DATE: April 29, 2005

FROM: Minnesota Fatality Assessment and Control Evaluation (MN FACE) Program Minnesota Department of Health

SUBJECT: MN FACE Investigation 05MN010
Farm Youth Dies After Becoming Entangled In the Unloading Beaters of a Forage Wagon

SUMMARY

A 17-year-old farm youth died after he became entangled in the unloading beaters of a forage wagon. The victim was working near a barn and used a tractor and a power-take-off (PTO) driven forage wagon to deliver forage to cows in a barn. The self-unloading wagon was equipped with two unloading beaters mounted across the front of it. The beaters broke apart the forage in the wagon as two chain conveyors on the floor of the wagon moved the forage to the front of the wagon. At the time of the incident, the forage wagon was nearly empty. One of the conveyor chains on the floor of the wagon had broken and as a result, the forage would not move forward toward the unloading beaters. As a result, the victim entered the forage wagon to shovel the contents from the wagon while the unloading beaters continued to operate.

The victim's step-father was working inside the barn and heard the victim scream. He ran outside and discovered the victim caught in the beaters. He stopped the tractor's PTO drive and then ran to the farmhouse and placed a 911 call. He returned to the victim who told him that he leaned over the top beater to determine if he needed to shovel any more of the forage from the wagon. When he leaned over the top beater bar, his jacket became caught in one of the tines of the top beater.

Emergency personnel arrived at the scene shortly after being called and assisted in freeing and removing the victim. After the victim was freed, he was placed in an air ambulance helicopter and airlifted to a major medical facility. After he arrived at the medical facility and was admitted, he died several hours later from the injuries he received during the incident. MN FACE investigators concluded that, in order to reduce the likelihood of similar occurrences, the following guidelines should be followed:

- Operators should, whenever possible disengage the power-take-off before dismounting from a tractor.

- Working youth should only be assigned age appropriate tasks, and;

• Workers should not wear loose-fitting clothing near or while operating machines.

INTRODUCTION

On February 17, 2005, MN FACE investigators were notified of a farm work-related fatality that occurred on February 14, 2005. The county sheriff's department was contacted and a copy of their report and pictures of the machine involved in this incident was obtained. The report and pictures of the machine provided a detailed description of this incident which was not witnessed. A site investigation was not conducted by a MN FACE investigator. During MN FACE investigations, incident information is obtained from a variety of sources such as law enforcement agencies, county coroners and medical examiners, employers, coworkers and family members.

INVESTIGATION

On the day of the incident, a 17-year-old farm youth was working with his step-father near a barn doing evening farm chores. The youth was alone outside the barn and used a tractor and a power-take-off (PTO) driven self-unloading forage wagon to deliver forage to a herd of cows in the barn. The self-unloading wagon was connected to the tractors power-take-off shaft and when the PTO drive mechanism was engaged, it operated two unloading beaters mounted across the front of the wagon. The unloading beaters were positioned in a vertical configuration one above the other and spaced about 12 inches apart. The beaters broke apart the load of forage as two apron chains that were also driven by the tractors PTO shaft moved the forage to the front of the wagon. Each unloading beater consisted of three steel bars mounted to a center shaft and each bar was equipped with tines spaced approximately 10-12 inches apart along the length of each bar. The tines were approximately 3-4 inches long and as the beaters rotated, the tines would tear apart the forage and cause it to tumble from the wagon.

The apron chains moved across the floor of the wagon from the back to the front when the power-take-off was engaged. The chains divided the wagon floor in half along a line extending along the middle of the wagon floor from the front to the back. Each apron chain consisted of two long parallel chains connected by cross bars that were approximately 18 to 20 inches apart. A third apron chain was located across the front of the wagon and beneath the unloading beaters. It transferred the forage from the wagon as it fell from the unloading beaters.

At the time of the incident, the forage wagon was nearly empty and contained only 4-6 inches of forage in the bottom of the wagon. One of the apron chains on the floor of the wagon had broken and as a result, the last of the forage in the wagon would not moved forward toward the unloading beaters. Since the contents of the wagon no longer moved forward due to the broken chain, the victim entered the forage wagon to shovel the contents onto the unloading apron chain located across the front of the wagon while the unloading beaters continued to operate.

The victims step-father was working nearby inside the barn and suddenly heard the victim scream. He ran outside and discovered the victim caught in the unloading beaters. After stopping the tractor's PTO drive that powered the beaters, he ran to the farm house and placed a 911 call for help and then returned to the victim. The victim told his step-father that he leaned over the top beater to determine if he needed to shovel the remaining forage from the wagon. He stated that as he leaned over the top beater bar, his jacket became hooked by one of the tines of the top beater and he was pulled into and between the two rotating beaters.

Emergency personnel soon arrived at the scene and assisted in freeing and removing the victim from the beater bars. After the victim was freed, he was placed in an air ambulance helicopter and airlifted to a major medical facility. After he arrived at the medical facility and was admitted, he died several hours later from the injuries he received during the incident.

This was the third farm work-related fatality involving a forage wagon that has been investigated by the MN FACE program. In each case, the victim became entangled in the rotating beaters of the wagon after entering the forage wagon box while the tractor's power-take-off (PTO) was still engaged. This incident involved a 17-year-old farm youth while the other incidents, MN FACE Case 96MN004 involved a 30-year-old male farmer and MN FACE Case 96MN039 involved a 50-year-old male farmer.

CAUSE OF DEATH

The cause of death on the death certificate was extensive hemorrhage, upper and lower extremities and intra-abdominal due to blunt force and shearing trauma due to farm accident.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Operators should, whenever possible disengage the power-take-off before dismounting from a tractor.

Discussion: Entanglements in power-take-off shafts and rotating machinery components can be prevented if a tractor's power-take-off is disengaged before operators dismount from the tractor. Although this may not be possible in certain cases where a tractor is used to power a stationary machine, it should always be done when the operator is using portable machines, such as the forage wagon in this incident. The design of forage wagons such as the one involved in this incident requires that the beaters be unguarded such that the forage in the wagon is able to come in direct contact with them as the forage is unloaded. Since it is not possible to guard the beaters without hindering the proper operation of this type of wagon, it is crucial that the tractor's PTO has been disengaged whenever it is necessary for someone to enter this type of wagon. Although it could not be determined exactly why the power-take-off was engaged while the victim was in the forage wagon, a general safe work practice that operators should follow is to disengage the power-take-off whenever possible before dismounting from a tractor.

Recommendation #2: Working youth should only be assigned age appropriate tasks.

Discussion: Farm youth may often be assigned and perform many different work related tasks at a young age. These tasks can range from simple chores such as providing feed and water to small animals to the operation of modern farm equipment. During their early teen years, some farm youth often perform tasks such as operating machines similar to those that they are prohibited by government regulations from operating in other industries. This can result in youth being exposed to serious work place hazards at an early age and at times they may even perform tasks that are inappropriate for their age. Compared to adults, youth may lack work experience, physical size, and attention to task. The ability of youth to safely operate farm equipment may be compromised by cognitive abilities that are less well developed than in adults, by diminished visibility from operators' cabs designed for adults, and by control layouts that may not accommodate their reach. Whenever youth are assigned any work task, it is essential that the task is appropriate for the age and maturity of the youth. In addition, youth should always be trained to safely perform any assigned task and properly supervised by an adult until it is determined that the youth has learned how to safely perform the task.

Recommendation #3: Workers should not wear loose-fitting clothing near or while operating machines.

Discussion: The risk of entanglement in rotating shafts and machine components can be reduced if operators do not wear loose fitting clothing. Work clothing should be well-fitting and zippered or buttoned, not open. Frayed or loose fitting clothes, jackets and sweatshirts with drawstrings, and boots or shoes with long shoelaces should not be worn. Although it could not be determined from pictures of the clothing caught in the beaters of the wagon involved in this incident if they were loosely fitting, this recommendation is a general safe work practice that should always be followed by operators of machines whenever the risk of entanglement exists.

George Wahl, M.S.
Safety Investigator 4
MN FACE

Alan Bender, D.V.M., Ph. D., Chief
Chronic Disease & Environmental Epidemiology
MN FACE