

Using Microwave as a Decontaminated Equipment for Frozen Sheep Meats

Nadia Ibrahim Abdul aali, Dahfer Abed Ali Alobaidi

Department of Public Health / College of Veterinary Medicine / University of Baghdad

Abstract: This study was carried out at the college of veterinary medicine, University of Baghdad, for three months, the aim of the present study was to investigate the effect of different times of microwave oven on the freezing sheep meat to reduced limited of bacteria on meat, Exposure three periods of microwave (10, 15 and 20) seconds. The data obtained revealed the following results: were significant differences ($P < 0.05$) between the means of bacterial count before exposure of microwave were limited of ranges (5.30 – 5.51) log cfu/g meat and total coliform were ranges (1.88 – 2.04) log cfu/g meat. The third times of exposure of microwave (25) seconds were significant difference ($p < 0.05$) between the data count, were reduced total of bacterial count for above 1.2 log were range (4.06 – 4.17) log cfu/g meat and total coliform were range (0.27 – 0.62) log cfu/g meat.

Keywords: Microwave, frozen sheep meat, Total bacterial count

1. Introduction

The microwave oven is one of the great inventions of the 20th century; over 90% of homes in America have at least one. Microwave ovens can play an important role at mealtime, but special care must be taken when cooking or reheating meat, poultry, fish, and eggs to make sure they are prepared safely (1; 2). Microwave ovens can cook unevenly and leave “cold spots” where harmful bacteria can survive. For this reason, it is important to use a food thermometer and test food in several places to be sure it has reached the recommended safe temperature to destroy bacteria and other pathogens that could cause food borne illness. Bacteria will be destroyed during microwave cooking just as in other types of ovens, so food is safe cooked in a microwave oven. However, the food can cook less evenly than in a conventional oven. Microwave cooking can be uneven just as with frying and grilling.

Microwaves refer to the electromagnetic waves in the frequency range of 300 to 300,000 megahertz (3;4). The use

of microwave oven provides a convenient way to thaw, cook and reheat foods.

Microwave relies on the same heating principle as radiofrequency heating but it uses higher frequencies. The permitted frequency bands for microwave are 433, 915, 2,450 and 5,800 MHz, as specified by the US FCC. Therefore, microwave at 915 MHz is more suitable for heating thick masses of materials such as red meats (5;6). Microwave has previously been studied for its effectiveness in destroying bacteria and extending the shelf life of meat products (7;8;9;10). It was found that bacterial counts were reduced by 1-2 log cfu/g in beef samples after exposure to microwave for 20-30 seconds. Heating by MW energy is used for several purposes, e.g., cooking, pasteurization, sterilization and blanching of foods (11;12; 13;14).

The short time of exposure of heat microwave were best for meat to reduce of bacteria ranges of times from (20 - 30) seconds, total bacterial count (14;15). heated in a microwave oven, bacterial counts were reduced by 1 log cycle in 20 s and by 2 log cycles in 30 s exposure (16; 17).

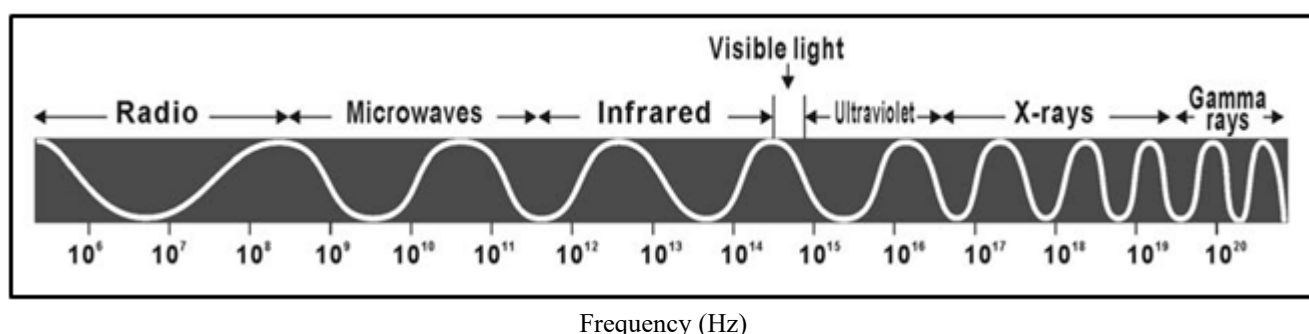


Figure 1: Electromagnetic waves spectrum. Resource (3;4)

2. Material & Methods

Collection of meat samples:

The sample of meat was from imported frozen sheep meat. Collected from local super market. Number of samples fifty-six sample (was means 10X 3 frequency). Storage the

samples in the laboratory, in the freezer (18-) °C, before beginning the bacteriological test.

Microwave irradiation:

A home microwave oven 2450 MHz - 900 W, Kelvinator (model 1.5CU, FT), different times of radiation (10, 15 and 25 sec)

Dilution of samples for bacteriological test

Made the serial dilutions firstly, from initial 10^1 to 10^6 , the bottle dilutions Content peptone water (1%) 90ml and other bottles content peptone water 9ml this bottles dilution sterilization in autoclave 121°C for 15minutes.add 10 grams from meat samples to first bottle dilute content 90ml peptone water to make 10^1 then tacked 1ml to second bottle to made 10^2 and then made other dilutions to 10^6 .

Bacteriological tests

Total bacterial count or total plate count (T.P.C.) described from (19), after made the dilutions add 1ml from bottle dilution 10^1 to multiple Petri dish content media culture (nutrient agar) and 1ml from other dilutions to multiple petri dish, then incubate at 37°C for overnight (24 Hour), then count the colony of culture of bacteria ranges (30 – 300): -

Count of bacteria (CFU)/gr meat= mean colony culture X dilute factor⁻¹

Total coliform count: described from (19), Petri dish content media culture(VRBA) violet red bile agar and 1ml from other dilutions to multiple petri dish, then incubate at 37°C for overnight (24 Hour), then count the colony of culture of bacteria ranges (15 – 150): -

Total coli form count(CFU)/gr meat= mean colony culture X dilute factor⁻¹

Statistical Analysis

The results were analyzed statistically, determining using completely randomized design (CRD). The significance of differences between groups was verified by the Duncan multiple range test; Levels of significance non-significant (ns), $p < 0.05$, using SAS program (20).

RESULTS & DISCUSSION

Table (1) shows the total bacterial load of untreated with microwave and treated with microwave in frozen sheep meat at -18°C exposure short times for 0, 15 ,20 and 25 seconds. The means of total bacterial counts were significant difference ($p < 0.05$) between the data before exposure of microwave were range (5.30 – 5.51) cfu /g meat. The total bacterial counts decreased with the increase of the microwave -irradiation from 10 ,15 and 25 seconds. The means of total bacterial count at the 10 and 15 seconds of exposure to microwave were range (5.08 – 5.39) cfu/g meat and (5.10 – 5.50), the decrease of bacterial count was a little

of the total bacterial count compare with total bacterial count before exposure.the means of total bacterial count at the 25 seconds of exposure to microwave were range (4.06 – 4.17) cfu/g meat, were reduced the bacterial count to 1.20 log of bacteria.

The mean values of total aerobic bacterial counts that mentioned in Table 1, were similar to the results obtained by the other researchers for exposure of the frozen meat (9;10;and 12).when heated in a microwave oven, bacterial counts were reduced by 1 log cycle in 20s.

Table (2) shows the total coliform of untreated with microwave and treated with microwave in frozen sheep meat at -18°C exposure short times for 0, 15 ,20 and 25 seconds. The means of total coliform counts were significant difference ($p < 0.05$) between the data before exposure of microwave were range (1.88 – 2.04) cfu /g meat. The total coliform counts decreased with the increase of the microwave -irradiation from 10 ,15 and 25 seconds. The means of total coliform count at the 10 and 15 seconds of exposure to microwave were range (1.67 – 1.95) cfu/g meat and (1.45– 1.80), the decrease of bacterial count was a little of the total coliform count compare with total coliform count before exposure. the means of total coliform count at the 25 seconds of exposure to microwave were range (0.28– 0.62) cfu/g meat, were reduced the bacterial count to 1.20 log of bacteria.

The mean values of total coliform counts that mentioned in Table 2, were similar to the results obtained by the other researchers for exposure of the frozen meat (13;14; and 15).

An overall conclusion on the basis of this investigation pointed out that the microwave -irradiation from 10 ,15 seconds not good to reduce the bacterial counts in the frozen sheep meats (17;18).

The mean values of total aerobic bacterial counts and total coliform counts that mentioned in Table 1 ,2 and were similar to the results obtained by the other researchers for the microwave -irradiation at 25 seconds the frozen sheepmeat (9;10;11and 12). the microwave -irradiation 25 seconds was the best exposure of irradiation to reduce the mean values of total aerobic bacterial counts and total coliform counts (table1 ;2).

Table 1: Means of bacterial count(cfu)/gm meat before exposure of microwave and after exposure of different times of microwaves oven (0, 15 ,20 and 25) seconds

Origin (Frequency)	Means of bacterial count(cfu)/gm meat before exposure of microwave	Means of bacterial count after exposure of different times of microwaves oven (cfu)/gm meat		
		10 seconds	15 seconds	25 seconds
Australia (6)	$5.30^A \pm 0.07$	$5.34^A \pm 0.08$	$5.09^B \pm 0.05$	$4.06^C \pm 0.04$
New Zealand (6)	$5.32^A \pm 0.06$	$5.23^{AB} \pm 0.06$	$5.08^B \pm 0.04$	$4.06^C \pm 0.04$
UAE (3)	$5.51^A \pm 0.04$	$5.39^{AB} \pm 0.05$	$5.28^B \pm 0.06$	$4.17^C \pm 0.07$
Moldavia (3)	$5.48^A \pm 0.03$	$5.37^{AB} \pm 0.04$	$5.26^B \pm 0.04$	$4.14^{bc} \pm 0.05$
Significant	$P < 0.05$	$P < 0.05$	$P < 0.05$	$P < 0.05$

Table 2: Means of Total coliform count before exposure of microwave and after exposure of different times of microwaves oven (0, 15, 20 and 25) seconds

Origin (Frequency)	Means of total coliform count(cfu)/gm meat before exposure of microwave	Means of Total coliform count after exposure of different times of microwaves oven (cfu)/gm meat		
		10 seconds	15 seconds	20 seconds
Australia (6)	1.90 ^A ±0.06b	1.73 ^A ±0.09b	1.45 ^C ±0.07b	0.47 ^D ±0.09b
New Zealand (6)	1.91 ^A ±0.01ab	1.71 ^B ±0.01b	1.46 ^C ±0.1b	0.27 ^D ±0.03c
Moldavia (3)	2.04 ^A ±0.05a	1.95 ^A ±0.01a	1.80 ^A ±0.04 a	0.62 ^C ±0.05 a
UAE (3)	1.88 ^A ±0.03b	1.67 ^B ±0.03	1.47 ^C ±0.02b	0.28 ^D ±0.02c
Significant	P<0.05	P<0.05	P<0.05	P<0.05

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