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## Breathing Easier Air-filtering respirator helps Illinois family

On a midsummer day in 1990, 13-year-old Terry Strine was cleaning the milk house on his family's small dairy farm in West Salem, Ill. Bending to rinse out what he thought was a feed bucket, Terry inhaled a quick-forming mist rising from the pail. That first breath sent him running for the house. Unable to speak and gasping for air, Terry was rushed to a local hospital.

Terry sustained permanent lung damage. The pail he had been rinsing originally contained a strong chemical mixture commonly used to clean milk-handling systems. The noxious fumes were not identified and Terry's bronchial injuries left him susceptible to asthma and allergic reactions to substances in his environment. If exposed to dust of any kind, Terry begins sneezing and wheezing uncontrollably and may experience trouble sleeping due to breathing difficulties.

His extreme sensitivity to dust and the strong odors of milk house chemicals might have kept Terry from working on the farm. However, with the assistance of AgrAbility, Terry's respiratory disability only temporarily kept him from his farm responsibilities. AgrAbility Unlimited, the AgrAbility project in Illinois, helped Terry acquire a battery-powered air-filtering respirator helmet to wear on the farm. "I could hardly do anything before I got the helmet" Terry recalls. The equipment allowed him to resume most of his farm chores growing up.

Today, Terry works full time driving forklifts at a local pallet manufacturing company. Since he works outdoors, his condition isn't really a problem and does not require the use of his air-filtering respirator. When he isn't driving forklifts, Terry still helps out around the farm. He currently manages his



*Terry Strine as a youth wearing his air-filtering respirator helmet while filling a feed bucket.*

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Client Feature

Terry Strine

condition with allergy medications, by “steering clear” of dust whenever possible, and by using the respirator when needed. He estimates he uses the device three to four times a week around the farm to avoid airbourne dust from wheat, beans, and feed as well as when mowing the grass.

His parents, Bill and Kathy Strine, still operate the farm that has been in the family for around 70 years. The Strines grow wheat, beans and corn on 800 acres. Some things have changed in the 14

years since Terry’s injury. The Strines no longer have the dairy operation but raise a small herd of beef cattle. But one thing hasn’t – Terry Strine’s air-filtering respirator helmet. He still uses the same respirator AgrAbility helped him acquire over 10-years ago. It’s a snug fit now and although the respirator filter has been replaced over the years and the original battery doesn’t hold a charge like when it was new, Terry says he’s not ready for a change. ❖

Focus

Respiratory Issues & AT Notes

## Respiratory Issues: Confinement Housing Hazards

A primary chronic health condition affecting farmers is respiratory disease.<sup>1</sup> Terry Strine developed his permanent respiratory damage from a gaseous chemical inhaled in the milk house on his family’s dairy farm, but many of his symptoms and complications parallel those seen in animal confinement workers.

While respiratory disease can be found in most types of confinement livestock production (e.g., cattle, swine, poultry, etc.), this article will focus on swine. Within modern swine confinement housing, dust and other gases can easily rise to levels harmful for both the animals and their human handlers.

### Dust

While the acceptable levels of airborne contaminants such as dust and harmful gases are legally controlled in many industries, this isn’t the case in production agriculture. In the United States, an estimated 700,000 people work in livestock confinement operations; in Iowa alone, 80,000 people work in swine confinement buildings.<sup>2</sup> In fact, the group of farmers/ranchers

and farm workers with the most frequent and severe health problems are those associated with swine confinement housing.<sup>2</sup>

The primary contaminant encountered in swine confinement barns is related to the very fine organic airborne dust the workers breathe. This fine dust is a chemical soup containing swine dander, swine feed and feces, insects, rodent and bird feces, and bacterial or fungal toxins.<sup>1</sup> Since these fine dust particles are small enough to enter the human respiratory system, the body’s natural reaction to a “foreign” material is to defend against it. This could take the form of an inflammatory response or perhaps even a toxic response. Immediate symptoms may be eye irritation, nasal stuffiness, or itchy throat. Delayed responses could include headaches, dizziness, shortness-of-breath, vomiting, and/or a fever. Inhaling this very fine dust could cause temporary, insidious, or permanent lung damage. The respiratory system should recover when the damage is temporary and the person is no longer exposed to the dust. When one suffers insidious damage, reducing exposure helps, but the person’s

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respiratory system may not fully recover. Permanent lung damage indicates that parts of the lung tissue are irreversibly damaged.

Below are some of the more serious respiratory conditions one may experience when exposed to these airborne contaminants.

**Sinus Conditions:** Occurring in up to 25% of swine confinement workers.<sup>1</sup> Treatment involves decreasing exposure.

**Chronic Bronchitis:** Is defined as a daily productive cough for three months a year, over a two-year period. Of the various animal and grain production workers, those working in swine confinement have the highest prevalence of chronic bronchitis. Prevention involves respiratory protection to decrease exposure to dusts and gases, and to stop smoking, which increases the risk.<sup>1</sup>

**Asthma-like Syndrome:** Asthma-like symptoms may disappear with time away from the contaminant but may reappear upon returning to the environment. This disease has been identified in up to 25% of swine confinement workers.<sup>1</sup> Treatment is similar to chronic bronchitis.

**Asthma<sup>a</sup>, Occupational Asthma:** Whether asthmatic, or experiencing an increase in airway reactivity such as wheezing, cough or dyspnea (air hunger), occupational asthma occurs because a particular antigen<sup>b</sup> is present.<sup>1</sup> While not common, continued exposure can lead to progressively worsening symptoms. Treatment follows a stepwise approach and prevention may require appropriate personal respirators and measuring/controlling airborne dust levels.

**Organic Dust Toxic Syndrome (ODTS):** ODTS is an inflammatory pulmonary reaction caused by exposure to massive amounts of organic dust containing molds and endotoxin<sup>c</sup> levels and is particularly common in swine confinement workers.<sup>1,3</sup> Treatment and prevention vary depending on severity and situation.

**Farmer's Hypersensitivity Pneumonitis (FHP) [formerly referred to as Farmer's Lung Disease or FLD]:** FHP is a form of hypersensitive pneumonitis<sup>d</sup> specific to actinomycete<sup>e</sup> spores found in organic dust. It is more common among dairy than swine confinement operations, since the source mold or spore filled contaminant are directly connected to feeding/handling moldy silage, grains, feed, hay, or straw bedding.<sup>1,3</sup> Again, treatment and prevention vary depending on severity and situation.

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<sup>a</sup> Asthma is defined as a chronic inflammatory pulmonary disorder with reversible obstruction of the lungs as a result of exposure to variable stimuli.<sup>1</sup>

<sup>b</sup> Antigen is defined as a substance, usually a protein, that causes the formation of an antibody and reacts specifically with that antibody.<sup>4</sup>

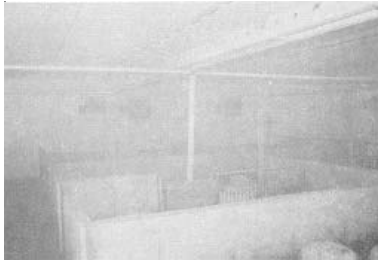
<sup>c</sup> Endotoxin is defined as a toxin contained in the cell walls of some microorganisms, especially gram-negative bacteria, that is released when the bacterium dies and is broken down in the body.<sup>4</sup>

<sup>d</sup> Pneumonitis is defined as an inflammation of the lung, which may be caused by a virus or by hypersensitivity reaction owing to allergy to chemicals or organic dusts as bacteria, bird droppings, or molds.<sup>4</sup>

<sup>e</sup> Actinomyces is a genus of anaerobic gram-positive bacteria, of which the species that may cause disease in humans is normally present in the mouth and throat.<sup>4</sup>

Focus

Respiratory Issues & AT Notes



The photo on the left shows that large amounts of dust are visible in swine barns when viewed with strong lighting.<sup>3</sup>

Together, these “dust and gases” form the primary airborne contaminants and while there are exposure risks associated with all types of livestock raised in confinement housing, human health responses seem to be the greatest when dealing with swine (see table 1).<sup>2</sup>

**Gases**

The two primary gases of concern to workers health in and around swine confinement housing include ammonia (NH<sub>3</sub>) from the animals’ urine/feces, and hydrogen sulfide (H<sub>2</sub>S) from stored manure in pits.<sup>1</sup> Ammonia has a low odor threshold that is lighter than air. Ammonia compounds the negative effects of dust, and can be carried deeper into the lungs via respiratory dust, thus causing inflammation, cough, and chest pain.

Hydrogen sulfide also has a low odor threshold, sometimes described as smelling like “rotten eggs”, while being both colorless and heavier than air. Hydrogen sulfide is much more serious than NH<sub>3</sub>. Hydrogen sulfide can cause paralysis of the respiratory center, and is considered a very toxic asphyxiant. Whenever manure pits are agitated in preparation for manure removal, lethal levels of hydrogen sulfide can easily be present.

**Assistive Technology**

Unfortunately, as stated above, acceptable levels of airborne contaminants such as dust and harmful gases are not legally controlled in most livestock confinement buildings. The first line of defense should be designing agriculture housing with proper ventilation to provide a safe and healthy environment for the animals and the workers. Engineers have determined the proper ventilation for all types of livestock confinement housing. These building ventilation plans can be viewed at the Midwest Plan Service (MWPS).<sup>6</sup>

If required to work in a livestock confinement housing building, there are simple ways to help reduce the amount of airborne dust contaminants that can sometimes be helpful. For example, when breaking/spreading bales for animal bedding, pouring some water into the bale prior to spreading it may reduce the amount of dust. If the confinement housing is equipped with misting

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**Table 1:** Dusts and Gases In Various Confinement Operations: Implications for Human Health

Confinement Operation	Dusts	NH <sub>3</sub> Gas	H <sub>2</sub> S Gas
Swine	Major concern	Moderate concern	Major concern
Poultry	Moderate concern	Major concern	None (manure is stored as solid)
Sheep, veal calf, dairy cattle, beef cattle	Minimal concern (lower dust concentrations resulting in fewer and less severe inflammatory reactions)	Moderate concern	Major concern, if have liquid manure system

sprayers for controlling the environment heat and animal stress, a short mist of water prior to entering the building will reduce the airborne dust. Even with the best ventilation, however, people who work in a swine confinement house should understand the dangers involved and take personal responsibility for their safety. An air-purifying respirator would offer additional personal protection.

There are essentially two types of air-purifying respirators, disposable and reusable<sup>7</sup> that protect the user in two basic ways. They remove contaminants from the air (e.g., particulate respirators); or they supply clean respirable air. The most common disposable respirator is the dust mask. The dust mask must be properly fitted, preferably with two straps rather than one. The common disposable dust mask cannot protect against gases, chemical vapors, or lack of oxygen. Another kind of disposable respirator looks like the dust mask, but contains a non-replaceable cartridge, designed for a specific hazard.

Reusable air-purifying respirators have cartridges that are replaceable, and may look like a dust mask, or have a full-face shield. Reusable respirator cartridges can be changed to match the particular hazard (i.e., selected for a particular gas or vapor). Full-face versions are light weight, easy to wear and usually also have a battery powered fan. When there is a lack of oxygen, or the contaminants are unknown and/or toxic, neither a disposable nor a reusable air-purifying respirator should be used. For example, if you need to enter a manure pit, which contains toxic H<sub>2</sub>S gas, only someone who is properly trained and wearing a self-contained breathing apparatus should be allowed to enter.

The photo on the right shows pictures of four different types of respirator, clockwise starting in the top-left corner: respirator with an exhalation valve; respirator with a filter cartridge, self-contained breathing apparatus (SCBA); and powered air purifying apparatus.



The National Institute for Occupational Safety and Health (NIOSH) provides ratings for disposable respirators, and approved respirators are marked with the manufacturer's name, part number, and the protection provided. For example, an N-95 would filter at least 95% of airborne particulates, but is not resistant to oils.<sup>8</sup>

Many of the local farm supply stores and industry/farm suppliers, such as *Gempler's*<sup>9</sup> or *Great Plains*,<sup>10</sup> offer safety and security equipment ranging from safety glasses, hearing protection, to NIOSH rated respirators.<sup>8,11</sup> These items may also be listed under the category of personal protective equipment (PPE). ❖

*References listed on page 8*

## AgrAbility Unlimited

Illinois was one of the first states to benefit from the USDA initiative for a state-level program to provide information on accommodating disability in agriculture. AgrAbility Unlimited offers education and assistance in identifying ways to accommodate disabilities, eliminate barriers, and create a favorable climate among rural service providers for people with disabilities. AgrAbility strives to help agricultural people maintain their livelihood by keeping them “on the farm,” providing information on safe, affordable modifications and solutions, regardless of disability, whether the farming operation is a large or small one.

University of Illinois Extension has combined with Central Illinois Easter Seals to establish this program, which offers comprehensive assistance to individuals and their families engaged in farming or a farm related activity and who have

been affected by a disability. Services offered by AgrAbility Unlimited include:

- A toll-free information and referral hotline
- Networking with local agricultural and rehabilitation professionals
- Community Resource Coordination
- On-Site assessments to determine adaptive requirements
- Equipment/Worksite Modification and Consultation
- Job Task Restructuring
- Agricultural Occupation Alternatives
- Stress Management Referral
- One-to-One Peer Support Network and
- Safety/Secondary Injury Awareness.

### Contact Information

<http://www.agrabilityunlimited.org>

Toll free: (800) 500-7325 ❖

## AgrAbility Unlimited Staff



### Dr. Robert Aherin, PhD - Project Director

Dr. Aherin grew up on a grain and livestock farm in central Illinois. He graduated from Illinois State University with a BS in Agriculture and a MS in Occupational Safety and Health and earned a PhD in Ag Education. He is currently the Agricultural Health and Safety Specialist for University of Illinois (U of I) Extension. Dr. Aherin provides overall direction for the AgrAbility project. He coordinates the project involvement of Extension professionals from the approximately 85 local and regional Extension offices around the state.



### Mike Brokaw - Program Manager

Mike Brokaw was born and raised in Texas but “grew up” on the family ranch in Wyoming. A pair of broken ankles and a wrist from a propane explosion put an end to ranching. “If it [AgrAbility] had been around in 1986 I might still be ranching.” Before coming to AgrAbility in 1999, Mike held numerous ag related positions. As program manager Mike handles all the day-to-day management activities of the program and provides the case service and technical assistance to Illinois farmers and their families.

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## AgrAbility Unlimited Staff



### **Dr. Chip Petrea - Research Support**

Dr. Petrea grew up on a registered Jersey Dairy farm outside of Iuka, Ill. He returned to the family farm following graduation from the University of Illinois with a B.S. in Dairy Science in 1976. He participated in all aspects of production and management of the family farm until 1987 when he returned to the U of I to obtain both a M.Ed. and Ph.D. in Agricultural Education. Dr. Petrea was the first graduate research assistant hired by AgrAbility Unlimited in 1991. He currently serves as an on-campus resource for research, evaluation, curriculum development, web content maintenance, and off-campus programming.



### **Jim Williams - Southern Field Coordinator**

Jim Williams grew up on the family farm in southern Illinois near Galatia, Ill. He graduated from Southern Illinois University with a B.S. in Agriculture. After serving in the U.S. Army in Germany, he was hired by Country Mutual Insurance Co. where managed Country Mutual's safety program. Since his retirement, he has been active in several volunteer efforts and currently serves as southern field coordinator for the AgrAbility Unlimited Community Ambassador Program. Jim manages the recruitment and retention of the program's ambassadors in 63 southern Illinois counties. He also helps with many other efforts for the program.



### **Brenda Besse - Northern Field Coordinator**

Brenda Besse grew up on a 2000 acre diversified grain and cattle operation in Whiteside County, Ill. She lost her leg in a farm accident but that hasn't slowed her down. Brenda is a nationally recognized professional golfer and world recognized Brown Swiss breeder. Brenda has been involved with AgrAbility since the early days as a spokesperson and a peer support person. She was keynote speaker at the 2001 AgrAbility National Training Workshop in Pennsylvania and has been an Illinois Community Ambassador. As northern field coordinator, Brenda is responsible for recruitment and retention of a "tremendous group of volunteers" in northern Illinois.

### **Elizabeth Burns - Program Assistant**

Elizabeth grew up on a 120 acre diversified grain and livestock farm in central Illinois. She received a B.S. degree in Animal Science from Illinois State University and an M.S. in Ag Education from the University of Illinois. She has held positions in swine farm management, corn research, high school and community college agriculture, a student safety program and outreach for a sustainable agriculture program. As program assistant, Beth facilitates communication between staff, volunteers and the advisory board members; organizes and publishes the quarterly newsletter, helps with outreach and education efforts at tradeshow and conferences and "whatever else Mike can think up for me to do." ❖

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The **AgrAbility Project** promotes success in agriculture for individuals with disabilities and their families through on-site assistance and educational resources. For additional information on the **National AgrAbility Project** or for a current list of state project sites, addresses and telephone numbers contact:

**University of Wisconsin - Cooperative Extension**  
**460 Henry Mall**  
**Madison, WI 53706**  
**866-259-6280 or 608-262-5166**

**Easter Seals, Inc.**  
**700 Thirteenth St., NW, Suite 200**  
**Washington, DC 20005**  
**800-914-4424 or 202-347-3066**

<http://www.agrabilityproject.org>

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