

# Are copper sulfate footbaths a problem?

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- Large amounts of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  being used, ie 50 bags every other day
- Spent bathwater added to manure slurry
- Inorganic copper fungicides have caused Cu toxicities
- Recommendations suggest lifetime loading of <30 lb/a on sands

# Hoards Dairyman, July 2001

## Foot bath solutions may cause crop problems

Farms that use heavy concentrations of copper sulfate could exceed lifetime soil limits in 15 years.

by Everett D. Thomas

USING copper sulfate hoof baths to control hairy heel warts and other hoof infections has become increasingly popular in the past few years. The popularity is especially high in free stall operations. The typical hoof bath consists of 1 pound of copper sulfate for each 4 gallons (or less) of water.

Most hoof baths are placed in the return alley of the milking parlor, so cows walk through the copper sulfate solution two or three times each day. However, some farmers also use hoof baths for heifers and dry cows.

Copper sulfate is relatively inexpensive, easy to use, and effective

80 ppm. However, soon after we started increasing our use of copper sulfate, the copper concentration of the manure in our slurry pit rose dramatically, averaging 975 ppm (Figure 1). And there's no question as to where the copper is coming from; a recent sample of milking center waste, including the used foot bath solution, tested over 16,000 ppm copper (dry matter basis).

Our situation is not all that unusual; a summary of 130 manure samples analyzed by the University of Vermont Agricultural Testing Laboratory found that 19 samples — all but one from free stall

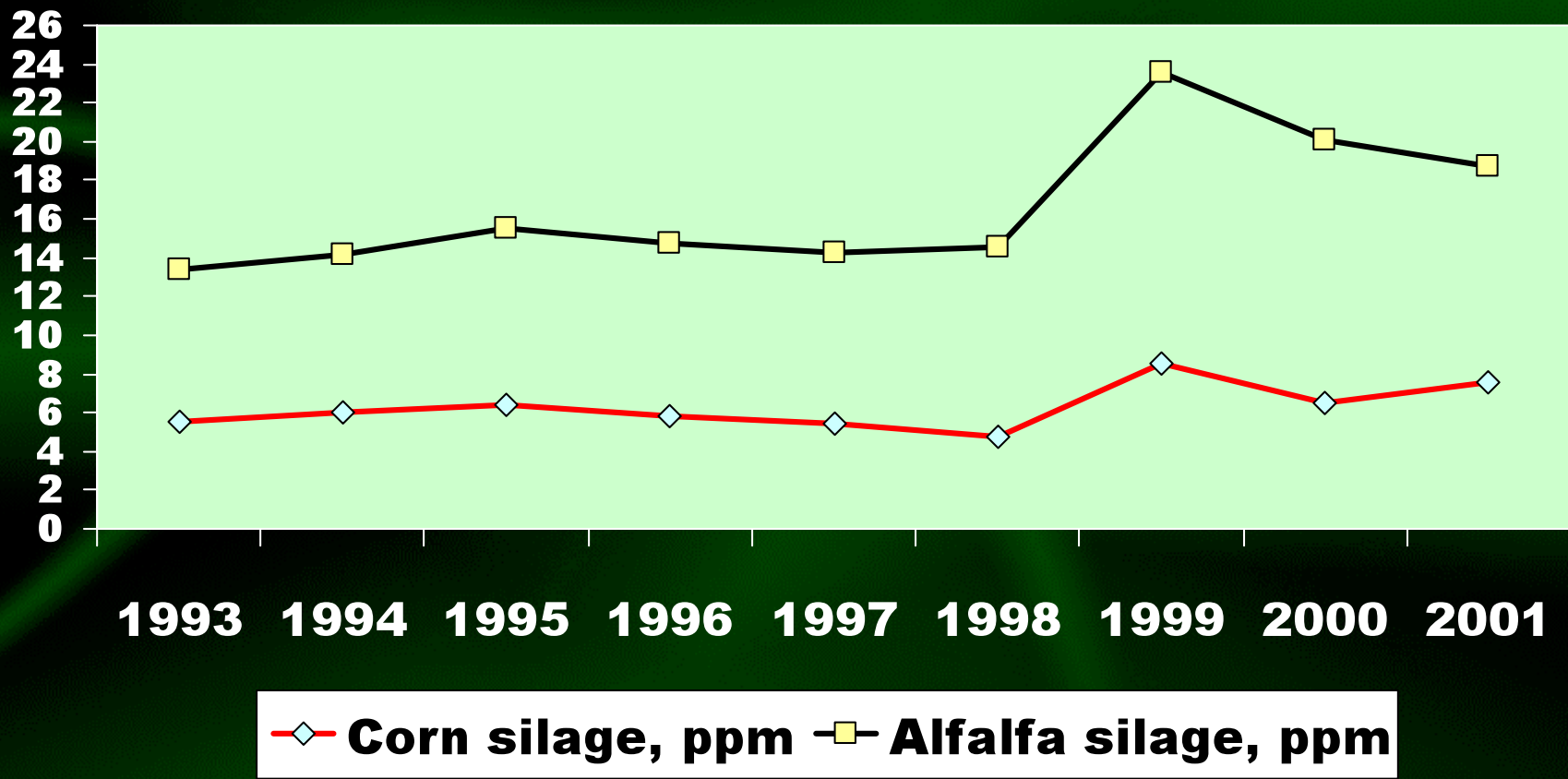
# The Miner Institute Situation

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- 1998 - Average use about 254 lbs.  $\text{CuSO}_4$  per week for 160 cow herd.
  - $\text{CuSO}_4$  = 25% copper
  - $254 \text{ lb} \times 52 \text{ weeks} \times 0.25 = \sim 3300 \text{ lbs. Cu}$
- Spent bath water pumped to pit for land application (470 acres).
  - 7.0 lbs. Cu/acre/year applied from  $\text{CuSO}_4$  (average)
- Noticed higher Cu concentrations in manure samples.

# The Miner Institute Situation

Corn silage and alfalfa silage copper concentration  
Miner Institute 1993-2001



# How much Cu is being added?

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## Wisconsin farm examples

### Farm 1

**50 lb CuSO<sub>4</sub> x 180 day x 25% Cu = 2250 lb Cu/yr**

**2250 lb Cu/yr over 295 acres = 7.6 lb Cu/ac/yr**

### Farm 2

**10,000 gal/a manure x 90 ppm Cu = 7.5 lb Cu/yr**  
**(equal to about 1300 ppm on d.m. basis)**

### Farm 3

**250 lbs. CuSO<sub>4</sub> x 52 weeks x 25% Cu = 3250 lb Cu/yr**  
**3250 lb Cu/yr over 400 acres = 8.1 lb Cu/ac/yr**

# How much Cu is in Wisconsin Manure?

Type	min	max	avg	load 160 lb N
	----- ppm Cu-----			lb/a/yr
Dairy solid	12	200	27	0.6
Dairy liquid	16	1320	191	2.4
Swine solid	270	515	381	11.1
Swine liquid	146	1923	673	4.9
Poultry solid	35	1350	438	3.7

# Copper behavior in soil:

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- Ionic and exchangeable forms available to plants
- Strongly bound by organic matter and to less extent minerals (not available)
- Availability not greatly affected by pH
- Time results in reversion to low available forms (2 weeks measured much less)
- Not moved to subsoil

# Several studies with high-Cu swine manure:

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- No yield decreases
- Up to 250 lb Cu/a added
- Only small increase in plant Cu
- Significant reversion occurred



# Biosolids Cu loading limit guidelines:

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> 4300 ppm ; no application

1500-4300 ppm ; 66 lb/a annual  
1349 lb/a lifetime

<1500 ppm ; no restriction

# Summary:

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1. Short term likely no problems
2. Long term problems seem unlikely
3. Continued monitoring warranted

# Kelling's Suggestions for Success

