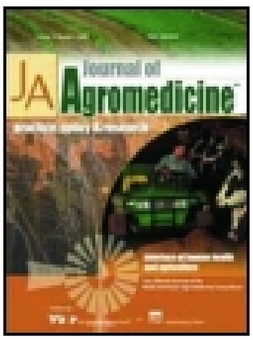

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Familial Clusters of Green Tobacco Sickness

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ABSTRACT. We present three examples of familial clustering of green tobacco sickness, taken from reports received by the Kentucky Regional Poison Center from 1991 through 1994. Each cluster contains three to five members of an immediate or extended family who became ill after working together in tobacco. Patients' ages ranged from 11 to 46 years; two thirds were males. The most frequent symptom was vomiting; other symptoms included nausea, weakness, dizziness, pallor, headache, and diaphoresis. Two persons were treated in the emergency department; the remainder were managed at home. We discuss three characteristics of tobacco farming in Kentucky which might contribute to familial clustering of GTS. *[Article copies available from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: getinfo@haworth.com]*

KEYWORDS. Green tobacco sickness, agricultural poisoning, clusters, families, poison center

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INTRODUCTION

Occupational medicine research contains literally thousands of studies reporting the effects of hazardous exposures on worker health. Some of these investigations describe groups of workers who developed the same illness after exposure to the same hazard. Such occurrences of the same disease either within a common geographic area or within a defined period of time are often referred to as *clusters.* The Centers for Disease Control and Prevention (CDC) defines "cluster" as "an unusual aggregation, real or perceived, of health events that are grouped together in time and space and that are reported to a health agency."[1]

A 1991 review of disease clustering in occupational settings summarized 87 studies.[2] Only four of these studies described disease clusters in the agricultural industry, including neuropathy in fish hatchery workers[3] and hypersensitivity pneumonitis in farmers,[4] duck pluckers,[5] and mushroom workers.[6] Studies of clusters in agriculture published since 1991 have included reports of hydrogen sulfide asphyxiation of swine workers,[7] drowning of commercial fishermen,[8] and asphyxiation of dairy farmers in a manure pit.[7] We expand the list of examples of disease clustering among agricultural workers by presenting three case studies describing the occurrence of a unique occupational poisoning, green tobacco sickness (GTS), among tobacco work crews on Kentucky farms.

GTS is acute nicotine poisoning following dermal contact with mature tobacco plants, *Nicotiana tabacum.*[9] Table 1 summarizes the exposure characteristics, symptoms, and treatment of GTS.[10,11,12] Lay persons sometimes believe GTS symptoms result from exposure to chemicals; however, this possibility can usually be ruled out, because the last application of agrochemicals normally occurs several weeks before harvest.

The University of Kentucky, in conjunction with the Kentucky Regional Poison Center, has monitored the incidence of GTS reported to the poison center by health providers and the public since 1990. During this time, we observed an interesting pattern indicative of disease clustering among GTS patients: prior to becoming ill, over one fourth had worked that day with at least one other person who also became ill with GTS. For example, in 1991, the

TABLE 1. Characteristics of Green Tobacco Sickness

Toxic agent:

Nicotine

Typical work setting:

Workers are "topping," cutting, or loading mature tobacco plants in July, August, and September.

Exposure characterisitics:

Wet or sappy tobacco plants or leaves come in contact with skin of person. Clothing becomes wet from tobacco plants or leaves that are wet from dew, rain or sap.

Length of time for symptoms to develop:

As little as 3 hours after contact with the agent

Symptoms:

Most common:	Other:
Weakness	Abdominal cramps
Nausea	Headache
Vomiting	Breathing difficulty
Dizziness	Abnormal temperature
	Pallor
	Diarrhea
	Chills
	Fluctuations in blood pressure or heart rate

Length of time for symptoms to resolve spontaneously:

Usually within 1-2 days from onset of symptoms

Treatment:

Home:	Emergency Department, if needed:
Work cessation	Intravenous rehydration
Showering	Antiemetics
Change of clothing	

poison center received 78 reports of GTS from mid-July through late September, the weeks during which field workers remove tobacco blooms and harvest the plants.[10] Further examination of poison center records revealed that 24 of those GTS cases (30.8%) could be traced to 10 work crews scattered among 9 Kentucky

counties. Often the crews were composed of family members who had worked together in tobacco on the same day. The three clusters we present are from cases that occurred from 1991 through 1994. Together, the clusters represent varied work crew compositions, exposure patterns, symptoms, and medical care received.

CASES

Example #1

Three-Person Cluster: Father and Two Sons

In September 1994, a 35-year-old father and his two sons (aged 11 and 14) cut tobacco "all day" in the field, stopping at 4:00 PM after becoming ill. At 6:00 PM, the man's wife contacted the poison center and reported that her husband was vomiting, shaking, and having chills; the younger son was also vomiting; the older son was pale and nauseated but had not vomited. Poison center staff advised the father and the younger son to proceed to the emergency department (ED) of a local hospital. Upon arriving at 7:00 PM, both received Phenergan to relieve vomiting. The father also received 4,000 cc normal saline intravenously for dehydration. Both were discharged at 9:00 PM with Phenergan suppositories to control nausea and vomiting. At noon the following day, telephone follow-up by the poison center revealed that all three were asymptomatic, and no further medical care was indicated.

Example #2

Four-Person Cluster: Mother and Three Teenage Children

In August 1991, a 34-year-old female, her sons (aged 15 and 16) and her daughter (age 13) cut wet tobacco in the field before noon. By the afternoon, all had vomited, and all except the 15-year-old son were weak and dizzy. The mother phoned the poison center about 7:00 PM. Poison center staff instructed her to have everyone change clothes and shower immediately and to phone the poison center if symptoms worsened. At 10:00 PM, a follow-up call by the

poison center staff revealed that vomiting had decreased and that all were feeling "much better." No further medical care was indicated.

Example #3

Five-Person Cluster: Husband and Wife, Her Mother, His Cousin, and an In-Law

Four persons in this September 1993 work crew began working in wet tobacco at 10:00 AM: a 29-year old man, his 35-year-old wife, her mother (age not specified), and the man's 15-year-old cousin. The fifth person, an "in- law" (age 46), joined the work crew at 2:00 PM. Work included loading previously cut tobacco onto a wagon, unloading the wagon in a tobacco barn, and hanging the tobacco for air drying. Everyone was asymptomatic when work stopped between 8:00 and 9:00 PM. Around 11:45 PM, the 15-year-old developed nausea and vomiting, prompting the youth's father to call the poison center shortly after midnight. Poison information specialists told the father to call again if vomiting continued or if his son felt worse. At 2:30 AM, a followup call revealed that the son felt much better. Around noon the next day, a second follow-up call to the youth's father revealed that the four relatives who had worked alongside the youth had also become ill. The poison center then contacted those four persons: (a) the youth's cousin, who had developed vomiting, weakness, and headache, in addition to becoming pale and clammy; (b) the cousin's wife, who had been pale and hot, was sweating profusely, and had no appetite; (c) her mother, who had also vomited; and (d) the in-law, who had vomited. None were seen in the ED or physician's office. At the time of the poison center's call, vomiting had subsided, but all remained weak.

DISCUSSION

The tendency for green tobacco sickness to cluster in families was first reported in 1974.[11] Yet neither that study nor any other GTS epidemiologic study[12,13] or case review[14,15] has provided examples of family clusters. Often, reports of disease clusters

prompt hypothesis generation,[16] especially about the etiologic agent (MMWR 1990). The etiologic agent of GTS (nicotine) is known,[9] and the symptoms reported to the poison center are consistent with those of green tobacco sickness in other studies.[9,12,13] We are more interested in the reason for the familial clustering phenomenon in GTS. Three characteristics of tobacco farming in Kentucky could contribute to the clustering of GTS within families: (1) types of tobacco grown, (2) harvesting and preparation methods, (3) the role of family members in the production of tobacco on family farms.

Tobacco is Kentucky's leading cash crop, grown in 111 of the 120 counties.[17] Kentucky's 454,000 pounds of tobacco produced in 1994 trailed only that of North Carolina (600,000 pounds) and far exceeded production in Tennessee (132,000 pounds), South Carolina (108,000 pounds), Virginia (106,000 pounds), and Georgia (81,000 pounds).[17] About 93% of the tobacco grown in Kentucky is a type known as "burley"; the remainder is dark air-cured or dark fire-cured tobacco.[17] (Kentucky does not grow any flue-cured tobacco.) Burley is characterized by a white stalk and lighter green leaves which, compared with the leaves of flue-cured tobacco, contain about 13% more nicotine.[18] Nicotine levels in the dark varieties of tobacco are even higher than in burley.[19] While the high nicotine content in burley tobacco would not account for familial clustering, it might explain why green tobacco sickness is currently a serious occupational health problem in Kentucky.

A second factor which could contribute to clustering of GTS in Kentucky is the work process necessary to grow burley tobacco. In contrast to the mechanical harvesting methods used where flue-cured types of tobacco are grown,[20] the growing and harvesting of burley involves considerably more dermal contact with the tobacco plant. Except for planting the tobacco and applying agrochemicals, burley tobacco growers prepare and harvest their crop by manual labor. As the tobacco matures in mid-summer, workers walk between the rows of tobacco to clip off ("top") the blooms and remove the suckers. Then, in late August to mid-September, the tobacco stalk is hand cut at ground level, impaled in groups of five to six on a wooden stake, and hung, with leaves attached, to air dry in barns for three to four months. During the harvest weeks, work

usually continues daily from early morning until dark, even when the tobacco leaves may be wet from dew or rain. Workers may be reluctant to wear long pants and long-sleeved shirts in the hot summer sun, thus increasing the amount of dermal contact with the tobacco leaves.

The third and most significant factor influencing the occurrence of these clusters relates to the work roles of family members on tobacco farms. The mechanization of tobacco harvesting in other states has led to a decline in the number of small family farms, as expensive machinery has replaced much of the work force and farms have become large and commercialized.[20] However, in Kentucky, the typical tobacco farm is still family owned and grows only 2.3 acres of tobacco per year.[21] Tobacco production in Kentucky remains a family operation.[22] Husbands, wives, children, grandparents, aunts and uncles work alongside each other as the tobacco is topped, cut, loaded, unloaded, and hung to dry.

In summary, the predominance of family-based work crews who manually harvest the tobacco, combined with the high nicotine content of burley, often results in several members of the same family becoming ill with GTS at the same time. These three factors in combination are more prevalent in Kentucky than in other tobacco states and can offer an explanation for the familial clusters observed in Kentucky.

We urge researchers in other states to examine the incidence of GTS in areas where these high-nicotine types of tobacco are grown and manually harvested on small, family-operated farms. While most states grow only small amounts of burley, others such as Tennessee have a large burley crop[17] and could possibly exhibit similar clusters of GTS.

These case studies have significance beyond a self-limited occupational poisoning that occurs in tobacco states. Previous research has demonstrated that poison control centers are effective in their surveillance of occupational,[23] environmental,[24] and agricultural poisonings.[25] Our descriptions, taken from routinely collected poison center records, provide new evidence that data from poison centers can be used to detect and describe clustering of agricultural poisonings. Future research could include the examination of poison center records to detect clusters resulting from toxic exposure to

pesticides, anhydrous ammonia, hydrogen sulfide gas, and moldy hay or grain.

The cases that we report here also underscore the importance of routine poison center followup.[26] Not only did followup calls assess changes in patients' conditions, but they also led to the discovery of GTS cases among other family members in addition to the person who had initially been reported to the poison center.

Since agriculture is both a life style and a way of work, familial clusters of disease, injury, and poisoning in agriculture are to be expected. Yet, the infrequency with which agricultural cluster studies appear in the literature prompts us to question whether researchers or clinicians customarily inquire about, report, or investigate potential clusters among farm families. We urge physicians and other health care providers to ask about familial clusters whenever any member of a farm family has an occupational illness, injury or poisoning. Diligence in asking such questions would improve the chances that disease clustering in agriculture can be detected and investigated.

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