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MICROBIAL COUNT AS AN INDEX OF THE HYGIENIC QUALITY OF RETAILED MEAT AT EL-MENOFIA PROVINCE.

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ABSTRACT

A total of 100 random samples of retailed meat represented by beef, buffaloe, mutton and goat meat (25 of each) were collected from different butcher's shops at El-Menofia province. The samples were examined microbiologically. The results revealed that, the mean values of total aerobic bacterial counts in beef, buffaloe, mutton and goat meat were $1.4\times10^6 \pm 2.9\times10^5$, $2.3\times10^6 \pm 4.2\times10^5$, $1.2\times10^6 \pm 2.2\times10^5$ and $3.2\times10^5 \pm 1.2\times10^5$ cfu/g. respectively. The mean values of total psychrophilic counts in beef, buffaloe, mutton and goat meat were $1.2\times10^6 \pm 1.8\times10^5$, $1.6\times10^6 \pm 2.1\times10^5$, $1.4\times10^6 \pm 1.1\times10^5$ and $1.1\times10^6 \pm 1.1\times10^5$ cfu/g. respectively. The mean values of total enterobacteriaceae counts in beef, buffaloe, mutton and goat meat were $1.2\times10^4 \pm 1.4\times10^3$, $2.6\times10^4 \pm 3.2\times10^3$, $2.1\times10^4 \pm 4.2\times10^3$ and $1.1\times10^4 \pm 1.5\times10^3$ cfu/g. respectively. The mean values of total coliform counts in beef, buffaloe, mutton and goat meat were $1.1\times10^4 \pm 1.5\times10^3$, $1.9\times10^4 \pm 1.8\times10^3$, $1.6\times10^4 \pm 1.5\times10^3$ and $9.0\times10^3 \pm 1.2\times10^3$ cfu/g. respectively. The mean values of total enterococci counts in beef, buffaloe, mutton and goat meat were $1.1\times10^4 \pm 1.2\times10^3$, $1.3\times10^4 \pm 1.6\times10^3$, $1.2\times10^4 \pm 1.4\times10^3$ and $1.0\times10^4 \pm 4.2\times10^3$ cfu/g. respectively. The mean values of total staphylococcus aureus counts in beef, buffaloe, mutton and goat meat were $1.6\times10^3 \pm 2.3\times10^2$, $2.1\times10^3 \pm 4.3\times10^2$, $1.2\times10^3 \pm 1.6\times10^2$ and $1.4\times10^3 \pm 1.9\times10^2$ cfu/g. respectively. The mean values of total mould counts in beef, buffaloe, mutton and goat meat were $3.8\times10^3 \pm 9.2\times10^2$, $3.3\times10^3 \pm 8.3\times10^2$, $1.2\times10^3 \pm 7.2\times10^2$ and $1.1\times10^3 \pm 6.8\times10^2$ cfu/g. respectively. The mean values of total yeast counts in beef, buffaloe, mutton and goat meat were $3.4\times10^3 \pm 1.7\times10^2$, $2.3\times10^3 \pm 1.6\times10^2$, $1.1\times10^3 \pm 5.2\times10^2$ and $1.1\times10^3 \pm 4.2\times10^2$ cfu/g. respectively. The significance and microbial counts index also the public health hazard of the obtained results was discussed and the measures to obtain a good quality were recommended.

INTRODUCTION

Meat is nutrient rich in substance which can support the growth of a wide range of microorganisms. Meat is considered as an excellent medium for most invading microorganisms, although the inner flesh of healthy animals is considered sterile until dehiding occurs, the surface of meat is liable for contamination from different sources with various kinds of microorganisms during slaughtering, evisceration, preparation, transportation, retailing and storage of carcasses.

External contamination of raw meat is possible from the moment of bleeding until consumption, so in order to improve the keeping quality of meat and minimize the contamination; a strict hygienic measure must be applied.

Microbial contamination of fresh meat has an important implication of food safety and product shelf-life. Air and water are considered the most dangerous sources of microbial contamination of meat during slaughtering.

Since meat is sold fresh and without application of any cooling devices this in the favorable condition supporting the growth and multiplication of contaminating organisms **(El-Nawawi et al., 1976).**

So, this work was aimed to carry out some microbial counts and its indication on the hygienic quality of retailed meat at El-Menofia province**.**

MATERIAL AND METHODS

A total of **one hundred** random samples of retailed meat represented by beef, buffalo, mutton, goat meat (**25 of each**) were collected from different butcher's shops at El-Menofia province, the samples were packed in sterile plastic bags and transferred directly to the laboratory with the minimum of delay where they were examined microbiologically.

Preparation of samples for microbiological examinations (ICMSF, 1978):.

Under complete aseptic condition, **5 gram** of sample were removed by sterile scissors and forceps after surface sterilization by hot spatula. The weighted samples were transferred into a sterile homogenizer flask contained **45 ml** of **0.1%** sterile pepton water, the contents were homogenized for **2-5** minutes at **14000 r.p.m** and then allowed to stand for about 1**5** minutes at room temperature that to make the first serial dilution **10^{-1}**. the contents of the flask were thoroughly mixed by shaking and **1 ml** of the original homogenate was transferred with sterile pipette to a separate sterile tube containing **9 ml** of **0.1 %** sterile pepton water to prepare a dilution 1/100 from which tenth fold serial dilution were prepared up to 10^{-6}.

Microbiological counts:.

1. **Determination of total aerobic bacterial count:** according to the method recommended by **(Cruickshank et al., 1975).**
2. **Determination of total psychrophilic count: (ICMSF, 1982).**
3. **Determination of total enterobacteriaceae count:** according to **(Gork, 1976).**
4. **Determination of total coli form count: (ICMSF, 1982).**
5. **Determination of total enterococci count: (ICMSF, 1982).**
6. **Determination of total Staphylococcus count: (ICMSF, 1982).**
7. **Determination of total mould, yeast count**: according to **(Bailey and Scott, 1978)**

Results

Table (1) statical analytical results of microbial counts in retailed beef, buffaloe, mutton and goat meat cfu/g (25 samples of each).

Meat samples	Beef				Buffaloe				Mutton				Goat			
Microbial counts	Min	Max	Mean	SEM	Min	Max	Mean	SEM	Min	Max	Mean	SEM	Min	Max	Mean	SEM
1-total aerobic bacterial counts	2.1×10^5	4.4×10^6	1.4×10^6a	2.9×10^5	2.6×10^5	4.9×10^6	2.3×10^6a	4.2×10^5	1.2×10^5	2.2×10^6	1.2×10^6a	2.2×10^5	8.1×10^4	5.2×10^5	3.2×10^5b	1.2×10^5
2-total psychro-philic counts	1.6×10^5	3.2×10^6	1.2×10^6a	1.8×10^5	1.8×10^5	3.9×10^6	1.6×10^6a	2.1×10^5	1.1×10^5	2.3×10^6	1.4×10^6a	1.1×10^5	1.2×10^5	1.6×10^6	1.1×10^6a	1.1×10^5
3-total entero-bacteriaceae count	2.6×10^3	3.4×10^4	1.2×10^4a	1.4×10^3	2.8×10^3	7.2×10^4	2.6×10^4a	3.2×10^3	1.2×10^3	3.2×10^4	2.1×10^4a	4.2×10^3	1.3×10^3	2.4×10^4	1.1×10^4a	1.5×10^3
4-total coli-form count	1.6×10^3	2.9×10^4	1.1×10^4a	1.5×10^3	2.1×10^3	3.6×10^4	1.9×10^4a	1.8×10^3	1.1×10^3	2.6×10^4	1.6×10^4a	1.5×10^3	1.1×10^3	2.1×10^4	9.0×10^3b	1.2×10^3
5-total enterococci count	1.3×10^3	1.7×10^4	1.1×10^4a	1.2×10^3	1.4×10^3	3.5×10^4	1.3×10^4a	1.6×10^3	0.8×10^3	1.6×10^4	1.2×10^4a	1.4×10^3	0.7×10^3	1.2×10^4	1.0×10^4a	4.2×10^3
6-total Staphylococcu s count	2.1×10^2	4.2×10^3	1.6×10^3a	2.3×10^2	4.2×10^2	5.2×10^3	2.1×10^3a	4.3×10^2	1.1×10^2	3.1×10^3	1.2×10^3a	1.6×10^2	1.3×10^2	2.9×10^3	1.4×10^3a	1.9×10^2
7-total mould count	1.4×10^2	1.2×10^4	3.8×10^3a	9.2×10^2	1.3×10^2	2.8×10^4	3.3×10^3a	8.3×10^2	1.1×10^2	1.6×10^3	1.2×10^3a	7.2×10^2	1.1×10^2	1.4×10^3	1.1×10^3b	6.8×10^2
8-total yeast count	1.8×10^3	4.9×10^3	3.4×10^3a	1.7×10^2	1.2×10^3	3.4×10^3	2.3×10^3a	1.6×10^2	1.2×10^2	1.5×10^3	1.1×10^3b	5.2×10^2	1.0×10^2	1.3×10^3	1.1×10^3b	4.2×10^2

DISCUSSION

The aerobic plate count was the most suitable method for evaluating the microbial quality of foods and that where food safety was of concern **(Miskimin et al., 1976).**

Table (1) shows that, the total aerobic bacterial counts **cfu/g**. in beef, buffaloe, mutton and goat meat were ranged from **2.1×10^5 to 4.4×10^6, 2.6×10^5 to 4.9×10^6, 1.2×10^5 to 2.2×10^6 and 8.1×10^4 to 5.2×10^5** with an average of **1.4×10^6** ± **2.9×10^5**, **2.3×10^6** ± **4.2×10^5**, **1.2×10^6** ± **2.2×10^5** and **3.2×10^5** ± **1.2×10^5 cfu/g.** respectively. Also there is a significant difference between the mean values of total aerobic bacterial counts of goat meat and each of beef, buffaloe and mutton meats **$P\leq0.05$**. Nearly similar results were reported by **Wanas (1995)**, **Mousa et al., (2000) and Abdel-Aziz (1997).**

The above results indicated that, the retailed meat are highly contaminated and this contamination may be attributed to unsanitary methods of production or exposure to condition favoring bacterial proliferation and contamination of meat from different sources as skin of the animal, pollution in abattoir atmosphere, visceral content in normal condition and water used for washing **(Longree,1972)**. The aerobic plate count is considered as indexes of sanitary quality, organoleptic quality, safety and utility of foods **(NAS, 1985).**

Also table (1) pointed out that, the total psychrophilic counts **cfu/g**. in beef, buffaloe, mutton and goat meats were ranged from **1.6×10^5 to 3.2×10^6, 1.8×10^5 to 3.9×10^6, 1.1×10^5 to 2.3×10^6 and $1.2\times10^5$to 1.6×10^6** with a mean value **of 1.2×10^6** ± **1.8×10^5**, **1.6×10^6** ± **2.1×10^5**, **1.4×10^6** ± **1.1×10^5** and **1.1×10^6** ± **1.1×10^5 cfu/g.** respectively. Also there is no significant difference between the mean values of total psychrophilic counts in beef, buffaloe and mutton and goat. Nearly similar results were reported by **El-Leithy and Rashad (1989)**, **Mira (1989) and Fliss et al., (1991).**

The factors which makes the psychrotrophic microorganisms important in food are their ability to produce a variety of products that affect flavor deleteriously, their ability to use simple nitrogenous foods, their proteolytic and lipolytic activity of some species, their aerobic tendencies enabling them to grow rabidly and produce oxidized products and slime at the surface of foods, where heavy contamination is most likely, their ability to grow at low temperatures, and pigment production by some species **(Frazier and Westhoff,1984).**

Table (1) show also that, the total enterobacteriaceae counts **cfu/g**. in beef, buffaloe, mutton and goat meats were ranged from **2.6×10^3 to 3.4×10^4, 2.8×10^3 to 7.2×10^4, 1.2×10^3 to 3.2×10^4 and $1.3\times10^3$to 2.4×10^4** with an average **of 1.2×10^4** ± **1.4×10^3**, **2.6×10^4** ± **3.2×10^3**, **2.1×10^4** ± **4.2×10^3** and **1.1×10^4** ± **1.5×10^3 cfu/g.** respectively. Also there is no significant difference between the mean values of total enterobacteriaceae counts in beef, buffaloe and mutton and goat meat **$P\leq0.05$**. Nearly similar results were reported by **Wanas (1995)**.

From the above results we observed that, the enterobacteriaceae count seems to be high and this is attributed to the contamination from enteric sources and can be used as an index of enteric contamination. **Mercuri and Cox (1979).**

On the other hand table (1) pointed out that the total coliform count in **cfu/g**. in beef, buffaloe, mutton and goat meat were ranged from **1.6×10^3 to 2.9×10^4, 2.1×10^3 to 3.6×10^4, 1.1×10^3 to 2.6×10^4 and 1.1×10^3 to 2.1×10^4** with a mean value of **1.1×10^4** ± **1.5×10^3**, **1.9×10^4** ± **1.8×10^3**, **1.6×10^4** ± **1.5×10^3** and **9.0×10^3** ± **1.2×10^3 cfu/g.** respectively. Also there is a significant difference between the mean values of coliform counts of goat meat and each of beef, buffaloe and mutton meats **$P\leq0.05$**. Nearly similar results were reported by **Wanas (1995)**, **Oliveira et al., (2002) and Saleh (2007).**

The above results reflect that beef, buffaloe, mutton and goat meat were highly contaminated with coliform which suggested mostly fecal contamination and points to potentially sever hazard **(Eribo and Jay, 1985).**

Table (1) revealed that, the total enterococci counts **cfu/g**. in retailed beef, buffaloe, mutton and goat meats were ranged from **1.3×10^3 to 1.7×10^4, 1.4×10^3 to 3.5×10^4, 0.8×10^3 to 1.6×10^4 and 0.7×10^3 to 1.2×10^4** with a mean value of **1.1×10^4** ± **1.2×10^3**, **1.3×10^4** ± **1.6×10^3**, **1.2×10^4** ± **1.4×10^3** and **1.0×10^4** ± **4.2×10^3 cfu/g..** Respectively. The table also there is no significant difference between the mean values of total enterococci counts in beef, buffaloe and mutton and goat.

(ICMSF, 1978) offers no recommended microbiological limits for the enterococci. Selective judgment based on experience was essential to interpret the significance of specific numbers in a particular food.

Also Calcioglu et al., (1999) reported that, the enterococci may be useful as an indicator of faecal contamination.

As well as table (1) show that, the total staphylococcus aureus counts in retailed beef, buffaloe, mutton and goat meats were ranged from **2.1×10^2 to 4.2×10^3, 4.2×10^2 to 5.2×10^3, 1.1×10^2 to 3.1×10^3 and 1.3×10^2 to 2.9×10^3** with an **average of 1.6×10^3** ± **2.3×10^2**, **2.1×10^3** ± **4.3×10^2**, **1.2×10^3** ± **1.6×10^2** and **1.4×10^3** ± **1.9×10^2 cfu/g..** Respectively. The table also there is no significant difference between the mean values of total staphylococcus aureus counts in retailed beef, buffaloe and mutton and goat meat **P≤0.05**. Nearly similar results were reported by **Wanas (1995)**, **and Mousa et al., (2000)**

USFDA (2004) reported that staphylococcus aureus is ubiquitous and inhabits the mucous membranes and skin of most warm blooded animals, including food animals and humans. Up to **50%** of humans may carry this organism in their nasal passages and throats and on their hair and skin.

It is evident from table (1) that, the total mould count in retailed beef, buffaloe, mutton and goat meats were ranged from **1.4×10^2 to 1.2×10^4, 1.3×10^2 to 2.8×10^4, 1.1×10^2 to 1.6×10^3 and 1.1×10^2 to 1.4×10^3** with an average of **3.8×10^3** ± **9.2×10^2**, **3.3×10^3** ± **8.3×10^2**, **1.2×10^3** ± **7.2×10^2** and **1.1×10^3** ± **6.8×10^2 cfu/g.** Respectively. The table also there is a significant difference between the mean values of total mould counts in retailed beef, buffaloe in one side and mutton and goat meat in the other side **P≤0.05**. Nearly similar results were reported by **Wanas (1995) and Khalil (2010).**

The above results show that, the retailed meat are highly contaminated with mould and this is may be due to ubiquitous distribution of mould spores and mycelia.

Various moulds can contaminate meat in the absence of hygienic measures during production and handling of meat. **(Pitt and Hocking, 1985).**

From the results listed in table (1) it was found that, the total yeast count in retailed beef, buffaloe, mutton and goat meats were ranged from **1.8×10^3 to 4.9×10^3, 1.2×10^3 to 3.4×10^3, 1.2×10^2 to 1.5×10^3 and 1.0×10^2 to 1.3×10^3** with a mean values of **3.4×10^3** ± **1.7×10^2**, **2.3×10^3** ± **1.6×10^2**, **1.1×10^3** ± **5.2×10^2** and **1.1×10^3** ± **4.2×10^2 cfu/g.** Respectively. The table also there is a significant difference between the mean values of total yeast counts in retailed beef, buffaloe in one side and mutton and goat meat in the other side **P≤0.05**.

Some species of yeast constitute a public health hazard as some species of Candida may cause gastrointestinal disturbances, vulvovaginities, endocarditis, pulmonary infection and occasionally fatal systemic disease **(Jesenska and Hrdinova, 1981).**

The spoilage yeasts are those which find their way into food because of their wide distribution in nature resulting in undesirable changes in physical appearance of food **(Walker, 1976).**

CONCLUSION

In conclusion, the retailed beef, buffaloe, mutton and goat meat were highly contaminated with different kinds of microorganisms, so a high standard of hygiene must be applied in slaughterhouses and also during slaughtering, evisceration and sectioning of the carcasses and also during retailing.

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