

ANALYSIS OF PUBLIC HEALTH RISKS FROM CONSUMPTION OF INFORMALLY MARKETED MILK IN SUB-SAHARAN AFRICAN COUNTRIES

Omoro AO^{1,3}, McDermott JJ¹, Staal S¹, Arimi SM², Kang'ethe EK² and Ouma EA¹

¹International Livestock Research Institute, P.O. Box 30709, Nairobi, Kenya;

²Dept. of Vet. Public Health, University of Nairobi, P.O. Box 29053, Nairobi, Kenya;

³Kenya Agricultural Research Institute, P.O. Box 57811, Nairobi, Kenya.

Despite policies to discourage them, informal milk markets account for over 80% of milk sales in most sub-Saharan African (SSA) countries. Informal milk market agents include farmer dairy co-operatives, small traders using bicycles and public or private transport and small retail outlets, such as dairy kiosks, and shops. Studies conducted by the International Livestock Research Institute (ILRI) and national collaborators (e.g., in Kenya¹) show that convenient delivery and lower prices (reflecting lower handling and processing costs) are the principal benefits for consumers. Current milk handling and safety regulations in most SSA countries are derived from models in industrialised countries. These may not be appropriate for local market conditions where such regulations may unnecessarily inhibit efficient milk marketing. An important step in developing targeted policies more supportive of market participation of the majority is to collect quantitative and qualitative information about milk-borne health risks under different production and marketing situations. This paper gives an over-view of on-going activities in central Kenya aimed at assessing public health risks from informally marketed milk and presents preliminary results of milk quality and handling practices of informal milk market agents and consumers.

Materials and Methods

Seasonal survey data were collected from 250 informal milk market agents and 230 households (hh) consuming raw (unpasteurised) milk in rural (Kiambu and Nakuru Districts) and urban (Nairobi City and Nakuru Town) locations in Kenya between January 1999 and January 2000. These sites also represented contrasting levels of market access and types of dairy production systems. Respondents were randomly selected within production system (extensive and intensive) and human population density (urban and rural) strata. Data on milk handling practises by consumers and market agents, dairy product consumption and preferences were collected using a questionnaire. Raw milk samples were collected from each milk market agent at retail points and from each consuming household for laboratory assessments. In addition, 110 pasteurised milk samples were collected from retail outlets with and without chilling facilities and subjected to the same tests for comparison.

Total and coliform bacteria in the milk samples were counted using the Standard Plate Count method; brucellosis status was investigated using the Milk Ring Test (MRT)

and the indirect ELISA² (the latter is more sensitive (96.5%) and specific (>99.5%)); selective media and biochemical tests were used to isolate *E. coli* and *E. coli* 0157:H7; and, drug residues were screened using Charm AIM test kit (Charm Sciences Inc., USA) to detect β -lactams, tetracyclines, aminoglycosides, macrolides and sulphonamides at levels above maximum residue limits (MRLs) recommended by the European Union (EU). In addition, risks of zoonotic tuberculosis are being investigated through speciation of *Mycobacteriaceae* isolated from patients suspected to be suffering from tuberculosis.

Results

Consumption is mainly of liquid milk. Raw fresh milk was purchased by 29% of households in Nairobi (average = 5.5 litres/hh/month) in comparison to 93% of households in both Nakuru urban (average = 22.5 litres/hh/month) and rural (average = 24.3 litres/hh/month). The total liquid milk equivalent of pasteurised milk and processed dairy products consumed in Nairobi, Nakuru urban and Nakuru rural were 15.6, 3.8 and 0.2 litres/hh/month, respectively. Pasteurised milk was purchased in Nairobi, Nakuru urban and Nakuru rural by 78%, 34% and 5% of sample households, respectively. More raw and pasteurised milk was purchased as income class increased. All households in urban areas and 96% in Nakuru rural reported boiling milk prior to consumption, mainly as an ingredient in other foods, mostly tea. Most consumers expressed a preference for raw over pasteurised milk.

Milk quality as judged by total and bacterial counts was generally low. This is discussed further in a companion paper³. The main zoonotic health risks examined to date were for brucellosis and coliforms. Interestingly, brucellosis antibody detection by ELISA varied by milk source. *Br. abortus* antibodies were not detected in raw milk sold in urban areas but were found at low levels (2-5%) in milk sampled from consumers in rural areas and at higher levels (25%) in pasteurised milk (Table 1).

Table 1. Proportions of raw milk samples from consumer households and various market agents in rural and urban areas in Kenya testing positive for *Br. abortus* using MRT and ELISA antibody tests.

Source of milk	Antibody Prevalence - Season 1			Antibody Prevalence - Season 2		
	Number	MRT	ELISA	Number	MRT	ELISA
	tested	Positive %	Positive %	tested	Positive %	Positive %
Urban consumers	105	9.5	0	107	0	0
Rural consumers	106	5.6	1.8	114	0.8	4.8
Informal market agents	239	3.3	5	239	1.2	4.2
Formal market agents	110	-	25	-	-	-

Of 258 milk samples tested for faecal coliforms, 22% and 1% contained *E. coli* and *E. coli* 0157:H7, respectively. This mirrored the high bacterial counts found in 162 milk samples collected from informal milk agents in Nairobi and Kiambu³. Another important health risk is from anti-microbial residues in milk. Residues exceeding EU MRLs were detected in 4-16% and 8% of informally traded and pasteurised milk samples, respectively.

Discussion

The variation in detection of brucellosis reflects past findings that show high variation of the disease by cattle production systems.^{4,5} Over 70% of marketed milk in Kenya is from smallholder herds without brucellosis.⁵ The results indicate that bulking of milk from many areas and production systems could pose significant health risks if the milk is not pasteurised or adequately boiled.

The high bacterial counts mainly reflect poor hygiene and a long time-lag between milking and sale of the milk³. Future efforts will focus on improving milk quality by informal market agents by training and extension on appropriate handling containers, milk temperature regulation and other factors. Of greatest risk in this regard is raw milk purchased from multiple-source markets, often at great distances. Market agents who currently bulk and retail raw milk could reduce health risks by processing or screening their milk prior to sale. Actual health risks from bacterial contamination are already judged to be low because of the common consumer practice of boiling milk before consumption, a practice that should be further encouraged. This practice may decrease the need for strict implementation of regulations preventing raw milk marketing. Of concern is the high proportion of samples with drugs above EU MRLs, This suggests that many farmers do not observe prescribed withholding times. Market agents may also use anti-bacterials to increase milk storage time. Further studies will determine which drugs are involved and when and how they are administered.

Many studies on zoonotic health risks in SSA have focussed at the farm-level without assessing actual risks to consumers. Similar studies by ILRI and its partners in Ghana and Tanzania and further analyses of the data from Kenya will provide additional risk information. When this information is combined with economic data on market efficiency, recommendations will be developed to support dairy markets serving resource-poor producers without impeding the efficient marketing of milk. These recommendations will not only inform policy decisions on raw milk marketing in SSA but also in the many regions of the world with similar circumstances.

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