

# Quality compliance of traded milk in urban retail outlets in Kenya

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## Background

The Kenyan dairy subsector plays a critical socio-economic role. It is a source of nutrition and livelihood for many, generating about 4 percent of the national GDP. This dairy industry is among the largest in sub-Saharan Africa (MoALF, 2010). According to the Economic Survey (KNBS, 2016), the milk processing capacity is on steady growth of about 14.8 percent annually in the recent past. This increase is linked to growing demand for milk (7.7 percent) and dairy products such as cheese (10.7 percent) and ghee (33 percent) among the expanding urban population. It is projected that per capita consumption of milk in Kenya will grow from 110 litres to 220 by 2030 (MoALF, 2010).

The growth in milk demand particularly for processed products has seen the entry of retailing innovation for pasteurised milk even as sale of raw milk persists. While on the one hand there is an increase in milk production and market penetration of pasteurised milk; on the other, there remains challenges of non-compliance with the minimum legally set quality and safety national, regional or international standards for traded milk. This is despite efforts to create awareness and build the capacity of producers and processors over the years.

The assumption is that pasteurised milk offers more value in quality and safety as compared to raw milk and thus retails at higher cost. For processors to sustain their competitiveness in the wake of increased production and imports, they need to assure consumers of high quality and safety of the processed milk. This has enormous implications for the sustainability of the growth in market penetration of processed milk and could ultimately hamper both domestic and regional competitiveness of Kenya's dairy industry. Besides, it poses massive health hazards and risks to consumers.

*The big question thus remains: Can Kenya sustain its increasing milk production with an increasing share of high quality processed products and assure consumers of quality and safety to foster sustainable growth of the industry?*

This brief summarises findings of a study on the levels of compliance of raw and pasteurised milk in urban retail outlets. It then outlines recommendations on policy and practice measures to boost compliance for sustainable growth. The study was carried out in four major towns (Nairobi, Nakuru, Eldoret, and Kisumu) that represent a high concentration of milk consumption. The retail outlets were where consumers purchase milk including supermarkets, milk bars, restaurants or at roadside sales by mobile milk traders.

## Findings and Implications for the Sector

### Milk quality levels

As figure 1 demonstrates, the solids not fat content of more than half of the sampled raw and pasteurized milk do not meet the national standards of being at least 8.5 percent. This failure in compliance is more prevalent ( $\geq 62\%$ ) in Kisumu, Eldoret and Nakuru compared to Nairobi ( $< 48.4\%$ ). The high level of noncompliance has implications on milk quality for processing high value products, milk nutritive value to consumers and on market performance and competitiveness of the dairy industry. In milk, the constituents of solids not fat (protein, lactose and minerals) should be an important quality criteria to farmers, processors and consumers, as is the practice in Brazil (Botaro et al. 2013).

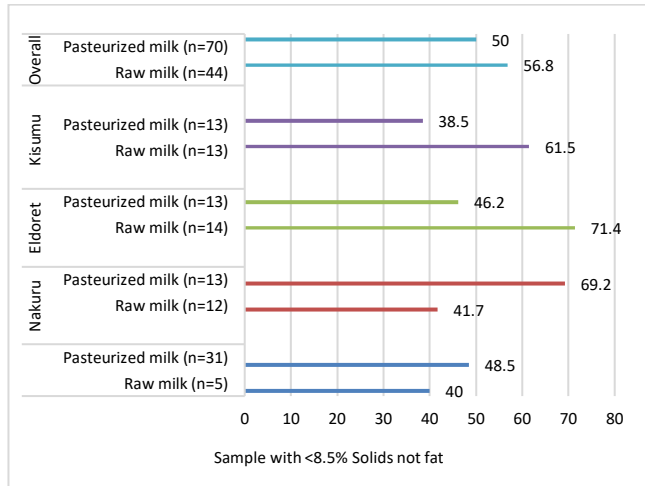
## Key messages

- Low levels of compliance with quality and safety standards of retailed milk pose health hazards to consumers and hampers the competitiveness of Kenya's dairy industry
- The low levels of compliance with milk quality and safety standards can curtail expansion in processing of high value dairy products.
- Pasteurised milk is not distinctly safer or of better quality than raw milk, thus undermining its value proposition
- The Kenya dairy industry needs re-orientation towards a quality focus to bolster competitiveness in the domestic and regional markets
- The ability of the industry to meet higher standards must necessarily involve all stakeholders in the value chain

## Policy recommendations

- Promote quality-based systems to drive competitive dairy sector development
- Establish systems to provide certification of compliance and facilitate frequent monitoring of the standards
- Establish a framework for public-private partnerships to enable inclusive and coordinated formulation of a regulatory and surveillance framework
- Kenya Dairy Board (KDB) should partner with county governments to establish and capacitate decentralized surveillance system to improve compliance with regulatory standards considering regional differences that may affect milk

Yet solids not fat is not a quality criteria in Kenyan dairy industry at the present, though is an essential component for cheese yields, dry milk powder yields and quality of ice cream. They confer to consumers the nutritional value -palatability, flavour and taste while lactose confers in milk the energy value, and this has high commercial value in food and pharmaceutical industries (Costa et al, 2019).



**Figure 1:** Samples of raw and pasteurized milk lower in solids-not-fat than is specified in national standards ( $\geq 8.5$  percent)

Even pasteurised milk show evidence of not complying with the national standards. This means processors procure poor quality milk. If they reject the milk, producers are still able to sell the rejected milk to informal milk traders who penetrate the market with poor quality and unsafe milk.

The milk pricing in Kenya is based on volumes rather than quality. This milk pricing structure - that does not reward for quality - is a massive barrier to improving milk quality. Quantity wins over quality when there are no incentives to invest in the production of better-quality and safe milk.



**Milk trader transporting in plastic containers**

Because of the high costs of quality feeds, production of high amounts of quality milk remains a mirage for most farmers, with a venture towards this resulting in a zero-sum game. Further, in a market context, which rewards quantity over quality, incentives toward improving quality milk are unattractive.

### Microbial levels

In the Kenya Bureau of Standards (KEBS), the allowable total viable counts (TVC) is less than  $\log_{10}$  6cfu/ml in raw milk and less than  $\log_{10}$  4.47 cfu/ml in pasteurized milk. For the total coliform counts (TCC), the standards allows

less than  $\log_{10}$  4.69 cfu/ml in raw milk and less than  $\log_{10}$  1.00 cfu/ml in in pasteurized milk. A large proportion of samples had bacterial load exceeding the allowable safe limits (Table 1). While this is less surprising for raw milk ( $\geq 52$  %), it is for pasteurized milk, especially milk traded in Kisumu town ( $\geq 54\%$ ).

The unacceptable microbial load in raw milk is associated with milk retailing using plastic containers, poor hygiene, poor milk handling, adulteration with poor quality water and limited access to appropriate infrastructure for milk chilling and storage.

**Table 1:** The mean bacterial counts ( $\log_{10}$ cfu/ml) of raw and pasteurized milk with samples exceeding safe allowable bacterial count by national standards in four Kenyan towns

Quality indicator	Product	Town	Sample (n)	Mean	SD	Samples exceeding allowable load (%)
<b>Total viable counts (<math>\log_{10}</math>cfu/ml)</b>						
Raw milk						
		Nairobi	5	6.62	0.53	100.0
		Nakuru	12	5.19	2.14	50.0
		Eldoret	14	6.30	0.77	50.0
		Kisumu	13	3.59	3.01	38.5
		Total	44	5.23	2.31	52.3
Pasteurized milk						
		Nairobi	31	0.80	0.96	0.0
		Nakuru	13	1.71	2.35	0.0
		Eldoret	13	0.87	1.46	0.0
		Kisumu	13	3.87	2.82	53.8
		Total	70	1.56	2.12	10.0
<b>Total coliform counts (<math>\log_{10}</math>cfu/ml)</b>						
Raw milk						
		Nairobi	5	5.46	0.50	100.0
		Nakuru	12	4.54	2.21	75.0
		Eldoret	14	5.03	0.80	57.1
		Kisumu	13	2.89	2.58	46.2
		Total	44	4.31	2.07	63.6
Pasteurized milk						
		Nairobi	31	0.38	0.73	19.4
		Nakuru	13	1.45	2.13	15.4
		Eldoret	13	0.53	1.05	7.7
		Kisumu	13	3.07	2.48	69.2
		Total	70	1.11	1.83	25.7

Even though huge emphasis has been placed on training farmers and milk traders in the country on milk quality and hygienic handling, this has not yet brought the desired changes in microbial quality of milk.

### Presence of aflatoxin, hydrogen peroxide and antibiotics

#### Aflatoxin FM1 content

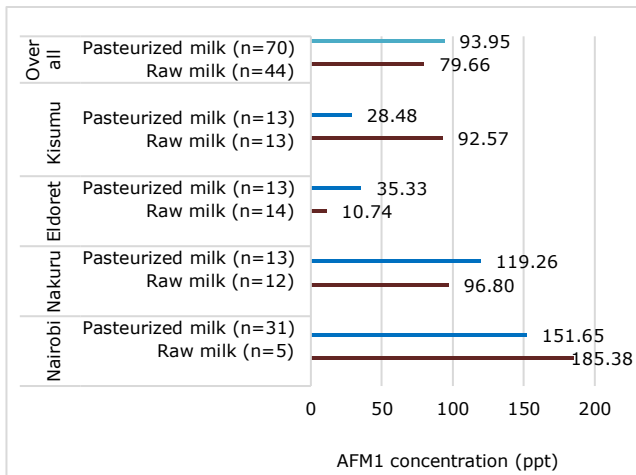
Aflatoxins are fungal toxins whose consumption can lead to serious health implications. For human consumption, the Codex standards recommends maximum safe limit of 500 ppt. In this study (Figure 2), all the samples of both raw milk (82.76 ppt) and pasteurized milk (75.06 ppt) were below 500 ppt, therefore free of unsafe AFM1 levels. This is good news for the dairy sector and to consumers that traded milk is less likely to pose AFM1 associated hazards.

Though would be considered safe where Codex standards apply, both raw and pasteurized milk retailed in Nairobi were relatively higher in aflatoxin AFM1 than milk retailed in the other towns. The observed AFM1 levels in both raw and pasteurised milk imply that mitigation strategies remain necessary because the levels would be unsafe for human consumption where the European standards of 50 ppt maximum safe limits apply.

In public health, AFM1 remain a concern for association with effects of child stunting, thermostable even in

pasteurization process, and due to farmers feeding AFB1 contaminated feeds from poor storage conditions favourable to fungal growth (Kiarie et al., 2016).

Interventions to avoid aflatoxin in feed and transfer it into milk thus have to involve education of farmers, feed millers and traders in improving feed quality, feed handling and storage. The focus should be in strengthening quality and safety control in the dairy value chain.

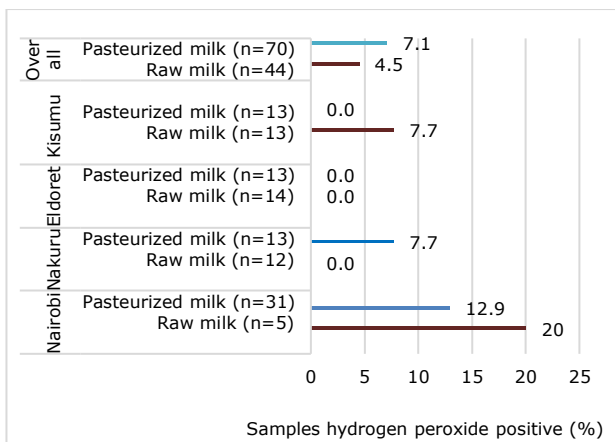


**Figure 2:** The mean aflatoxin AFM1 concentration (ppt) in samples of raw and pasteurized milk

#### Hydrogen peroxide content

Hydrogen peroxide is added to milk to prolong shelf life, especially during transportation over long distances. But the practice is prohibited in both domestic and international markets. Use of hydrogen peroxide has been a persistent issue in the Kenyan dairy sector (Omoro et al. 2005).

The study found both pasteurized and raw milk tested positive for hydrogen peroxide, but the incidences were 1.6 times more in pasteurized milk (7.1%) than in raw milk (4.5%) as demonstrated in Figure 3. Observed incidences were highest in milk sold in Nairobi, for both raw and pasteurised milk.



**Figure 3:** Percent (%) samples of raw and pasteurized milk testing positive for presence of hydrogen peroxide

These results reflect weaknesses in the quality assurance system in the dairy value chain. The current model of quality assurance emphasizes inspection at the end-of-line product, rather than throughout the chain. A more pragmatic approach would entail engagement of all value

chain actors for each to exercise responsibility for milk quality and safety.

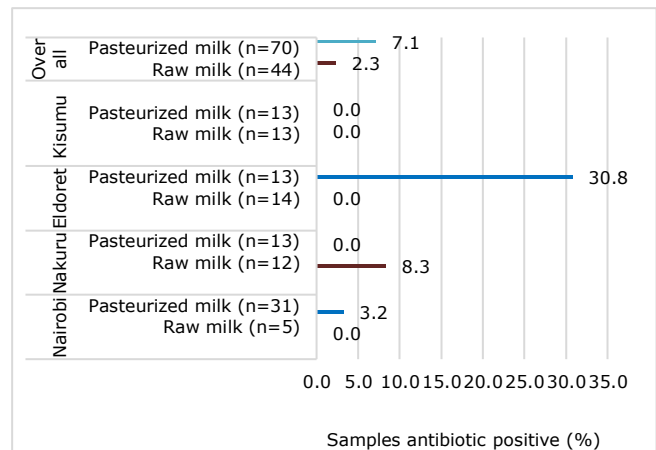
#### Antibiotic residue

Both pasteurized and raw milk contain high traces of antibiotic residues, but was more prevalent in pasteurized milk: 3.1 times more in pasteurised milk (7.1%) than in raw milk (2.3%). Relative to the other towns, Eldoret town had a marked prevalence, as high as 30.8% of milk samples tested positive (Figure 4).

Antibiotic residues in pasteurized milk imply weak quality testing when procuring milk, farmers ignore recommendations for withdrawal period after antibiotics treatments, or just engage in unethical practice.

In practice, milk processors should reject milk with antibiotics because it inhibits the activity of starter cultures used in fermenting milk for producing high value dairy products such as yoghurt and cheese.

Presence of antibiotic residues in milk poses a health hazard to consumers, due to the potential for progressive development of antimicrobial resistance. It can also induce allergic reactions.



**Figure 4:** Percent (%) samples of raw and pasteurized milk testing positive for presence of antibiotics

#### Which way forward?

The Kenyan dairy industry is rapidly growing to meet domestic demand and has potential to expand into regional and international markets. However, the key challenge remains continued low levels of compliance with quality and safety standards on all the indicators as confirmed by the study, posing health risks to consumers

The industry is struggling to effectively enforce compliance of national standards and regulations governing the industry. These include Dairy Industry Act, the Standards Act, the Public Health Act, the Food and Drugs Act and the Animal Diseases Act, most of which are weakly implemented. Although the Kenya Dairy Industry Regulations 2017 was developed to fill gaps and provide a coordinated regulatory framework, enforcement still remains a challenge (USAID-KCDMS, 2018).

Despite innovations in milk retailing, consumers are still not offered substantive value proposition related to safety and quality. The common perception is that raw milk is more likely to be compromised than pasteurized milk. However, the findings reveal that pasteurized and packaged milk is no safer than raw milk although it retails at a higher price. The tradition of boiling milk

before consumption should remain a safety practice among consumers to reduce degree of hazards exposure.

If processors want to be competitive, they should demonstrate to consumers' value for their money by offering safe and quality products. The challenge of procuring quality milk compromises processors capacity to expand the manufacture of high-value and premium dairy products thus threatening their competitiveness in the current liberalized market.

Overall, there is need for interventions and investments that will reorient the Kenyan dairy industry from volume focused to a quality based system. This calls for introduction of quality-based milk payment systems (QBMPS), designed to reward quality and enhance safety compliance. Lessons from a recent pilot intervention show that introducing QBMPS need economic incentives for farmers and their organizations, processors, transporters and other value chain actors to enable the additional investments and make it sustainable (Ndambi et al., 2018).

Additionally, these systems are best introduced through multi-actor partnerships to ensure safeguarding of private investments and the public good inherent in enhanced quality and safety of the dairy sector. Such partnerships are to mobilize technology options that offer cheaper solutions to enhance safety and quality (e.g. chilling tanks, energy options, testing equipment). These should be coupled with innovative institutional arrangements along the supply chain to enhance a competitive, quality based industry. This will be driven by mutually supportive business relations, trust and ethical practice.

The differences in levels of compliance across various retail practices and between the major urban towns in Kenya point to the need for targeted approaches that pay attention to the regional context and the market channels.

This is a critical moment for the Kenyan dairy sector. Repositioning itself as competitive and sustainable industry lies in addressing quality and safety concerns. While the role of the KDB as a regulator is central to improving compliance, meaningful engagement of all, including the formal, semi-formal and dairy value chain actors is imperative.

There is need for a jointly formulated guidelines towards inclusive and coordinated efforts to uphold quality and safety in the industry. These should outline clear roles and accountability structures for private sector, national and county governments to strengthen the regulatory framework, surveillance and enforcement. The industry may consider an annual publication of milk quality status to foster the orientation towards a quality based dairy sector.



**Weighing and testing of milk at collection point**

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