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Hand Safety for Specialty Crop Production Workers – Frequencies of Open Wound Hand Injuries

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Abstract. *The objective of this study was to identify minor open-wound hand injuries of farm workers who hand harvest fresh fruits in Utah. During on-site data collection during harvesting of fruit, farm workers were asked to have their hands examined for minor open-wounds. Data collection was conducted on four farms. There were 33 workers that participated. The majority (57.6%) of farm workers were male. Most farm workers (81.8%) identified themselves as Latino or Hispanic. There were six (18%) individual who identified themselves as Thai. There were eight (24%) farm workers who had cuts to the dorsal portion of their hands. Only two (6%) individuals had cuts to the palm portion of their hands. There were four (12%) workers with dorsal abrasions located near the base of the hand near the wrist, while only one (3%) individual was identified with a palm abrasion. Only two (6%) farm workers were found with small puncture wounds to one of their fingers. There were two (6%) individuals that were noted with fingernail loss. This study has identified essential safety issues that need to be addressed for improving the effectiveness of safety training for migrant farm laborers. These open wound injuries to Migrant Hispanic farm workers during hand harvesting could create additional health problems with the possibility of infection and the spread of diseases such as hepatitis A. Continued research is need to understand workers' acceptance of these injuries and barriers to personal protection. **Keywords.** hand wounds, farm worker safety.*

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Introduction

Specialty crop production in the United States relies heavily on migrant and seasonal workers for hand harvesting fresh fruits and vegetables. This important labor force is growing. Population estimates vary regarding this group, but the Farmworker Enumeration Study documented that Utah's migrant labor force grew from 8,983 in 1990 to 17,991 in 2000 (National Center for Farmworker Health, 2009; Villarejo, 2003). Insuring the health and safety of these laborers has been an ongoing issue for intermountain producers as documented by Arbab and Weidner (1986) who found 46 Utah farms did not provide field toilet facilities or in-field hand washing facilities. Their investigation of health clinic utilization records indicated that migrant workers were treated for diarrhea 20 times more than urban poor with 77% of the cases occurring during the field work season (Arbab & Weidner). The high incidence of treatment for diarrhea may be due to inadequate work-related hygiene and sanitation practices. In Colorado, Vela-Acosta et al. (2002) found that farm laborers were at an increased risk of gastrointestinal health risks due to inadequate field sanitation provisions. Open wound injuries have been reported in agricultural health and safety research conducted in California and North Carolina (Ciesielski et al., 1991; McCurdy et al., 2003). Cuts, in addition to broken bones and sprains, accounted for 80% of the injuries of North Carolina farm migrant workers. McCurdy et al. found, among California Migrant Hispanic farm workers, that the most common crops associated with agricultural injury were tomatoes, cherries, and wine grapes. The most common task associated with these injuries to farm workers was hand harvesting of crops.

Current research is limited that documents if these work conditions continue to be prevalent for Utah farm workers. There is a need to investigate the frequency of open wound hand injuries among farm workers hand harvesting fruits and vegetables. These open wounds could become infected from pathogenic bacteria found in the field. Very little is known about the infection risks posed by pathogenic bacteria that are facing this at-risk population. With worker payment linked to quantity of produce harvest, the incentive for these workers to boost their productivity may come at the cost of faster and less careful work increasing the risk of injury (McCurdy et al., 2003).

Currently the United States Department of Agriculture offers the "good agricultural practice" (GAP) audit program that certifies farms' production practices in order to minimize risks of health hazards. This program is voluntary and requires considerable resources to be invested by the producer. Producers who have USDA GAP certification incorporate prevention practices that improve worker hygiene habits and provide protection from injury. This may serve as a crucial component in protecting farm workers from hand wound injuries and potential conditions that may lead to infection. The USDA's Good Agricultural Practices are implemented only by request of a retail purchaser through a contractual agreement with the producer. Several third party audit programs are also available, but the effectiveness of these programs has come under question (Costa, 2011).

Safety Emphasis

This pilot project provides valuable pilot data to support the need for further development and the design of a case control field study investigating the impact of safety training programs to improve safety knowledge and behavior of agricultural workers.

Purpose

The purpose of this pilot study was to understand the risks for open wound injuries to the hands of farm workers during harvesting of fruit crops requiring labor intensive harvesting.

Objectives

1. Describe working conditions during hand harvesting at “GAP” certified farms and non-certified farms.
2. Identify open wound hand injuries among Utah migrant and seasonal farm laborers who hand harvest fruit.

Research Question

What is the difference in injury prevalence between migrant and seasonal farm workers who hand harvest at “GAP” certified and those who hand harvest at non-certified fruit farms?

Hypothesis

There will be no significant difference in farm workers’ open wound hand injury frequency between USDA GAP certified farms and non-certified farms.

Methods

This pilot study was deemed exempt by Utah State University Institutional Review Board. A total of four fruit operations were identified through an agricultural affiliated organization directory. Two farms were USDA “GAP” certified and two farms were not certified. All farms relied on migrant and seasonal labor for hand harvesting produce. Contact was made with farm owner/operators via letter and telephone. Letters of information were read and provided to field workers in Spanish and English regarding their rights as research participants. To encourage farm workers participation work gloves, hand sanitizer, sunglasses, sunscreen, and a travel size first aid kit were offered as incentives to participate in the study.

During site visits, observations were made on harvesting methods and sanitation facilities. Mobile hand wash stations and mobile latrines availability and locations were observed. The opisthenar (back or dorsal) and palm regions of farm workers hands which included the fingers along with the wrist area were observed for open wounds. Farm workers were asked to self-report hand washing frequency during their work day, glove use and type, and frequency of glove changing during the harvesting season. Figure 1 is the graphic used on the data capture form for recording location and description of open wound hand injuries. The location and type of open wounds were recorded for each farm worker. Open wounds were classified as cut, puncture, abrasion or fingernail loss.

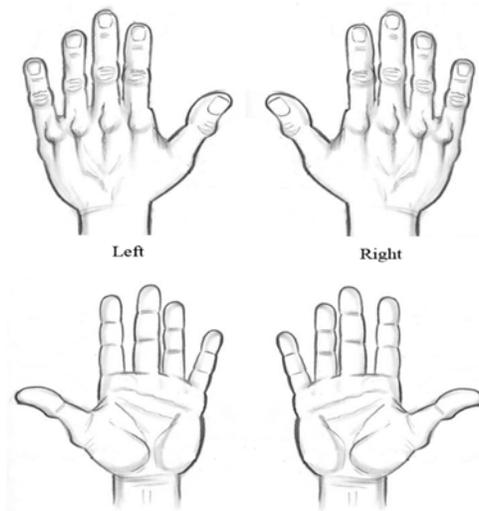


Figure 1. Graphic used to record location of open wound hand injuries

Open hand wounds were considered cuts if the skin area was severed/broken in a linear or irregular pattern with either smooth or jagged edges. For a cut, the shape of the wound should change when the skin is moved or stretched. Cuts could be superficial which only extend partially through the top layer of skin or deep (>0.25 inches or 6.35 millimeters). Abrasions were defined as a fine line (scratch) or wide grazed area (scrape) that had removed the outer layers of skin away. Additionally, if an injury was to be considered an abrasion, the shape of the wound had to hold its shape when the skin was moved or stretched. A puncture was defined as a wound made by a pointed object such as a thorn, nail, or screw. This type of wound was characterized as being deeper than it was wide due to the length and narrowness of the penetrating object. A fingernail loss injury was defined as an avulsion occurring to the fingernail or the skin that supports the fingernail. This injury was also considered if there was a complete loss of the fingernail.

The number of open wounds in each category for non-certified and certified farm workers was entered into PASW version 18 statistical analysis software. Open wound frequencies and percentages were reported for farm workers by farm category. The chi-square test of association was used to test for differences between the farm workers who work at GAP certified farms and those who work at non-certified farms on the nominal dependent variable, open wound presences (yes or no).

Results/Findings

There were 19 workers that participated from the two non-certified farms. A total of 14 workers participated from the two USDA GAP certified farms. The majority (73.7%, $n = 14$) of farm workers at non-certified farms were female. All farm workers at the “GAP” certified farms were male ($f = 14$). Most farm workers (81.8%) identified themselves as Latino or Hispanic. There were six individuals who identified themselves as Thai. Farms were hand harvesting raspberries and apples during data collection.

For non-certified farms, there were four out of 19 farm workers (21.2%) who had cuts on the back of their hands around their fingers. There were two of the 19 workers from non-certified farms (10.6%) who had cuts to the palm areas of their hands. There were four (21.1%, $n = 19$) workers from non-certified farms with dorsal abrasions located near the base of the hand near the wrist, while only one (3%) individual was identified with a palm abrasion. Only one (5.3%, n

= 19) non-certified farm worker was found with small puncture wounds to one finger. There were two (6%) non-certified farm workers that were noted with a fingernail loss.

For GAP certified farms, four out of 14 farm workers (28.5%) had cuts on the back of their hands around their fingers. There were no farm workers from GAP certified farms with cuts to the palm areas of their hands. None of the farm workers from the GAP certified farms were observed with abrasions on their hands or wrists. Only one (7.1%, $n = 14$) farm worker from the GAP certified farms had a fingernail loss.

The frequency of farm workers with open wound injuries to their hands was slightly higher for non-certified farms (Table 1). The chi-square test of association showed no significant difference in frequency of open wound ($\chi^2 (1) = 0.138, p = .710, \phi = .065$) presence between farm workers who work at GAP certified farms and those who work at non-certified farms. The null hypothesis that there will be no significant difference in farm workers' open wound hand injury frequency between USDA GAP certified farms and non-certified farms was retained.

Table 1. Frequency of farm workers with open wounds by farm type

Farm Type	Presence of open wounds	
	Yes (<i>f</i>)	No (<i>f</i>)
GAP certified ($n = 14$)	5	9
Non-certified ($n = 19$)	8	11

At GAP certified farms, workers reported washing their hands more frequently during the work day than workers at non-certified farms. At non-certified farms, 58% of workers reported either washing their hands once or not at all during the work day. Table 2 summarizes the frequency of self-reported hand washing frequencies.

Table 2. Farm workers' frequency of self-reported hand washing attempts by farm type

Farm Type	Hand washings during the work day				
	None (<i>f</i>)	Once (<i>f</i>)	Twice (<i>f</i>)	Three times (<i>f</i>)	Four or more times (<i>f</i>)
GAP certified ($n = 14$)	0	0	0	3	11
Non-certified ($n = 19$)	5	6	5	2	1

Workers were asked if they wore gloves during harvesting. All GAP farm workers reported wearing gloves during harvesting. Only six workers from the non-certified farms reported wearing gloves during harvesting. Workers were asked about the material that their gloves were made from. The majority (64%) of GAP farm workers wore a cloth type glove with 36% reporting wearing leather gloves. Non-certified farm workers who reported wearing gloves indicate they used a cloth-type glove. Most (64%) GAP farm workers changed their gloves two to three times in a harvesting season. Table 3 summarizes the frequency of farm workers using gloves and the types of glove materials used.

Table 3. Frequencies of farm workers using gloves during harvesting and the type of glove material.

Farm Type	Glove use during the work day		Type of Glove Material		
	Yes (f)	No (f)	Cloth (Cotton blend) (f)	Leather (f)	Polymer Coated Cloth (Cotton Blend) (f)
GAP certified (n = 14)	14	0	9	5	0
Non-certified (n = 19)	6	13	5	0	1

Only one non-certified farm had a portable latrine located near the harvesting site. No hand washing stations were located near workers in the field at non-certified farms. GAP certified farms were equipped with mobile hand washing stations accessible to workers in the field. Mobile hand washing stations were located on the back of a truck hitch and were operated by foot pedals. Soap and paper towel dispensers were full during the observation. Mobile latrines were located on trailers at the edge of the fields that were being harvested.

Limitations/Discussion/Conclusions

Caution should be exercised when generalizing the results of this study to other populations outside of the participants from this exploratory pilot study. A limitation to this study was the limited number of participating farms and farm workers. Further research is being conducted to gather data from more farms.

The results of this pilot study are timely with the recent outbreak of *Listeria monocytogenes* in fresh cantaloupes creating concerns about the integrity of farm certification programs. The frequency of open wounds on these participating farm workers' hands could become a potential infection hazard. If methicillin-resistant *Staphylococcus aureus* (MRSA) were present, migrant and seasonal farm labors could be at risk for serious infections that could spread to surrounding soft tissue, requiring rigorous and extensive treatments (CDC, August 2010). This could lead to greater work loss time and medical expenses for these workers. The sanitation and hand washing equipment present at GAP farms in this study indicated that working conditions promote hand hygiene and wound care. The type of crop being harvested may limit the type and use of gloves to prevent damage to soft fleshy produce. If applicable farm workers who use gloves will reduce exposure to environmental conditions that may cause open wounds and will help them prevent dirt and debris from entering injured area. Farm workers who change out gloves may also reduce the risk of infection to these open wounds. First aid and open wound treatments sought by farm workers was not addressed by this project. Future research should identify frequency and type of open wound treatments sought by farm workers. The frequent hand washing of farm workers during the hand harvesting may be an effective method for preventing open wound infections. This is limited on farms without hand washing stations and proper sanitation facilities at the work site. The farms without proper hand washing stations and sanitation equipment may expose migrant and seasonal farm workers with open wounds on their hands to dirt, debris, and bacteria leading to infection. Non-certified farms hiring farm workers to hand harvest fruits and vegetables should make proper hand hygiene a priority to prevent infections. Assisting non-certified farms in identifying essential practices to improve worker hygiene habits and on-farm management practices to promote hand hygiene should be

a priority. If farm worker payment is linked to quantity of produce harvest, the incentive for these workers to boost their productivity may come at the cost of faster and less careful work, increasing the risk of infection and illness. Future hand washing and hygiene educational programming should be directed to prevent the spread of these pathogens and improve wound care.

This participatory study has provided valuable pilot data to support the need for further development and the design of a case control field study investigating the impact of food safety audit programs to improve hygiene safety knowledge and behavior of agricultural workers. Further research is needed to assess routes of introduction of bacteria pathogens and identifying on-farm management practices that improve safety. A strong collaborative proposal could be initiated to identify the types/strains of bacterial organisms and develop on-farm management practices that improve worker safety.

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