

AIDS Among Persons Aged ≥50 Years — Continued

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Fatalities Associated With Large Round Hay Bales — Minnesota, 1994-1996

Agriculture has one of the highest occupational fatality rates of all U.S. industries. Since the mid-1970s, traditional small-bale balers have gradually been replaced by large-bale balers in the agriculture industry. Expanded use of these balers has resulted in worker exposure to new hazards not present during handling of traditional small bales; the larger size of the bales increases the potential for serious injury or death while workers handle them. During 1994-1996, seven persons in Minnesota died in separate incidents that involved large round hay bales (i.e., cylindrical bales approximately 5 feet in length with flat ends, diameters of approximately 6 feet, and weights ranging from 750 to 1500 lbs). The Minnesota Fatality Assessment and Control Evaluation program (MN FACE), a program sponsored by CDC's National Institute for Occupational Safety and Health (NIOSH),* was notified of these incidents by the Minnesota Extension Service, a newspaper clipping service, and/or by death-certificate review. This report describes three incidents that were reported to MN FACE during 1994-1996, summarizes national surveillance for bale-associated deaths during 1980-1995, and provides recommendations to prevent fatalities associated with large bales.

Case Reports

Incident 1. On January 23, 1994, a 38-year-old male farmer died from injuries sustained when a large round hay bale fell on him while the bale was being loaded onto a flatbed trailer. The worker was using a tractor and front-end loader to load hay bales onto the trailer. The loader bucket had been modified to lift hay bales by attaching two removable tines, which cradled the bale as it was lifted; the bucket was not equipped with a bale clamp or other bale-handling device specifically designed to secure the bale during lifting. The farmer was loading the second layer of bales, which required raising the bucket to near its maximum height above the tractor. The unsecured bale tumbled down the loader lift arms and struck the farmer while he was seated in the operator's seat of the tractor. He died 30 days later from severe head injuries.

Incident 2. During the evening of November 26, 1996, a 59-year-old male part-time farmer died of injuries sustained when the tractor he was driving overturned. As reconstructed by investigators, he was using a tractor and loader to move a large round hay bale into a cattle lot. The incident occurred after dark, and the farmer may have

*Minnesota is one of 16 states (Alaska, California, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Washington, West Virginia, and Wisconsin) that receives funding from NIOSH for state FACE programs.

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raised the loader and bale above the tractor hood so that the bale would not interfere with illumination provided by the tractor headlights. As the tractor was driven through the lot, it overturned to the right and came to rest upside down. The farmer was pinned to the ground beneath the loader and the left rear wheel of the tractor. The following morning, a passing motorist discovered the overturned tractor and called emergency medical personnel. The farmer was pronounced dead at the scene. The tractor was not equipped with a rollover protective structure (ROPS) and a seat belt.

Incident 3. On November 30, 1996, a 52-year-old man died from injuries sustained at his farm when he was crushed by a large hay bale. The bale fell from a parked trailer that was being loaded to transport bales that had been sold for cattle feed. The man was crushed by the unsecured bale and died at the scene.[†]

Surveillance for Fatalities Associated with Large Round Hay Bales

Since 1992, the Minnesota Department of Health has compiled surveillance and field investigation data about selected work-related agricultural fatalities through the FACE program. FACE collects epidemiologic data about occupational fatalities from multiple sources (including local law enforcement reports, on-site fatality investigations, and Minnesota Occupational Safety and Health Administration reports) and develops and disseminates safety recommendations to address identified risks and reduce the potential for the occurrence of similar incidents.

During 1994–1996, all seven persons in Minnesota who died in incidents involving large round hay bales were men; their ages ranged from 38 to 70 years (mean: 55 years). All of the incidents occurred on family-owned farms. Four incidents occurred when tractors being used to transport large bales overturned; two incidents occurred when a hay bale fell off the tractor loader and onto the tractor operator; and one incident occurred when a hay bale fell from a trailer that was being loaded to transport hay bales. The weights of the bales involved in these incidents ranged from 750 to 1500 lbs.

During 1980–1991, NIOSH's National Traumatic Occupational Fatalities (NTOF)⁵ surveillance system identified 41 work-related fatalities resulting from hay bale-associated injuries in the United States. The Census of Fatal Occupational Injuries (CFOI)[†] identified an additional 46 such cases during 1992–1995. Of the 87 persons who died, 86 were male; 37 (38%) were aged ≥65 years; and 72 (74%) were employed in the agriculture/forestry/fishing industries. Forty-two (43%) deaths occurred in the Midwest; 23 (24%), in the West; 20 (21%), in the South; and two (2%), in the North-east.**

[†]Although this farm work-related incident was reported to the MN FACE program, a detailed FACE report was not completed because local authorities and immediate family members declined to participate in a FACE investigation. General details concerning the incident were obtained from public information published in local news reports of the incident.

⁵NTOF is based on death certificates for the 50 states, the District of Columbia, and New York City for persons aged ≥16 years for whom there was a work-related injury that was the cause of death.

[†]CFOI is a multiple-source reporting system for occupational fatalities implemented nationwide by the Bureau of Labor Statistics in 1992.

** *Northeast*=Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont; *Midwest*=Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South*=Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia; and *West*=Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

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Of the 46 deaths identified through CFOI, 20 (44%) occurred when a hay bale fell from a piece of equipment and struck a worker. Ten (22%) other deaths involved tractor rollovers. In some rollovers, the bale fell from the tractor, and the rollover occurred as the tractor struck the bale on the ground; in others, the narrative stated only that the tractor overturned as a hay bale was being transported. In eight (17%) incidents, the bale fell on a worker in a storage area or fell from a transport vehicle. Eight (17%) case narratives indicated only that the worker was struck by a falling hay bale. Narratives of cases identified by NTOF and CFOI contained varying levels of information; although some narratives specified shape and weight of the bale, others only stated that a hay bale was involved.

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Editorial Note: The findings in this report indicate that fatalities associated with large bales are a continuing source of preventable work-related deaths among workers in the agricultural industry. Although the cases in Minnesota involved large round bales, large square bales pose similar risks to agricultural workers.

In general, bales can be transported more safely by tractors equipped with rear attachments rather than front-end loaders. The likelihood of tractors rolling over sideways or tipping over backwards is reduced because bales are carried in a lower position than when hauled with front-end loaders. In addition, the rear tractor tires can accommodate the extra weight more effectively (1). Bales transported at the rear of a tractor do not block the operator's forward vision and generally do not interfere with rearward vision (2). When large bales cannot be transported by means of a rear attachment, front-end loader attachments specifically designed for transporting large bales should be used to prevent crush injuries. The potential for an unsecured bale to roll down the lift arms of a front-end loader and onto the tractor operator increases when the loader is raised (3). Loader attachments that securely hold bales include bale forks that have a tri-spear design, bale grapples with support arms that wrap around bales, and bale huggers that secure bales by squeezing them between two arms.

Preventing death and serious injury to tractor operators during tractor rollovers requires the use of a ROPS and a seat belt.^{††} A ROPS may be either a roll-bar frame or an enclosed roll-protective cab and is designed to withstand the dynamic forces during a rollover; seat-belt use is necessary to ensure that the operator remains within the "zone of protection" provided by the ROPS.

The risk for a rollover can increase when a tractor is equipped with a front-end loader because a loader changes the tractor's center of gravity. The center of gravity rises as the loader is raised and as the weight of transported items increases. Raising the center of gravity increases the potential of a side rollover, especially if the tractor is driven across inclined terrain. When front-end loaders are used to transport large bales, appropriate counter weights should be added to the rear of the tractor. Counter weights increase tractor stability by counterbalancing items being transported and ensure that the rear tractor wheels remain in contact with the ground. Conversely, when bales are transported with rear attachments, appropriate counter weights

^{††}Occupational Safety and Health Administration (OSHA) regulations (4) require that all tractors built after October 25, 1976, and used by employees of a farm owner must be equipped with a ROPS and a seat belt. This standard is not actively enforced on farms with <11 employees, and family farms without other employees usually are exempt from enforcement of OSHA regulations.

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should be added to the front of the tractor. Front-end counter weights enable the operator to maintain steering control of the tractor by ensuring that the front wheels remain in contact with the ground.

To reduce the risk for injuries and fatalities associated with transporting large bales, the following safety precautions are recommended:

- Workers should ensure that the equipment being used is designed for the task being performed and is capable of transporting the load; workers should always operate equipment according to manufacturer's instructions and recommendations.
- Whenever possible, operators should use tractors with rear attachments to transport large bales.
- When using front-end loaders to transport bales, operators should use attachments specifically designed to securely handle large bales, and loaders should not be raised or lowered while the tractor is in motion.
- Tractors with loaders should be operated at slow speeds and with the loader bucket in the lowest possible position.
- Workers should ensure that tractors are equipped with adequate counter weights before transporting heavy loads such as large bales with either front-end loaders or rear attachments.
- If a front-end loader must be used to transport a bale on sloped terrain, the bale should be kept on the up-slope end of the tractor with the loader bucket maintained in the lowest possible position.
- When unsecured bales are present on a parked transport trailer, workers should avoid areas near and around the trailer unless they are actively engaged in fastening or unfastening devices used to secure the bales.
- All tractors should be equipped with a ROPS and a seat belt.

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