

Usage Patterns of Chemically Treated Wood on Michigan Dairy Farms

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Large amounts of wood are treated with preservative chemicals and distributed in commerce every year. In 1977, approximately 32 million cubic feet of lumber and timber was treated with arsenicals and approximately 10 million cubic feet was treated with pentachlorophenol (ANONYMOUS 1980). Both preservatives effectively extend the life of wood by protecting against destructive rot-causing bacteria and fungi which typically inhabit high moisture environments such as water, soil, and manure. Since all of these environments are common to dairy farms it has become common practice in recent years to incorporate treated wood into various farm structures.

In 1977, several Michigan dairy farms were quarantined by state regulatory officials because of suspected over-exposure of cattle to chemicals in penta treated wood and the possible adulteration of meat and milk with toxic substances. The primary concern was over the presence of polychlorodibenzo-p-dioxins (CDDs) and -furans (CDFs). Health problems in cattle from one farm were described by THOMAS et al. (1977). Since 1977, several toxicologic and toxicokinetic studies have been conducted (FIRESTONE et al. 1979; MC CONNELL et al. 1980; KINZELL et al. 1981; FORSELL et al. 1980).

In order to evaluate the magnitude of potential exposure of Michigan dairy cattle to wood preservatives a survey was initiated in 1977 to determine the extent and frequency of treated wood usage in various farm structures. The findings generated from this survey were to serve as a basis for accomplishing a second objective, that being to determine whether there is sufficient need to launch an educational campaign on the proper and safe use of chemically treated wood on dairy farms and to guide educators in formulating educational strategies directed toward users of treated wood.

PROCEDURES

A survey form was specifically designed for this program. Twenty-seven Michigan Department of Agriculture dairy fieldmen (inspectors) recorded the information on the survey forms with the aid of the dairy farmer during a routine farm inspection. The period of the survey was from August 1977 to December 1979. The data were coded and computer tabulated using the Statistical Package for Social Scientists (SPSS), version 8.0, on a Cyber 170/750 computer. In all cases, an incompletd response for type of treated wood, treated building structure, or treated feed structure was taken to indicate no use of treated wood and was entered as zero. Incompletd responses for type of facility and number of milking cows appears as "not reported." Several computer crosstabulations were performed.

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RESULTS

More than 6000 survey forms were collected which represents approximately 90% of the total number of grade A dairy farms in Michigan. Several farms were invalidated on the basis of incomplete identification, bringing the total data base to 5985 farms. Only part of the collected data is presented here.

Table 1 is a crosstabulation of type of treated wood with type of housing facility. Of the 4734 farms that reported type of housing facility, 61% indicated treated wood usage. The majority of free stall types (93%) indicated treated wood usage whereas the majority (66%) of stanchion barn types indicated no usage. Much of the treated wood associated with stanchion barn types is in open lots, probably fences. Regardless of type of housing facility, 98% of the farms that reported treated wood usage indicated penta-treated as the type used.

TABLE 1

Crosstabulation of the number of farms reporting type of chemically-treated wood versus type of housing facility.

Type of Facility(s) ^b	Type of Treated Wood ^a				Total
	None	Penta	Arsenical	Both ^c	
number of farms					
Free stall types					
FS only	54	601	17	25	697
FS and OL	24	608	14	22	668
FS and SB	14	53	5	3	75
FS and LH	6	30	1	0	37
FS, OL and SB	1	46	0	3	50
Other	2	15	1	0	18
	<u>101</u>	<u>1353</u>	<u>38</u>	<u>53</u>	<u>1545</u>
Stanchion barn types					
SB only	1573	335	34	11	1953
SB and OL	12	409	26	25	472
SB and LH	36	119	2	1	158
SB, LH and OL	1	42	1	0	44
	<u>1622</u>	<u>905</u>	<u>63</u>	<u>37</u>	<u>2627</u>
Miscellaneous types					
LH only	68	313	14	2	397
OL only	2	11	1	2	16
LH and OL	31	110	4	4	149
	<u>101</u>	<u>434</u>	<u>19</u>	<u>8</u>	<u>562</u>
Total reported	1824	2692	120	98	4734
Not reported	1090	131	17	13	1251
TOTAL	<u>2914</u>	<u>2823</u>	<u>137</u>	<u>111</u>	<u>5985</u>

^{a/} Does not include feed structures or fences.

^{b/} FS=free stall, OL=open lot, SB=stanchion barn, LH=loose housing.

^{c/} Combination of penta and arsenical.

The frequency of treated wood usage in various building structures is shown in Table 2. Treated pole supports were the most common, whereas treated rafters were found with the least frequency.

TABLE 2
Number of farms reporting treated wood usage
in different building structures.

<u>Structure</u>	<u>Number of Farms</u>
pole supports	2598
splash boards	2426
free-stall supports	536
door frames	404
calf pens	285
alley curb boards	244
stall curb boards	209
stall dividers	188
rafters	48

Table 3 is a crosstabulation of number of treated building structures with number of milking cows. Less (40%) of the smaller farms (≤ 50 cows) reported one or more treated building structures whereas more (94%) of the larger farms (≥ 101 cows) reported one or more treated building structures.

TABLE 3
Crosstabulation of the number of farms reporting 0 to ≥ 4 treated
building structures versus number of milking cows.

<u>Number of Cows</u>	<u>Number of Treated Building Structures^a</u>					<u>Total</u>
	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>≥ 4</u>	
	<u>number of farms</u>					
≤ 50	2282	407	735	213	138	3775
51-100	151	122	468	179	152	1072
≥ 101	14	26	106	56	49	251
Total reported	2447	555	1309	448	339	5098
Not reported	561	72	183	39	32	887
TOTAL	3008	627	1492	487	371	5985

^{a/} Structures (8) include: pole supports, rafters, door frames, splash boards, free-stall dividers, corner stall supports, alley.

The frequency of treated wood usage in various feed structures is shown in Table 4. Treated wood in feed bunks, bunk silos, and corn cribs was found with the greatest frequency (e.g., 16%, 8%, and 9% of the farms, respectively). When cross-tabulated with number of milking cows (Table 5), fewer (24%) of the smaller farms (≤ 50 milking cows) reported one or more treated feed structures whereas more (56%) of the larger farms (≥ 101 cows) reported one or more treated feed structures. Regardless of the number of cows, one treated structure was the most prevalent. Of the 5100 farms reporting the number of milking cows, 31% had one or more treated feed structure.

TABLE 4

Number of farms reporting treated wood usage in different feed structures.

Type of Structure	Entire	Side	Support	Other	Total
	Structure	Boards Only	Posts Only		
	number of farms				
Bunk Silo	186	207	--	24	498
Feed Bunk	476	128	274	66	944
Feed Bin	19	7	10	4	40
Hay Rack	100	38	--	107	245
Corn Crib	55	35	--	465	555
Mineral Feeder	40	--	--	9	49

TABLE 5

Crosstabulation of the number of farms reporting 0 to ≥ 4 treated feed structures versus number of milking cows

Number of Cows	Number of Treated Feed Structures ^a					Total
	0	1	2	3	≥ 4	
	number of farms					
≤ 50	2854	715	167	32	8	3776
51-100	560	352	132	28	1	1073
≥ 101	111	86	38	16	0	251
Total reported	3525	1153	337	76	9	5100
Not reported	690	152	35	6	2	885
TOTAL	4215	1305	372	82	11	5985

^{a/} Structures (6) include: bunk silo, feed bunk, feed bin, hay rack, corn crib and mineral feeder.

Treated fences including gates were reported by 1800 farms (Table 6). Use in the barnyard area was the most prevalent location.

TABLE 6

Number of farms reporting treated wood usage in fences.

Location of Fence	Number of Farms
barnyard only	618
holding area only	137
barnyard and holding area	131
other	914
Total	1800

Table 7 shows the results of crosstabulating 1) necessary and/or proper usages of treated wood with 2) unnecessary and/or improper usages. All structures including building and feed structures and fences were placed into either of these two categories (see Table 7 footnote for categorization strategy). As shown, 3504 farms (59% of total) reported treated wood usage. Of this number, 40% had one or more necessary and/or proper usages with no unnecessary and/or improper usages, 13% had one or more unnecessary and/or improper usages with no necessary and/or proper usages, and 47% had a combination of usages in both categories.

TABLE 7

Crosstabulation of the number of farms reporting necessary and/or proper usages of treated wood versus those reporting unnecessary and/or improper usages.

Necessary and/or Proper Uses ^a	Unnecessary and/or Improper Uses ^b							
	0	1	2	3	4	5	6	Total
0	2481	389	61	10	3	1	0	2945
1	440	177	55	15	3	0	0	690
2	749	545	222	57	15	2	0	1590
3	160	141	108	52	14	1	0	476
4	33	63	54	43	17	2	0	212
5	6	10	16	10	14	3	2	61
6	0	1	5	1	2	2	0	11
Total	3869	1326	521	188	68	11	2	5985

a/ Includes: pole supports, splash boards, corner stall supports, alley curbbboards, stall front curbbboards, fences.

b/ Includes: rafters, door frames, calf pens, bunk silo, feed bunk, free-stall divider, feed bin, mineral feeder, hay rack and corn crib.

DISCUSSION AND CONCLUSIONS

The accuracy of the survey tabulation is difficult to judge. The inspectors were considered to be quite knowledgeable in identification of treated wood. However, there will exist an unknown amount of error resulting from misidentification of treated wood; for example, the color of aged penta-treated wood is visually similar to untreated wood.

The survey results show that chemically-treated wood has widespread usage on Michigan grade A dairy farms. Even though current marketing trends indicate greater total sales of arsenical-treated wood than penta-treated wood, this does not appear to be the case for dairy farms since only one out of 24 farms indicated use of the former compared to one out of two farms for the latter.

The results also indicate a trend towards a greater frequency of treated wood usage in building and feed structures on larger dairy farms that have a free-stall type of housing facility. Many of these usages are necessary and/or proper, i.e., necessary for protection of the wood or proper in that exposure of animals to the preservative chemicals is minor. For example, pole supports, splash boards, and fences fall into this category. The results indicate that 51% of Michigan dairy farms are exercising necessary and/or proper usage of treated wood. On the other hand, 35% have one or more unnecessary and/or improper usages, such as feed structures, calf pens, rafters, etc. These are uses that could result in over-exposure of animals to preservative chemicals or are simply not required for protection of the wood. Most farms that used treated wood were found to have a combination of necessary and unnecessary or proper and improper usages.

The survey results clearly suggest the need for an informational campaign on the proper and safe use of chemically-preserved wood on livestock farms. Such an effort is currently being organized in Michigan.

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