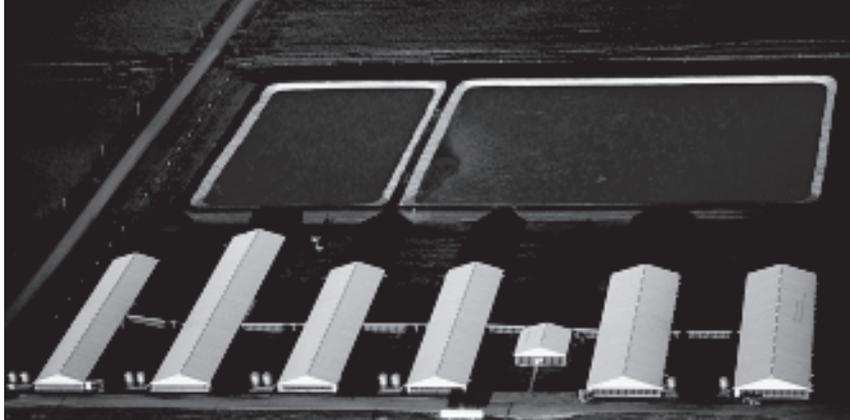


# Odor

# and Nutrient Management

EDC-129-21, Volume 6, Issue 9

Winter 2003



## Ammonia accumulation in settling basin liquids

by Kris Kohl ISU Extension Ag Engineering Field Specialist, Jeffery Lorimor and Patricia Jaranilla, Department of Agricultural and Biosystems Engineering

**A**mmonia in surface waters is a serious pollutant because both fish and vegetation are very sensitive to it. Fish kills have been reported below small feedlots with settling basins when the basins have not drained completely following precipitation events and when retained liquid is flushed into nearby streams. The inability to maintain grass directly below settling basin outlets is also thought to be a result of high ammonia concentrations. Ammonia concentrations are believed to increase with time in undrained settling basins, but little data exists on how quickly the ammonia accumulates.

**Procedure and results.** A study, conducted by the authors in summer 2003, examined how quickly ammonia accumulates, and factors that influence the ammonia accumulation. In laboratory tests, initial solids and nitrogen concentration in the manure, the pH of the slurry, and the temperature of the slurry were studied. Liquid:manure solids ratios of 5:1, 10:1, 20:1, and 40:1 were tested in warm (60-70 °F) and cold (40-50 °F) conditions. Both beef and swine manure solids were tested.



Dewatered solid settling basin below beef feedlot.

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For the beef manure in warm conditions, there was an initial doubling of the ammonia concentration from 200 to 400 mg/L, then an increase 600 mg/L more than 7 days for the 5:1 liquid :manure solid ratio, (Fig. 1). Ammonia concentrations in that same mixture (5:1) exposed to cold temperatures remained relatively constant (Fig 2).

The 10:1 ratio increased similarly from a lower initial concentration up to 300 mg/L, and the 20:1 ratio increased to a concentration of 200 mg/L. Data on the 40:1 showed no significant increase in the ammonia concentrations at either temperature. Swine manure reacted the same as beef. In general, the concentrations quickly doubled, then increased three to five times the original concentration within 6 to 7 days.

At cold temperatures, ammonia concentrations remained at approximately the initial concentration.

A field study was done for both warm and cold temperatures. The average temperatures were 84°F during the day and 66°F at night. The test showed that the ammonia-N concentration increased similar to the laboratory results, increasing from 75 to 450 mg/L in 8 days (Fig. 3).

In all the tests pH remained essentially constant at approximately 6.8 through the duration of the tests.

Swine manure is similar to beef manure but converts to ammonia at a faster rate making it more important to dewater before the conversion occurs. The warmer the temperature the faster the conversion occurs. There is also more clean-water to dilute the liquid from a solids settling structure immediately after an event when the concentration is the lowest.

Results for the cold temperature study showed that the concentration remained constant and only slightly increased with time.

**Conclusions.** Several conclusions were derived from this study. Our findings indicated that:

- Ammonia concentrations at warm temperature increased to 3x the original concentration before stabilizing.
- The conversion to ammonia is slower at cold temperatures.
- For the warm temperature, the 5:1 ratio stabilized at 7 days, the 10:1 ratio stabilized at 4 days and the 20:1 ratio stabilized at 3 to 4 days. Unfortunately, data on the 40:1 was not enough to sufficiently conclude the exact number of days the manure ammonia concentration stabilized.
- Chemical analyses done on the 5:1, 10:1 and 20:1 ratios showed that total Kjeldahl nitrogen, total solids and total volatile solids had a direct correlation with the concentration of manure to water.
- It is important to dewater settling basins as quickly after rainfall as possible, before the conversion to ammonia occurs.

Figure 1. 5:1 liquid:manure solid ration at 70°F.

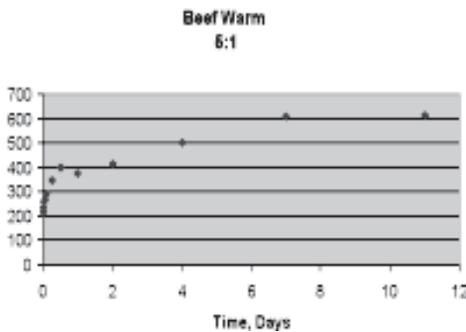


Figure 2. 5:1 Liquid:manure solid ratio at 50°F.

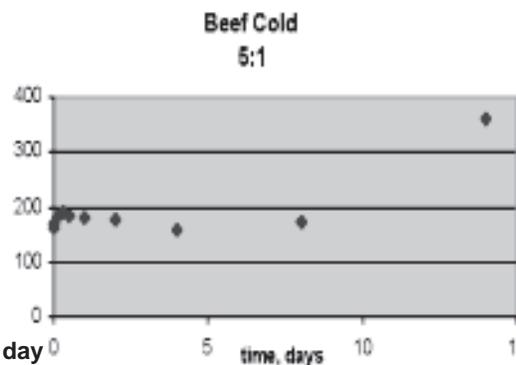


Figure 3. Field test of beef manure at 84 degree F day temperature and 66 degree F night temperature.

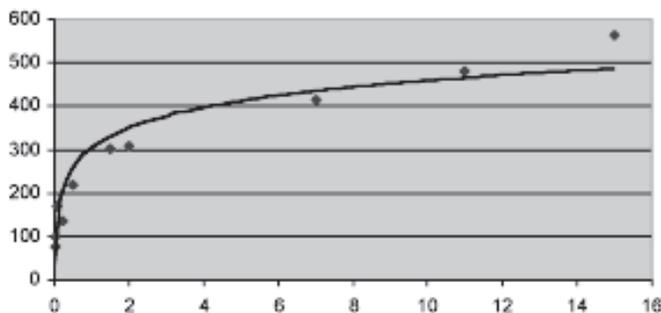
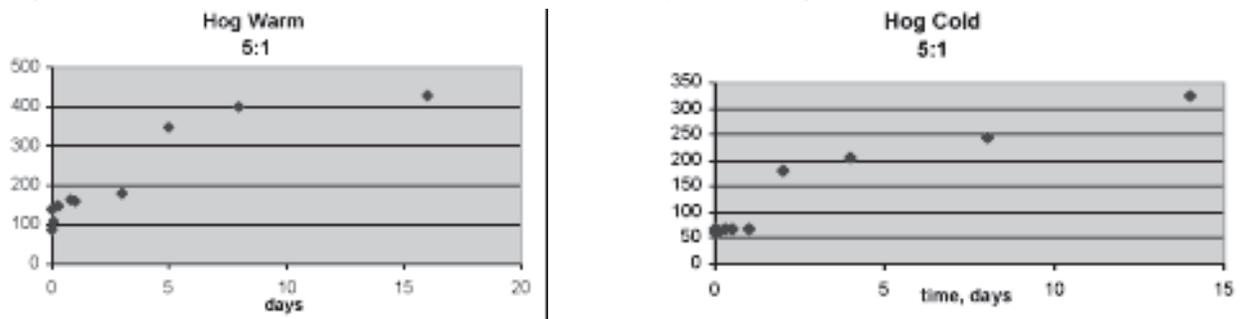


Figure 4. Ammonia concentrations over time from swine open finishing lots at 70°F and 50°F.



## Producers may benefit from testing manure following a change in feed ingredients

by Wendy Powers, Department of Animal Science

As soybean meal costs continue to creep up, there is greater interest in incorporating crystalline amino acids into feed rations. While lysine use has expanded considerably in the last few years, incorporation of methionine has been much less wide spread. Economically, methionine is more attractive now than it has ever been, because of the rising cost of soybeans. Environmentally, there's additional incentive to add both lysine and methionine into the feeding program.

Lysine and methionine are the first and second most limiting amino acids in corn-soy diets, meaning that they are the most deficient in the diet, relative to what the animal needs. By using crystalline amino acids, the animal's requirements for lysine and methionine are met without overfeeding the remaining amino acids that are contained in the feed. The result is that less crude protein is fed to the animal. Much of the diet crude protein is from soybean meal so less soybean meal can be fed. Furthermore, if less excess protein is fed, then less excess nitrogen is consumed and therefore, less nitrogen is excreted in manure that has to be managed.

In recent research at Iowa State University, including lysine, alone, in swine diets resulted in a reduction of dietary crude protein from 17.4 percent to 17.0 percent. Adding lysine, methionine, threonine and tryptophan to the diet reduced crude protein content even further, to 14.5 percent.

Incorporation of lysine and methionine, though not tested in this study, would have resulted in a dietary crude protein content of approximately 16.2 percent. The reduced diet content does translate into less manure excretion. Urine nitrogen, where most of the nitrogen is excreted, decreased by 15 percent by adding the four amino acids. In addition, ammonia emissions were reduced by half. Others have demonstrated similar results. Similar results would be expected following feeding to poultry. However, data that addresses the combined use of lysine and methionine for poultry or swine is somewhat limited.

Nutrient excretion reductions will be site-specific based on how the amino acids are formulated in the diet and which amino acids are used. Producers who want to see how such practices affect their manure values should plan to test their manure before and after implementing such a change. If the change in diet formulation has already taken place, producers should still test their manure to see how composition in their manure storage facility compares to values used by a producer in his/her manure management plan. The change in nitrogen content may have a positive effect on manure management planning.

Information regarding manure sampling is available from Iowa State University Extension. Contact your ISU Extension county office for more information and ask about publication *How to Sample Manure for Nutrient*

*Analysis* (PM 1558.) This publication can also be ordered from ISU Extension Distribution Center by calling (515) 294-5247 or downloaded from the Web at <http://>

[www.extension.iastate.edu/pubs/](http://www.extension.iastate.edu/pubs/). The next issue of the Odor and Nutrient Management newsletter will feature information on manure sampling methods.

## Education fees and business license are main changes for 2004 manure applicator program

by Karen Grimes, Iowa Department of Natural Resources

**Confinement Site Applicators.** Confinement site or private applicators who apply manure from a manure storage structure can expect to pay an additional \$25 educational fee because of a new law, House File 644, passed in the spring of 2003. This fee is in addition to the certification fee of \$100, good for three years. The educational fee begins in 2004 and will help cover the costs to provide training or administer tests. The fee will be paid each time an applicator attends the required two-hour annual training or when a test is taken to renew a certificate. The educational fee will not be charged if an applicator is taking a make-up test because of a training session that was missed. Fees will be adjusted annually based on program costs. Certification fees and educational fees are paid to the Iowa Department of Natural Resources (IDNR).

As before, certification is not required if the source of the manure is an open feedlot or a small animal feeding operation (500 or less animal unit capacity or about 1250 swine finishers).

**Commercial Applicators.** Because of a change in state law, commercial applicators will need to be affiliated with a business and the business will need to be licensed as a commercial manure service, starting in 2004. All currently certified commercial applicators will receive a letter from IDNR in early December, asking for the business contact information.

**Business license:** The commercial manure service license fee will be \$200 in 2004, whether the business is a sole proprietor or a business association. Each business shall identify only one manager to the DNR, someone who is actively involved in and makes management decisions in the operation of the business. The manager's certification fees are covered under the business license. Commercial manure services should plan to inform the DNR when a substitution occurs or when an employee is terminated.

**Employees:** Commercial applicators, including managers, are now called commercial manure service representatives (or representatives). They will still receive an

individual certificate, but they must be associated with one business at a time starting in 2004. That means that if a representative leaves one company and starts work for another company, the representative or service will have to notify the IDNR and receive a new certificate. The certification fee for employees or representatives is \$75. If the commercial manure service pays the \$75 certification fee for its representatives, the business will hold the certificate numbers for its employees, allowing substitutions if an employee is terminated during the year. The new or substituted employee will have the same certificate number as the former employee and must complete training requirements within 30 days.

**Educational requirements:** The commercial application year has been changed to begin on March 1 and run to March 1 of the following year. This means that applicators and businesses must complete the required training testing prior to March 1. Applications, training records and fees must be received or postmarked by March 1 or a \$12.50 late fee will apply.



Loading a manure tank wagon.

Most representatives, including the manager, will need to pay a \$25 educational fee in 2004 in addition to the certification fee. The fee will be paid when an applicator applies for certification after taking the required three-hour training or passing a test. However, if the \$200 certification fee was paid from Jan. 1 through May 29, 2003, an education fee will not be required in 2004. Education fees are paid to IDNR.

All employees will have to fulfill the training or testing requirement annually. New or substituted employees who have not taken training or passed a test must complete those requirements within 30 days of hiring. They must also be supervised until certified.

## ISU at 2004 Iowa Pork Congress

by Sherry Hoyer, Iowa Pork Industry Center

Several Iowa State University (ISU) faculty and staff members will present information and answer questions at the 2004 Iowa Pork Congress, Jan. 28-29, in Des Moines. Iowa Pork Industry Center (IPIC) is coordinating the ISU display area, which will be located in the northwest corner of the lower level of Veterans Memorial Auditorium. Specialists from ISU colleges of agriculture, veterinary medicine, family and consumer science and ISU Extension will be available in the Ask-A-Specialist area from 9 a.m. to 4 p.m.

both days. Attendees will be able to talk with the specialists about questions and concerns in a variety of areas, including animal health, facilities, farm management, animal genetics and reproduction, nutrition and health. The Iowa Manure Management Action Group also will have a display in this area and will have members available to answer questions about manure management issues. For more information about Iowa Pork Congress please visit: <http://www.iowaporkcongress.org/>

## 2004 Confinement site manure applicator workshops

by Angela Rieck-Hinz, Department of Agronomy

Iowa State University (ISU) Extension will host workshops for confinement site applicators in January and February 2004. See Table 1 for locations and dates. These workshop will provide the 2 hours of annual training required by law for confinement site applicators. Confinement site applicators are encourage to attend a workshop prior to March 1, 2004 to avoid paying late fee penalties for renewing applicator certificates and to ensure training opportunities. Due to the short turnaround time in deadlines, ISU Extension can't guarantee the availability of video tapes for training prior to mid-February 2004.

For exact workshop locations and to confirm exact times or to determine meeting

options in the event of bad weather, please call the ISU Extension county office where you plan to attend the workshop.

If your county is not hosting a meeting, please make plans to attend a workshop in a neighboring county. Registration is not required for these meetings, but you may wish to contact the ISU Extension county office to ensure there will be adequate space and training materials available. There is no registration fee to attend these workshops. For more information about the Manure Applicator Certification Program, please call (515) 294-9590 or visit <http://extension.agron.iastate.edu/immag/mac.html>

**Table 1. 2004 Dates and Locations for Confinement Site Manure Applicator Workshops**

County/Location	Telephone	Date	Time
Adair/Adair City Hall	515-734-8412	January 16, 2004	1:30 pm
Adams/Corning, L & J's Kitchen	641-322-3184	January 20, 2004	1:30 p.m.
Allamakee/County Extension Office	563-568-6345	February 3, 2004	1:30 pm
Benton/Vinton at Kirkwood Center	319-472-4739	January 27, 2004	9:30 a.m.
Boone/County Extension Office	515-432-3882	January 30, 2004	9:30 am

County/Location	Telephone	Date	Time
Buchanan/County Extension Office	319-334-7161	January 23, 2004	1:30 pm
Buena Vista/County Extension Office	712-732-5056	January 22, 2004	9:30 am
Calhoun/Pomeroy Community Bldg.	712-297-8611	February 26, 2004	7:00 pm
Carroll/County Extension Office	712-792-2364	February 24, 2004	9:30 am
Cedar/County Courthouse	563-886-6157	February 18, 2004	9:30 am
Cerro Gordo/County Extension Office	641-423-0844	January 20, 2004	9:30 a.m.
Cherokee/Western Iowa Community College	712-225-6196	February 19, 2004	9:30 am
Chickasaw/County Extension Office	515-394-2174	February 26, 2004	1:30 pm
Clay/County Extension Office, Dickens Community Center	712-262-2264	January 27, 2004	1:30 pm
Clayton/County Extension Office	563-245-1451	January 13, 2004	9:30am
Clinton/DeWitt Community Center	563-659-5125	February 12, 2004	7:00 pm
Dallas/County Extension Office	515-993-4281	February 23, 2004	1:30 pm
Davis/County Extension Office	641-664-2730	January 20, 2004	1:30 pm
Des Moines/County Extension Office	319-754-7556	January 27, 2004	7:00 pm
Dickinson/County Extension Office	712-336-3488	January 29, 2004	1:30 pm
Dubuque/County Extension Office	563-583-6496	January 21, 2004	9:30 am
Fayette/County Extension Office	563-425-3331	February 12, 2004	1:30 pm
Floyd/NE Iowa Research Farm	515-228-1453	January 12, 2004	1:30 pm
Franklin/Hampton State Bank, Hampton	641-456-4811	January 9, 2004	9:30 am
Greene/County Extension Office	515-386-2138	February 25, 2004	9:30 am
Grundy/Memorial Building, Dike	319-824-6979	January 27, 2004	9:30 am
Hamilton/County Extension Office	515-832-9597	January 21, 2004	1:30 pm
Hancock/County Extension Office	641-923-2856	February 24, 2004	1:30 pm
Hardin/County Extension Offices	641-648-4850	February 4, 2004	1:30 pm <u>or</u> 7:00 pm
Henry/Masonic Lodge, Mt Pleasant	319-385-8126	February 18, 2004	1:30 pm
Howard/County Extension Office	563-547-3001	February 3, 2004	1:30 pm <u>or</u> 7:00 pm
Jasper/Lynnville First State Bank	515-792-6433	January 21, 2004	1:30 pm
Jefferson/County Extension Office	641-472-4166	February 13, 2004	9:30 am
Johnson/Fairgrounds, Montgomery Hall	319-337-2145	January 22, 2004	9:30 am
Keokuk/County Extension Office	641-622-2680	February 4, 2004	9:30 am
Kossuth/Burt Community Center	515-295-2469	February 4, 2004	9:30 am
Louisa/Southeast Research Farm	319-523-2371	February 4, 2004	9:30 am
Lyon/George Community Bldg ForsterCommunity Bldg, Rock Rapids	712-472-2576	January 28, 2004	1:30 pm
Mahaska/County Extension Office	641-673-5841	January 21, 2004	1:30 pm
Marion/County Extension Office	641-842-2014	February 3, 2004	1:30 pm
Marshall/County Extension Office	515-752-1551	February 4, 2004	1:30 pm
Mitchell/County Extension Office	515-732-5574	February 2, 2004	7:00 pm
Monona/Western Iowa Research Farm -Castana	712-423-2175	February 17, 2004	1:30 pm
Muscatine/County Extension Office	563-263-5701	February 27, 2004	1:30 pm
O'Brien/Northwest Community College Bldg C, Sheldon	712-757-5045	February 5, 2004	1:30 pm
Osceola/Legion Bldg, Sibley	712-754-3648	February 10, 2004	7:00 pm
Page/Essex Community Center	712-542-5171	January 21, 2004	9:30am
Palo Alto/County Extension Office	712-852-2865	February 11, 2004	1:30 p.m.
Plymouth/Prime Bank, LeMars	712-546-7835	February 25, 2004	9:30 am
Pocahontas/Rolfe Community Bldg	712-335-3103	February 10, 2004	1:30 pm
Pottawattamie/East- HancockFire Station	712-482-6449	February 4, 2004	1:30 pm
Sac/Iowa State BankSac City	712-662-7131	January 8, 2004	7:00 p.m.
Scott/County Extension Office	563-359-7577	January 20, 2004	7:00 pm
Shelby/Portsmouth St. Mary's Parish Center	712-755-3104	February 5, 2004	7:00 pm
Sioux/American State Bank, Sioux Center	712-737-4230	February 12, 2004	1:30 pm
Northwestern State Bank, Orange City		February 3, 2004	9:30 am
		February 10, 2004	9:30 am

County/Location	Telephone	Date	Time
Story/County Extension Office	515-382-6551	February 2, 2004	1:30 pm
Wapello/Eddyville High School	641-682-5491	January 29, 2004	7:00 pm
Washington/National Guard Armory	319-653-4811	February 19, 2004	7:00 pm
Wayne/Humeston Methodist Church	641-872-1755	February 25, 2004	1:30 pm
Webster/County Extension Office	515-576-2119	February 11, 2004	7:00 pm
Woodbury/Correctionville			
Community Center	712-279-2157	February 2, 2004	1:30 pm
Wright/County Extension Office	515-532-3453	February 11, 2004	1:30 pm



## 2003 Environmental Quality Incentive Program

by Chris Murray, Natural Resources Conservation Service

The Farm Security and Rural Investment Act of 2002 (Farm Bill) provided for increased funding of the Environmental Quality Incentive Program (EQIP). In fact, it suggested the funding should increase nationally from \$400 million in 2002 to \$1.3 billion in fiscal year 2007. The total funding, \$5.8 billion over the life of the Farm Bill, is a major departure from the \$150 to \$200 million per fiscal year allocated over the life of the last farm bill legislation.

EQIP funding in Iowa increased substantially in 2003. Iowa's EQIP Incentive Payment Allocation totaled approximately \$12.7 million. There were more than 3,200 applications for EQIP cost share funding this year totaling \$36.5 million. About 2,150 applications were not funded due to lack of funds.

This year, 1,050 applications were funded in Iowa. These projects were chosen for funding based on ranking criteria developed by the Conservation District Commissioners, the NRCS District Conservationist and the local working group in each county. Each project was ranked by how well it addressed the resource conservation concerns of the county. Iowa counties allocated \$10.8 million

or 85 percent of the state EQIP funds in this manner. \$1.5 million or 12 percent was allocated to open feedlots from a state reserve fund targeted to assist those producers who are developing systems to meet federal and state requirements for their operations. Special projects around the Rathbun Reservoir were funded with \$400,000 in EQIP money.

The top five applications of the EQIP cost share funds can be found in the chart.

These cost share incentives represent a substantial investment in addressing the resource concerns of the state. Waste/manure storage and handling and nutrient management incentives made the top five. Implementation of these practices total almost \$2.8 million dollars or 22 percent of the total EQIP funding for Iowa and will have an impact on the state.

Primary practice applied	EQIP dollars
Waste storage facility	\$1,947,000
Terrace	\$1,020,500
Nutrient management	\$ 821,000
Grade stabilization structure	\$ 737,000
Prescribed grazing incentive	\$ 570,000



## Commercial applicator training for 2004

by Angela Rieck-Hinz, Department of Agronomy

Iowa State University (ISU) Extension, in cooperation with the Iowa Department of Natural Resources (IDNR), will offer a satellite downlink program on Tuesday, Jan. 6, 2004 for the commercial manure applicator program. This program will begin with

registration at 8:30 a.m. and the program concludes at 12:30 p.m. You must be registered and in your seat by 9 a.m. when the program begins. This program will provide the mandated 3 hours of annual training required for commercial manure service representatives

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and business managers. (See article on pg. 4 for more details about fees and new program requirements.) All currently certified commercial applicators must attend training and submit forms prior to March 1, 2004, to avoid paying late fees.

Commercial manure service representatives and managers may also meet training requirements by scheduling an appointment and watching the 3-hour tape at their local ISU Extension office or by contacting their regional IDNR field office and scheduling an appointment to take the exam. Because the training tapes are an edited version of the three-hour satellite program and must be duplicated and sent to county offices, ISU Extension can't guarantee the training tapes will be available for training prior to mid February 2004. For this reason, you are encouraged to attend the satellite program on January 6, 2004. Currently certified commercial applicators will receive a registration brochure in mid-December 2003.

Complete the registration form and mail to the ISU Extension county office listed in the brochure where you plan to attend prior to Dec. 31, 2003. If you do not receive a brochure, please print one off the Web at <http://extension.agron.iastate.edu/immag/certification/manurebrochure.pdf> or contact your ISU Extension county office. There is no registration fee to attend this program.

A manure applicator workshop for dry commercial manure applicators will be held on Thursday, Feb. 26, 2004 at Memorial Hall in Eagle Grove. This workshop is geared exclusively for dry poultry manure applicators. Please register for this event prior to Feb. 23, 2004 by calling Angie Rieck-Hinz at (515) 294-9590.

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