Predisposing factors for microbial loads in camel milk along the pastoral dairy value chain in Kenya

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Introduction

Spoilage of camel milk due to high microbial loads reduces its value. This study mapped the camel milk value chain in Kenya and established predisposing factors for increased microbial counts in the milk along the chain.

Materials and methods

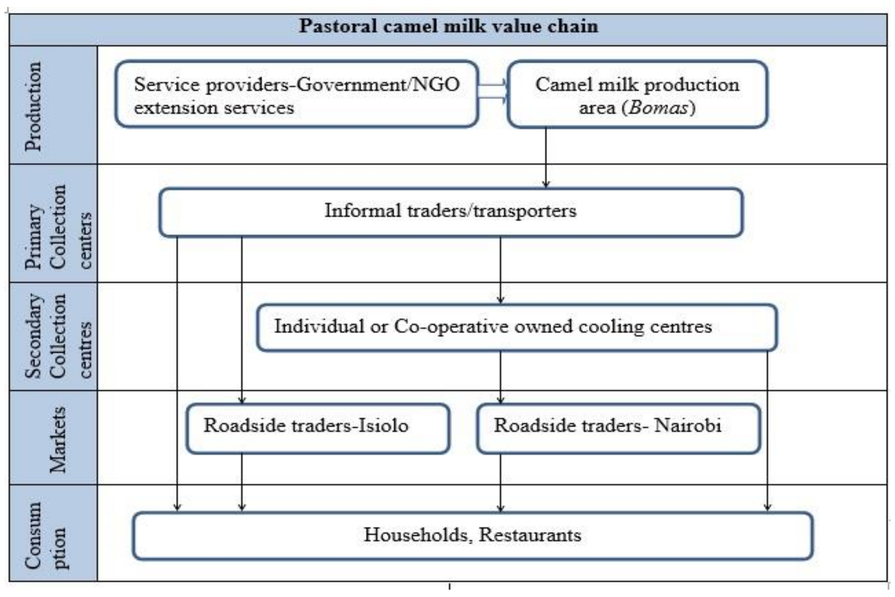
Study area: Isiolo and Nairobi urban market, between February and August 2015.

Field data collection Data was collected by observation, interviewing key informants, and administration of structured interview schedules to 90 actors along the chain from producers, collection center operators, transporters and traders.

Milk sample and lab analysis: Milk samples for microbial tests were collected during milking, and along the value chain from collection centres, transporters, and traders.

Results

1) Map of the camel milk value chain is summarized below



2) Predisposing factors for increased microbial counts in milk

i) **Milking hygiene**: Hand washing and udder cleaning were not practiced before milking the camels, and the milk was handled using non-food grade plastic containers that are difficult to clean.

ii) **Ambient and milk temperature:** Ambient and milk temperature had strong and positive correlation (adj R^2=0.90181, p=<0.0001) from production to delivery to secondary collection centres in Isiolo town. The average milk temperature was 30.7±1.4^{o}C which is favourable for growth of spoilage microorganisms.

iii) **Time:** Milk delivery to secondary collection centres, where cooling was done took 4 to 10 hours after milking and was between 10.15am and 6.30pm. Milk was thus held at high temperature (30^{o}C) for a long time (4 to 12 hours), which exposes milk to increased microbial growth.

iv) **Roads:** Collection of milk from production areas is hampered by lack of proper access roads. Movement of herds over long distances in search of feed and water makes the situation even worse.

3) Summary of microbial counts along the value chain as influenced by predisposing factors

	Node along value chain	Microbial count (TVC)	Time	Milk temp	Ambient temp
Flow of milk along the value chain ↑	Nairobi market 	7.52±1.32cfu/ml	11.30am	17.8 ℃	22.5 ℃
	Discharge from cold tank at group owned sec collection 	7.78 cfu/ml	Following day, at 5.00am	7.0 ℃	28.5 ℃
	Delivery to secondary collection centre 	6.49±0.77cfu/ml	11.47am± 1 hr 4 min	30.7±1.4 ℃	30.8±1.04 ℃
	Storage at Primary collection centre 	5.09±0.60 cfu/ml	10.38am± 28 min		
	Production/Milking 	4.91±1.04 cfu/ml	6.00-8.00am		

Conclusion

- Poor hygiene practices along the chain contribute to high microbial counts in milk. Assuring water access at production level will improve milking hygiene. In addition, access to low cost food grade plastic containers will improve milk quality along the value chain.
- Milk transportation to collection centres takes long (4-12hours) at high ambient temperature (30^{o}C) contributing to increased microbial counts in the milk. Alternative decentralised energy cooling facilities using solar energy, or evaporative cooling would greatly reduce milk spoilage.
- Improving access roads to milk production areas would reduce time taken to deliver milk to Isiolo town.
- Milk processing would prolong shelf-life, and enable access to distant markets for attractive prices.
- Training of milk handlers should include all actors handling milk along the value chain

Bibliography

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