TRIALS FOR FUNGAL DECONTAMINATION ON SHEEP CARCASSES

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ABSTRACT

The fungal contamination onto the outside (subcutaneous) surface of 20 sheep carcasses, slaughtered and dressed at Mansoura municipal (old-fashioned) abattoir, was analyzed before and after 5 different decontamination trials (two at the abattoir and three at the laboratory). At abattoir, this contamination was surveyed over the round, flank, shoulder, and neck surfaces each of 10 carcasses before and after abattoir decontamination trials, whereas, at laboratory the same mycological analysis was carried out on the surface of abdominal flap, freshly excised from every of other 10 sheep carcasses before and after laboratory decontamination trials.

The presence of yeast and mould contamination was detected in all triple-swab samples taken from the examined surfaces before decontamination trials (100%). After application of the first abattoir trial, the presence every of yeast and mould contamination was recognized in 80 - 100% of round, flank, shoulder, and neck samples of carcass surfaces hose-sprayed with tap water for one minute, while the second abattoir decontamination trial could decrease the yeast-contaminated samples to 50 - 80%, and mould-contaminated samples to 70 - 90% over the same carcass surfaces hose-sprayed with tap water for one minute then wiped with sterilized cloth until removal most of visible dirts. Yeast and mould contamination were also detected in 40 and 50% samples of abdominal flap surfaces sprayed with 0.27% benzoic acid solution for one minute (first laboratory decontamination trial), in 50 and 80% samples of abdominal flap surfaces sprayed with 2% acetic acid solution for one minute (second laboratory decontamination trial), and in 80% samples (each) of abdominal flap surfaces sprayed with 2.5% potassium sorbate solution for one minute (third laboratory decontamination trial), respectively.

The mean levels of yeast and mould intensities onto the untreated carcass surfaces, sampled at abattoir, were 90.5 & 116, 69.01 & 79.23, 152 & 94.5, and 192.5 & 101.9

propagules/cm2 of round, flank, shoulder, and neck surfaces reduced to 51.07 & 44.05, 32.05 & 43.01, 60.09 & 47.95, and 58.21 & 67.86 propagules/cm2 with corresponding reduction percentages of 55.72 & 43.57%, 53.56 & 45.72%, 60.47 & 49.26%, and 69.76 & 33.41% onto the same surfaces after hose-spraying each of them with tap water for one minute, while these levels further decreased to 28.16 & 27.10, 11.20 & 31.0, 10.08 & 30.85, and 20.19 & 50.07 propagules/cm2 with synonymous decrease percentages of 85.46 & 68.88%, 83.77 & 60.87%, 93.37 & 67.35%, and 89.51 & 50.86% on these surfaces, consecutively after hose-spraying each of them with tap water for one minute followed by wiping with sterilized cloth. Furthermore, the initial mean values of yeast and mould population over the untreated abdominal flap surfaces, sampled at laboratory, were 70.28 & 49.06 propagules/cm2 decreased to 16.99 & 28.08 propagules/cm2 after spraying each of them with 0.27% benzoic acid solution for one minute, to 18.03 & 26.01 propagules/cm2, and to 26.91 & 23.0 propagules/cm2 after an independent spraying each of them with 2% acetic acid and 2.5% potassium sorbate solutions for one minute with corresponding decline percentages of 75.83 & 42.76%, 74.35 & 46.98%, and 61.71 & 53.12%, successively.

A total of identified 619 (100%) mould strains, belonged to 20 genera, could be isolated from all surveyed samples and distributed as 109 (17.61%) Penicillium, 104 (16.80%) Aspergillus, 74 (11.95%) Cladosporium, 53 (8.56%) Alternaria, and 51 (8.24%) Monilliella strains at the top, followed by 26 (4.2%) Humicola, 24 (3.88%) Geotrichum candidum, 23 (3.72%) Fusarium, 22 (3.55%) Absidia, 20 (3.23%) Syncephalastrum, and 19 (3.07%) Acremonium strictum strains, together with 16 (2.58%) Stemphylium, 13 (2.1%) Mucor, 12 (1.94%) each of Aureobasidium and Paecilomyces, 9 (1.45%) every of Scopulariopsis and Trichoderma, 8 (1.29%) each of Rhizopus and Botrytis, alongside 7 (1.13%) Thamnidium strains. The obtained 104 (100%) Aspergillus strains further characterized into 11 groups as 42 (40.38%) A. niger, 23 (22.12%) A. flavus, and 9 (8.65%) A. fumigatus strains at the top, followed by 7 (6.73%) A. amstelodami and A. candidus, 5 (4.81%) every of A. sydowii and A. ochraceus, 2 (1.92%) each of A. clavatus and A. nidulans, together with one strain (0.96%) every of A. chevalieri and A. wentii.

INTRODUCTION

Sheep were probably among the first animals to be domesticated by man for mutton, milk, and wool production. In Egypt, lambs provide the most important meat for making fried "kofta"and Kabob, hence they are usually slaughtered at 36-45 kg live weight with a resultant 17-23

kg dressed carcass. However, mutton can also derived from gimmers, ewes, wethers, and rams.

The healthy inner flesh of dressed sheep carcasses has been reported to contain few or no microorganisms, although they have been found in lymph nodes, bone marrow, and even flesh. The important contamination, however, comes from the external sources during bleeding, handling, and dressing. During bleeding, skinning, and evisceration, the main sources of microorganisms including fungi are the exterior of animal (skin, wool, and hooves) alongside the gastrointestinal tract. The exterior of animal harbors large numbers and many kinds of fungi particularly moulds derived from soil, water, feed, and manure besides its natural surface flora **(Batista et al., 1961; Klare, 1970; Nakae et al., 1976; Ayres et al., 1980; Ramirez, 1982; Farghaly, 1985; and Rosenzweig et al., 1986)**. Knives, cloths, abattoir environment (floor, walls, air, and water of slaughter halls), in addition to hands and clothing of the workers can serve as intermediate sources of these contaminants **(Refai and Loot, 1969; Mansour, 1986; Eldaly et al., 1988; Yassien et al., 1989; Hamdy et al., 1991; and Ismail et al., 1995)**.

There is no fungus - free environment in our life **(Chao et al., 2002)**. Therefore, the sheep carcasses during their dressing can be contaminated with fungal propagules from the surrounding environments. So, moulds of many genera could reach the meat surfaces and grow there; Penicillium, Aspergillus, Cladosporium, Geotrichum, Mucor, Fusarium, Alternaria, and Thamnidium are prevalent species **(Ayres et al., 1980)**. Nature and extent of fungal contamination on dressed sheep carcasses are important criteria in judging their hygienic quality **(Samson et al., 1981)**. The mycological condition of carcasses is very dependent on the conditions under which their animals are reared, slaughtered, and dressed.

Along with moulds, yeasts belong to the class Mycota or fungi, which are primitive plant-like structures lacking in chlorophyll. The yeasts are microscopic, single-celled organisms generally larger than the bacteria. Yeasts are mostly saprophytic, while few species are pathogenic. They occur almost everywhere in the environment as well as on skin and in alimentary tract of mammals. A mould consists of a mycelium of branched filaments (hyphae) which bear spores or conidia. In contrast to the yeasts, moulds can be seen with the naked eye as fluffy growths on meats; coloured black, white, or other pigments. Like yeasts, they are primarily saprophytic organisms, breaking down complex organic materials into simpler substances, thus contributing to the decomposition of meats **(Gracey and Collins, 1992)**.

Meat provides an ideal medium for fungal growth, as it has an optimal pH range (5.6-6.7). A high water content (aw = 0.99), a rich supply of nitrogenous substance, and a source of carbohydrate. Meat may assume a mouldy odour and taste if the mould affection is extensive, and for long standing the fat rancidity may occur **(Jay, 1992)**. Furthermore, most of moulds can deterio-

rate meat through production of their proteolytic and lipolytic enzymes **(Ayres et al., 1980)**. Some moulds can also elaborate toxic substances (mycotoxins) in infected meats that are poisonous for man **(Bullerman et al., 1969a&b)**. So, the mould growth on meat causes an economic loss caused by trimming of the affected parts **(Welser, 1962)**.

Moulds and yeasts could grow on lamb and mutton carcasses stored at -5°C. The mould genera of Penicillium and Cladosporium attack and penetrate the superficial layers of connective tissues or of fat covering the musculature and produce discolouring spots ranging from yellow to black. Mycelia of various members of the Mucoralis may also observed onto these carcasses, wherein strains of Thamnidium, Mucor, and Rhizopus can produce an extensive whiskery, or cottony grey- to- black growth **(Ayres et al., 1980)**. On the other hand, yeasts seldom cause spoilage of fresh red meats, being only a small part of the initial microbial population and growing more slowly than most bacteria. Yeasts cause spoilage of refrigerated meats only when bacterial numbers have been restricted **(Ayres et al., 1980)**. Spoilage of chilled beef (at -1.1°C) is caused by growth of a mixture of bacteria, yeasts, and moulds on the beef surface **(Empey and Scott, 1939)**. In general, yeasts can grow on much dryer surfaces than can bacteria. The characteristic yeasty odour is mostly pronounced in the affected meats.

The fungal contamination over cattle and sheep carcasses was evaluated by many researchers **(Eldaly et al., 1988; Yassien et al., 1989; Elgazzar, 1992; and Shabanh, 1995)**, however they did not try to inhibit or reduce such inevitable contamination. Meat hygiene aims at reducing contamination and preventing the proliferation of harmful mycoflora. Hence, one minute hose-spraying of the whole surface of freshly dressed carcasses at abattoirs with a tap water, either exclusively or followed by wiping with sterilized cloth until removal most of visible dirts, are probable successful trials for decontamination **(Mohammed, 2004)**. In addition to the trend of the use of some chemicals including organic acids to prevent or delay the meat spoilage has been practiced 5000 B. C. **(Luck, 1980)**. Propionic, sorbic, benzoic, acetic, formic acids and their salts received much interest in the last decade as fungal decontaminators in/on food **(Farkas, 2001)**.

The aim of the present work, therefore, was to evaluate the mycological condition of the freshly dressed sheep carcasses at Mansoura municipal (old-fashioned) abattoir alongside the creation of some applicable fungal decontamination trials, through fulfilling these points:

I. Estimation of both yeast and mould populations per each square centimeter of the outside surface of freshly dressed sheep carcasses, before and after decontamination trials.

II. Generic identification of the isolated mould strains with further group characterization of the obtained aspergilli.

III. Evaluation of the efficacy of different 5 fungal decontamination trials onto the tested carcass surfaces; (1) hose-spraying of the whole carcass surface with a municipal (tap) water for one minute, (2) hose-spraying of the whole carcass surface with a municipal water for one minute, followed by wiping with a sterilized cloth until removal most of visible dirts, (3) spraying of a limited outside surface area of the abdominal flap (about 10x10 cm), freshly excised from dressed untreated sheep carcass, with 0.27% benzoic acid solution for one minute, (4) spraying of a limited outside surface area of the abdominal flap (about 10x10 cm), recently excised from dressed untreated sheep carcass, with 2% acetic acid solution for one minute, and (5) spraying of a limited outside surface area of the abdominal flap (about 10x10 cm), freshly excised from dressed untreated sheep carcass with 2.5% potassium sorbate solution for one minute.

MATERIAL AND METHODS

I. COLLECTION AND PREPARATION OF THE SAMPLES :

The outside (subcutaneous) surface of different sites of 20 sheep carcasses, slaughtered and dressed at Mansoura municipal (old-fashioned) abattoir, was swabbed and tested mycologically, before and after 5 various decontamination treatments. All sampled carcasses were from animals had unclean fleece and processed under similar conditions, where they have been slaughtered by Islamic method after being lain on a dirty floor, through severing both carotid arteries and jugular veins, trachea, besides oesophagus then left 2 minutes for efficient bleeding followed by floor-dressing.

Out of the examined carcasses, the outside surface each of round, flank, shoulder, and neck of 10 carcasses was alternatively sampled 3 times at the abattoir; every time represented one of the three carcass conditions: (1) immediately after skinning and evisceration "without rinsing or any decontamination treatment", (2) after a continuous hose-spraying of the whole carcass surface with a municipal (tap) water for one minute (at a maximal pressure without splashing of the neighboring carcasses), and (3) after a continuous hose-spraying of the whole carcass surface with a tap water for one minute followed by wiping with a sterilized cloth. The latter carcass condition was achieved by wiping the previously hose-sprayed surface until removal most of the visible dirts.

The outside surface of one large abdominal flap, aseptically excised from each of the remaining 10 untreated carcasses, was also sampled rapidly at the laboratory under 4 different conditions (every condition was revealed onto an independent flap subsample having a limited area of about 10x10 cm): (1) shortly after dressing of untreated carcass plus excision and packaging of

sampled flap "without rinsing or any decontamination treatment", (2) after a continuous spraying of the whole outside surface of flap subsample with a 0.27% benzoic acid solution (maximal solubility) for one minute, (3) after a continuous spraying of the whole outside surface of flap subsample with a 2% acetic acid solution for one minute, and (4) after a continuous spraying of the whole outside surface of flap subsample with a 2.5% potassium sorbate solution for one minute. Each of the treated flap subsample was sprayed with one type of the applied decontaminating solutions, by using a 500-ml plastic sprayer, after being hung and clipped on a sterilized frame made of stainless steel.

A limited area (20 cm^2) over each surface sample inside a sterilized metal template (4x5 cm) was rubbed repeatedly and successively by 3 sterilized gauze-cotton swabs (having a size of about 3.5x1.5 cm and attached to flat wooden stick of about 10 cm length); the first swab was moistened with a 0.1% peptone water (the diluent used) while the other 2 swabs were dry. The 3 swab sticks were broken off below the contaminated handled area into a sterile 100-ml flask containing 40 ml of the used diluent to give an original dilution of 1:2 after thorough homogenization of the triple swabs **(Patterson, 1971)**. Each swab sample was then marked and subjected to prompt mycological examination.

II. MYCOLOGICAL TESTS:

(1) Enumeration of the yeast and mould propagules in the surface samples (King et al., 1979):

One fifth (0.2) ml amount from the previously prepared original dilution (1:2) was delivered and spread onto the dried surface each of sterilized duplicate plates of dichloran rose bengal chloramphenicol agar (DRCA). The inoculated plates as well as the control one were incubated at 25°C for 5 days. The average of yeast and mould colonies were then enumerated over the duplicate plates and the total yeast count/cm^2 plus the total mould count/cm^2 of the tested surface were calculated and recorded. Every mould growth onto a countable plate was picked up and transferred either onto a slope of Czapek yeast extract agar (CYA) (for hydrophilic moulds) or onto a slope of Czapek yeast extract agar with 20% sucrose (CY20S) (for osmophilic moulds) then incubated at 25°C for 1-2 weeks and subjected for identification.

(2) Identification of the isolated mould strains:

Generic identification of the obtained mould strains was carried out according to **Raper and Thom (1949), Arx (1967), Zycha et al. (1969), Barnett and Hunter (1972), Samson et al. (1976), Schipper (1978), and Pitt and Hocking (1985)**, whereas group characterization of the

recovered aspergilli was completed owing to **Raper and Fennell (1965) and Samson (1979).**

III. STATISTICAL ANALYSIS:

The data obtained in this study were statistically analysed according to the methods described by **Snedecor (1971).**

DISCUSSION

Inspection of Table (1) exhibits the presence of both yeast and mould contamination in all surveyed swab samples (100%) taken from the untreated carcass surfaces of round, flank, shoulder, neck, and abdominal flap. This fungal presence decreased to 80 & 90% in round and to 90% each of yeast and mould in shoulder samples, respectively, while the yeast-contaminated flank samples reduced to 90% after hose-spraying each of their surfaces with tap water for one minute (first abattoir decontamination trial), whereas the occurrence of mould contamination in flank and neck samples as well as the yeasts in neck ones not affected by this decontamination trial as they could be detected in 100% of these samples. More reductions in yeast- and mould-contaminated abattoir samples to 50 & 70%, 70 & 80%, 60 & 80%, and 80 & 90% were established in those samples obtained from round, flank, shoulder, and neck surfaces, successively after hose-spraying each of them with tap water for one minute followed by wiping with sterilized cloth (second abattoir decontamination trial). Furthermore, a considerable decrease in yeast- and mould-contaminated laboratory samples, taken from the abdominal flaps, to 40 & 50%, respectively was achieved after spraying each of their surfaces with 0.27% benzoic acid solution for one minute (first laboratory decontamination trial). Similar drastic reduction (50%) was also detected in yeast-contaminated samples that obtained from the flap surfaces after spraying every of them with 2% acetic acid solution for one minute (second laboratory decontamination trial), while moderate decrease (20%) was only exhibited in mould-contaminated samples recovered from the same treated surfaces. The third laboratory decontamination trial could slightly and equally reduce the number of both yeast-and mould-contaminated samples by 20% after spraying each of their flap surfaces with 2.5% potassium sorbate solution for one minute. General view on the obtained results reveals the noticeable reducing effect of the 0.27% benzoic acid spraying on the occurrence frequency of yeast and mould propagules in tested samples, while both hose-spraying with tap water and spraying with 2.5% potassium sorbate solution were the least two effective trials. Also, the presence of yeast contamination in swab samples of treated surfaces was ≤mould one. The decreasing effect of abattoir decontamination trials on the yeast- and mould-contaminated samples was more appreciable on the round and shoulder surfaces than that on the flank and neck ones. This may be attributed to the more intense fungal con-

tamination on the latter 2 surface sites. The detection of fungal contamination in all examined swab samples of untreated carcass surfaces agreed with the findings obtained by **Shabanh (1995)** on sheep carcasses besides those results evaluated by **Abd-Allah (2005)** on beef carcasses, and can be explained by the literature of **Empey and Scott (1939)** who determined the average yeast and mould numbers in dry soil found on animals by $5x10^4$ and $1.2x10^5$ propagules/g, in fresh animal faeces by $2x10^5$ and $6x10^4$ propagules/g, and in rumen content by $1.8x10^5$ and $1.6x10^3$ propagules/g, consecutively. Furthermore, the transfer of microfloral contamination from skin and gut of the slaughtered animals to the surface of their carcasses during dressing is inevitable even with using a current slaughterhouse technology **(Thornton and Gracey, 1974 and Dickson and Anderson, 1992)**, in addition to the very high fungal population may be get onto the dressed carcasses from the air, dust, and soil inside slaughter halls **(Lacey, 1973; Christensen et al., 1978; McKenzie and Taylor, 1983; Hill et al., 1984; and Hamdy et al., 1991)**.

Concerning the intensities of yeast propagules onto the untreated carcass surfaces: they ranged from 21 to 203 /cm^2 on round, 14 - 137 /cm^2 on flank, 33 - 260 /cm^2 on shoulder, 47 - 310 /cm^2 on neck, and 12 - 250 /cm^2 on abdominal flap with mean values of 90.5 ± 18.11, 69.01 ± 14.76, 152 ± 29.08, 192.5 ± 39.1, and 70.28 ± 18.36 /cm^2, respectively. The first abattoir decontamination trial (hose-spraying the whole carcass surface with tap water for one minute) could reduce these yeast propagules to 0 - 138 /cm2 on round, 0 - 89 /cm^2 on flank, 0- 79 /cm^2 on shoulder, and 5 - 99 /cm^2 on neck with mean levels of 51.07 ± 10.06, 32.05 ± 7.0, 60.9 ± 12.12, and 58.21 ± 13.0 /cm^2, consecutively. The second abattoir decontamination trial (hose-spraying the whole carcass surface with tap water for one minute followed by wiping with sterilized cloth until removal most of visible dirts) induced the highest reduction in yeast contamination on carcass surfaces wherein the range (minimum - maximum) and mean value of the yeast propagules/cm^2 were 0 - 52 and 28.16 ± 4.22 on round, 0 - 28 and 11.2 ± 2.86 on flank, 0 - 19 and 10.08 ± 2.66 on shoulder, besides 0 - 41 and 20.19 ± 5.26 on neck surfaces. The three independent laboratory decontamination trials could also decrease the yeast propagules/cm^2 to 0 - 29 and 16.99 ± 5.0, 0 - 34 and 18.03 ± 4.98, alongside 0 - 85 and 26.91 ± 8.72 on the abdominal flap surfaces after spraying every of them for one minute with solutions of 0.27% benzoic acid (first laboratory decontamination trial), 2% acetic acid (second laboratory decontamination trial), and 2.5% potassium sorbate (third laboratory decontamination trial), respectively (Table, 2). These data indicate that the first abattoir decontamination trial (hose-spraying the whole carcass surface with tap water for one minute) could remove 55.72, 53.56, 60.47, and 69.76% of yeast contamination from the round, flank, shoulder, and neck surfaces, successively, whereas the furthest reduction levels in yeast contamination resulted from the second abattoir decontam-

ination trial (hose-spraying the whole carcass surface with tap water for one minute followed by wiping with sterilized cloth until removal most of visible dirts) as 85.46, 83.77, 93.37, and 89.51% on the round, flank, shoulder, and neck surfaces, consecutively. Reduction in yeast populations onto the surveyed abdominal flap surfaces can also be obtained by percentages of 75.83, 74.35, and 61.71% after 3 independent laboratory decontamination trials: spraying each of flap surface for one minute with solutions of 0.27% benzoic acid, 2% acetic acid, and 2.5% potassium sorbate, respectively (Table, 4). Moderately lower yeast contamination levels were detected by **Abd-Allah (2005)** over the untreated beef carcasses (mean values of 41.43 - 100 propagules/cm2), at the contrary, extremely higher yeast populations ($4x10^3$ - $2x10^4$ propagules/cm2) onto the analogous carcass surfaces were obtained by **Eldaly et al. (1988)**. This variation may be referred to the different abattoir-sanitation levels and yeast-enumeration techniques.

In regard to the decontaminating effects of the first abattoir trial, the greatest reduction in yeast population was revealed on the surfaces of neck (69.76%) followed by shoulder (60.47%), round (55.72%), and flank (53.56%), consecutively after hose-spraying the whole carcass surface with tap water for one minute (Table, 4). These findings correspond with the reports of **Kotula et al. (1974); Notermans et al. (1980); and Siragusa (1995)** who emphasized that the spray washing of carcasses significantly reduces their surface microflora. Approximately similar surface yeast reductions (47.13 - 77.78%) were achieved on beef carcasses, slaughtered and dressed at Mansoura municipal abattoir, after similar decontamination trial performed by **Abd-Allah (2005)**. With respect to the efficacy of second abattoir trial for yeast decontamination, the highest yeast reduction (93.87%) induced by this trial was detected onto the shoulder succeeded by 89.51% on neck, 85.46% on round, and 83.77% on flank after hose-spraying the whole carcass surface with tap water for one minute followed by wiping with sterilized cloth until removal most of visible dirts (Table, 4). These results are analogous to the yeast reductions (82.76 - 98.61%) obtained by **Abd-Allah (2005)** onto the similarly treated beef carcasses. The ultimate yeast decontamination revealed by the second abattoir trial can be attributed to the fact that the spray washing replaces the contaminated water film on carcass surface with a clean water film, thus reducing the microbial load, alongside, the removal most of visible dirts from spray-washed carcass surface with sterilized cloth would additionally enhance the microbial safety of treated carcass meat **(Mulder, 1985; Gill, 2004; and Mohammed, 2004)**.

Regarding the laboratory decontamination trials for decreasing yeast population over the surface of abdominal flaps excised from freshly dressed sheep carcasses, one minute-spraying each of these surfaces with a 0.27% benzoic acid solution was the most effective trial as could reduce 75.83% of their yeast contamination, followed by the similarly and independently sprayed 2% acetic acid and 2.5% potassium sorbate solutions as could decrease 74.35 and 61.71% of their

yeast population, respectively (Table. 4). Higher yeast reduction percentages were obtained by **Abd-Allah (2005)** after identical benzoic acid trial (96.12%) and acetic acid trial (94.57%), whereas analogous yeast reduction level (60.47%) resulted after similar potassium sorbate trial onto the surface of beef abdominal flaps. The antimycotic effect of benzoic acid for controlling yeast contamination in/on foods was emphasized by **Chistester and Tanner (1972); Luck (1986); and Frazier and Westhoff (1995)** besides the inhibitory concentration of benzoic acid against most yeasts was estimated by **Chipley (1993)** as from 20 to 700 mg/ml. Furthermore, **Baird-Parker (1980)** established the capability of acetic acid to reduce microbial population on carcass surfaces through lowering their tissue pH and changing permeabilities of microbial cell membrane. The inhibitory effect of potassium sorbate on the yeast growth and its subsequent importance for extending the shelf life of beef steaks for 2 days were also reported by **Chistester and Tanner (1972); Greer (1982); Bullerman (1985); and Sofos (1989)**.

Figures arranged in Table (3) show the mould population onto the tested carcass surfaces, before and after decontamination trials; its range (minimum - maximum) and mean value on the untreated surfaces were 17 - 204 and 116 ± 21.93 propagules/cm^2 on round, 15 - 181 and 79.23 ± 19.07 propagules/cm^2 on flank, 20 - 316 and 94.5 ± 21.89 propagules/cm^2 on shoulder, 33 - 349 and 101.9 ± 22.31 propagules/cm^2 on neck, together with 14 - 127 and 49.06 ± 12.08 propagules/cm2 on abdominal flap. The first abattoir decontamination trial decreased these figures considerably to 0 - 90 and 44.05 ± 9.16, 9 - 107 and 43.01 ± 9.96, 0 - 198 and 47.95 ± 11.01, in addition to 24 - 210 and 67.86 ± 16.05 propagules/cm^2 of the round, flank, shoulder and neck surfaces, respectively after hose-spraying the whole each of their carcasses with tap water for one minute. The second abattoir decontamination trial could induce the ultimate reduction in the level of surface moulds where they ranged from 0 to 63 with a mean of 27.1 ± 6.98 propagules/cm2 on round, 0 - 83 and 31.0 ± 7.09 propagules/cm2 on flank, 0 - 147 and 30.85 ± 7.06 propagules/cm2 on shoulder, besides 0 - 166 and 50.07 ± 13.04 propagules/cm^2 on neck surfaces after hose-spraying the whole each of their carcasses with tap water for one minute followed by wiping with sterilized cloth until removal most of visible dirts. On the other hand, appreciable reduction in mould propagules over the abdominal flap surfaces can also be obtained, as their ranges and mean levels were 0 - 49 and 28.08 ± 3.07, 0 - 70 and 26.01 ± 5.96, together with 0 - 91 and 23.0 ± 4.99 /cm^2 after an independent spraying of each surveyed surface for one minute with 0.27% benzoic acid, 2% acetic acid, and 2.5% potassium sorbate solutions, consecutively. These findings emphasized that the considerable reduction levels in mould contamination were achieved after application of the first abattoir decontamination trial, with the greatest reduction was occurred on shoulder (49.26%), followed by 45.72, 43.57, and 33.41% reductions on flank, round, and neck surfaces after hose-spraying the whole each of

their carcasses with tap water for one minute, while the furthest mould decontamination was recognized by percentages of 67.35, 60.87, 68.88, and 50.86% onto the same surfaces, successively after hose-spraying the whole each of their carcasses with tap water for one minute followed by wiping with sterilized cloth until removal most of visible dirts (second abattoir decontamination trail), in addition to the mould reductions resulted after using the three independent laboratory decontamination trials onto the abdominal flap surfaces; 53.12% was the greatest decrease percentage in mould contamination induced by the one minute-spraying each tested surface with 2.5%potassium sorbate solution (third laboratory decontamination trial) followed by 46.98% caused by the one minute-spraying every surveyed surface with 2% acetic acid solution (second laboratory decontamination trial) together with 42.76% elicited by the one minute-spraying each investigated surface with 0.27% benzoic acid solution (first laboratory decontamination trial) (Table, 4).

With reference to the mould population detected onto the examined untreated carcass surfaces, the highest intensities were determined over both round and neck surfaces followed by those found on shoulder and flank ones, whereas the least mould contamination levels were observed on the abdominal flap surfaces. These findings corresponded, to large extent, with those obtained by **Abd-Allah (2005)** onto the similar surfaces of beef carcasses. In comparison with the obtained mould intensities, **Yassien et al. (1989)** recovered approximately similar mould populations onto the outside shoulder and thigh surfaces of surveyed cattle carcasses (mean values of 120 and 56 propagules/cm2, respectively), whereas the lower mould contamination levels on similar beef carcass surfaces (mean values of 31.15 - 83.5 propagules/cm^2) were detected by **Abd-Allah (2005)**, on the contrary, exceedingly higher mould intensities by mean values of $2x10^2$ - $2x10^3$ propagules/cm2 determined by **Eldaly et al. (1988)**, and by mean values of 98 = 266 propagules/cm^2 estimated by **Elgazzar (1992)** over the cattle carcass surfaces, together with the mean values of mould contamination as 2.46x103 - 2.82x103 propagules/cm^2 recognized by **Shabanh (1995)**, and as 5.67x104 propagules/cm^2 evaluated by **Hassan (2004)** onto the sheep carcass surface.

Concerning the efficacy of first and second abattoir decontamination trials in ascending reduction of mould contamination levels on the surveyed carcass surfaces, the resulted reduction percentages (33.41 - 49.26% & 50.86 - 68.88%, consecutively) coordinated with **Patterson (1968)** who established that the spray-washing of carcass reduces the mould propagules onto its surface by removing the liquid film containing propagules before they become more closely attached with the rough outside (subcutaneous) surface of the dressed carcass. Additional removal of visible dirts, having some mould propagules, by the sterilized cloth onto the hose-sprayed carcass surface could enhance its microbial safety through reaching to the ultimate mould decon-

tamination **(Gill, 2004)**. Moderately higher reduction percentages in mould contamination over the beef carcass surfaces (38.68 - 60.48% & 60.38 - 77.84%) obtained by **Abd-Allah (2005)** after treating them with identical two abattoir decontamination trials, respectively. However, lower decrease level (about 18%) in mould population was detected by **Sakhare et al. (1999)** on the surface of dressed chicken carcasses after spraying them with tap water. In comparison with yeasts, the decontaminating effects of these abattoir trails against yeasts were higher, in all cases, than that against moulds found on carcass surfaces, where their effectiveness against yeasts simulating, to large extent, that against bacteria **(Mohammed, 2004)**.

With respect to the reducing effect of 0.27% benzoic acid on the intensities of mould contamination of carcass surfaces, the reduction percentage obtained in the present study (42.76% reduction) correspond with **Chistester and Tanner (1972), Luck (1986), Prasai et al. (1991),** and **Frazier and Westhoff (1995)** who emphasized that the benzoic acid can inhibit the mould growth owing to its antimycotic effect. Furthermore, the inhibitory concentrations of benzoic acid against moulds are recommended by **Chipley (1993)** as a range of 20 - 2 000 mg/ml. However, lower reduction percentage (about 11%) in mould population was detected onto the outside surface of cattle carcasses by **Nassar et al. (1995)** after swabbing each of them with 0.7% benzoic acid solution for 3 - 5 minutes. Meanwhile, the higher mould decontamination percentage (76.53%) established on beef carcass surfaces as a result of identical 0.27% benzoic acid trial **(Abd-Allah, 2005)**. As regards the decontaminating effect of 2% acetic acid solution on the mould population over the surveyed carcass surfaces, the decline percentage in mould contamination determined in the present work (46.98%) may be supported by the findings obtained by **Awad (1994)** who could retard the appearance of visible mould growth onto the outside surfaces of luncheon sausage, hung at ordinary temperature simulating the market condition, for 4 days after spraying each of them with 1% acetic acid solution for one minute. Greater reduction percentages in mould contamination (88.78 and 66.80%) over the broiler carcass surfaces, after independent spraying each of them with 0.5% and 2% acetic acid solutions, determined by **Sakhare et al. (1999) and Eldaly et al. (2002)**, respectively, as well as onto the beef carcass surfaces (58.01%)after treating each of them with acetic acid trial identical to that of the present study **(Abd-Allah, 2005)**. Inspection of the selective fungal decontaminating effect of the 2% acetic acid trial onto the examined carcass surfaces, reveal that the acetic acid was more effective against yeasts than moulds;this findings agreed with that reported by **Banwart (1989), Frazier and Westhoff (1995), and Farkas (2001)**. Concerning the decreasing effect of 2.5% potassium sorbate trial on the intensities of surface mould contamination applied in the present work, the obtained decreasing percentage (53.12%) can be emphasized through the finding of **Awad (1994)** who delayed the visible mould growth over the outside surfaces of luncheon sausage, hung at

the ordinary room temperature simulating the market condition, for 24 days after spraying each of them with 5% sorbic acid solution for one minute; together with the finding of **Baldock et al. (1979)** who prevented the mould growth onto cured ham surfaces for 60 days after their spraying with 5 or 10% potassium sorbate solution; in addition to the result of **Sofos and Busta (1981)** who established that the dipping of dry sausage casings in 2.5% potassium sorbate solution could prevent the mould growth over the product surface during drying period. An extremely higher decline percentage (95.04%) in mould population was obtained by **Hassan (2004)** onto the sheep carcass surfaces after their spraying with 0.2% potassium sorbate solution, while lower reduction level in mould contamination (45.68%) was detected by **Abd-Allah (2005)** onto the cattle carcass surfaces after their treatment with a potassium sorbate trial identical to that applied in the present study. Sensory evaluation of the laboratory-treated flaps exhibited no bleaching, discoloration, abnormal odor, or abnormal taste was detected in their meat after spraying each of them with any of 0.27% benzoic acid, 2% acetic acid, and 2.5% potassium sorbate solutions for one minute, because these organic acids and their salts were used in the present study by approved low concentrations.

Collectively, all fungal decontamination trials (abattoir and laboratory ones) applied in this work could reduce the yeast contamination by higher levels than that of mould type onto all the surveyed carcass surfaces. In conclusion, the abattoir (mechanical) decontamination trials are considered the most effective and applicable methods for reducing fungal decontamination on the freshly dressed carcasses at municipal (old-fashioned) abattoirs, whereas the laboratory (chemical) decontamination trials can be done in meat factories.

Results in Table (5) reveal that a total of identified 619 (100%) mould strains belonged to 20 genera could be isolated from all surveyed surfaces before and after decontamination trials, distributed as 109 (17.61%) Penicillium, 104 (16.80%) Aspergillus, 74 (11.95%) Cladosporium, 53 (8.56%) Alternaria, and 51 (8.24%) Moniliella strains at the top, followed by 26 (4.2%) Humicola, 24 (3.88%) Geotrichum candidum, 23 (3.72%) Fusarium, 22 (3.55%) Absidia, 20 (3.23%) Syncephalastrum, and 19 (3.07%) Acremonium strictum strains, together with 16 (2.58%) Stemphylium, 13 (2.1%) Mucor, 12 (1.94%) each of Aureobasidium and Paecilomyces, alongside 9 (1.45%) every of Scopulariopsis and Trichoderma, 8 (1.29%) each of Rhizopus and Botrytis, besides 7 (1.13%) Thamnidium strains. The recovered 104 (100%) Aspergillus strains were further characterized into 11 groups and distributed as 42 (40.38%) A. niger, and 23 (22.12%) A. flavus strains at the top, followed by 9 (8.65%) A. fumigatus, 7 (6.73%) each of A. amstelodami and A. candidus, 5 (4.81%) every of A. sydowii and A. ochraceus, in addition to 2 (1.92%) each of A. clavatus and A. nidulans, alongside 1 (0.96%) every of A. chevalieri and A. wentii (Table, 6). Nearly similar percentages of Penicillium (17.94%), Aspergillus (18.72%), Cladosporium (11.9 & 12.21%), Alter-

naria (8.7 & 8.94%), Geotrichum candidum (3.3 & 3.63%), Fusarium (3.35 & 3.8 & 4.01%), Absidia (3.94%), Mucor (2.1%), Aureobasidium (1.5%), Paecilomyces (2.2%), Scopulariopsis (1.4%), Trichoderma (1%), Rhizopus (1.4%), Botrytis (1.3 & 1.5%), and Thamnidium strains (1.6%) detected onto the surface of cattle and sheep carcasses as well as of fresh meats **(Refai and Loot, 1969; Mansour, 1986; Eldaly et al., 1988; Yassien et al., 1989; Elgazzar, 1992; and Abd-Allah, 2005)**, whereas higher levels of Penicillium (21.5 & 26.11 & 28.49%), Aspergillus (28.7 & 34.6 & 39.66%), Cladosporium (25.5%), Alternaria (10.34%), Moniliella (13.17%), Humicola (12.21%), Geotrichum candidum (14.31%), Absidia (6.8%), Syncephalastrum (5.5%), Acremonium strictum (4.58%), Stemphylium (5.3%), Mucor (4.5 & 8.1%), Aureobasidium (2.5%), Paecilomyces (2.8%), Scopulariopsis (2.2%), Trichoderma (3.94%), Rhizopus (1.6 & 3.94 & 5.2%), Botrytis (2.7%), and Thamnidium strains (3.4%) isolated from the surface of cattle and sheep carcasses alongside of fresh meats plus frozen beef and poultry **(Refai and Loot, 1969; Mansour, 1986; Eldaly et al., 1988; Yassien et al., 1989; Mansour et al., 1990; Elgazzar, 1992; and Abd-Allah, 2005)**, on the contrary, lower percentages of Penicillium (12.1%), Aspergillus (13.93%), Cladosporium (5 & 6.42%), Alternaria (0.95 & 2.1 & 3.3%), Geotrichum candidum (0.49 & 1.2%), Fusarium (1.7 & 2.46%), Acremonium strictum (0.5 & 2.4%), Stemphylium (0.19%), Mucor (0.38 & 0.98%), Aureobasidium (0.38%), Scopulariopsis (1.15%), Trichoderma (0.5%), and Thamnidium strains (0.1%) determined over the surface of cattle and sheep carcasses together with fresh meats **(Refai and Loot, 1969; Mansour, 1986; Eldaly et al., 1988; Yassien et al., 1989; Elgazzar, 1992; and Abd-Allah, 2005)**. On the other hand, approximately analogous percentages of A. niger (42.2%), A. flavus (19.18%), A. candidus (7.1%), A. nidulans (2.47%), and A. chevalieri strains (1.37%) estimated onto cattle carcass surfaces **(Elgazzar, 1992 and Abd-Allah, 2005)**, however, higher levels of A. niger (49.32%), A. fumigatus (11.7%), A. amstelodami (13.7%), A. candidus (14.7%), A. sydowii (12.2%), A. clavatus (16.7%), A. chevalieri (3.4%), and A. wentii strains (2.4%) isolated from the surface of cattle carcasses as well as of frozen beef and poultry **(Abdel-Rahman et al., 1985; Elgazzar, 1992; and Abd-Allah, 2005)**, while, lower percentages of A. flavus (5.63 & 17.6%), A. fumigatus (1.37%), A. amstelodami (4.5%), A. candidus (2.47%), and A. ochraceus strains (3.9 & 4.11%) detected over cattle carcass surfaces **(Eldaly et al., 1988; Elgazzar, 1992; and Abd-Allah, 2005)**.

Table (1): Number and percentage of yeast - and mould-contaminated swab samples taken from the outside surface of surveyed sheep carcasses; before and after decontamination trials (n = 10 for each surface site at every condition of carcasses and flaps).

Examined sites and contaminated samples / Condition of examined carcasses and flaps	Round		Flank		Shoulder		Neck		Abdominal flap	
	Yeast samples	Mould samples	Yeast samples	Mould samples	Yeast samples	Mould samples	Yeast samples	Mould samples	Yeast samples	Mould samples
After dressing "without any decontamination trial".	10(100%)	10(100%)	10(100%)	10(100%)	10(100%)	10(100%)	10(100%)	10(100%)	10(100%)	10(100%)
After dressing and hose-spraying with tap water for one minute.	8(80%)	9(90%)	9(90%)	10(100%)	9(90%)	9(90%)	10(100%)	10(100%)	Not applied	
After dressing and hose-spraying with tap water for one minute followed by wiping with sterilized cloth.	5(50%)	7(70%)	7(70%)	8(80%)	6(60%)	8(80%)	8(80%)	9(90%)	Not applied	
After spraying with 0.27% benzoic acid for one minute.	Not applied		Not applied		Not applied		Not applied		4(40%)	5(50%)
After spraying with 2% acetic acid for one minute.	Not applied		Not applied		Not applied		Not applied		5(50%)	8(80%)
After spraying with 2.5% potassium sorbate for one minute.	Not applied		Not applied		Not applied		Not applied		8(80%)	8(80%)

n = Number of tested samples.

Table (2): Intensity of yeast contamination per each cm^2 of the outside surface of surveyed sheep carcasses, before and after decontamination trials (n = 10 for each surface site at every condition of carcasses and flaps).

Examined sites and number of yeast propagules / Condition of examined carcasses and flaps	Round			Flank			Shoulder			Neck			Abdominal flap		
	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.
After dressing "without any decontamination trial".	21	203	90.50 ± 18.11	14	137	69.01 ± 14.76	33	260	152 ± 29.08	47	310	192.50 ± 39.10	12	250	70.28 ± 18.36
After dressing and hose-spraying with tap water for one minute.	-	138	51.07± 10.06	-	89	32.05± 7.00	-	79	60.09 ± 12.12	5	99	58.21± 13.00	Not applied		
After dressing and hose-spraying with tap water for one minute followed by wiping with sterilized cloth.	-	52	28.16 ± 4.22	-	28	11.20 ± 2.86	-	19	10.08 ± 2.66	-	41	20.19± 5.26	Not applied		
After spraying with 0.27% benzoic acid for one minute.	Not applied			Not applied			Not applied			Not applied			-	29	16.99± 5.0
After spraying with 2% acetic acid for one minute.	Not applied			Not applied			Not applied			Not applied			-	34	18.03 ± 4.98
After spraying with 2.5% potassium sorbate for one minute.	Not applied			Not applied			Not applied			Not applied			-	55	26.91 ± 8.72

n = Number of tested samples. Min. = Minimum. Max. = Maximum. S.E. = Standard error.

Table (3): Intensity of **mould contamination** per each cm^2 of the outside surface of surveyed sheep carcasses, before and after decontamination trials (n = 10 for each surface site at every condition of carcasses and flaps).

Examined sites and number of mould propagules / Condition of examined carcasses and flaps	Round			Flank			Shoulder			Neck			Abdominal flap		
	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.	Min.	Max.	Mean± S.E.
After dressing "without any decontamination trial".	17	204	116 ± 21.93	35	181	79.23 ± 19.07	20	316	94.50 ± 21.89	33	349	101.9± 22.31	14	127	49.06 ± 12.08
After dressing and hose-spraying with tap water for one minute.	-	90	44.05 ± 9.16	9	107	43.01± 9.96	-	198	47.95 ± 11.01	24	210	67.86± 16.05	Not applied		
After dressing and hose-spraying with tap water for one minute followed by wiping with sterilized cloth.	-	63	27.10 ± 6.98	-	83	31.00 ± 7.09	-	147	30.85 ± 7.06	-	166	50.07± 13.04	Not applied		
After spraying with 0.27% benzoic acid for one minute.	Not applied			Not applied			Not applied			Not applied			-	49	28.08 ± 3.07
After spraying with 2% acetic acid for one minute.	Not applied			Not applied			Not applied			Not applied			-	70	26.01 ± 5.96
After spraying with 2.5% potassium sorbate for one minute.	Not applied			Not applied			Not applied			Not applied			-	91	23.00 ± 4.99

n = Number of tested samples. Min. = Minimum. Max. = Maximum. S.E. = Standard error.

Table (4): Reduction percentages* of yeast and mould contamination on the outside surface of surveyed sheep carcasses after decontamination trials (n = 10 for each surface site at every condition of carcasses and flaps).

Examined sites and reduced contaminants / Type of decontamination trials	Round		Flank		Shoulder		Neck		Abdominal flap	
	Yeasts	Moulds	Yeasts	Moulds	Yeasts	Moulds	Yeasts	Moulds	Yeasts	Moulds
Hose-spraying with tap water for one minute.	55.72%	43.57%	53.56%	45.72%	60.47%	49.26%	69.76%	33.41%	Not applied	
Hose-spraying with tap water for one minute followed by wiping with sterilized cloth.	85.46%	68.88%	83.77%	60.87%	93.37%	67.35%	89.51%	50.86%	Not applied	
Spraying with 0.27% benzoic acid for one minute.	Not applied		Not applied		Not applied		Not applied		75.83%	42.76%
Spraying with 2% acetic acid for one minute.	Not applied		Not applied		Not applied		Not applied		74.35%	46.98%
Spraying with 2.5% potassium sorbate for one minute.	Not applied		Not applied		Not applied		Not applied		61.71%	53.12%

n = Number of tested samples. * Reduction percentage equal to the % of mean value of the contamination intensity that lost after decontamination trial.

Table(5): Type, number, and percentage of mould strains isolated from the outside surface of round, flank, shoulder, neck, and abdominal flap of surveyed sheep carcasses, before and after decontamination trials.

Mould genera	No. and % of mould strains
Penicillium	109 (17.61%)
Aspergillus	104 (16.80%)
Cladosporium	74 (11.95%)
Alternaria	53 (08.56%)
Moniliella	51 (08.24%)
Humicola	26 (04.20%)
Geotrichum candidum	24 (03.88%)
Fusarium	23 (03.72%)
Absidia	22 (03.55%)
Syncephalastrum	20 (03.23%)
Acremonium strictum	19 (03.07%)
Stemphylium	16 (02.58%)
Mucor	13 (02.10%)
Aureobasidium	12 (01.94%)
Paecilomyces	12 (01.94%)
Scopulariopsis	9 (01.45%)
Trichoderma	9 (01.45%)
Rhizopus	8 (01.29%)
Botrytis	8 (01.29%)
Thamnidium	7 (01.13%)
Total	619 (100%)

Table(6): Type, number, and percentage of aspergilli isolated from the outside surface of round, flank, shoulder, neck, and abdominal flap of surveyed sheep carcasses, before and after decontamination trials.

Aspergillus groups	No. and % of aspergilli
A. niger	42 (40.38%)
A. flavus	23 (22.12%)
A. fumigatus	9 (08.65%)
A. amstelodami	7 (06.73%)
A. candidus	7 (06.73%)
A. sydowii	5(04.81%)
A. ochraceus	5(04.81%)
A. clavatus	2 (01.92%)
A. nidulans	2 (01.92%)
A. chevalieri	1 (00.96%)
A. wentii	1 (00.96%)
Total	104 (100%)

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الملخص العربى

محـــاولات لإزالـــة التلـــوث الفطـــرى على ذبائـــح الغنـــم

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نظراً لتواجد الفطريات (الخمائر والأعفان) فى كل مكان يحيط بأسطح ذبائح حيوانات اللحم أثناء تجهيزها : فى محتوى الأمعاء والكرش وكذلك على سطح جلد الحيوان الخارجى وفى أجواء المجزر المحيطة بتلك الذبائح (الهواء - الماء - الأرضيات والجدران الخاصة بصالة الذبح) وأيضاً على أيدى وملابس العاملين بالمجزر وعلى السكاكين، لذلك فإنه من المستحيل تجنب وجود هذا التلوث على أسطح الذبائح لاسيما إذا كانت عمليات الذبح والسلخ والتجويف لحيوانات تلك الذبائح تتم بطريقة غير صحية فى معظم مجازرنا المنتشرة فى أنحاء الجمهورية، ولما كان إنتاج لحوم نظيفة ذات مستويات متدنية من التلوث الميكروبى بصفة عامة والفطرى بصفة خاصة هو من صميم أهداف الرقابة الصحية على اللحوم، لذا كان ضرورياً إستنباط طرق علمية وتطبيقية واقتصادية من أجل إزالة معظم التلوث الفطرى من فوق الذبائح الملوثة در اً لمخاطره الاقتصادية والصحية.

تناولت الدراسة الاختبار الفطرى للأسطح الخارجية لعشرين ذبيحة غنم عن طريق المسح الثلاثى لكل عينة (سطح) قبل وبعد محاولات إزالة التلوث الفطرى من عليه، وتم تمثيل كل عينة مختبرة بعدد ثلاث ممسحات (قطن - شاش) متتالية لاقتطاف أكبر عدد من بذيرات التلوث الفطرى الموجودة على أسطح الفخذ والخاصرة والكتف والرقبة لكل ذبيحة من جملة عشرة ذبائح علاوة على سطح لحم البطن الخارجى لكل ذبيحة من جملة عشرة ذبائح أخرى، تم أخذ عينات العشرة ذبائح الأولى فى المجزر بينما عينات العشرة ذبائح الأخرى فى المعمل بعد قطعها من ذبائحها بالمجزر ونقلها فى كيس نظيف ثم تقسيمها إلى أربعة أجزاء صغيرة، وقد تم إجراء خمسة محاولات لإزالة التلوث الفطرى من على أسطح ذبائح الغنم، إثنتان منهم فى المجزر وهما : (١) رش كل السطح الخارجى للذبيحة فور تجهيزها بخرطوم موصل بمياه الصنبور "مياه البلدية" لمدة دقيقة واحدة، (٢) رش كل السطح الخارجى للذبيحة فور تجهيزها بخرطوم موصل بمياه الصنبور "مياه البلدية" لمدة دقيقة واحد ثم تنظيف وتجفيف هذا السطح بمسحة بفوطة قطنية معقمة (١×١م) حتى إزالة معظم التلوث المرئى من عليه، بينما كانت الثلاث محاولات الأخرى فى المعمل وهى : (١) رش كل السطح الخارجى لقطعة لحم البطن الصغيرة بمحلول حامض البنزويك (٢٧ر٠٪) لمدة دقيقة واحدة، (٢) رش السطح الخارجى لقطعة لحم البطن الصغيرة بمحلول حامض الخليك (٢٪) لمدة دقيقة واحدة، و(٣) رش السطح الخارجى لقطعة لحم البطن الصغيرة بمحلول سوربات البوتاسيوم (٥ر٢٪) لمدة قطعة واحدة.

وقد أظهرت أطباق دايكلوران روزبنجال كلورامفنيكول الأغار للعد الفطرى تواجد أجناس الخمائر والأعفان المختلفة فى جميع عينات الممسحات المختبرة (١٠٠٪) قبل محاولات إزالة التلوث الفطرى من على أسطح الذبائح بينما انخفض هذا التواجد ليكون ٨٠ - ١٠٠٪ من عينات الأسطح المختبرة فى المجزر بعد رش كل السطح الخارجى للذبيحة فور تجهيزها بخرطوم موص بمياه الصنبور "مياه البلدية" لمدة دقيقة واحدة بينما تراجعت نسبة تواجد الخمائر إلى ٥٠-٨٠٪ والأعفان إلى ٧٠-٩٠٪ على تلك الأسطح بعد رش كل السطح الخارجى للذبيحة فور تجهيزها بخرطوم موصل بمياه الصنبور "مياه البلدية" لمدة دقيقة واحدة ثم تنظيف وتجفيف هذا السطح بمسحة بفوطة قطنية معقمة (١×١م) حتى إزالة معظم التلوث المرئى من عليه، فى حين تراوحت نسب تواجد الخمائر والأعفان فى عينات أسطح قطع لحم البطن التى تم إختبارها فى المعمل مابين ٤٠ و ٥٠٪، ٥٠ و ٨٠٪ (لكل منهما) بعد رش كل واحد من تلك الأسطح بمحلول حامض البنزويك (٢٧ر٠٪) ومحلول

حامض الخليك (٢٪) ومحلول سوريات البوتاسيوم (٥ر٢٪) كل على حدا لمدة دقيقة واحدة على الترتيب.

وسجلت قيم متوسطات أعداد الخمائر والأعفان لكل سنتيمتر مربع من السطح الخارجي للفخذ والخاصرة والكتف والرقبة قبل محاولات إزالة التلوث الفطرى من عليه ٥ر٩٠ & ١١٦ و ٦٩ر٠١ & ٧٩ر٢٣ و ١٥٢ & ٥ر٩٤ و ١٩٢ر٥ & ١٠١ر٩ بذيرة فُطرية / سم٢، بينما تضاءلت تلك القيم إلى ٥١ر٠٧ & ٤٤ر٠٥ و ٣٢ر٠٥ & ٤٣ر٠١ و ٦٠ر٠٩ & ٤٧ر٩٥ و ٥٨ر٢١ & ٦٧ر٨٦ بذيرة فُطرية / سم٢ بنسب انخفاض مئوية مقدارها ٥٥ر٧٢ & ٥٧ر٤٣٪ و ٥٣ر٥٦ & ٤٥ر٧٢٪ و٤٧ر٦٠ & ٤٩ر٢٦٪ و ٦٩ر٧٦ & ٤١ر٣٣٪ على تلك الأسطح بعد رش كل سطح خارجي للذبيحة المختبرة فور تجهيزها بخرطوم موصل بمياه الصنبور "مياه البلدية" لمدة دقيقة واحدة، فى حين انخفضت تلك الأعداد إلى حد كبير لتصبح ٢٨ر١٦ & ٢٧ر١٥ و ١١ر٢٠ & ٣١ر٠ و ٨٠ر٠ & ٣٠ر٨٥ و ٢٠ر١٩ & ٥٠ر٠٧ بذيرة فُطرية /سم٢ بنسب انخفاض مقدارها ٤٦ر٨٥ & ٦٨ر٨٨٪ و ٧٧ر٨٣ & ٨٧ر٦٠٪ و ٣٧ر٩٣ & ٣٥ر٦٧٪ و ٥١ر٨٩ & ٨٦ر٥٠٪ على التوالى بعد رش كل السطح الخارجي للذبيحة فور تجهيزها بخرطوم موص بمياه الصنبور "مياه البلدية" لمدة دقيقة واحدة ثم تنظيفه وتجفيفه بفوطة قطنية معقمة (١×١م) حتى إزالة معظم التلوث المرئى من عليه من ناحية أخرى كانت متوسطات أعداد الخمائر والأعفان لكل سنتيمتر مربع من السطح الخارجي للحم البطن قبل محاولات إزالة التلوث من عليه فى المعمل ٢٨ر٧٠ & ٠٦ر٤٩ بذيرة فُطرية فى حين تراجعت تلك المتوسطات إلى ٩٩ر١٦ & ٠٨ر٢٨ و ٠٣ر١٨ & ٠١ر٢٦ و ٩١ر٢٦ & ٠ر٢٣ بذيرة فطرية بعد الرش المنفرد لكل من الأسطح المختبرة بمحلول حامض البنزويك (٢٧ر٠٪) ومحلول حامض الخليك (٢٪) ومحلول سوريات البوتاسيوم (٥ر٢٪) لمدة دقيقة واحدة، تطابقت مع نسب انخفاض مئوية مقدارها ٨٣ر٧٥ & ٧٦ر٤٢٪ و ٣٥ر٧٤ & ٩٨ر٤٦ و ٧١ر٦١ & ١٢ر٥٣٪، على الترتيب.

وقد أمكن عزل وتصنيف ٦١٩ (١٠٠٪) عترة عفن من جميع الأسطح المختبرة كانت تنتمى إلى ٢٠ جنس مختلفة، كان توزيعها كالتالى ١٠٩ (١٧ر٦١٪) بنيسليوم و١٠٤ (١٦ر٨٠٪) اسبيرجلس و٧٤ (١١ر٩٥٪) كلادوسبوريوم و٥٣ (٨ر٥٦٪) ألترناريا و٥١ (٨ر٢٤٪) مونيليللا و٢٦ (٤ر٢٪) هيوميكولا و٢٤ (٣ر٨٨٪) جيوتريكم كانديدم و٢٣ (٣ر٧٢٪) فيوزاريام و٢٢ (٣ر٥٥٪) أبذيديا و ٢٠ (٣ر٢٣٪ سبنسفلسترم و ١٩ (٣ر٠٧٪) أكريمونيوم ستركتم و١٦ (٢ر٥٨٪) ستمفيليام و١٣ (٢ر١٪) ميكور و١٢ (١ر٩٤٪) كل من أريوبازيديوم وباسيلومايسز و٩ (١ر٤٥٪) كل من سكوبيولاريوبسس وترايكوديرما و ٨ (١ر٢٩٪) كل من رايزوبس وبوتريتس و٧(١ر١٣٪) ثامنيديوم. كما أسفر التصنيف التفصيلى لعترات أسبيرجلس التى تم عزلها من جميع الأسطح المختبرة وعددها ١٠٤ عترة (١٠٠٪) عن وجود ٤٢ (٤٠ر٣٨٪) أسبيرجلس نيجر و٢٣ (٢٢ر١٢٪ أسبيرجلس فلافس و٩ (٨ر٦٥٪) أسبيرجلس فيوميجاتس و ٧ (٦ر٧٣٪) كل من أسبيرجلس أمستيلودامى وأسبيرجلس كانديدس و ٥ (٤ر٨١٪) كل من أسبيرجلس سيدواى وأسبيرجلس أوكريشياس و٢ (١ر٩٢٪) كل من أسبيرجلس كلافتس وأسبيرجلس نيديولانز بالإضافة إلى ١(٠ر٩٦٪) كل من أسبيرجلس شيفاليرى وأسبيرجلس ونتياى.