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# COMPOSITION AND SOME TECHNOLOGICAL PROPERTIES OF FRIESIAN COW'S MILK DURING AN OUTBREAK OF EPHEMERAL FEVER

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**ABSTRACT:** ρ **The effect of ephemeral fever on composition and some technological properties of milk was studied in fifty five lactating cows, during an outbreak of the disease in Egypt. The disease was diagnosed clinically and immunologically using indirect immunofluorescence technique. Milk samples were collected under aseptic conditions from the animals during the ephemeral fever and after complete recovery. The milk samples were subjected to some chemical and bacteriological examination.**

**The results indicated that ephemeral fever induced significant decrease in daily milk yield, protein percentage and non-significant decrease in fat percentage. Acidity of milk preserved at 20 ± 2 °C for 0, 3, 6 and 9 hours was found to be higher in diseased cows than that of milk of cows after recovery. The reduction time of methylene blue in milk of diseased cows was faster than that in milk of cows after recovery. Significant increase in both microbial counts and percentages of isolated microorganisms in milk of diseased cows than that of milk of recovered ones.**

**Losses in milk yield, reduction in protein percentage and lower keeping quality of milk induced by the disease should enforce the authorities to place the disease on the top of priorities in control programmes.**

## INTRODUCTION

Milk is generally considered as the most nearly perfect foodstuff and it exceeds all other foods in the variety and quality of materials which furnish the human body.

Bovine ephemeral fever is an insect-borne viral disease of cattle and buffaloes. The clinical severity of the disease is not apparent and mortality rate is low. However, high morbidity, enormous economic losses in terms of significant reduction in production particularly milk yield and variety of complications resulting from the disease specially mastitis **(Nadi and Negi, 1999)**.

The appearance of the disease in Egypt among the animals of the

newly established farms in most of the Egyptian governorates was alarming **(Zaghawa et al., 2000).** This has directed the attention from the researches to resolve the unsolved questions. Therefore, the objective of this study was to determine the effect of ephemeral fever on composition and some of technological properties of milk of Friesian cows.

## MATERIAL AND METHODS

### Animals:

This study was carried out in a private farm at Alexandria governorate, fifty five Friesian dairy cows averaging 400 ± 35 kg body weight in early lactation were chosen showing typical signs of ephemeral fever according to **Scott (1990).** The animals showed high temperature (40-41.5 °C), anorexia, salivation, lacrimation, nasal discharge, stiffness, lameness in one or more legs, subcutaneous emphysema and recumbency in some cows. Spontaneous recovery occurred in some cows with cold applications especially over the head and lower extremities to reduce the fever, others responded to calcium therapy after disappearance of fever as Cal-D-Mag (Pfizer, Egypt) at a dose rate of 500 ml/head slowly intravenous injection as well as severe complicated cases received different medication as described by **Uren et al. (1989), Hungerford (1990)** and **St. George (1997)** as the following: (a) anti-inflammatory and antipyretic as Arthridin produced by Virbac, the drug contains 20 grams phenylbutazone and 2 grams sodium salicylate/100 ml. The drug was administered by slow intravenous injection at dose rate of 30 ml/day/animal for the first two days, reduced gradually to 20 ml/animal for two days and then to 10 ml/animal over several days. (b) anti-inflammatory as Finadyne solution (Schering-Plough-Animal Health), the drug contains flunixin meglumine 50 mg/ml. The drug was administered intravenously at a dose rate of 2.2 mg/kg body weight (2 ml/45 kg b.wt.) for 3 days. (c) Panterramycin (Pfizer, Egypt) as oxytetracycline hydrochloride at a dose rate of 150 mg/50 kg body weight, intramuscular injection for 3 days to face secondary bacterial infection. (d) Tonophosphan 20% phosphorus (Bayer) at a rate of 20 ml/animal for three days, intravenous injection for downer cows that did not respond to calcium therapy. (e) Ringer solution for dehydrated animals.

### Sampling and analytical methods:

Blood samples were taken from the animals during fever, films were prepared from the buffy coat and subjected to indirect immunofluorescence technique for diagnosis of bovine ephemeral fever virus infection according to **Hassan et al. (1991).**

Milk yield was recorded daily. Individual as well as composite milk

samples from evening and morning milkings were collected during the outbreak and after complete recovery. The milk samples were analysed for determination of protein percentage (formol method) and titratable acidity according to the **Egyptian Organization for Standardization (1974)**. Fat percentage and methylene blue reduction test were determined as described by **American Public Health Association (1985)**. Also, milk samples were examined microbiologically for counts of total bacteria, Coliforms, Streptococci and Staphylococci. Isolated organisms were identified according to **Thatcher and Clark (1975)**. The results were statistically analysed according to **Steel and Torrie (1980)**.

## RESULTS AND DISCUSSION

### Clinical examination:

The major clinical symptoms were fever lasting no more than three days, inappetance, salivation, lameness, oedematous lymph nodes, subcutaneous emphysema and recumbency. Our results were nearly similar to symptoms described by **Nagano et al. (1990), Hassan et al. (1991), Soheïr (1994), Farag et al. (1998)** and **Liao et al. (1998)**. The observed clinical signs may be explained as follows: the fever may be due to the release of pyrogens from polymorphs, macrophages and Kupfler cells and the way in which these pyrogens disturb the thermoregulatory center **(Stoner, 1972)**. The inappetance could be a natural sequel to fever and salivation was not necessarily due to an increased production of saliva but possibly to interference with swallowing, moreover the subcutaneous emphysema is probably the result of pulmonary vesicular emphysema which progress to interstitial emphysema with gas dissecting a path beneath the pleura, into the mediastinum and then via fascial planes to beneath the skin of the neck **(Burgess and Sparadbrow, 1977)**. The lameness and recumbency may be due to an increase in the amount of synovial fluid and vascular damage which are responsible for joint pain and may be sufficient to cause lameness, paresis and apparent pain **(George et al., 1995)**. In the same time, the enlarged lymph nodes may be due to alteration in the permeability of blood vessels or due to lymphadenitis **(Radostits et al., 1995)**.

### Daily milk yield:

The obtained data in Table (1) indicated a significant decrease in milk yield during ephemeral fever and did not return to the normal level. The obtained results substantiated what have been reported by **Scott (1990)**.

### Chemical examination:

Milk samples collected during ephemeral fever had fat percentages

in the range of 2.79 - 3.33 with a mean value of 3.12 ± 0.06 while for cows after recovery, it ranged between 3.16 and 4.23 with a mean value of 3.79 ± 0.18.

99.9% of milk samples collected during ephemeral fever within the legal fat percentage (not less than 3%) according to the **Egyptian Organization for Standardization (1974)**. In the same time, fat percentage of milk collected during the ephemeral fever showed non-significant decrease as compared with its value before the outbreak and after recovery (Table 2).

Table (3) showed that protein percentage ranged from 2.70 to 3.30 with a mean value 2.83 ± 0.13 for milk collected during the ephemeral fever and 3.20 to 3.66 with a mean value of 3.35 ± 0.11 for milk samples after complete recovery, the difference was statistically significant.

It is interested to note that ephemeral fever resulted in significant reduction in both daily milk yield and milk protein percentage. This effect may be due to the decrease in food intake during the disease which in turns decrease the amount of nutrients available for milk synthesis. On the other hand, the insignificant decrease in fat percentage may be explained on the basis that the animals used their body fat stores for synthesis of milk fat.

**Keeping quality test**:

The data presented in Table (4) showed that the milk acidity of milk preserved at room temperature for 0, 3, 6 and 9 hours was higher in milk of diseased animals compared to their values in milk of recovered ones. In order to confirm the previous results, methylene blue reduction test was carried out, the reduction of methylene blue in milk of diseased animals was faster than that of normal recovered cows after all preservation periods (Table 5).

**Bacteriological examination**:

From the data recorded in Table (6), it was found that the total colony count in milk of diseased cows was higher than that in milk from recovered ones. The same effect could also be observed for counts of total Coliform, Staphylococci and Streptococci. The higher incidence of isolated organisms in milk from diseased cows than in milk from recovered ones confirmed the differences in bacteriological counts (Table 7).

The pathogenic microorganisms isolated from milk of diseased cows were *Streptococcus agalactiae* (23.64%), *Streptococcus dysagalactiae* (14.55%), *Staphylococcus aureus* (18.18%) and *E. coli* (43.64%), those from milk of recovered cows were *Streptococcus agalactiae* (22%), *Streptococcus dysagalatiae* (6%), *Staphylococcus aureus* (12%) and *E. coli* (26%). The higher counts and percentage of isolated microorganisms in milk of diseased cows may be in a part due to the decreased defense mechanism

of the body and in another part to the recumbent position in some diseased animals which increases the chance of penetration of the udder tissue by pathogens that are abundant in faeces and mud resulting in mastitis **(Tizard, 1983)**.

In conclusion, the results of this study indicated that the disease has a major economic significance from the losses in milk yield and reduction in protein percentage as well as lowering keeping quality. Finally, to safeguard the consumer, milk must be thoroughly boiled and the attention of authorities must be directed towards the disease and place it on the top of priorities in control programmes.

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**Table (1): Effect of ephemeral fever on daily milk yield.**

| Mean ± S.E. of Milk yield (kg/head/day) | | |
|---|---|---|
| Before outbreak | During outbreak | After recovery |
| 17.59 ± 0.37 a | 6.99 ± 0.31 b | 11.32 ± 0.16 c |

Means followed by different letters differ significantly at P=0.05.

**Table (2): Effect of ephemeral fever on fat percentage.**

| | Minimum | Maximum | Mean ± SE |
|---|---|---|---|
| Before outbreak | 3.21 | 3.90 | 3.39 ± 0.12 a |
| During outbreak | 2.79 | 3.33 | 3.12 ± 0.06 a |
| After recovery | 3.16 | 4.23 | 3.79 ± 0.18 a |

Means followed by different letters differ significantly at P=0.05.

**Table (3): Effect of ephemeral fever on protein percentage.**

| | Minimum | Maximum | Mean ± SE |
|---|---|---|---|
| During outbreak | 2.70 | 3.30 | 2.83 ± 0.13 b |
| After recovery | 3.20 | 3.66 | 3.35 ± 0.11 a |

Means followed by different letters differ significantly at P=0.05.

**Table (4): Effect of ephemeral fever on acidity of raw milk preserved at room temperature.**

| Preservation period (hours) | Cow's milk during ephemeral fever | | Cow's milk after recovery | |
|---|---|---|---|---|
| | Acidity % | Increase % | Acidity % | Increase % |
| 0 | 0.170 ± 0.010 | 0 | 0.168 ± 0.012 | 0 |
| 3 | 0.183 ± 0.011 | 7.65 | 0.170 ± 0.012 | 1.19 |
| 6 | 0.204 ± 0.013 | 20.0 | 0.183 ± 0.090 | 8.93 |
| 9 | 0.215 ± 0.010 | 26.47 | 0.196 ± 0.014 | 16.67 |

**Table (5): Effect of ephemeral fever on methylene blue reduction of raw milk preserved at room temperature.**

| Preservation time (hours) | Reduction time (hours) | |
|---|---|---|
| | Diseased cow's milk | Cow's milk after recovery |
| 0 | 4.50 ± 0.50 | 5.15 ± 0.61 |
| 3 | 3.15 ± 0.29 | 4.45 ± 0.52 |
| 6 | 2.35 ± 0.19 | 3.40 ± 0.23 |
| 9 | 1.40 ± 0.11 | 2.25 ± 0.21 |

**Table (6): Bacterial counts of cow's milk as influenced by ephemeral fever.**

| Bacterial counts | Mean ± SE | |
|---|---|---|
| | Milk during ephemeral fever | Normal milk |
| Total colony count | $5.30 \times 10^6 \pm 0.19 \times 10^6$ a | $6.50 \times 10^5 \pm 0.31 \times 10^5$ b |
| Coliform count | $4.50 \times 10^2 \pm 0.16 \times 10^2$ a | $2.90 \times 10^2 \pm 0.17 \times 10^2$ b |
| Streptococcus count | $3.35 \times 10^2 \pm 0.16 \times 10^2$ a | $1.80 \times 10^2 \pm 0.08 \times 10^2$ b |
| Staphylococcus count | $4.30 \times 10^2 \pm 0.08 \times 10^2$ a | $2.80 \times 10^2 \pm 0.13 \times 10^2$ b |

Means in the same row followed by different letters differ significantly at P=0.05.

**Table (7): Effect of ephemeral fever on incidence of pathogenic microorganisms isolated from Friesian cow's milk.**

| Type of isolates | Milk during ephemeral fever | | Normal milk | |
|---|---|---|---|---|
| | No | % | No. | % |
| *Strept. agalactiae* | 13 | 23.64 | 11 | 22 |
| *Strept. dysagalactiae* | 8 | 14.55 | 3 | 6 |
| *Staph. aureus* | 10 | 18.18 | 6 | 12 |
| *E. coli* | 24 | 43.64 | 13 | 26 |

No. of examined composite milk samples during the ephemeral fever = 55.

No. of examined composite milk samples after recovery = 50.