

A Review of the Design and Management of Footbaths for Dairy Cattle

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KEYWORDS

• Dairy cattle • Footbaths • Infectious hoof disease

KEY POINTS

- Footbaths may play a significant role in the prevention of infectious hoof disease in confinement housed dairy herds.
- Copper sulfate appears to be the most effective antibacterial agent, but there are legitimate concerns regarding disposal and lifetime accumulation of copper in the soil.
- Alternatives to copper sulfate exist, but relatively few have been subjected to scientific testing in the field.
- Scientific testing of footbaths requires greater standardization of footbath design and management and assessment of outcomes.
- Design and management of the footbath are critical to the success of the program.

INTRODUCTION

Use of a footbath in the dairy industry for the control of infectious hoof disease is widespread in North America and elsewhere around the world. Most confinement housed dairy herd owners use a regular footbath protocol, and frequent use was a feature of the well-managed freestall housed dairy herds maintaining high levels of milk production with low levels of lameness in a recent Wisconsin survey.¹ However, the benefits of footbaths are not universally accepted, because some authors have associated footbath use with increased risk for lameness problems.²

The cost of using a footbath is considerable. For a 1000-cow dairy using a 5% copper sulfate footbath once a day for 4 days per week through a typical 200-L (~50 US gallons) bath, changing the bath solution every 200 cow passes, with a 23-kg (50 lb) bag of copper sulfate costing ~\$80 US, the annual cost would be ~\$41,600 or ~\$42 US per cow per year. This cost would rival what many farms would spend on

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animal medications and treatments in a typical dairy herd, yet there are no national guidelines for prudent footbath use or requirements for control or oversight as there would be for other antimicrobial use in the United States.

In some countries, there are stricter controls on footbath use however, and these are likely to be embraced globally in the future. Since 2006, copper sulfate has been illegal for footbath use in the European Union as a result of the EU biocide directive,³ put in place largely due to environmental concerns. Formaldehyde, also commonly used in footbaths, is a carcinogen in humans⁴ and is considered a hazard in the workplace. As such, it is likely that the use of this chemical on the farm will come under increasing scrutiny and control.

Clearly, if one is to continue to use a footbath as an aid in lameness prevention programs, one must look to the scientific literature and other available evidence to develop best practice recommendations for their use, and be mindful of the human health and environmental risks associated with them.

In this review, the author summarizes the current peer-reviewed literature on footbath use and management to date and attempts to create a best-practice protocol for use on the dairy farm based on the available evidence.

CURRENT FOOTBATH MANAGEMENT PRACTICES

Antibacterial Choice

There are few reports of footbath practices in North America and elsewhere. Cook and colleagues⁵ reported on a survey of 65 freestall housed dairy herds averaging 1023 milking cows in size with a range from 100 to 4100 cows. The herds originated from United States, Spain, Japan, United Kingdom, and New Zealand. Forty-two percent of herds used more than one antibacterial agent in rotation. Copper sulfate was the most commonly used antibacterial, with 63% of herds using it at concentrations of between 1% and 10%. Formaldehyde was used by 34% of herds at between 2% and 5% formalin solution. Of note in this survey was that antibiotics, including lincomycin and oxytetracycline, were used by only 5% of herds, and then only as a second-choice agent. Although antibiotics have been recommended for use in footbaths by some,⁶ such use cannot be justified from the perspective of prudent drug use. However, there are distinct regional and herd level differences. For example, in a sample of larger high-producing upper Midwest herds, where mean lameness prevalence was 13%, copper sulfate was used by 100% of the herds, only 8% used formaldehyde, but 17% used an antibiotic in their footbath.¹ Similarly, Solano and colleagues⁷ reported on footbath management on 141 farms in Quebec, Ontario, and Alberta. Again, a high proportion of herds used more than one product (62%): 41% used both copper sulfate and formaldehyde; 37% only used copper sulfate; 15% relied solely upon formaldehyde; and 7% used other products.

There are a myriad of alternative footbath agents marketed to the dairy industry in North America. These products are largely untested and unregulated and appear not to have been embraced by the industry given the perceived efficacy of copper sulfate and formaldehyde. However, if use of these agents is more tightly controlled, there is scope for increased use of other products if they can be shown to be efficacious.

Footbath Design

Given that there has been no standardized footbath design recommended in the dairy industry, there are substantial differences in bath designs in use in the field. The median footbath measured 0.81 m wide, was 2.03 m long, and was filled to a depth of

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