



## Knowledge, Attitudes and Practices (KAP) of Herdsmen in Ghana with respect to Milk-Borne Zoonotic Diseases and the Safe Handling of Milk

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### ABSTRACT

The study was carried out to determine the knowledge, attitudes and practices (KAP) of herdsmen (N=224) within the coastal savannah zone of Ghana on brucellosis, tuberculosis (TB) and safe handling of fresh cow milk.

Respondents were herdsmen with between one to over 40 years experience in the business and 83% of them had never received any formal training in milk handling. Most respondents were aware of TB (88%) and brucellosis (76%) but only 2.7% and 1.8% knew the correct cause of TB and brucellosis respectively. Most respondents did not know how humans could contract TB (66%) and brucellosis (87%) from cattle and 31% did not know that boiling of milk can prevent milk-borne diseases. Respondents with formal training in milk handling were more likely to give correct responses ( $P < 0.05$ ). However, only experience in the milk business was significantly responsible for respondent's knowledge of TB in cattle and man and for each extra year of experience with milking of cattle there is a 4.5% (95% CI, 1.2-7.9) increase in the odds of a participant knowing about TB. For brucellosis the increment is 4.1% (95% CI, 1.2-7.9) per year experience.

There is an urgent need for intensive health education for herdsmen on safe handling of milk and the transmission of zoonotic diseases to man through the consumption of raw milk.

**KEY WORDS:** Knowledge, attitudes, practices, fresh milk, herdsmen, TB, brucellosis.

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### INTRODUCTION

Ghana has a cattle population of about 1.25 million. The West African Shorthorn (WASH) is the most common breed and constitutes about 60% of the cattle population, while the Sanga (a cross between white Zebu and the WASH) is preferred by dairy farmers because of its high milk production capacity [1]. In the northern parts of Ghana cattle rearing is practiced mostly by individual families who keep one or few animals only, whereas in the south, cattle keeping is a commercial venture with often fairly large herd sizes, frequently between 50 and 200 herds [2, 3]. In many cases the owners of these enterprises are absentees and the herds are cared for by hired herdsmen who are considered to have greater indigenous knowledge of milk farming. The herdsmen's remuneration is the right to sell the milk and in some cases be given the third calf from any cow [3]. The herdsmen's wife may generate some extra income by the production of *wagashi*, a soft cheese prepared from fresh milk. Thus the herdsmen double up in both roles as producers and retailers of milk while their wives further process some of the milk for retailing [4].

The milk production in Ghana is estimated at 34,000 metric tons and an additional amount of on average 37,195 metric tons of liquid milk equivalent (LME) was imported annually into Ghana in the last decade [5]. Consumers often prefer imported dairy because it is perceived that the locally produced milk is produced and marketed under unhygienic conditions, and therefore is considered unsafe [6]. Public health concerns have also been raised over the consumption of local milk because zoonotic disease organisms such as *Mycobacterium*, *Brucella* and enteropathogenic *Escherichia coli* that may be present in milk can lead to health problems in the human population such as tuberculosis (TB), brucellosis and haemorrhagic enteritis. With brucellosis, a poor correlation between the spatial distribution of human cases (which tend to

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be in urban areas) and the cattle reservoir (which tend to be in peri-urban and rural areas) is suggestive of brucellosis infection occurring through dairy value chains [7]. Indeed most of the milk produced and marketed through the informal circuit is produced and processed under unhygienic conditions with most of the activities including the milking done manually. Thus, there is a clear need to improve the quality of the milk production and processing. Improvement in the quality of the dairy then may help to stimulate the growth of this important economic sector. This study was undertaken to determine the background and knowledge, attitudes and practices (KAP) of herdsmen on the two milk-borne zoonotic diseases; TB and brucellosis and with respect to the safety of milk. Such information is essential for the development of an effective information and training program.

## MATERIALS AND METHODS

### Study Area

The study was conducted within the coastal savannah zone, one of the six agro-ecological zones in Ghana. This zone covers an area of 4,500 km<sup>2</sup> with a mean rainfall of 800 mm ranging from 600-1200 mm [8]. The major rainy season is from March to July and the minor rainy season from September to October. This zone has the greatest concentration of cattle kraals in southern Ghana and is thus the hub of the small scale dairy production and marketing.

### Test design, sampling and data collection

The study was carried out from May 2007 to July 2007 and was designed as a community-based cross sectional study. Multistage sampling method was applied; first by simple random sampling 12 out of 21 districts within the coastal savannah zone and then by dividing each selected district into four quadrants. In each selected district, two out of the four quadrants were randomly selected and all kraals within the selected quadrants were contacted. For each kraal, the herdsman or the next in command was interviewed after verbal consent. In cases where the selected kraal had moved on for grazing a replacement was found in a non-selected quadrant in the same district. In all 31 settlements (villages/towns) were involved.

### Study Instrument

A five page structured questionnaire was prepared in English and translated into the indigenous language for proper understanding. The questions related to the background of the herdsmen, their knowledge (on TB and brucellosis), as well as attitudes and practices with regards to safe handling of milk. On average each interview lasted 30 minutes.

### Statistical analysis

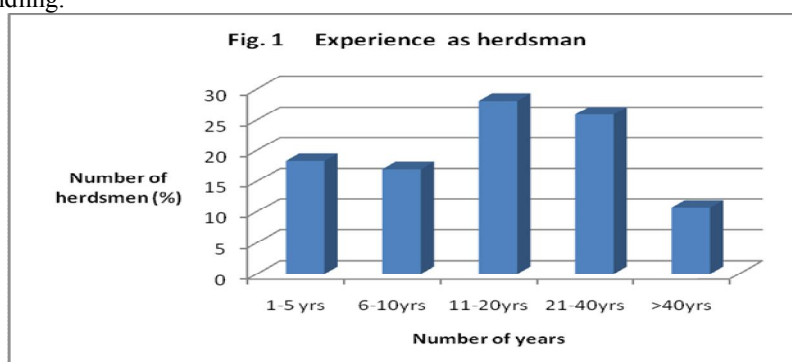
The data was entered into excel and basic statistics, including percentages and means analyzed using SPSS. Chi-square test was used to test for associations between categorical variables. Using binary version of each category (of knowledge) as a response, logistic regression models were fitted to estimate association between level of knowledge and other important predictor variables so that these could be proposed in future educational programs. Therefore, the binary logistic regression model was built with 'Knowledge of TB in cattle and man' and 'Knowledge of brucellosis in cattle and man' (with responses 0 = 'No' and 1 = 'Yes'), 'Herd size', 'Formal Training' (1 = 'Yes', 0 = 'No'), 'Experience in milking' (referring to the number of years participants had been herdsmen), and 'Vaccinated cattle' (referring to whether or not respondents had vaccinated their cattle) as the dependent variables.

## RESULTS

### Background of herdsmen

A total of 224 herdsmen, (each from a different farm) were interviewed of whom 58% (N=130) were in charge of small/medium herds of between 20 and 100 animals and 42% (N=94) were in charge of herds with over 100 animals. Most (97%, N=217) herds were kept in enclosures outside the home while enclosures inside the home constituted 3%. All but 5% of the respondents stated to consume raw milk or milk products, 35.3% indicated that they always boiled the milk before consumption, 40.6% always consumed raw dairy and 22.8% either took milk raw or after boiling. Only 1.3% of the respondents consumed milk as an additive in local cereal, but never alone, and always used it raw. The majority (82%) of the respondents had been herdsmen for a period ranging from 5 to over 40 years (Fig 1), and most

(83.9%) of them had only indigenous knowledge of milk handling while 16.1% had received training in milk handling.



### Attitudes and practices

On their attitude toward safe handling of milk (Table 1), 19% of the respondents did not wash their hands before milking, 92% did not wash teats before milking and 5% milked cows even under acaricide treatment (used to control tick infection). Cattle were watered from communal watering points like small rivers and streams (64.2%), stagnant water left after rains (22.8%), tap water (7.6%) while the rest depended on dug outs filled with water. Milk was mostly stored in plastic containers (87%) or aluminum cans (13%) for up to 5 hours prior to collection by distributors for onward sale to processors or purchased directly by processors. Any unsold milk is usually processed into cheese for household consumption.

**Table: 1. Responses to questions on knowledge of diseases and attitudes and practices towards safe milk handling**

Question	Respondents	Yes	No
Have you heard of TB?	224	196 (87.5%)	28 (12.5%)
Have you heard of brucellosis?	224	170 (75.9%)	54 (24.1%)
Do you know the cause of TB ?	224	4 <sup>1</sup> (1.8%)	220 (98.2%)
Do you know the cause of brucellosis?	224	6 <sup>1</sup> (2.7%)	218 (97.3%)
Do you know the symptoms of TB in man?	224	121 <sup>1</sup> (54%)	103(46)
Do you know the symptoms of brucellosis in man?	224	10 <sup>1</sup> (4.5%)	214 (95.5%)
Do you know cattle can have TB?	224	167 (74.6%)	57 (25.4)
Do you know cattle can have brucellosis?	224	178 (79.5%)	46 (20.5%)
Do you know the symptoms of TB in cattle?	224	172 <sup>1</sup> (76.8%)	52 (23.2%)
Do you know the symptoms of brucellosis in cattle?	224	154 <sup>1</sup> (68.8%)	70 (31.2%)
Do you know how man gets TB from cattle?	224	74 <sup>1</sup> (33%)	150 967%)
Do you know how man gets brucellosis from cattle?	224	29 <sup>1</sup> (12.9%)	195 (87.1%)
Do you know that boiling of milk prevents TB/brucellosis?	224	154 (69%)	70 (31%)
Do you wash your hands before milking?	224	181(80.8%)	43 (19.2%)
Do you wash teats before milking?	224	24 (10.7%)	200 (89.3%)
Do you milk cows under acaricide treatment?	224	11(5%)	213 (95%)
Do you supplement cattle feed with industrialized feed?	224	33 <sup>2</sup> (14.7%)	191 (85.3%)
Have you vaccinated your cattle against brucellosis?	224	32(14.3%)	192 (85.7%)

<sup>1</sup> Yes means that the respondent gave at least one correct answer

<sup>2</sup> In the dry season mostly

### Knowledge of zoonotic diseases and safe handling of milk

TB was known by 88% of the respondents and brucellosis by 76% but the correct cause of these two diseases was known by only 2.7% and 1.8%, respectively (Table 1). Respondents who knew about TB in cattle were more likely (P = 0.005) to have had cattle with chronic cough a characteristic of TB.

Coughing was mentioned by 77% of the respondents as a symptom of TB in cattle while 54% mentioned it as a symptom of TB in man. While 69% knew one symptom (abortion) of brucellosis in cattle, only 4.5% knew a symptom of brucellosis in man. Within the year, 33.5% (75/224) of the respondents had experienced abortions in their herd. Herdsmen who knew about brucellosis in cattle were more likely ( $p=0.04$ ) to have experienced abortions within their herd. The mode of transmission of TB and brucellosis from cattle to humans was known by 33% and 12.9%, respectively; the others did not know or gave incorrect responses.

**Table: 2. Predictors of knowledge of TB in cattle and man**

	B	S.E.	Wald	p	OR	95% CI (OR)	
						Lower	Upper
Herd size	.001	.002	.054	.816	1.001	.996	1.005
Formal training	-.198	.593	.111	.739	.821	.257	2.624
Number of years experience with milking	.044	.016	7.398	.007	1.045	1.012	1.079
Vaccinated cattle	-19.834	7072.729	.000	.998	.000	.000	.
Constant	20.693	7072.729	.000	.998	970107833.202		

Of the different variables only the number of years of milking experience was predictive for respondents' knowledge of TB in cattle and man (Table 2). With one more year of experience in the milking of cattle there is a 4.5% (95% CI, 1.2-7.9) increase in the odds of a participant knowing about TB in cattle and man. The specificity of the model was 84.8% and the Nagelkerke R-squared was 15.6%, indicating that about 16% of the variability in the dependent variable was accounted for by the independent variables. Similar to the previous model, only the number of years of milking experience was predictive for respondents' knowledge of brucellosis in man. For brucellosis, the Nagelkerke R-squared was 17.2%, indicating that about 17% of the variability in the dependent variable was accounted for by the independent variables, (Table 3) with the specificity of the model being 79.3%. Thus with one more year of experience in the milking of cattle there is a 4.1% (95% CI, 1.2-7.9) increase in the odds of a participant knowing about brucellosis in man.

**Table: 3. Predictors of knowledge of brucellosis in cattle and man**

	B	S.E.	Wald	p	OR	95% CI (OR)	
						Lower	Upper
Herd Size	.000	.002	.011	.916	1.000	.996	1.003
Formal training	-.055	.513	.011	.915	.947	.347	2.586
Years experience in milking	.041	.014	8.544	.003	1.041	1.013	1.070
Vaccinated cattle	-20.231	7080.836	.000	.998	.000	.000	.
Constant	20.697	7080.836	.000	.998	973808140.803		

## DISCUSSION

### Background of herdsmen

The fact that most (83.9%) respondents had no formal training in milk handling is a cause for concern as this could render them incapable of employing milk safety measures with adverse consequences for consumers. Training had been given to farmers in the past through the peri-urban dairy project and was on dairy production and hygienic milk handling and processing to encourage the marketing and use of milk from local cows in selected districts [9, 10]. This training comprised short-term practical courses at the Amrahia Dairy Farm [11]. However, these interventions mostly benefited women, who constitute the majority of small-scale milk processors and vendors, leaving out the predominantly male herdsmen. In spite of the existence of regulations that require milk pasteurization, over 75% of the fresh milk marketed in many developing countries including Ghana is sold raw through informal channels where regulations are not generally implemented [12]. It is therefore worthwhile considering an extension of this training program to include herdsmen as they are the first point of contact in the raw milk marketing chain and will benefit from such training.

### **Knowledge of zoonotic diseases and safe handling of milk**

Only 'experience in milking' was significantly responsible for respondents' knowledge of TB in cattle and man. It is possible that herdsmen with a long practical experience had a greater knowledge because of past experiences with either TB or brucellosis in their herd. This finding is an indication that most herdsmen likely might have learnt about TB and brucellosis in cattle and man through their involvement in the milking business and not by specific formal training or education.

Although respondents with formal training were more likely to give correct responses, it was not significantly responsible for knowledge on TB and brucellosis in cattle and man. This could however be attributed to the fact that the number of trained herdsmen in our sample was quite small. However, it appears that this factor could significantly predict respondents' knowledge of TB and brucellosis in cattle and man if further training programs are tailored to meet their knowledge requirements in all facets of cattle rearing.

In comparison to a previous study in Dangme East district of Ghana [13, 14], respondents in our study exhibited greater knowledge of TB and brucellosis. In the previous study none of the respondents knew that cattle could have TB, that TB could be transmitted from cattle to man and that boiling of milk prevents diseases such as TB. This apparent improvement in the knowledge could be attributed to better access to information through veterinary extension officers or through local radio (at most of the kraals visited a radio set was present). In spite of this, the fact that most respondents did not know that diseases such as TB and brucellosis could be contracted by drinking contaminated milk and that boiling of milk can prevent diseases is very worrying.

### **Attitudes and Practices**

Hand washing before milking is critical because the process of stabilizing the cow by tying the hind legs with a rope during manual milking leads to heavily contaminated hands. In this study 81% of the herdsmen practiced hand washing before milking but for hand washing to be effective in improving milk quality there is the need for clean water and detergent which was missing in most of the kraals. Such incomplete cleaning may further hinder the role of elementary hygiene practices [15]. Washing the teats before milking was not practiced because of the belief that allowing the calf to suckle prior to milking decontaminated the teats. Various studies [16] have reported that the calf suckling practice plays a role in reducing the faecal coliforms and staphylococci counts in milk by the elimination of the foremilk (the first milk fraction), which is known to be the most contaminated by bacteria [17]. However there is evidence that the number of microorganisms on teat skin can be reduced more than 10 times after calf sucking if teats are disinfected [18].

In Ghana acaricides are used to control tick infection [19] and the withdrawal time before milking cows under such treatment as recommended by the manufacturer is one day, the maximum residue limit being 0.008 mg/kg [20]. However, 5% of respondents admitted milking cows under acaricide treatment. This practice could lead to drug contamination of the milk [21] with even greater consequences especially as it has been found that a significant number of the acaricides used are not certified by the Food and Drugs Board of Ghana as required by law [22].

The consumption preferences identified in this study compares with a report that consumption of raw milk amongst herdsmen and their families is high [4]. Continuous education is therefore needed on the health hazards associated with the consumption of raw milk and the need to boil milk before consumption if this pattern is to change.

Most cattle kraals are located far from villages because of the need to have a grazing field and not to interfere with human activities. The major problem with this situation however is the difficulty in accessing water for the cattle. In our study we found that 64% of the herdsmen watered their cattle at the communal watering point which is also used for domestic purposes such as cleaning of milk storage containers leading to cross-contamination of milk. With the explosion in the plastics industry most herdsmen have resorted to the use of plastic containers to store the milk and although these containers are easy to clean the practice of using containers with no lids leads to the milk exposed and usually swarming with flies.

All interviewed herdsmen lived close to the kraals although the herds were kept in enclosures outside the home in most (97%) cases with only 3% being kept in enclosures inside the home. This close proximity leads to an increased contact between livestock production systems and human activity which is unhealthy and if unchecked could create the potential for pathogen transmission in both ways, constituting new risk factors for disease transmission.

Our findings indicate a large number of issues that need to be addressed in a training program such as the need for boiling of milk before consumption, washing of hands and teats before milking and ensuring a hygienic milking environment as well as storing milk properly in clean containers with lid.

## CONCLUSION

Knowledge of herdsmen on the potential zoonotic transmission of diseases such as TB and brucellosis to man through raw milk consumption is generally poor. As this has direct impact on safe handling of milk, it could justify the public perception about the poor quality of raw milk. Our study has shown that experience in the milk business leads to acquisition of more knowledge on zoonotic diseases and thus safe milk handling. However, this is not enough as the knowledge is gained gradually over a long period. This study has also proven that formal education on milk handling can have a great impact on knowledge and thus proper milk handling. Regular and sustained onsite education could lead to improved milk quality with benefits to both producers and consumers. Public health hazards associated with the consumption of fresh milk can only be eliminated if both producers and processors have adequate knowledge on safe milk handling.

Efforts are now being made by the veterinary services directorate to regularly train the herdsmen in safe handling of milk. It is believed that these training programs will meet the herdsmen's need for adequate knowledge in TB and brucellosis in cattle and man. Training may not only improve the safety of milk but also will lead to a reduced health risk for the herdsmen, their family and their livestock and will contribute to economic development and prosperity.

## ACKNOWLEDGEMENTS

The Ghanaian-Dutch collaboration for health research and development (Project ID number 2005/OD/08) funded this research. The authors are most grateful to the staff of the Animal Research Institute, Ministry of Food and Agriculture and the Veterinary Services Directorate for their support during the questionnaire administration. We are also grateful to the herdsmen for their maximum co-operation during the interviews. The publication was funded by the Afrique One Consortium of the Noguchi Institute.

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