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Impact of livestock hygiene education programs on mastitis in smallholder water buffalo (*Bubalus bubalis*) in Chitwan, Nepal

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ABSTRACT

A project implemented from 2003 to 2005 trained women in Chitwan District, Nepal, in hygienic dairy production using a process of social mobilization. The aim of this research was to assess if the prevalence of mastitis in water buffalo in the households of women who were trained was lower one year after training than in untrained households, if the training influenced knowledge and practices for the prevention or control of mastitis, and if these practices and knowledge were associated with a lower prevalence of mastitis. A total of 202 households from Eastern and Western Chitwan District were included in the study. Of these, 60 households had participated in the project and 142 had not. Milk samples were collected from 129 households (33 project households and 96 non-project households). Clinical mastitis was determined using visual inspection of udders and detection of macroscopic clots and flakes in milk. The California Mastitis Test was used to diagnose sub-clinical mastitis from milk samples, and the IDEXX SNAP test to identify the presence of tetracycline residues. The prevalence of mastitis in trained households (39.4%) was 43.78% of that in untrained households (60.4%), lower but not significantly so ($p = 0.08$, 95% CI 0.17–1.12). Thirteen indicators of knowledge or practice for the control or prevention of mastitis were more likely to occur in trained households, four significantly so (not consuming milk from sick buffalo ($p = 0.001$), using soap to wash hands before milking ($p = 0.001$), discarding milk after antibiotic usage ($p = 0.01$), and choosing appropriate flooring for their livestock ($p = 0.03$)). Trained households that discarded milk from sick buffalo were 2.96 times more likely to have at least one animal with mastitis in the household ($p = 0.03$, 95% CI 1.15–7.65). Trained households that knew to wash buffalos' teats after milking were less likely (OR 0.25) to have mastitis in their herd ($p = 0.02$, 95% CI 0.08–0.80). Of the 138 buffalos tested, only one tested positive for tetracycline residues.

1. Introduction

From 2003 to 2005, a program of social mobilization was implemented in Chitwan, Nepal to educate women about animal hygiene and safe food handling. Social mobilization encourages community organizations such as women's groups, and emphasizes sharing the benefits of new ideas and skills between group members and the remaining community. This particular social mobilization program for women concentrated on minimizing public health risks by preventing and controlling transmission of livestock diseases through improved animal care and dairy production at the farm level (Jost et al., 2005). The project specifically targeted women for two reasons. Women in

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the project communities were already members of Heifer International women's groups, which provided easy and organized access to the communities. Secondly, women are the primary food preparers and are often the main caretakers of livestock in Nepal. Members of women's groups organized by Heifer International Nepal were given informational handouts and public health social mobilization training by IAAS Veterinary School faculty and students. An end of project qualitative evaluation in 2005 documented changes in women's food production and preparation, including hand washing before and after milking, safe food storage, proper boiling of milk, and changes in water supply to improve livestock and human hygiene (Jost et al., 2005).

Mastitis is a bacterial disease that causes economic losses in dairy buffalo in Nepal. A 2002 study in Nepal found the economic impact of clinical mastitis in buffalo to be $63 (US) per buffalo per lactation due to lower milk yield, quality, shelf life and fat content, and $30 for treatments, veterinary services and extra labor to care for sick livestock (Dhakal and Thapa, 2002). In a previous study of mastitis in Chitwan District, researchers using the California Mastitis Test (CMT) found the prevalence of mastitis to be 21.4% in cows and 38.5% in buffalo (Knox et al., 2000). In addition to economic effects, the direct human health effects of ingesting improperly pasteurized mastitic milk involve the consumption of heat stable toxins and microorganisms (National Mastitis Council, 2005). Little research has been done on normal SCC in water buffalo, however Dhakal (2006) recommends an SCC threshold of 200,000 per milliliter for tropical dairy farm buffalo. The California mastitis test (CMT) is a commonly used rapid test for sub-clinical mastitis that detects somatic cell nuclear material, relying on a threshold of 300,000 SCC per milliliter (Radostitis et al., 1994).

The economic impact of therapeutic failure with inexpensive broad spectrum antibiotics in developing countries is an increasing reliance on newer, expensive drugs unaffordable to the general population (World Health Organization, 2001). There is currently no data available on the presence of antibiotic residues in milk in Chitwan District, although a previous study found that most people are not aware of the need to withhold milk following treatment. That study attempted to quantify the presence of β-lactam antibiotic residues in milk, but did not find any cattle or buffalo with detectable residues (Turnbull, 2003). This may be because of reduced use due to injectable ampicillin and penicillin treatment failure in the area. A recent study has found that coagulase negative Staphylococci were predominantly associated with cases of clinical and sub-clinical mastitis in Chitwan District, followed by Coliforms (Dhakal et al., 2007). Ampicillin was found to be the least effective antibiotic against these organisms, with the sensitivity of the drug decreasing from 70.7% in 2002 to 53.3% in 2005. The same study found that tetracyclines, a popular antibiotic amongst smallholders and veterinary technicians in the area, was 79.0% effective in 2002, but only 57.0% effective in 2005. Enrofloxacin is now widely used as an antibiotic of first choice for mastitis treatment in Nepal (Dhakal et al., 2007).

Buffalo are important assets in smallholder farming communities in Chitwan District. They provide a critical source of protein for household consumption, and excess milk can be sold. In Chitwan District, 43.5% of households are dependant on animal and crop production for food and income, while 74.8% of households consume milk from their own herd and sell the extra for income (Turnbull, 2003). It was anticipated that social and economic factors might prevent households from treating or removing animals affected by mastitis from their herd, particularly sub-clinical mastitis, and that a short-term impact of the training one year after the project might not be measurable. However, it was anticipated that knowledge and practices associated with safe household milk production and consumption would be more common in trained households. The aim of this research was to measure the impact of the project one year after implementation by assessing if the prevalence of mastitis in water buffalo (*Bubalus bubalis*) in the households of women who were trained was lower than in untrained households, if the training influenced knowledge and practices for the prevention or control of mastitis, and if these practices and knowledge were associated with a lower prevalence of mastitis.

2. Materials and methods

2.1. Population surveyed

A region of Nepal's tropical Terai from longitude 27.66421° to 27.54935° and latitude 84.90842° to 84.34019° was surveyed, covering parts of Western and Eastern Chitwan District near the Chitwan National Park and Tribhuvan University.

At the time of study design, the mastitis status of buffalo in the households was unknown. Therefore, the study was designed to include several untrained households per trained household based on proximity to the trained household (Dohoo et al., 2003). A total of 202 households were included in the study with a ratio of 2.3:1 untrained to trained households. The local head of Heifer International in Chitwan developed lists of eligible trained and untrained households. Trained households included all possible households that were members of a Heifer International women's group in the study area, had participated in the "Training Communities" project and that had at least one buffalo, for a total of 60 trained households. All eligible trained households were interviewed and included in the study. Untrained households were identified as those buffalo-owning households with at least one buffalo and near trained households, which included some members of the Heifer women's groups that had not participated in the project. A number of eligible untrained households refused to participate and 142 untrained households were included in the study. Trained–untrained groups were created by stratifying households within each training group, and then randomly assigning untrained households from each training group area to trained households. In this way trained–untrained pairs were created, ranging from 1 to 4 untrained households per single trained household.