Green Tobacco Sickness: An Occupational Hazard Among Tobacco Harvesters

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DR. OLENCHOCK: Thank you Don. Our next speaker is Terri Ballard from the Division of Surveillance, Hazard Evaluations and Field Studies of NIOSH. And Terri will speak to Green Tobacco Sickness: An Occupational Hazard Among Tobacco Harvesters.

DR. BALLARD: Good afternoon. Today I am going to be talking to you about an investigation of an outbreak of green tobacco sickness that occurred last year during the tobacco harvest in the south central region of Kentucky. I would like to acknowledge my co-investigators, most of whom are in the audience today.

Green tobacco sickness is an occupational hazard for tobacco harvesters. It is a form of nicotine poisoning that is caused by transdermal absorption of nicotine that's dissolved on the moisture on the wet tobacco plant. The main signs and symptoms are nausea and vomiting, weakness and dizziness. There is an initial tachycardia and hypertension that is followed by a lowering of the heart rate and blood pressure in the more severe cases. These signs and symptoms are very similar to that for organophosphate pesticide poisoning and also for heat exhaustion. Green tobacco sickness is a self limited condition. It usually lasts only one to two days but it can be very incapacitating during those couple of days.

There have been very few reports of green tobacco sickness in the medical literature. The only two from the United States up until this year were in Florida in 1970 and North Carolina in '73. In the North Carolina Study, the researchers were able to document that non-smoking tobacco harvesters were absorbing large amounts of nicotine as measured by a urinary cotinene, this is a primary metabolite of nicotine. They also found in their studies that non-smokers were a much greater risk for developing green tobacco sickness than smokers.

In 1979 a series of studies were performed in India that were similar to those in North Carolina. Both of those two groups also did intervention trials where they found that workers who wore plastic clothing, raincoats or aprons absorbed much less nicotine than the workers who did not.

In Kentucky an occupational medicine resident did a clinical study to try to distinguish green tobacco sickness from organophosphate pesticide poisoning or heat exhaustion.

The outbreak of green tobacco sickness was detected because Kentucky has a surveillance system for agricultural illness and injuries in place. This program was part of the Occupational Health Nurses and Agricultural Communities or OHNAC. This is a NIOSH funded project in 10 agricultural States. The OHNAC nurses particularly in the Bowling Green and Elizabethtown areas as they were making their rounds to the hospitals to get reports of illnesses and injuries started hearing about cases of green tobacco sickness.

They began to wonder though if this problem wasn't more widespread than previously thought and were concerned that it could have economic and health consequences for the tobacco workers in their communities. At that point in August last year, they started active surveillance in their participating hospitals. They provided literature to the emergency rooms. They did radio and newspaper spots in the local communities to try to get the word out about green tobacco sickness.

I would like to show you a few slides to tell you about the tobacco growing process for those of you who have never seen it. In the early spring, the small plants are set into the ground. And as the plants grow, when the flower appears, the flower is taken off by hand, this is called topping, and then a growth inhibitor is applied to the plant to prevent suckers from growing. Then three to four weeks before the harvest begins, the plants are sprayed with an organophosphate compound against the tobacco worm and other pests.

The harvest begins in August normally and it is done in Kentucky by having a worker walk through a row of densely packed plants and cutting each plant individually. He does that by grabbing the top of the plant with one hand and cutting off the plant at the base. Then the plant is impaled onto a stick through this metal cone-shaped piece which is itself an incredible source of occupational injury. The stakes are left in the field to dry for a day or two, then they are loaded onto the wagon and taken to the barn where they are placed on multitiered drying racks inside the barn until they are dry. And this is a photo from 1940 but the process is the same today. When the plants are dry, the stakes are taken down, the leaves are stripped off the stalks and then bundled up for market.

In the middle of September last year, NIOSH received a report of 33 possible cases of green tobacco sickness, so we went down to the Bowling Green area as well as Elizabethtown to review the records of those reports and also to initiate a medical record review at the five participating hospitals in the OHNAC Project.

We did a case control study to try to determine what the risk factors were and to describe the outbreak. A case control study is one which compares cases with a group of controls who are persons at risk for developing a disease but who did not develop it. We found 47 cases through our reports and medical record review from the five participating hospitals. And our definition of a case was a person who had received an emergency room diagnosis of green tobacco sickness, nicotine poisoning, tobacco croppers illness, a similar type diagnosis, plus who had a work history of having worked in the tobacco patch within 24 hours of becoming ill.

We tried to choose our controls from as many varied sources as possible in order to increase the chance of selecting them from the true population of tobacco harvesters. We used as our definition for control any person in the five county area who had worked in tobacco in 1992 but who did not have any symptoms of green tobacco sickness.

Over a four week period, we interviewed by

telephone 40 of the 47 case patients and 83 of 101 eligible controls. Once we reached these people by telephone, no one refused an interview. We were interested in tobacco workers use of protective clothing and their exposure to wet tobacco, their personal tobacco use and also how long they were working in terms of hours per day and days per week in tobacco.

We also wanted to investigate the relationship between rainfall and the number of cases and to do this we collected data on the rainfall of the day preceding or the day of the illness for the 47 cases using the weather station that was nearest to their home address. This however was not an exposure variable for the case control study because our controls were not time matched to the cases, they were not selected on the same day as the case got sick.

This is what's called the epidemic curve. It describes the number of cases over the time period in the south central region of Kentucky last year. We had cases starting from the week of July 25th through the week of September 19th. But you can see that the majority of the cases occurred in the week of August 22nd which happened to coincide with the first newspaper reports on this in the local newspapers.

Of our 47 cases, 12 of them were admitted to the hospital for a day or two and two of them went to the intensive care unit for low blood pressure and pulse. Thirty-five were treated in the emergency room and released and in the emergency room they received only symptomatic treatment, intravenous fluids and anti-emetic drugs.

We estimated a crude incidence rate for the two month period in the five county region for emergency room diagnosed cases of green tobacco sickness to be 10 per 1,000 tobacco harvesters.

This is a slide showing several demographic factors for the cases and the controls. The age distribution was different. Among the cases the median age was 29 years where the controls were older. Their median age was 39. The sex distribution was equal between both groups, with 87 percent of the respondents being male. We also looked at tobacco use and the controls reported more often to be current users of tobacco during the tobacco growing season last year than the cases.

When we analyzed the data from our study, we found that young age was a strong risk factor for developing green tobacco sickness. We found that the risk of getting this disease was three times greater for those workers who were under the age of 30. We also found that working in conditions where the clothing were likely to become soaked from the moisture that was on the green tobacco plants was a strong risk factor. One hundred percent of the case patients and 83 percent of the controls described this type of working condition. We also found that not using tobacco during the time of working in the field might have been a risk factor for developing it, although it was a small risk factor and not statistically convincing.

We found that gender, the amount of hours or days working in tobacco and the use of protective clothing were not different between the cases and the controls. All in all, reported use of protective clothing at least

once during the tobacco harvest was equal for both groups. Thirty-two percent reported ever having used gloves and only five percent reported ever having used any type of waterproof clothing.

This is a graph showing the rainfall data. On the days when there was .2 inches of rain or more, there were three times as many cases as on the day when there was no rainfall. This does suggest that wet days are associated with developing green tobacco sickness.

The conclusions from our study were that younger age was an increased risk factor for developing green sickness. It may be that the younger workers drop out of the work field once they get sick and we had some evidence of this as we interviewed them. Many people said that they were never going to do that again and find another summer job. And that the workers who remained in tobacco harvesting are most likely older, they have developed protective work practices and have more experience in perhaps staying out of the tobacco patch when it's wet.

We also found that tobacco use was a little bit protective and there is a biological reason why this may be so. Smokers do develop a tolerance to the effects of nicotine, however this tolerance can be overwhelmed if the absorbed amount of nicotine taken during the work situation greatly exceeds the normal intake of personal tobacco use. And finally, we found that wet working conditions were associated with developing green tobacco sickness.

There are several limitations to our study which might affect some of the findings. The controls were not time matched to the cases, so this may have limited our ability to look at certain risk factors. This is probably the case why we weren't able to point out protective clothing as being a protective factor. Secondly, we did not randomly select our controls from the tobacco harvesters in the community and this may have led to some bias in our selection of controls and that may explain the age distribution that we found in our study.

As a result of our case control study and the investigation of this outbreak, we were convinced that green tobacco sickness is an important public health problem in Kentucky. Tobacco is the top ranking legal agricultural product in Kentucky and there may be as many as 60,000 persons who work in it at least part-time who may be at risk for developing this condition. This means that as many as 600 persons may have sought care last year for green tobacco sickness, but even this figure is an underestimate of the true burden of the disease because a lot of people did not seek care who did get sick and had to leave the field for a day or two. Medical costs are not considerable either. The Workers Compensation Program in Kentucky does not cover agricultural conditions.

NIOSH has issued two recommendations to tobacco workers to prevent developing green tobacco sickness. The first is to avoid handling wet tobacco whenever possible. This means staying out of the patch during or immediately after a rainfall or in the early morning when heavy dew is present on the plants, and it may require some sort of flexible scheduling of work. When this is not

possible, workers should try to reduce their skin contact with the wet tobacco and this can be done through the use of protective clothing, rain jackets or aprons or slickers and the use of gloves. We also recommend that workers change into dry clothing whenever their clothing gets wet.

However we realize that these recommendations may not always be practical or feasible. Tobacco harvesters are under an incredible time constraint to get their crop cut before the first frost and they're often working 12 to 14 hours a day and a flexible work schedule may not be possible. The other problem with these recommendations is that there is an increased risk of developing heat stress when wearing impermeable clothing under hot working conditions and this risk needs to be weighed against the benefit of wearing protective clothing. It might be that wearing a rain jacket just for the first few hours of the day would be helpful.

We have been able to use education as our most powerful tool for public health intervention and have identified two main target groups for the educational efforts that the OHNAC nurses have been undertaking this whole year and particularly now as the harvest is starting. The first is to try to get the word out to the tobacco harvesters and farm families. We need to let them know that this condition exists, what it is and how to prevent it. And we have been using a NIOSH Update which is out there in the foyer if you want copies of it. It is a one sheet information leaflet written for the lay public. The nurses have been very active in eliciting the cooperation of agricultural extension agents to distribute materials and talk to their constituents. They also have been using newspapers, radios, and local magazines which we found out is probably the most effective form of communication.

The second group for our educational efforts are the health care providers in tobacco growing regions. We need to get the word out to them what this condition is, how to recognize it and how to treat it. The nurses have been providing in-service education to the emergency rooms. They've been distributing an MMWR article that came out on this in April as well as the NIOSH Update. And they have been stressing with the doctors that the key to diagnosis of green tobacco sickness is to take a careful and thorough work history.

Kentuckians have been harvesting tobacco the same way for the past 50 years or more, but this doesn't mean that they have to keep getting sick in the same way as well. Thank you. ■

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