is an average figure, so some cattle are becoming infected at a very young age. Although heifers often seem to be particularly sensitive to DD, to date no immunity to it has been shown and unless infectious lameness is controlled in dairy youngstock, they will act as a source of infection for other cows when they enter the main herd. Even though this may be seen as an extra chore when time and resources are short, it is important that youngstock are footbathed regularly to keep herd DD levels under control.

Do you footbath all year round, even if cows are at grass?

- There is some evidence now that farmers who footbath throughout the grazing season have less lameness in their herds than those who do not. Footbathing cows throughout the year is an important way to reduce the DD challenge. This is critical for herds which zero graze, housing cows all year round, but also effective for cows out at grass.

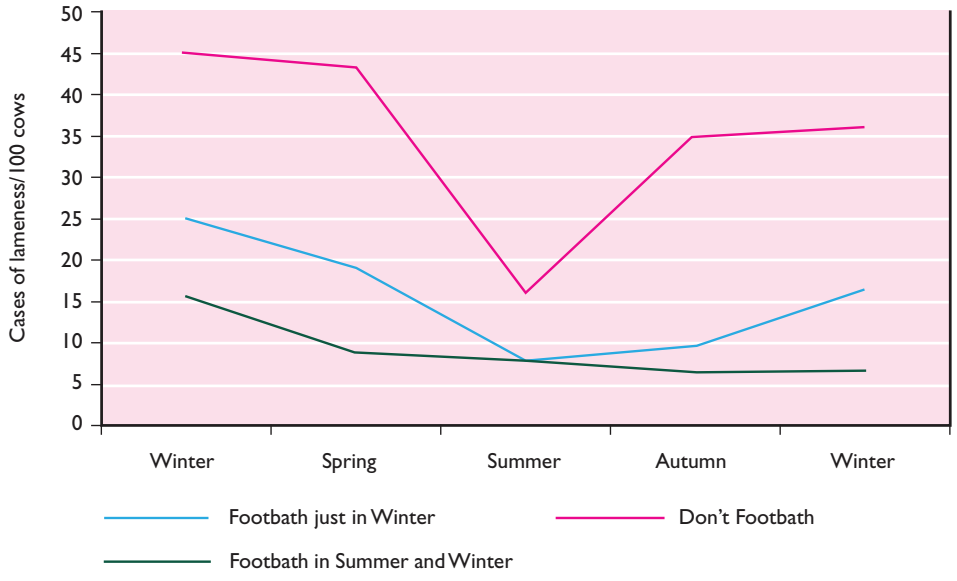

Fig 5 Footbathing throughout the year reduces the number of lame cows

Are acute cases treated topically with a spray or a bandage?

- Acute cases of DD are very painful for the cow, leading to severe lameness, which should be treated promptly by cleaning the affected area and treating with topical antibiotics. Bandaging the foot will help the treatment to remain in contact with the lesion, especially if waterproof covering is used to hold the bandage in place. It is important to remove the bandage after 2 – 3 days or the bandage traps dirt and makes the lesion worse.

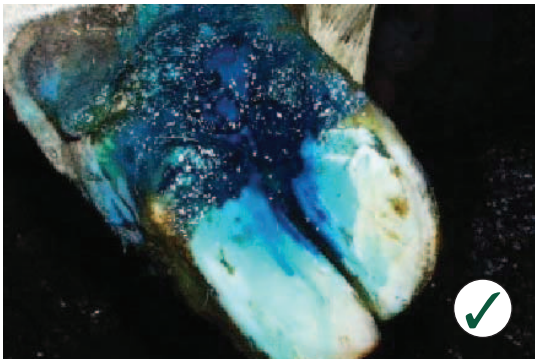

Fig 6a Treatment of acute individual cases with topical spray can be helpful.

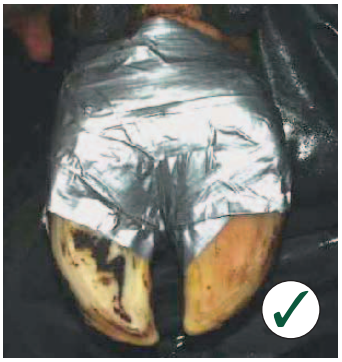

Fig 6b Bandaging acute DD lesions helps by increasing treatment contact time but remember to take it off after 2- 3 days!

Do you wear personal protective equipment against hazardous chemicals?

- Formalin, for example, is a hazardous chemical as defined under the COSHH Regulations [2002], requiring personal protective equipment.
- Seek guidance and information from your chemical supplier on safety precautions when storing and handling any chemical. You will then be able to assess the risks and hazards associated with the product, and decide on the safeguards needed.
- A good starting point is a free HSE publication C2000, published April 2005, 'COSHH: A brief guide to the Regulations 2002', available from www.hsebooks.co.uk.

REMEMBER!

- Minimise the risk of introducing DD by isolating all cattle coming on to the farm
- Monitor the extent and causes of lameness in your herd
- Keep cows clean and comfortable at all times
- Have a decent footbathing set up
- Use it effectively and safely

What makes a good footbathing system?

Is the routine consistent?

- Routine footbathing, to suit the chosen frequency, needs to be done consistently if it is to be effective. Footbathing regularly to control infectious lameness should be seen in the same way as teat dipping and prevention of mastitis; something that is part of the routine, and something which must be carried out regularly and effectively to maintain cow welfare.
- Make the footbath procedure easy to set up, operate and clean out.

How often?

- Footbathing needs to be carried out as often as is needed to keep levels of infectious lameness to a minimum.
- Monitoring levels of infectious lameness in the herd gives an idea of how frequently footbathing should be done. As a rough guideline, if more than 10% of cows are affected then footbathing should be done at least two or three times a week. At levels below this, once a week may be sufficient.
- If DD increases then footbathing daily for a week may be enough to bring levels back down. Alternatively antibiotic footbaths used occasionally (under veterinary direction) can be effective when DD is particularly prevalent or acute in the herd.

Is the routine quick and easy?

- Footbaths which don't need temporary gating to be set up are more likely to be used on a regular basis. Ease of working is a major factor in encouraging busy staff to footbath cows routinely. Setting up and cleaning out should not take longer than 10 minutes.

Fig 7a Footbaths should be stored nearby so that set up is quick and easy

Fig 7b Use of temporary gating may make regular use less likely

- Filling arrangements for footbaths must be quick. A water hose or tap directly into the bath saves time. Chemicals should be safely stored immediately adjacent to the treatment bath. Alternatively if parlour washings are used, they can be pumped directly to a footbath or stored adjacent for gravity fill.
- Ideally cows' feet should be pre-washed before entering the treatment solution, either by using a hose or pre-wash footbath. A pre-wash footbath significantly reduces contamination caused by dunging in the footbath.

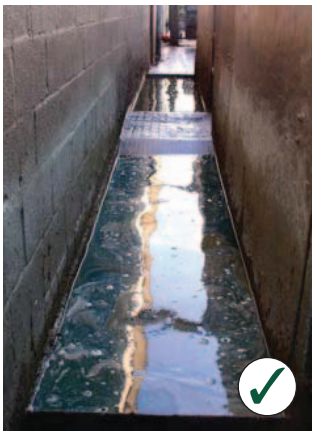

Fig 8a Use of a pre-wash bath is recommended

Fig 8b Pre-washing removes dirt from feet and reduces dunging in the treatment footbath

Is the system safe and accurate?

- The preparation of footbathing solutions must be accurate if the correct concentrations are to be used. If too dilute, they may not be effective; using concentrations of solution that are too weak is a major reason for farmers experiencing poor results and thus giving up on footbathing, often with disastrous results. If solutions are too strong, they may do more harm than good (especially formalin which can cause chemical burns to the cow's skin at concentrations greater than 10%). Either way the solutions are not being used efficiently if they are used at the wrong concentrations. Table 1 shows the amount of chemical concentrate required to achieve a range of final treatment solution concentrations for different footbath capacities. For example to achieve a final concentration rate of 5% in a 500 litre capacity footbath you need 25 litres of concentrate. (Formalin as a concentrate is supplied as a 40% w/v solution. A 5% final footbathing solution is 5% of this concentrate ie 5% of the 40%).

Table 1. Calculating the amount of concentrated chemical (kg or litres) required

Total solution in footbath [litres]	Required concentration rate					
	2%	4%	5%	6%	8%	10%
200	4	8	10	12	16	20
250	5	10	12.5	15	20	25
300	6	12	15	18	24	30
350	7	14	17.5	21	28	35
400	8	16	20	24	32	40
450	9	18	22.5	27	36	45
500	10	20	25	30	40	50
550	11	22	27.5	33	44	55
600	12	24	30	36	48	60
650	13	26	32.5	39	52	65
700	14	28	35	42	56	70
750	15	30	37.5	45	60	75

- Capacities can be calculated using the simple relationship that 1000 litres of liquid occupies 1 cu m by volume. Table 2 assists by giving capacities for a range of footbath sizes, for 100mm depth of solution. Alternatively, a known volume of water can be poured into the bath and the bath side marked with a permanent scored line. Provided that cows' feet are clean when they go into the treatment bath, 1 litre per cow is a reasonable minimum capacity for a treatment bath, especially if used in conjunction with a pre-wash bath.

Table 2. Footbath capacities with solution depth of 100mm

Footbath length metres	Footbath width metres	Volume of liquid litres
2.5	0.7	175
2.5	1.4	350
2.5	2.1	525
3	0.7	210
3	1.4	420
3	2.1	630
3.5	0.7	245
3.5	1.4	490
3.5	2.1	735
4	0.7	280
4	1.4	560
4	2.1	840
4.5	0.7	315
4.5	1.4	630
4.5	2.1	945

- The system must be safe for cattle to use without injury. The race must be wide enough so that even heavily pregnant cows can go through the bath and race without the risk of injury. The footbath must also be wide enough to prevent cows from avoiding the solution by straddling the bath.
- Where footbaths are situated outside the solution may freeze and become slippery in frosty conditions. All access floors to and from the footbaths must be well-maintained, without potholes, and be non-slip surfaces, without any tight turns, steps or steep ramps.

Fig 9a Avoid potholes in worn concrete which can cause lameness and damage to feet

Fig 9b Walking surfaces should be kept in good repair

Fig 9c Avoid steps or steep ramps

- Where footbaths are inside, the system must be well-lit and well-ventilated particularly if using noxious chemicals such as formalin.

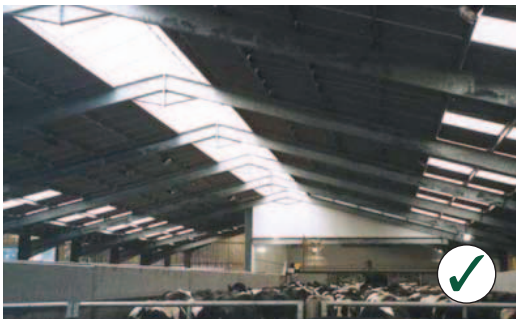

Fig 10a Good ventilation is important for indoor footbaths.

Fig 10b Poorly ventilated footbaths in dark areas are to be avoided.

Is the system cost effective?

- Estimates of the average costs of footbathing 200 cows in 2006 through 250 litres of solution at recommended concentrations range from £8.50 to £40.00 per bath, or £0.05 to £0.20 per cow, not including labour or footbath installation costs.
- Lame cows produce less milk, are less likely to get back in calf and are more likely to be culled. When these indirect costs are added to treatment and labour costs, the cost of footbathing represents roughly 18% of the cost of digital lameness. Hence it is cost effective to footbath regularly and routinely.

Fig 11 Valves fitted to divert circulation wash to the footbath after cleaning milk plant

- Milk plant washings can be used and are of course free, since they would run to waste anyway. It is simply a case of diverting the used circulation wash by fitting pipes and a valve from the dairy to the footbath.

Is the solution efficacious as a disinfectant?

- Many different solutions can be used to control infectious lameness. Generally the generic products have been found to be as effective as the proprietary products available. Copper sulphate (at concentrations of 2 – 8 %) and formalin (at 5% or less) are the most commonly used solutions in the UK at present. These can be used either singly or mixed together or in conjunction with other products such as salt (2%), detergent or other disinfectants.
- In order for a solution to be effective in the footbath it must be capable of killing off the bacteria responsible for DD. This means it must be used at the correct concentration, and free from contamination from dirty feet and dunging in the footbath. Ideally cows' feet should be pre-washed before entering the treatment solution

Fig 12a Keeping cows' feet clean and dry reduces lameness

- Keeping passageways, and therefore cows' feet, clean by attentive slurry management is good practice which will help footbathing to be more effective and keep cows cleaner.

Fig 12b Standing in slurry increases lameness and reduces the efficacy of the footbathing

Fig 12c Dirty cows generally have dirty feet and more lameness

Does the solution cover the skin likely to be affected by DD?

- The solution must be deep enough to cover the skin likely to be affected by DD. Ideally the solution should be at least 100mm deep to ensure good coverage. This is equally as important for the last cow through the footbath as for the first cow through, particularly as lame cows are likely to hang back and come through later.

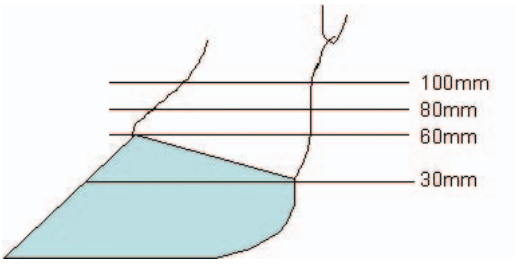

Fig 13a 80mm is the minimum depth needed to cover skin likely to be affected by DD

Fig 13b Cow standing in 80mm of solution

- Walking cows through shallow, heavily contaminated solution is unlikely to be effective in controlling DD.

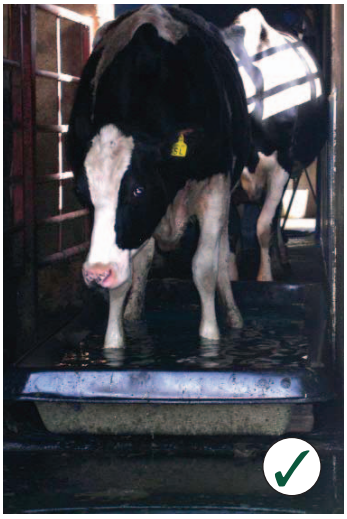

Fig 14a Sufficient depth is essential for effective footbathing

Fig 14b Inadequate depth is unlikely to reduce lameness

- The treatment must be as effective for the last cow as it is for the first. For this reason it is important to try and minimise solution loss to below 20% when footbathing.

Fig 15a Splash loss during use can leave the footbath too shallow to be effective for the last cows through

- Cows should ideally take 3 – 4 steps in the bath, and if walking though calmly this should take them between 6 – 9 seconds. For this the footbath needs to be 3 – 4m in length. If cows are walking briskly, then only about 60% will achieve four steps through a 3m bath. A longer bath is therefore preferable.

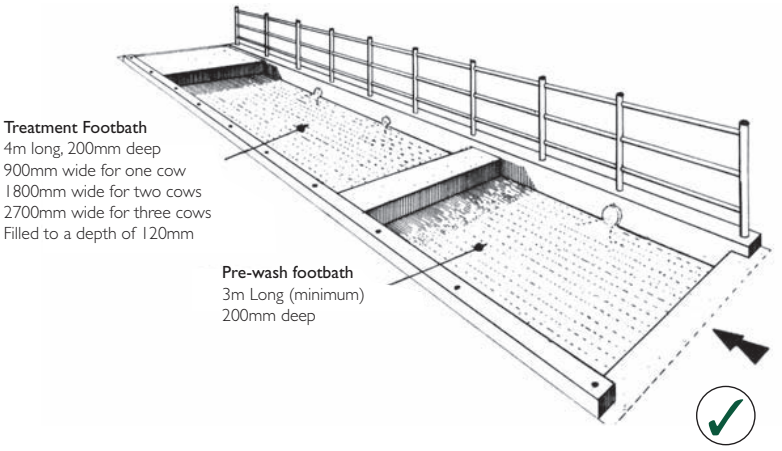

Fig 15b Dimensions of a good footbath system

Fig 16 The footbath needs to be long enough for cows to take 3 – 4 steps per foot

- Cows leaving any treatment footbath should have immediate access to a clean, dry standing area for the treatment to take effect. This is best done by allowing them back into clean, scraped cubicle passages or feed stances. Ideally their feet should stay clean and dry 30 minutes after footbathing to allow the solution time to work.

Fig 17a Footbathing solution is inactivated by dirty conditions

Fig 17b Footbathing is more effective if cows can stand in clean dry conditions afterwards

Does the spent solution drain from the footbath quickly and easily?

- Emptying arrangements must be rapid and effective without blockages. Some wider footbaths are formed with a gentle slope in and out to allow a tractor scraper through the bath to take out solids. But even here a drain is useful to wash out liquids. The larger plastic footbaths are lifted manually, initially from one corner to allow liquids to escape for further lifting and full emptying. Good access must be provided to allow staff to do this without risking back or shoulder injury. A small lifting block and pulley could be helpful, set above the lifting corner. A convenient powerful washing out hose will help prevent blockages and ensure a clean bath for refilling.

Fig 18 Adequate drainage from the footbath is essential

Disposal of used footbath solution

- The Environment Agency and Scottish Environment Protection Agency (SEPA) considered disposal of footbathing solution into the slurry system and spreading on land as current best practice. Normally this does not require authorisation under the Groundwater Regulations 1998 but this situation may change in the future as environmental concerns generally come to the fore. If in doubt, contact the Environment Agency or SEPA for further advice.

General advice from the Environment Agency and SEPA

- Spent footbath solutions should be mixed with slurry and spread in accordance with the general provisions of The Water Code (MAFF 1998). If this is not possible, the spreading should be done as evenly as possible, observing the following:

Never spread:

- Within at least 10 metres of a ditch or watercourse.
- Within at least 50 metres of a spring, well or borehole that supplies water for human consumption, or that is to be used in farm dairies.
- On very steep slopes with run-off risk.
- Where it will breach management agreements (eg SSSI, ESA).
- On fields next to a watercourse, spring or borehole where any of the following apply;
  - the surface is severely compacted, or
  - which are waterlogged, or
  - that have a steep slope and the soil is at field capacity, or
  - that have a moderate slope, a slowly permeable soil and the soil is at field capacity.
- Always consider the environmental impact of emptying used footbaths. Guidelines in the Prevention of Environmental Pollution From Agricultural Activity (PEPFAA) code of good practice on the storage and application of slurry should be followed at all times to reduce pollution.

Fig 19 Always dispose of spent solutions according to the Environment Agency or SEPA guidelines

REMEMBER!

- Minimise the risk of introducing DD by isolating all cattle coming on to the farm
- Monitor the extent and causes of lameness in your herd
- Keep cows clean and comfortable at all times
- Have a decent footbathing set up
- Use it effectively and safely

What makes a good footbathing layout?

- Every dairy unit presents its own challenge in finding the most suitable footbathing layout. Some existing layouts are very restrictive, whilst new, or substantially upgraded dairy units, offer the best opportunity to improve matters. We need to integrate better footbathing arrangements into building layouts than has been the case in the past.
- Permanent arrangements which do not involve setting up temporary gating are more likely to be used on a regular basis. Ease of working is a major factor in encouraging busy staff to footbath cows routinely.
- The use of a pre-wash footbath significantly reduces the amount of contamination going into a treatment footbath. Hence the use of a pre-wash footbath is highly recommended. A solid platform between the two, say 3m, will help to shed off some washings prior to footbathing.
- Alternatively the pre-wash and treatment races could be split by a narrow step, see fig 20, rather than lose bath length in a limited space. It is important to check that splash from the pre-wash bath does not dilute the treatment dip if they are close together. Fig 21 shows this arrangement at the cow exit, with losses minimised by solid walls, and a step up out of the bath after treatment.

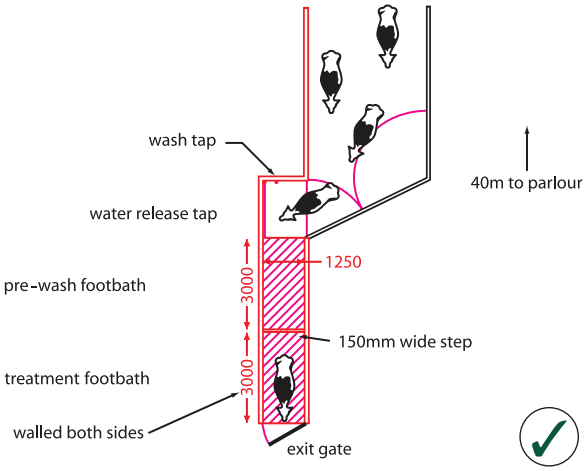

Fig 20 Pre-wash and treatment

Fig 21 Treatment bath at the cow exit

- Emptying arrangements must be rapid and effective without blockages. Never install a drain less than 100mm internal diameter. If in doubt put in a 150mm diameter drain, preferably with a plug arrangement at the side of the bath, so as to not interfere with cow traffic. The drain could be placed angled into the side of a concrete footbath or with a lifting pipe section set into a side recess. Very large footbaths should have more than one drainage outlet.

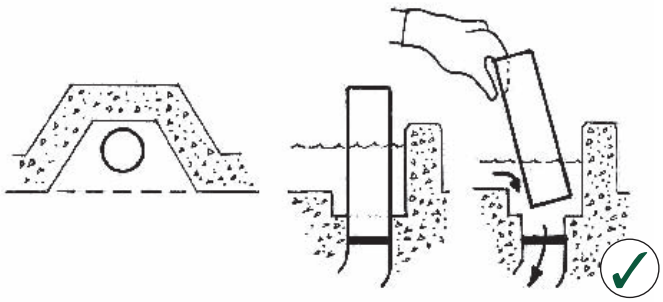

Fig 22 An alternative drainage arrangement for footbaths

- An alternative drainage arrangement is shown in fig 22. A short removable section of 100mm diameter plastic pipe is set into a recess and sump at the side of the footbath, onto a rubber seal on the drain. It extends 150mm above the solution level so that it can be easily lifted to empty the footbath.
- Some wider footbaths are formed with a gentle slope in and out to allow a tractor scraper through the bath to take out solids. But even here a drain is useful to wash out liquids. The larger plastic footbaths are lifted manually, initially from one corner to allow liquids to escape for further lifting and full emptying. Good access must be provided to allow staff to do this without risking back or shoulder injury. A small lifting block and pulley could be helpful, set above the lifting corner.
- A convenient powerful washing out hose will help prevent blockages and ensure a clean bath for refilling.

What is the best location for a footbath?

- The footbath operation must not significantly slow down the milking routine. Cows should walk through the footbath without disruption, fig 23. This means for example having a minimum space of at least one side of cows, and preferably two sides, for a herringbone or rapid exit parlour, beyond the parlour exit. A footbath immediately at the parlour exit will slow cows down and disrupt the milking routine, see fig 24.
- To work out the space required by a group of cows leaving a parlour allow 1.5 sq m per cow. Hence a 20 stall herringbone-type parlour should ideally have a floor area, post-milking, of at least 30 sq m prior to footbathing.
- For rotary parlours the situation is eased because of the way cows are released individually after milking. Layouts with a significant distance, say over 20m from the exit to the footbath, work well. A typical post-milking layout is shown in fig 25. This allows cows to be diverted through either a manual or automatic shedding gate to a clean footbath and pre-wash bath without disrupting milking.

Fig 23 Cows walking through a treatment footbath in good light, without disruption

Fig 24 A tight turn into a footbath immediately at the parlour exit is bad practice

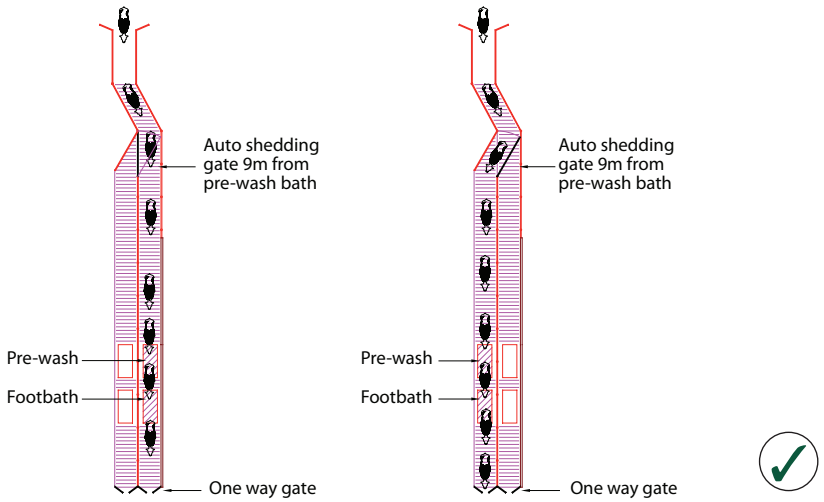

Fig 25 A double arrangement whereby a group of cows can be switched to a clean footbath

- Footbathing prior to milking requires a different design approach since cows are coming forward for milking as a group. Such an arrangement is shown in figs 26 and 27, for an upgraded existing dairy unit. The footbath has been excavated out of the stepped passage. Cows are footbathed as they travel to the collecting area, without any disruption to milking.

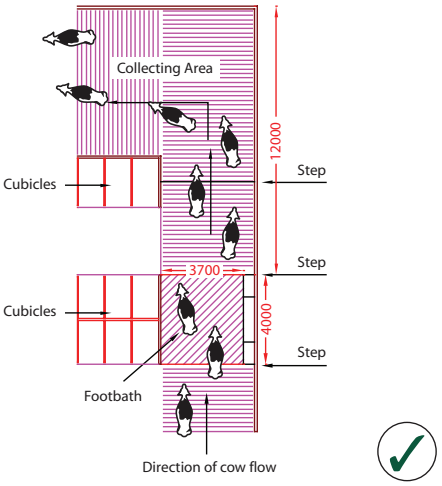

Fig 26 & 27 Pre-parlour footbathing, excavating out a raised step

- Whatever the footbath choice, the location should be such as to allow all races and yards adjacent to the footbath to be readily scraped or washed down, without any risk of contaminating the footbath.
- Cows leaving any treatment footbath should have immediate access to a clean, dry standing area for the treatment to take effect. This is best done by allowing them back into clean, scraped cubicle passages and feed stances, see fig 28b.

Fig 28a Returning cows to a dirty area increases DD risk

Fig 28b Cleaning out the cow return area whilst cows are being milked

What is a good footbath design?

- Footbath length for a treatment footbath should ideally be 4m, to ensure that all cows achieve four steps per foot of exposure to the treatment solution.
- Footbath length is not so critical for a pre-wash bath and a 3m length should be adequate to clean up feet prior to treatment
- A minimum race width should be 850mm, going up to 950mm for very large or heavily pregnant cows. Generally, allow 900mm per cow width. A bath capable of taking 3 cows across should be 2.7m wide. For plastic baths make the race wide enough for the bath to fit between race stanchions, without compromising ease of lifting when emptying, and without allowing cows to 'straddle' the bath.
- Do not choose a plastic footbath which has a heavily ridged base since cows are very reluctant to walk on such a surface. If the footbath base is heavily ridged or grooved, a lightweight, perforated, removable rubber mat will help improve cow foot comfort and hence cow flow. Straw on the base is an option, but it makes a portable bath more difficult to lift and empty and risks blockage of the drains from a permanent bath.
- It is important to try and minimise solution loss when footbathing. The best way to do this is to have a lip depth of at least 80mm, this means keeping the liquid level 80mm or more below the bath lip. This will ensure that solution losses are below 20%. At the end of footbathing the solution depth should be not less than 100mm for effective penetration. Hence at the beginning of footbathing, assuming a 20% spillage, the solution depth should be 120mm, and hence the footbath itself should be 200mm deep.
- A solid wall or a splash guard fitted either side of the footbath will reduce spillage. A step down arrangement at entry, and step up on exit, will also help, especially if most of the spillage runs back into the footbath. Every effort must be taken to make the footbath as effective for the last cow through as the first.

How big should my footbath be?

- Consider a minimum footbath size of 1 litre of treatment solution per cow.
- A treatment footbath, 4m long by 900mm wide, 200mm deep filled to a depth of 120mm at the start of treatment contains about 430 litres of solution. Assuming 20% losses, it contains 100mm depth at the end of footbathing, which is 360 litres of solution. This averages out at 400 litres, throughout the operation, and so the treatment should cater for up to 400 cows. This arrangement should be run together with a pre-wash bath.
- A pre-wash bath could be 3m long, 200mm deep, filled initially to a 150-175mm depth, since water spillage losses are not such an issue.
- For larger herds the choice lies between providing larger baths, especially pre-milking, or having a diversion arrangement to fresh baths, or a self-cleaning, self-emptying arrangement using one treatment bath, preferably with a pre-wash bath.

REMEMBER!

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- Use it effectively and safely

New developments in footbath design and use

- New developments which lead to effective treatment are to be welcomed. Sufficient exposure time and adequate coverage of clean feet in the treatment solution, spray, pad or foam are the key elements in achieving success.

Fully automated footbath

- The DeLaval footbath AFB1000 is designed to automatically fill, empty, rinse and replenish when timed to do so. It consists of a footbath and a controller with water valve and treatment dosing pumps. The footbath can replenish itself at any set time during the milking period, and is designed to suit large herds requiring continuity of footbathing without disruption, see fig 29. A perforated rubber mat on the base of the footbath encourages secure foot comfort, and hence good throughput.

Fig 29 De-Laval AFB1000 bath

- A 900 cow dairy unit visited in Germany to see the system comprised one treatment bath filling and emptying automatically every 150 cows. This worked well. However a non-automated, pre-wash footbath, sited prior to the treatment bath, became very dirty and ineffective.
- The concept of a fully automated footbath is excellent in solving the problems associated with footbath contamination and treatment solution losses for larger herds. However anyone contemplating such a footbath should weigh up purchase and installation costs against potential benefits, and ensure that the footbath is an integral part of an effective system. The automated footbath in the 900 cow dairy unit cost 3500 euros to be installed, with the bath itself costing about 1100 euros.

Split footbath

- The Intracare BV split footbath is designed to maximise the effect of any treatment solution by reducing dung contamination. Dung falls through a grid between bath sections, see fig 30. The capacity of the bath is deliberately low to reduce the volume and hence the cost of treatment solution. The bath length is about 2.1m which is below our recommended absolute minimum length of 3m, and drainage outlets are too small at 50mm diameter.

Fig 30a/b The Split Footbath

- The split footbath reduces dung contamination, with dung falling through the central grid. Spillage is low with a bath depth of 200mm holding about 160mm depth of solution. Cows adapted quickly and coped well with the split walkway. The design lends itself to trials using different treatments each side, but in its present form the bath is not long enough to give adequate exposure times for effective treatment. Double the existing length would give acceptable exposure times.

Footbath with foam mat inlay

- Whilst reducing significantly the amount of treatment solution required, this type of footbath is very labour intensive, needing a top up every 25 cows. The ability of the treatment solution to consistently penetrate high enough up the foot, [80mm min] is questionable with any matted system.

Parlour washings as a treatment

- Parlour washings from milk plant cleaning are free and readily available, but are they effective as a foot treatment?
- Trials using the split footbath indicated that there was no significant difference between left feet exposed daily to parlour washings and right feet exposed to water. However measurements of the bactericidal properties of treatment solutions in the laboratory suggested that parlour washings are substantially more effective than water. Immersion times are critical and the split footbath does not give sufficient immersion time, of at least 4 seconds per foot per treatment.
- More trials are required on the potential benefits to foot health of using parlour washings.

Other treatments

- One farmer visited uses carbide lime to form a thick paste which clings to the cow's feet. We were not able to investigate, nor substantiate his claims that this method of DD control is much better than footbathing.
- Foams were seen in action on two visited farms, but on both farms conventional footbaths were also used, so it was not possible to comment on the efficacy or otherwise of the foam.

REMEMBER!

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- Monitor the extent and causes of lameness in your herd
- Keep cows clean and comfortable at all times
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Appendix 1 – Lameness recording sheet

Cow	Date	Foot	Foul	*DD/IDD	IDG	SH	Heel Erosion	Ulcer	Abscess	Wall/WL lesion	Double sole	Over grown	Blocked	Bandaged	Outcome / action
		LF RF													
		LH RH													
		LF RF													
		LH RH													
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1	Mild	3	See again	DD/IDD	Digital or interdigital dermatitis
2	Major	4	See vet	IDG	Interdigital growth
				SH	Sole haemorrhage/bruising
				WL	White line damage

Glossary

DD: Digital dermatitis

IDD: Interdigital dermatitis

IDG: Interdigital growth

Dispersal area: The area available for cows after footbathing, clean and dry.

Footbath capacity: Total volume, but make allowances in practice to calculate working capacity to acceptable lip level only.

Footbath lip: The gap between the solution level and the top of the footbath itself.

Formalin: Solution 40% w/v formaldehyde

Holding area: The area available for cows prior to footbathing.

Permanent footbath: A fixed arrangement using concrete, with associated drains.

Pre-wash footbath: A footbath located prior to the treatment footbath, to clean feet prior to treatment.

Split footbath: A footbath with two treatment channels either side of a central grille.

Temporary footbath: A movable proprietary footbath usually made of plastic.

Treatment footbath: A footbath containing treatment chemicals.

AgriSearch was formed in 1997 to provide a mechanism through which dairy, beef and sheep farmers could have direct involvement in near market research. Funds contributed to AgriSearch are used to commission research into the improvement and development of sheep, beef and dairy farming and to disseminate and publish the results. Dairy projects are recommended to the AgriSearch Council by a Dairy Advisory Committee comprised of six people, of which four are farmers. The AgriSearch Council is comprised of ten people of which six are farmers.

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