

THE HYGIENIC EFFECT OF IODOPHOR ON AIR AND WATER QUALITIES WITH THEIR REFLECTION ON BROILER PERFORMANCE

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SUMMARY

Four hundred apparently healthy white "Arbor Acres" one-day-old chicks were housed under appropriate hygienic conditions on deep litter system. At the one week age, the birds were divided into 4 groups [control, (G-A), (G-B), (G-C)] each of 100 birds.

Starting from this age "one week old" until the age of "42 days", group (A) received drinking water containing 25-ppm active iodine, group (B) received the same sanitizing drinking water (25-ppm active iodine) beside aerosolized 10-ppm active iodine (50 ml. of 10-ppm iodine / 10 m² space area) and this aerosolization of iodine was done twice / week. Group (C) was only aerosolized with 10-ppm active iodine with the same previous amount. The control group received fresh water without additional improvement with the iodine and was away from the iodine aerosolization.

After using the iodine as a sanitizer for water and air, the mean values of total bacterial and coliform counts in water and also the mean value of total bacterial count in air showed highly significant difference ($P < 0.001$) in comparison with control group.

All broilers' groups, including control one, showed good performance (over 150) according to the modified European Performance Factor "MEPF". Also, the average final body weight and the feed utilization efficiency were nearly equal in all groups. However, group-B in which both air and water were sanitized with iodine, revealed numerical superiority with respect to final body weight (20 grams more than the control group), average FUE (1.93) and the MEPF (203.6) than the other groups.

It could be recommended to use iodine as an air sanitizer (at 10-ppm concentration), at the same time with its use as a water sanitizer (with 25-ppm concentration), in addition of improvement of broilers' performance.

INTRODUCTION

The use of disinfectants during rearing of birds will help in control of microorganisms' exist in poultry farms, so that the biosecurity measures are supported and continuing in keeping flock in its highest optimum condition.

Iodophor refers to a combination of iodine with a solubilizing agent, which is a certain type of surfactants that have detergent properties. This complex enhances the bactericidal activity of iodine and renders it nontoxic, nonirritating and non-staining when used as directed (Gerschenfeld, 1977 and Bermudez, 2003).

Iodine is a widely and popular sanitizer for poultry drinking water due to its low toxicity, low pH and it is not affected by hard water or other chemicals such as detergents and acids (Brown, 1996 and Jansen, 2001).

Iodine was approved practically to sanitize poultry drinking water in a level ranged from 2 to 25-ppm and found to improve growth and performance of birds (Krueger et al., 1981, Stanley et

al., 1989, Emeash et al., 1994, Zamzam et al., 1994, Webster et al., 1994, Maclean and Crober, 1997 and McNaughton, 2003).

This work was planned to investigate the possible use of iodophor as aerosolized disinfectant to control air-borne microorganisms beside its use as water sanitizer with the reflection on broiler performance.

MATERIALS & METHODES

This work was conducted in Animal Research Center, Fac. of Vet. Med., Cairo University.

Rearing place:

The chicks were reared in an open built-up litter house, which was thoroughly cleaned and disinfected prior to receiving the chicks. The floor covered by a uniform layer of finely chopped wheat straw (5-7 cm) thickness. The temperature and relative humidity were thermostatically controlled all over the experiment and according to the recommended standards.

Birds' vaccination was carried out as follows: Hitchner B1 at 7th day, Gumboro (IBD) at 13th and 19th day and Lasota at the 21st day.

Feeding and watering systems:

Feeding was available ad-libitum through round-ed feeders providing a space of 6 cm/bird. The chicks were fed on a starter corn-soya ration till

the age of 21 days, then a grower corn-soya ration till the end of the experiment period. The rations were formulated in the Animal Research Center, Fac. of Vet. Med., Cairo University.

Birds were supplied with chlorinated drinking water (municipal tap water) and watering was done with the manual bell shaped drinkers of 4-liter capacity.

The used disinfectant:

A commercial disinfectant under the name of Iodis® (Preserve Int. Co. USA) was used in this experiment. Its active ingredient is iodophor 1.75%.

Experimental work:

Four hundred apparently healthy white "Arbor Acres" one-day-old chicks were housed under appropriate hygienic conditions on deep litter system. At the one week age, the birds were divided into 4 groups [control, (G-A), (G-B), (G-C)] each of 100 birds (stocking density was 10 birds/m²).

Starting from this age (one week old) until the age of "42 days", the different groups subjected to the following proceedings:

Group A (water sanitation)	Group B (water & air sanitation)	Group C (air sanitation)
25-ppm active iodine in drinking water (twice/day)	- 25-ppm active iodine in drinking water (twice / day). + - Aerosolized 50 ml. of 10-ppm active iodine / 10 m ² (twice / week)	Aerosolized 50 ml. of 10-ppm active iodine / 10 m ² (twice / week).

The control group received fresh water without additional improvement with the iodine and was away from the iodine aerosolization.

Iodophor dilution was freshly prepared daily and kept in sealed plastic containers and added to drinkers twice each day.

N.B: Iodine was not used 48 hours prior to and 24 hours after vaccination.

Water Sampling:

Five samples, each of 100-ml. were collected weekly from the drinkers of groups (A, B and the control) in a sterile glass flask after 1 hour from the addition of iodine. Samples were immediately transferred to the laboratory for bacteriological examination.

Air Sampling:

Air samples were collected twice / week from the control group, beside groups (B and C), using settle plate method (open nutrient agar plates) before and after 10 minutes from iodine aerosolization.

Bacteriological examination:

A- The total bacterial colony count (using nutrient agar medium) and total coliform count (using the multiple tube fermentation technique, with the MacConkey broth and agar media) were carried out on each collected water sample according to APHA., 1989.

B- The average total bacterial colony count was carried out on the collected air samples.

Bird performance:

Recording the performance parameters started at the end of the 1st week and was done weekly until the end of the 6th week of the trial.

A random sample of 20% of each group was collectively weighed weekly to obtain the average body weight and consequently the average weekly weight gain (gm/bird).

The average weekly feed intake (gm/bird) and the feed utilization efficacy (FUE) were calculated according to Absiekong, 1988 and Yalcin et al., 2004.

The modified European Performance Factor "MEPF" was calculated according to Sainsbury, 1992:

$$\text{MEPF} = \frac{\text{Final body weight (Kg x 10000)}}{\text{Av. FUE x rearing period /day}}$$

Where:

Values < 130 indicate poor performance.

Values from 130-150 indicate average performance.

Values over 150 indicate good performance.

Mortalities of birds were recorded weekly.

Statistical analysis was done according to Ingelfinger et al., 1994. Analytical tests used included unpaired student t-test for comparing means of the two groups. Significance level of 0.05 and 0.01 was used throughout the statistical tests with-

in this study.

Results are recorded in Tables (1 - 3) and Figures (1 - 3).

RESULTS AND DISCUSSION

The effect of sanitizing broiler drinking water with iodine on the microbial load is represented in table (1) and fig. (1 & 2), where the mean value of total bacterial count in water samples obtained from group-A (supplied with 25-ppm iodine in water) was 15×10^5 at the 8th day of age and 20×10^5 at the 15th day of age and both showed significant difference ($p < 0.05$) in comparison with control group at the same levels of age, while starting from the 3rd week of age until the 6th week, the mean value showed highly significant difference ($p < 0.001$) in comparison with the control group.

Concerning group-B (25-ppm iodine in water + 10-ppm aerosolized iodine), the mean value of total bacterial count of water samples revealed highly significant difference ($p < 0.001$) beginning from the 2nd week of age until the 6th week of age.

Also, in table (1), the mean value of total coliform count in water samples obtained from both group A and B, showed highly significant difference ($p < 0.001$) at all levels of birds' age in comparison with the control group.

The effect of iodine aerosolization on the total bacterial count of the air is represented in table (2) and fig. (3), in which there was highly significant difference ($p < 0.001$) in the mean value of total bacterial count of air samples obtained from both group-B (25-ppm iodine in water + 10-ppm aerosolized iodine) and group-C (10-ppm aerosolized iodine) in comparison with the air samples obtained before iodine aerosolized at the same group.

These results of water improvement with iodine sanitizer agree with the findings of Zamzam et al., 1994, Brown, 1996, and Maclean and Crober, 1997.

The reflection of air and water sanitation with iodine on performance parameters of broilers is represented in table (3), where the average final body weight was nearly similar (1635, 1620.5, 1655 and 1625 gram / bird) for all bird groups (control, A, B and C groups, respectively).

Also, the average feed utilization efficiency was nearly equal in control group and groups A and C (2.02, 2.05 and 1.99 respectively), and it was somewhat improved (1.93) in group-B in which both air and water were sanitized with the iodine.

All groups (control, A, B, and C groups) showed good performance (over 150), according to the modified European performance factor (192.7,

188.4, 203.6 and 193.8 respectively) with noticed higher value in group-B (203.6) than other groups.

The mortality rate ranged from 3 to 5 % in all groups without obvious effect of iodine used for water and/or air sanitation than the control group.

The findings concerning group A, in which birds consumed water treated with iodine while no obvious improvement in performance parameters than the control group disagreed with the results recorded by Krueger et al., 1981, Stanley et al., 1989, El-Agrab 1991, Emeash et al., 1994, Zamzam et al., 1994, Webster et al., 1994, Maclean and Crober, 1997 and McNaughton, 2003.

However, group-B in which birds received sanitized water and the air was also sanitized two times/week with iodine, revealed numerical superiority with respect to final body weight (20 grams more than the control group), average FUE (1.93) and the MEPF (203.6) than the other groups.

Conclusively, it could be recommended to use iodine as an air sanitizer (at 10-ppm concentration), at the same time with its use as a water sanitizer (with 25-ppm concentration), in addition of improvement of broilers' performance, which could be concerned as a step on the trial of producing organic-birds (birds free from medications).

Tabel (1): effect of iodine on the microbial load of the broiler drinking water.

Age of birds in days	Mean of total bacterial count (n=5) (CFU/ml*)			Mean of total coliform (n=5) (coliform/100ml water)		
	Control	Group A (25-ppm iodine in water)	Group B (25-ppm iodine in water + 10-ppm aerosolized))	Control	Group A (25-ppm iodine in water)	Group B (25-ppm iodine in water + 10-ppm aerosolized))
8	20x10 ^{5c}	15x10 ^{5a}	8x10 ^{5b}	30x10 ^{2c}	130 ^b	140 ^b
15	23x10 ^{5c}	20x10 ^{5a}	15x10 ^{5b}	30x10 ^{2c}	180 ^b	180 ^b
22	22x10 ^{5c}	20x10 ^{4b}	15x10 ^{4b}	25x10 ^{2c}	160 ^b	180 ^b
29	15x10 ^{5c}	18x10 ^{4b}	20x10 ^{4b}	25x10 ^{2c}	170 ^b	130 ^b
36	8x10 ^{5c}	30x10 ^{4b}	30x10 ^{4b}	35x10 ^{2c}	180 ^b	150 ^b
42	18x10 ^{5c}	15x10 ^{4b}	25x10 ^{4b}	25x10 ^{2c}	180 ^b	180 ^b

Mean in the same row having different superscript a and c, differ significantly P<0.05.
 Mean in the same row having different superscript b and c, differ highly significantly P<0.001.
 * CFU/ml.: Colony Forming Unit/milliliter water.

Tabel (2): effect of iodine aerosolization on the total bacterial count of the air.

Age of birds in days	Mean of total bacterial count (n=5) CFU/10 cm diameter of <i>Petri-dish</i> / 10 minutes.)				
	Control Group	Group B (25-ppm iodine in water + 10-ppm aerosolized)		Group C (10-ppm iodine aerosolized)	
		Before iodine aerosolized	After iodine aerosolized	Before iodine aerosolized	After iodine aerosolized
8	1500	2000	800	2200	500
15	2200	2000	1200	2500	900
22	1800	1500	1000	1800	1000
29	3000	2500	400	2000	700
36	3000	2400	500	1500	800
42	2500	1500	800	1800	800
P*		<0.001 (highly significant)		<0.001 (highly significant)	

P*: Significance difference determined at all levels of birds' age, before and after iodine aerosolized

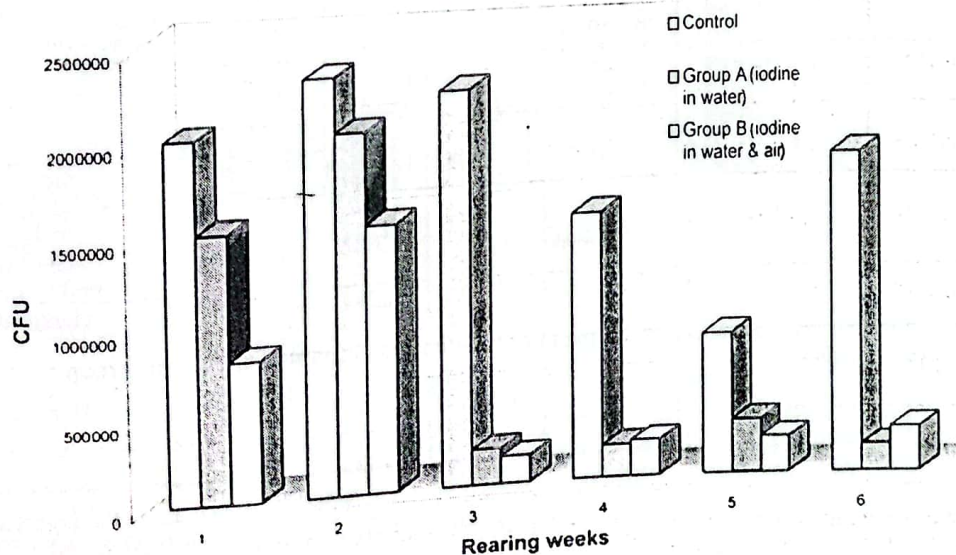


Fig (1): Effect of iodine on the mean of total bacterial count in the broiler drinking water

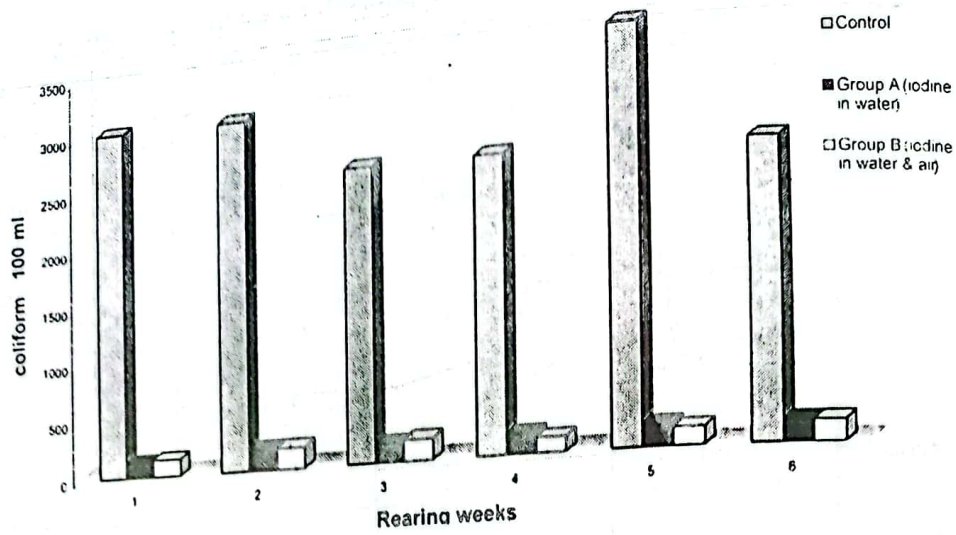


Fig (2): Effect of iodine on the mean of total coliform count of the broiler drinking water

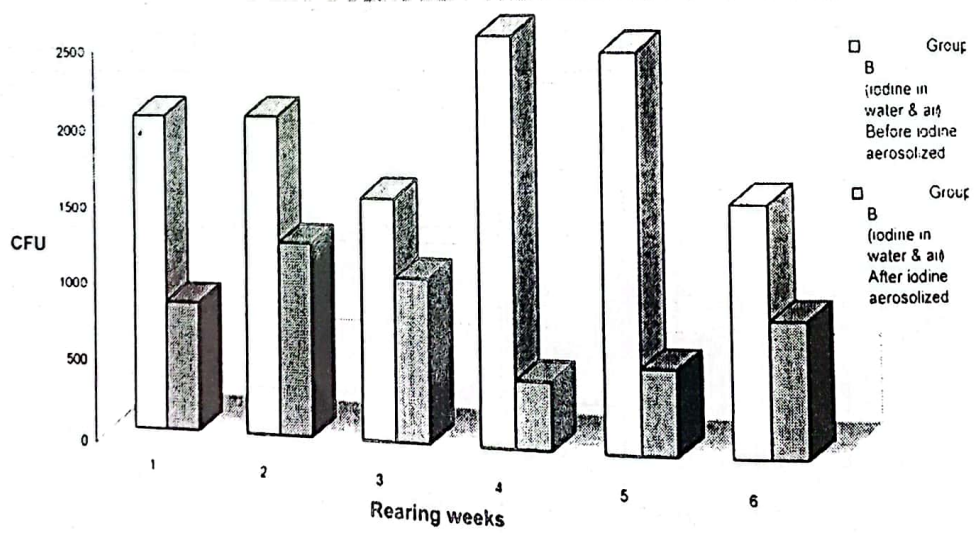


Fig (3): Effect of iodine aerosolization on the mean of total bacterial count of the air in (group B) of broiler birds

Table (3): Reflection of air and water sanitation with iodine on performance parameters of broilers.

Rearing Groups	Age in weeks	Average final body weight (bird/gm)	Average weekly feed intake (bird/gm)	Average weekly weight gain/gm.	*FUE	Average FUE	Mortality rates %	**MEPF
Control group	2	330	260	160	1.62	2.02	4	192.7
	3	590	435	250	1.67			
	4	965.5	680.5	375.5	1.81			
	5	1305.4	798	339.9	2.35			
	6	1635	872.5	329.6	2.65			
Group-A (25-ppm iodine in water)	2	310	255	140	1.82	2.05	5	188.4
	3	540	430.5	230	1.87			
	4	950.5	690	410.5	1.68			
	5	1300	795	349.5	2.27			
	6	1620.5	835	320.5	2.60			
Group-B (25-ppm iodine in water and 10-ppm aerosolized)	2	320.4	258	150.4	1.72	1.93	3	203.6
	3	590.66	425	270.26	1.57			
	4	968.5	644	377.84	1.70			
	5	1315	775.5	346.5	2.24			
	6	1655	832	340	2.45			
Group-C (10-ppm iodine aerosolized)	2	335	248	165	1.50	1.99	3	193.8
	3	580.5	430	245.5	1.75			
	4	940.3	675	359.8	1.88			
	5	1298	793	357.7	2.22			
	6	1625	860	327	2.63			

* FUE: Feed Utilization Efficacy.

**MEPF: Modified European Performance Factor.

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