



EFFECT OF SOME DISINFECTANTS ON MICROBIAL POLLUTION OF WATER IN POULTRY FARMS AT KALIOBIA GOVERNORATE

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ABSTRACT

The present study was carried out to evaluate the efficiency of three water disinfectant (chlorine, iodine and H₂O₂) against total bacterial count, total fungal count and fecal E.coli count in water samples collected from main source of Toukh poultry farms, Kaliobia governorate. Water samples were taken from poultry farm supplied by underground water and examined for total bacterial count, total fungal count, fecal E.coli count and organic matter and found that T.B.C is 500 cfu/ml, T.F.C. was 40 cfu/ml and fecal E.Coli count was 320 cfu/ml and organic matter was 1.3 mg/L. Different concentrations of previously mentioned disinfectants were prepared and applied at different exposure times and the results were as follows: Aquatabs Granules®: give 100% reduction of T.B.C. and fecal E.coli at concentration of 25 g/L at exposure time 30 min., while give 100% reduction of T.F.C. at concentration of 30 g/L at exposure time 60 min.. Virkon-S®: give 100% reduction of T.B.C. and fecal E.coli at concentration of 1 g/L at exposure time 30 min., while give 100% reduction of T.F.C. at concentration of 2 g/L at exposure time 60 min. Iodoblex®: give 100% reduction of T.B.C and fecal E.coli at concentration of 10 ml/L at exposure time 30 min., while give 77.5% reduction of T.F.C. at concentration of 10 ml/L at exposure time 30 min.

KEY WORDS: Chlorine, E.coli, Hydrogen peroxide, Iodine, Poultry.

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1. INTRODUCTION

Poultry industry started great revolution as a result of an increased egg and meat demand. Accordingly, it caused spreading of intensive methods of production that needs improving of poultry management to achieve ideal environment as possible. This takes place by paying great attention to all vehicles that enter the farm, this comes with agreement with biosecurity rules.

Water was the most critical nutrient to guarantee the best poultry performance. The water quality which offered to poultry depends on physical, chemical and microbiological parameters. Bacteria, molds, minerals and water additives

interact in the water source, and within the pipelines and drinkers. These interactions complicated the management necessary to guarantee the best water quality for optimum poultry performance. Water from surface sources is often contaminated by microbes, as well as groundwater can be contaminated by harmful chemicals from human activities or from the natural environment.

Sanitation is the practices that most poultry producers implement to improve water quality for their poultry. Regular cleaning of the water lines in poultry buildings is essential, and special attention should be paid to checking the reservoir tanks [4]. Chemical methods depend mostly on

selected chemicals with oxidizing and biocidal properties. Their practical applications are important for removing undesirable constituents and harmful microorganisms for disinfecting water supplies. When microorganisms were not removed from drinking water and its usage will cause birds to fall ill. The most commonly used chemicals include chlorine and hydrogen peroxide (H₂O₂) [14]. The present study was carried out to evaluate the efficiency Virkon-S® (H₂O₂), Aquatabs Granulus® (chlorine) and Idoblex® (Iodophore) at different concentrations in poultry drinking water on T.B.C, T.F.C. and E.coli count at different concentrations.

2. MATERIALS AND METHODS

2.1. Sampling for microbiological examination:

Water sample were collected from main water supply of the chosen farm after sterilization by inserting moist cotton piece in alcohol inside tap mouth and firing till redness then tap was opened by towel, after cooling the sample were taken in sterile bottle of 250 ml capacity and send to the laboratory as soon as possible for examination. Procedures of sampling were carried out according to Clesceri et al. [6].

2.2. Bacteriological examination:

Determination of total bacterial count, total fungal count and fecal E.coli was summarized in table 1

Table 1 Parameters and methods of Bacteriological examination

Parameter	Methods
TBC	Water samples were examined according to the technique recommended by Clesceri et al. [6]
TFC	Total fungal count (Membrane filtration technique) according to Clesceri et al. [7].
F E.coli	Fecal coilform count (Membrane filtration technique) [2].

T.B.C. Total bacterial count, T.F.C. Total fungal count, F E.coli Fecal E.coli count

2.3. Disinfectants used:

Disinfectants used; Virkon-S® (H₂O₂), Aquatabs Granulus® (chlorine) and Idoblex® (Iodophore); in the current study in poultry drinking water were summarized in table 2.

3. RESULTS AND DISCUSSION

Effect of Different Water chemical disinfectants on T.B.C.:

The displayed results in table (3) showed that the usage of Virkon-S® at 0.25 and 0.50 g/L caused 100% reduction in total bacterial count at 60 min. of exposure. Concentrations of 1.0 and 1.5 g/L gave 100% reduction at an exposure time 30 minute. 2 g/L concentration gave 100% reduction at 20 min. of exposure time, though this concentration was above recommended dose reported by manufacturing company.

Table 2 Summary of disinfectants used; Virkon-S® (H₂O₂), Aquatabs Granulus® (chlorine) and Idoblex® (Iodophore); in poultry drinking water in the current study

Disinfectant type	Chlorine	Iodine	Hydrogene peroxide
Commercial name	Aquatabs Granules®	Iodo-blex®: (2.5 % av. iodine)	Virkon-S®
Origin	Medentech	Nobelwax	PROVAX, Vet medica- Boehringer Ingelheim, U.S.A
Recommended dose for drinking water	20 mg/L	10 ml/L	1g/L
Used dilution	10, 15, 20, 25 and 30 mg/L	2.5, 5.0, 10.0, 12.5 and 15.0 ml/L	0.25, 0.50, 1.00, 1.50 and 2.00 g/L
Exposure times	-----	5, 10, 15, 20, 30, and 60 min	-----

The obtained results show that effect of Aquatabs Granulus® at dilution 10 g/L reach to 82% reduction at 60 min. exposure time and give 99.2 % reduction at the same time. but at concentration or 15 g/L and give 100 % reduction % at the concentration of 20 g/L, but at exposure time 30 min. the reduction % in total bacterial count were 100% at concentration of 25 g/L with increasing concentration to 30 g/L the reduction % reach 100% at lower exposure time reach to 20 min. Germicidal effect of Iodoblex® on T.B.C. were 100% reduction% at concentration of 2.5 and 5 ml/L with exposure time 60 min., while give 100% reduction % at concatenation of 10, 12.5 and 15 ml/L at exposure time 30 minute.

From table (3) found that the best concentration of Virkon-S® and Aquatabs Granulus® was at 2 g/L and 25 g/L with exposure time 20 min. to kill all bacterial count in water samples. While concentration of Iodoblex® was 5 ml/L at 30 minute exposure time that reduce bacterial count .This results come near similar to the results obtained by earlier studies [2, 3, 11, 12, 17].

Effect of Different Water chemical disinfectants on T.F.C:

The displayed results in table (4) showed that the total fungal count reduced by use different type of disinfectant with different time of exposure at 30 minute exposure reduction % were 30, 52, 2, 82, 5, 90 and 95 with concentration of 0.25 and 2 g/L of Virkon-S® and found complete reduction of total fungal count (100%) at 10 min. of exposure time with concentration of 2.0, 1.5, 1.0 and 0.5 g/L. The results obtained from Aquatabs Granulus® that give reduction % were 30, 52.5, 77, 80 and 90%, respectively at exposure at concentration of 10, 15, 20, 25 and 30 g/L at exposure time 30 min. But reduction % reach 100 % of T.F.C. at concentration of 30 g/L at exposure time 60 min. Using Iodoblex® give reduction % at 30 min. exposure time were 37.5, 82.5, 77.5 and 90

% with concentration of 2.5, 5.0, 10.0, 12.5 and 15 ml/L, respectively, those results come agreed with Lensing and Oei [13].

Effect of different chemical disinfectants on E. coli Count :

The results obtained in table (3) showed that reduction % at 30 time exposure in E.coli count respectively were 67.81 and 71.25% at concentration of 0.25 and 0.5 g/L of Virkon-S®, while 100% at the concentration of 1.5 and 2 g/L at exposure time 20 minute and 1 g/L concentration give 100% reduction at 30 min

The results obtained by Aquatabs Granulus® were 100% reduction at concentration of 10 g/L at 60 minute, and 20 g/L at 30 minute and 25, 30 g/L at exposure time 20 min.

Using Iodoblex® show that complete reduction of E.coli count need increasing concentration than recommended dose till 12.5 and 15 ml/L and this need only 20 minute time exposure but at exposure time 30 min. the complete reduction occur at concentration of 10 ml/L but at lower dilution 5 ml/L reduction 100% occur after long time reach one hour and the lower dilution 2.5 ml/L can't reach to complete reduction with in 1 hour exposure time .

The recorded results in tables (2-5) showed that chlorine, iodine and H₂O₂ were good water disinfectant used to decrease and may complete elimination of T.B.C., T.F.C. and E. coli in water samples.

The total bacterial count is the best available measure for testing the efficacy of water disinfectant that was used in water treatment. So chlorine followed by Virkon-S®, then Iodobnlex® at 30 min. exposure and recommend dose that were respectively 20 g/L, 1g/L and 10 ml/L is the best for killing, all total bacterial count and fecal E.coli and reach to highest reduction % in case of total fungal count that were 77.0, 5.0, 90.0 and 77.5 for Aquatabs Granulus®, Virkon-S® and Iodoblex®.

Table 3 Effect of different disinfectants / times against total bacterial count /mL at different exposure time.

Disinfectant	Dilution	T.F.C BEFORE	Exposure time											
			Count after 5 min		Count after 10 min		Count after 15 min		Count after 20 min		Count after 30 min		Count after 60 min	
			No. of colony/ml	Reduction %	No. of colony/ml	reduction %	No. of colony/ml	of Reduction %	No. of colony/ml	of Reduction %	No. of colony/ml	of Reductio n %	No. of colony/ml	of Reduction %
Virkon-S® (mg/L)	0.25	500	485	3	353	23	390	36	162	67.6	55	89	0	100
	0.50	500	422	15.6	382	25	293	42	210	71	33	93.4	0	100
	1.00	500	390	22	390	27	210	53	98	80.4	0	100	0	100
	1.50	500	340	38	300	40	180	64	30	94	0	100	0	100
	2.00	500	280	44	280	44	40	92	0	100	0	100	0	100
Aquatabs Granules® (ml/L)	10.00	500	490	2	470	6	360	36	320	36	104	79.2	90	82
	15.00	500	482	3.6	395	21	210	43	90	82	25	95	4	99.2
	20.00	500	470	6	320	36	199	47	70	86	10	98	0	100
	25.00	500	420	16	302	39.6	105	58	40	92	5	99	0	100
	30.00	500	403	19.4	300	40	62	73.6	0	100	0	100	0	100
Iodoblex® (mg/L)	2.50	500	493	1.4	410	18	323	35.4	175	65	92	81.6	0	100
	5.00	500	479	4.2	303	39.4	220	56	102	79.6	75	85	0	100
	10.00	500	440	12	291	42	133	73.4	70	86	0	100	0	100
	12.50	500	310	38	250	50	72	85.6	2	99.6	0	100	0	100
	15.00	500	300	40	180	64	60	88	3	99.4	0	100	0	100

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Table 4 Effect of different disinfectants / times against total fungal count/mL at different exposure time

Disinfectant	Dilution	T.F.C Before	Exposure time											
			Count after 5 min		Count after 10 min		Count after 15 min		Count after 20 min		Count after 30 min		Count after 60 min	
			NO. of colony/ml	Reduction %	NO. of colony /ml	reduction %	NO. of colony /ml	Reduction %	NO. of colony/ml	Reduction %	NO. of colony/m	Reduction %	NO. of colony/ml	Reduction %
Virkon-S® (mg/L)	0.25	40	35	12.5	35	12.5	32	20	30	25	28	30	25	37.5
	0.50	40	37	17.5	31	14.5	31	22.5	27	32.5	19	52.5	12	70
	1.00	40	33	19.5	27	32.5	20	50	14	65	7	82.5	3	92.5
	1.50	40	28	21.5	20	50	12	70	8	80	4	90	1	97.5
	2.00	40	21	25	17	57.5	9	77.5	5	87.5	2	95	0	100
Aquatabs Granules® (ml/L)	10.00	40	39	2.5	38	3.5	37	7.5	31	22.5	28	30	19	52.5
	15.00	40	37	5.5	35	12.5	31	22.5	27	32.5	19	52.5	8	80
	20.00	40	32	20	25	37.5	19	52.5	12	70	9	77.5	6	85
	25.00	40	30	25	26	35	17	57.5	11	72.5	8	80	2	95
	30.00	40	27	25	22	45	12	70	9	77.5	4	90	0	100
Iodoblex® (mg/L)	2.50	40	38	6.5	35	12.5	30	25	28	30	25	37.5	18	55
	5.00	40	36	7.5	32	20	25	37.5	20	50	17	57.5	11	72.5
	10.00	40	32	20	27	32.5	19	52.5	14	65	9	77.5	5	87.5
	12.50	40	30	23	21	47.5	16	60	11	72.5	7	82.5	2	95
	15.00	40	29	25	22	45	13	67.5	9	77.5	4	90	1	97.5

Table 5 Effect of different disinfectants / times against E.coli count/mL at different exposure time

Disinfectant	Dilution	E.coli Before	Exposure time												Count after 5 min
			Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min	Count after 5 min		
			NO. of colony/ml	Reduction %	NO of colony /ml	Reduction %	NO. of colony /ml	Reduction %	NO. of colony/ml	Reduction %	NO. of colony/m	Reduction %	NO. of colony/ml	Reduction %	
Virkon-S® (mg/L)	0.25	320	304	5	292	8.75	204	36.25	193	39.688	103	67.813	65	79.688	
	0.50	320	302	5.63	277	13.44	197	38.438	130	59.375	92	71.25	40	87.5	
	1.00	320	290	9.38	201	37.19	158	50.625	42	86.875	0	100	0	100	
	1.50	320	281	12.2	113	64.69	53	83.438	0	100	0	100	0	100	
	2.00	320	273	14.7	162	79.38	42	91.25	0	100	0	100	0	100	
Aquatabs Granules® (ml/L)	10.00	320	312	2.5	292	8.75	260	18.75	198	38.125	122	61.875	0	100	
	15.00	320	291	9.06	273	14.69	222	30.625	180	43.75	92	71.25	0	100	
	20.00	320	255	20.3	199	37.81	107	66.563	40	87.5	0	100	0	100	
	25.00	320	221	30.9	172	46.25	93	70.938	0	100	0	100	0	100	
	30.00	320	202	36.9	132	58.75	83	74.063	0	100	0	100	0	100	
Iodoblex® (mg/L)	2.50	320	312	2.5	288	10	204	36.25	194	39.375	122	61.875	99	69.063	
	5.00	320	304	5	267	15.3	136	57.5	94	70.625	27	91.563	0	100	
	10.00	320	292	8.75	201	37.19	122	61.875	32	90	0	100	0	100	
	12.50	320	290	9.38	173	45.94	56	82.5	0	100	0	100	0	100	
	15.00	320	267	16.6	104	67.5	45	85.938	0	100	0	100	0	100	

The lower concentration need longer time but the higher concentration was rapid in action .Aim of water disinfection is to free water from harmful Bacteria. After using of three chemical disinfectants we can say that chlorine is still the germicidal choice to free water from its contamination. It is cheap, available and not harm to poultry. Beside that it can lower content of ammonia, nitrate and organic matter by oxidation as stated by World Health Organization [16].

Disadvantaged of chlorine is corrosion of equipment as mentioned by Fiessinger et al. [8] and can overcome this by use plastic drinkers and pipes. The warm temperatures enhance chlorine effectiveness [1].

Chlorination need to suspended two days before vaccination by any live vaccination to avoid inactivation of vaccines and resumed after 4 hours after vaccination completed as reported by Jeffrey [12]. Blake and Hess [3] reported that the general recommendation of chlorine in the drinker was 2 to 3 ppm and the residual chlorine at least 0.1 ppm.

Gehan Zakaria [9] found that H₂O₂ (Virkon-S®) was gave 6 time reduction % at very low concentration (1%) but at 120 min. of exposure. H₂O₂ had sporocidal , bactericidal, viricidal and fungicidal effect and remains active in the presence of organic matter [14]. El-Naggar et al. [5] found that H₂O₂ able to kill E.coli at high concentration within 15 min. only.

Iodoblex® (2.5% Iodine) that is also effective in the presence of organic matter [10] is a good fungicide that able to kill aspergillus fumigatus and candida albicans at 0.1% after 5 min. of exposure [13] Zahran [17] reported that the reduction % reach 100% in T.B.C at 10 ppm iodine concentration at 45 min. of exposure but the activity of iodine is affected by hardness of water, besides, it imports color and taste to water [15]. Hosnia Swafey [11] found that iodine destroy E.coli at the concentration of 1:400 at 10 min. in the absence of interfering substance.

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تأثير بعض المطهرات على التلوث الميكروبي للمياه في مزارع الدواجن بمحافظة القليوبية

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الملخص العربي

أجريت هذه الدراسة لتقييم كفاءة مطهرات المياه الثلاثة (الكور، اليود، وفوق أكسيد الهيدروجين) مع استخدام تركيزات مختلفه من كل مطهر وتغيير وقت التلامس بين المطهر والميكروب ضد العد البكتيري الكلى والعد لكلى للفطريات وعدد البكتريا القولونية فى عينات المياه التي تم جمعها من المصدر الرئيسي فى مدينة طوخ (محافظة القليوبية) والمأخوذه من المياه الجوفية والتي تم تحليلها بالطرق الكيميائية والبكتريولوجية المعملية. وقد اظهرت النتائج ان العد البكتيري الكلى (500 وحدة مستعمرة بكتيرية/مللى) والعد الكلى للفطريات (40 وحدة مستعمرة فطرية/مللى) وعدد البكتريا القولونية (320 وحدة مستعمرة بكتيرية/ مللى) والمواد العضوية 1.3 ملجم/لتر. وقد وجد ان الكور يقضى تماما على العد البكتيري الكلى وعدد البكتريا القولونية عند التركيز 25 و20 على الترتيب وهذا مع وقت التلامس 30 دقيقة. اما بالنسبه الى العد لكلى للفطريات فعند وقت التلامس 30 دقيقه يصل الى اعلى نسبة قضاء على الفطريات وهى 90% عند تركيز 25 ملجم/لتر. وأظهرت النتائج المعروضة أن فوق أكسيد الهيدروجين يقضى تماما على العد البكتيري الكلى عند التركيز 1 ملجم/لتر فى وقت التعرض لمدة 30 دقيقة . وايضا يقضى تماما على العد البكتيري الكلى عند وقت التعرض 20 دقيقة ولكن فى تركيز 2 ملجم/لتر وكان هذا التركيز اعلى من الجرعة الموصى بها من الشركة المصنعة للمطهر. سجلت الدراسة أن اليود يقضى تماما على العد البكتيري الكلى وعدد البكتريا القولونية فى عينات المياه عند وقت التعرض 30 دقيقه عند التركيز 10 مل/لتر. اما العد لكلى للفطريات فيعطى اعلى نسبة قضاء على الفطريات وهى 90% عند التركيز 15 مل/لتر. (مجلة بنها للعلوم الطبية البيطرية: عدد 23(2)، ديسمبر 2012: 245-253)