A photograph of a man in a white turban and orange shirt milking a white cow. The man is on the left, and the cow is on the right. The background is a light, textured surface. The text is overlaid on the image.

# Quality and Safety Assessment of Raw Bovine Milk in Herat Province, Afghanistan

---

MAHRUF SOFIZADA, EHSANULLAH AZIZI, NESAR  
AHMAD ISAQZAI ERSHAD FAQIRI, ROMA AMINI,  
ZAHRA RAHIMI, SHAKIB AMINI

# Introduction

---

- Afghan annual per capita milk consumption is ~66K/yr.
- Large national focus on increasing milk production and consumption
- Much growth in both small and large milk businesses
- To date, there are no comprehensive studies on the quality of milk available to consumers in Herat

# Introduction

---

- Objective: assess the quality of milk from open markets and small milk shops
- Measured:
  - Total bacteria
  - Coliforms
  - Composition (fat%, protein%, sugar%, ash%)
  - Presence of adulterants (e.g., water, antibiotics)

# Procedures

---

- Microbiology
- Aerobic Plate Count
  - Diluted milk samples
  - Plated on Plate Count Agar
- Coliforms
  - Diluted milk samples
  - Plated on Violet Red Bile Agar



# Procedures

- Composition
- Measured by ultrasound:
  - Fat
  - Protein
  - Lactose
  - Ash





# Procedures

- Adulteration
- Measured:
  - Added water
  - Added starch
  - Added  $\text{CaCO}_3$
  - Antibiotics (tetracycline, penicillins, sulfa drugs)
    - ROSA Antibiotic Strips



# Results

---

Age and price of milk samples used in this study.

Source	Age (% Samples)				Price*
	< 6 hr	12 – 24 hr	> 24	Mixed	AF
Overall (n = 100)	53.0	44.0	2.0	1.0	28.7
Bazar (n = 55)	52.7	41.8	3.6	1.8	26.2 <sup>b</sup>
Milk Shop (n = 45)	53.3	46.7	0.0	0.0	31.1 <sup>a</sup>

Numbers with different superscripts are significantly different at  $P < 0.05$ .

Comparisons are between sampling groups (bazars vs. milk shops) and within column. \* = at time of collection.

**Milk samples were similar ages at time of collection and analysis**

# Results

---

Composition of milk samples collected from bazars and milk shops in Herat City, Afghanistan

Source	Fat (%)	SNF (%)	Protein (%)	Lactose (%)	Salts (%)
Overall (n = 100)	3.25	8.45	3.33	4.76	0.57
Bazars (n = 55)	3.0 <sup>b</sup>	8.10 <sup>b</sup>	3.29	4.70	0.56
Milk Shops (n = 45)	3.5 <sup>a</sup>	8.80 <sup>a</sup>	3.38	4.82	0.58

Numbers with different superscripts are significantly different at  $P < 0.05$ ; comparisons are between sampling groups (bazars vs. milk shops) and within columns.

**Milk samples from bazars frequently had composition (fat) irregularities.**



# Results

Percentage of milk samples with irregularities (fat or water) or adulterants (starch or antibiotic residues).

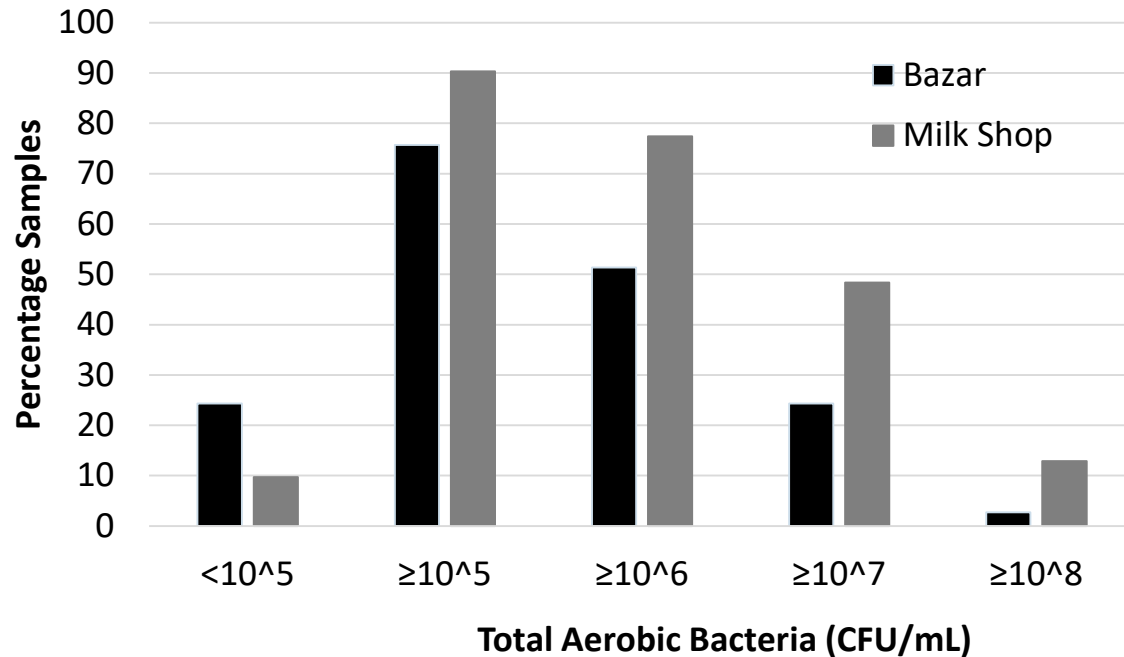
Source	Fat	Water	Starch	Antibiotic Residues		
				Beta-lactams	Tetra-cyclines	Sulfa-nomides
Bazaar	34.5 <sup>a</sup>	32.7 <sup>a</sup>	25.5 <sup>a</sup>	4.0 <sup>b</sup>	2.0	0.0
Milk Shop	11.1 <sup>b</sup>	15.6 <sup>b</sup>	2.2 <sup>b</sup>	19.0 <sup>a</sup>	4.8	0.0

Numbers with different superscripts are significantly different at  $P < 0.05$ .  
Comparisons are within column.

**Milk samples from bazars more frequently had adulterations.**

# Results

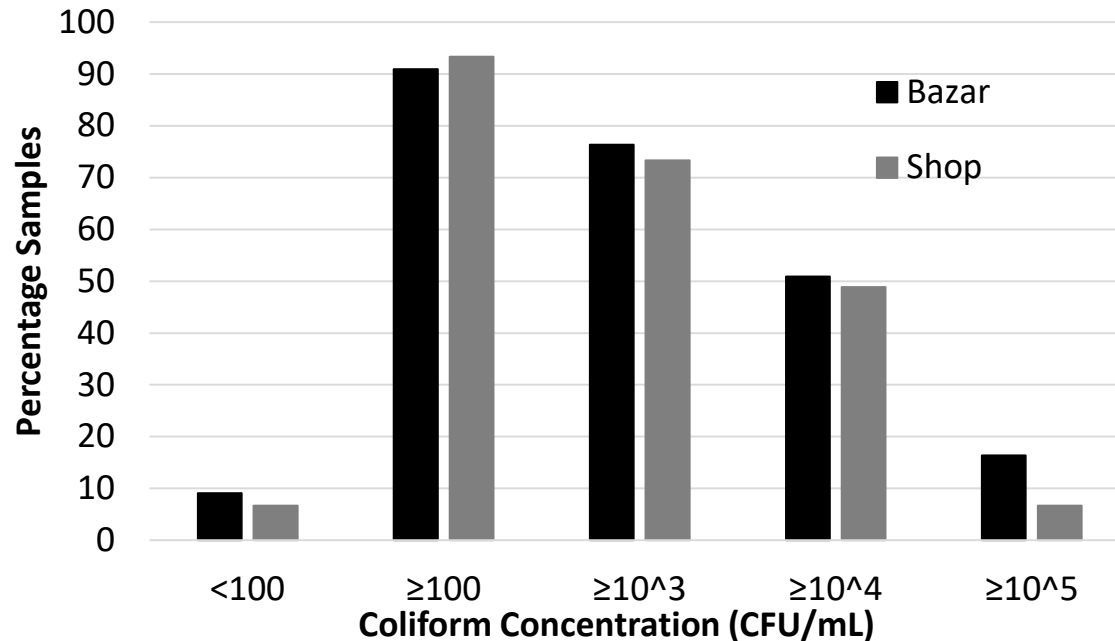
---



**75 – 90% of all milk samples had TOTAL BACTERIA concentrations above the international standard ( $10^5$  CFU/mL)**

# Results

---



**~90% of all milk samples had COLIFORM concentrations above the international standard (100 CFU/mL)**

# Conclusions

---

- Milk samples from bazars more frequently had irregularities (e.g., added water, starch, fat irregularities)
- Milk from both sources had high bacterial concentrations

# Conclusions

---

- High bacterial concentrations indicate sanitation and hygiene issues
- Milk shop owners should work directly with their suppliers to make sure they are collecting, storing, and transporting milk using hygienic practices.
- Decreasing bacterial concentrations will increase:
  - Shelf-life
  - Product quality
  - Profit