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EFFECT OF VOLATILE OILS ON CONCOMITANT INFECTION OF *ORNITHOBACTERIUM RHINOTRACHEAL* "ORT" AND VELOGENIC VISCEROTROPIC NEWCASTLE DISEASE "VVND" IN BROILER CHICKENS.

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SUMMARY

Typical respiratory and nervous clinical signs have been recorded after concomitant ORT and VVND infection together with classical postmortem lesions . These clinical signs and postmortem lesions varied in severity in different experimented groups with maximum extreme in non-vaccinated non-treated infected groups, and minimum extreme in vaccinated volatile oils plus amoxicillin treated groups .

Regardless of NDV vaccination, milder respiratory clinical signs in volatile oils treated groups together with significant increase in the final body weight were recorded as compared with non-treated control groups. However concomitant treatment of volatile oils and amoxicillin (specific antibiotic for ORT) gave the superior results in protection rate and performance including final body weight and relative weight gain percentage .

Liquefying thick and sticky mucous and shrinkage of respiratory mucous membranes by the effect of volatile oils assumed to provide a relief in birds breathing and consequently, hypoxia is avoided which improves efficacious of the birds feed- intake, general health conditions, resistance to infectious agents and zootechnical performance.

Volatile oils improved the immune response against NDV vaccination and the increase in response was dose dependent .

INTRODUCTION

Undoubtedly, respiratory diseases constitute a major problem with expecting tremendous economic losses in avian species especially with the expansion of poultry industry and the increasing tendency towards massive production under modern systems of intensive rearing . Despite chemotherapy is recommended for controlling bacterial respiratory diseases ; almostly dyspnoea occurs due to the partial occlusion of nasal passages with exudates and mucous secretion accompanying the clinical disease picture which put the affected birds under severe stress and delays the rate of healing . Vaccination against viral respiratory diseases is the most common way for prevention and control of such pathogens, however; the same clinical problem can exist .

It is already known that volatile oils play an important role in human and veterinary medicine. They may be used for their therapeutic action as local stimulants, carminatives, diuretics, mild antiseptics, local irritants, anthelmintics, or parasaticides . (Brander and Pugh, 1977 ; Balbaa et al., 1981) .

Accordingly; this work was planned to demonstrate the effect of eucalyptus and peppermint oils on the disease picture and the zootechnical performance of broiler chickens infected with Ornithobacterium rhinotracheal "ORT" triggered by VVND .

MATERIAL AND METHODS

Volatile oils:

Eucalyptus oil and peppermint oil in emulsifiers produced commercially under the trade name "MENTOFIN®" by EWABO Co., Germany was used .

Experimental chickens:

Eight hundred and twenty five , day-old meat typ chickens were equally divided into 11 groups (1-11) . Each group was consisting of 75 birds which were divided into 3 subgroups as replicat . All birds were housed in separate pens and fed on a commercial balanced ration ad libitum consumption .

Experimental design:

Chicken groups 1-4 and 9-11 were sprayed with Newcastle disease Hitchner B1 vaccine in a dose of 10^6 EID_{50} / bird at 10 day of age. While other chicken groups were kept without vaccination against Newcastle disease. All chicken groups were vaccinated against infectious bursal disease using Gumboro vaccine D-78 at 13 and 23 days of age via drinking water .

Concomitant infection of 10^8 CFU of ORT / bird (via aerosol route) together with $10^{4.33}$ EID_{50} of Velogenic Viscerotropic Newcastle disease virus (VV ND) / bird (via intramuscular route) was carried out for chickens of groups 1-8 at 21st day of age.

After the appearance of the first respiratory cli cal signs treatment with the volatile oils in a dose of 0.25 ml / liter (L) drinking water for 12 hours/ day for 5 successive days was adopted for chicken groups 2, 3, 6, and 7. Treatment with amoxicillin in a dose of 20 mg / kg. B.Wt. was undertaken for chicken groups 1, 3, 5, and 7 for 5 successive days .

The lesion is given numeric scoring of one for mild, two for moderate and three for severe in the challenged birds. The mean per bird in the group is then plotted and a disease lesion profile for the flock can be obtained.

For immunoassay, chickens of groups 9, and 10 were treated with the volatile oils 24 hours daily for 3 successive days in a dose of 0.25 and 0.5 ml. / L drinking water respectively. While birds of group 11 were kept without treatment as control group .

RESULTS

Obtained results are shown in tables 1-3 and Figs. 1 - 8.

The recorded clinical signs in experimentally infected chickens were respiratory in nature including nasal discharge, coughing, sneezing , dyspnoea and rales with nervous signs of torticollis, leg paresis and paralysis, moving in circles together with general clinical signs of ruffled feathers, depression, anorexia and huddling together . These signs varied from mild to very severe in different studied groups . Postmortem lesions were septicemia, inflammation of the entire respiratory tract , haemorrhagic lesions in provenrticulus, ceca, and small intestine . Airsacculitis was also found with yughort like exudates in the abdominal cavity .

These clinical signs, mortality and postmortem lesion scoring varied in severity in different experimental groups with maximum extreme in non-vaccinated non-treated infected groups, and minimum extreme in vaccinated volatile oils plus amoxicillin treated groups (Tables 1 and 2) .

Statistical analysis of body weights:

In vaccinated chicken groups: Significant increase in volatile oils treated or volatile oils plus amoxicillin treated groups at 4th week of age over their controls was obtained.

In non-vaccinated chicken groups: Significant increase was determined at 4th ,5th and 6th week of age in volatile oils treated as well as volatile oils plus amoxicillin treated chickens over their controls . While significant increase in amoxicillin treated chickens was determined only at 5th and 6th weeks ($P<0.05$) .

Table 1: The zootechneal performance and results of challenge of vaccinated broiler chickens treated and untreated with Mentofin, Amoxicillin or both.

Group No.	Age weeks	Flock performance				Results of challenge	
		Body weight (g.)	FCR*	Perform. index**	RGR***	Mortality rate	Lesion Score
1 Amoxicillin Treated Group	1	150± 2.35	0.95	15.79	100.0	12%	6
	2	363.6± 7.01	1.22	29.59	83.17		
	3	657± 6.22	1.42	46.27	58.15		
	4	991± 4.11	1.75	56.63	40.53		
	5	1301± 4.66	1.73	75.20	27.05		
	6	1723± 3.50	1.96	87.91	27.91		
2 Mentofin Treated Group	1	150± 4.00	0.95	15.79	100.0	8%	6
	2	361± 9.30	1.22	29.59	82.58		
	3	657± 5.96	1.42	46.27	58.15		
	4	993± 6.78@	1.74	57.07	40.73		
	5	1325± 2.56	1.72	77.03	28.65		
	6	1751± 4.40	1.95	89.79	27.70		
3 Mentofin + Treated Group	1	150± 3.8	0.95	15.79	100.0	4%	2
	2	361± 5.02	1.22	29.59	82.58		
	3	657± 3.57	1.42	46.27	58.15		
	4	1003± 6.36@	1.73	57.98	41.69		
	5	1370± 4.40	1.71	80.12	30.93		
	6	1803± 4.80	1.94	92.94	27.29		
4 Non-treated Control Group	1	150± 4.80	0.95	15.79	100.0	20%	30
	2	361± 6.80	1.22	29.59	82.58		
	3	657± 4.40	1.42	46.27	58.15		
	4	913± 5.20	1.77	51.58	32.61		
	5	1115± 5.96	1.81	61.60	19.92		
	6	1431± 5.79	1.99	71.91	24.82		

* FCR= Fedd conversion rate. ** Performance index. *** RGR = Relative growth rate.

@ Statistical significant differences ($P < 0.05$).

Table 2: The zootechnical performance and results of challenge of non-vaccinated broiler chickens treated and untreated with Mentofin, Amoxicillin or both.

Group No.	Age (weeks)	Flock performance				Results of challenge	
		Body weight (g.)	FCR*	Perform. index**	RGR***	Mortality	Lesion Score
5 Amoxicillin Treated Group	1	150± 567	0.95	15.97	100.0	48%	60
	2	371± 3.57	1.2	30.91	84.84		
	3	667± 7.70	1.37	48.69	57.03		
	4	778± 1.76	1.65	47.15	15.36		
	5	973± 7.90@	1.73	56.24	22.27		
	6	113± 9.79@	1.95	58.10	15.19		
6 Mentofin Treated Group	1	150± 4.20	0.95	15.79	100.0	44%	44
	2	371± 4.81	1.2	30.91	84.84		
	3	667± 7.13	1.37	48.69	57.03		
	4	793± 9.66@	1.63	48.65	17.26		
	5	981± 7.13@	1.72	57.03	21.20		
	6	1153± 6.93@	1.94	59.43	16.12		
7 Mentofin + Treated Group	1	150± 3.60	0.95	15.79	100.0	28%	21
	2	371± 4.66	1.2	30.91	84.84		
	3	667± 6.22	1.37	48.69	57.03		
	4	805± 4.66@	1.59	50.63	18.75		
	5	993± 5.79@	1.69	58.76	20.91		
	6	1179± 6.36@	1.92	61.41	17.13		
8 Non-treated Control Group	1	150± 5.79	0.95	15.79	100.0	60%	90
	2	371± 5.79	1.2	30.91	84.84		
	3	667± 6.55	1.37	48.69	57.03		
	4	715± 3.57	1.63	43.74	6.67		
	5	905± 5.22	1.74	52.01	23.73		
	6	1011± 6.93	1.96	51.58	11.06		

* FCR= Fedd conversion rate. ** Performance index. *** RGR = Relative growth rate.

@ Statistical significant differences ($P < 0.05$).

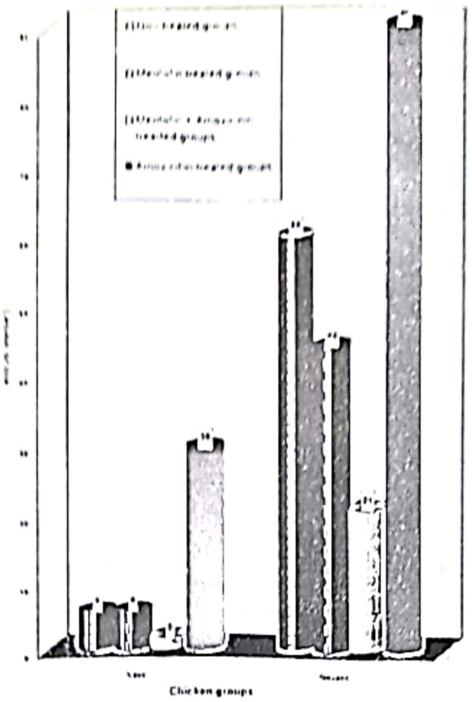


Fig.1: The mean lesion scores of vaccinated and non-vaccinated broiler chickens infected with ORT and VVND.

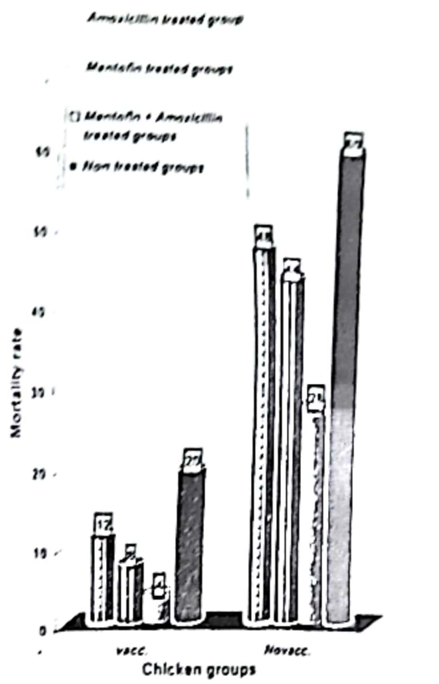


Fig.2: The mortality rate of broiler chickens after VVND and ORT infection.

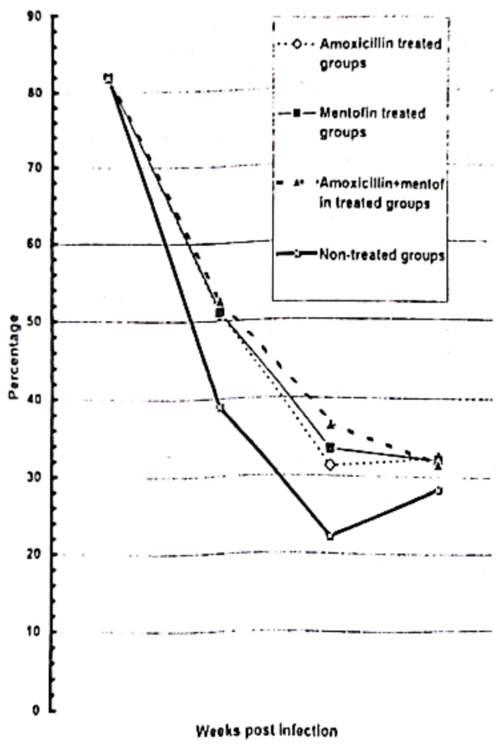


Fig.3: The relative body weight gain percentage of vaccinated broiler chickens post ORT and VVND infection.

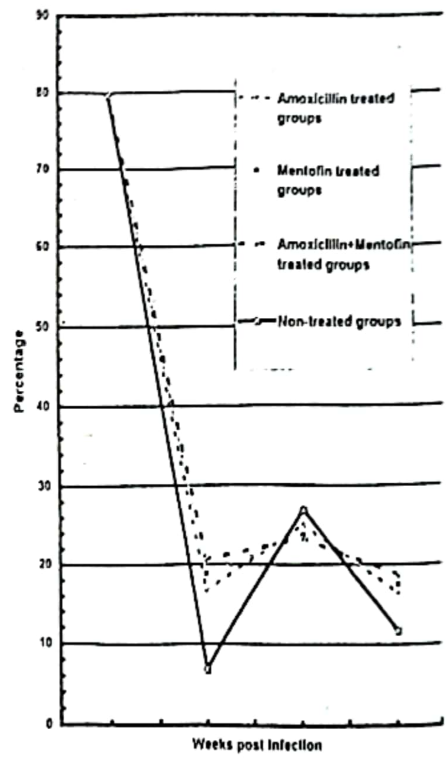


Fig.4: The relative body weight gain percentage of nonvaccinated broiler chickens post VVND and ORT infection.

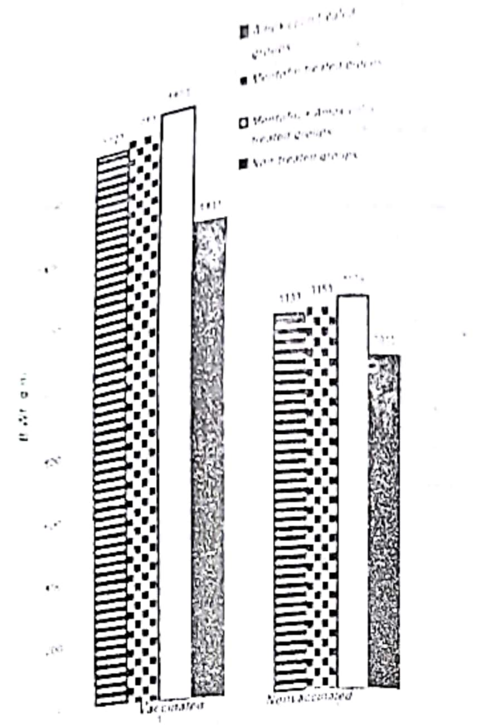


Fig.5: The final body weight of NDV vaccinated and nonvaccinated broiler chickens infected with ORT and VVND.

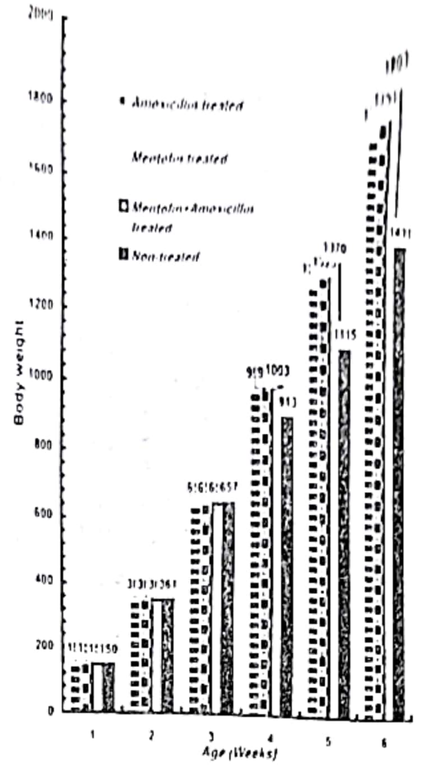
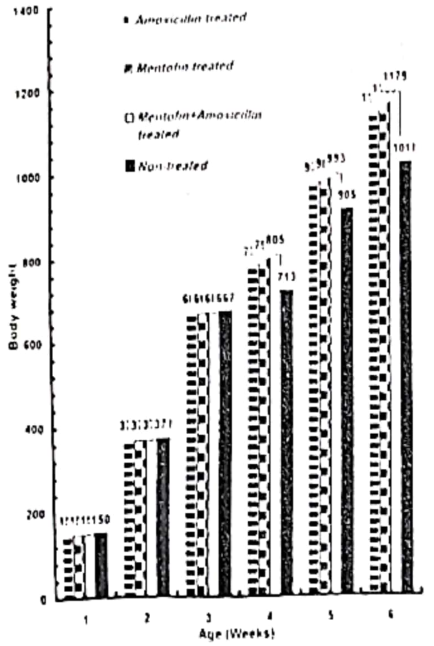


Fig.6: Weekly body weight of vaccinated chicken broiler infected with ORTand VVND.



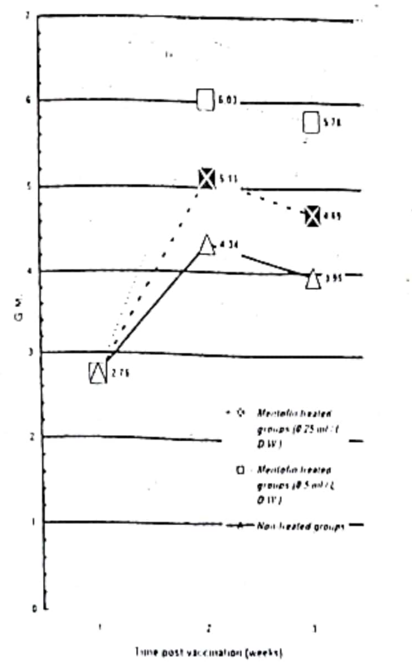


Fig.8: The geometric mean (G.M.) of HI antibody titers against NDV of broiler chickens treated with MENTOFIN.

Fig.7: Weekly body weight of nonvaccinated chickens broiler infected with ORT and VVND.

Table 3: Results of NDV haemagglutination inhibition (HI) titers of Mentofin treated and untreated chickens after NDV vaccination.

Group No.	Mentofin Treatment	Geometric means of HI titers		
		2 week post vaccination	3 week post vaccination	4 week post vaccination
9	0.25 ml/L	2.75	5.11	4.69
10	0.5 ml/L	2.75	6.03	5.78
11	--	2.75	4.38	3.95

DISCUSSION

In many instances of respiratory disease complex, it is quite difficult to determine an etiological agent on clinical basis . This difficulty might be attributed to the divert and multifactorial etiology of respiratory diseases . Difficulties arise from frequent occurrence of some of them in a wild or a typical form with a consequent modification of the clinical and pathological picture, and might be due to modifying or even obscuring of the clinical picture of many diseases in the field by vaccination procedures . Hence , adoption of symptomatic treatment is quite logic for controlling respiratory diseases .

ORT is now an emerging disease problem of poultry in many areas of the world. It is a cause of economic losses due to the debilitating effects of the respiratory disease and loss of egg production in adults (Vandamme et al, 1994, Trevers; 1996, Hafez and Sting , 1999 and El-Gohary and Sultan, 1999).

In the present investigation, typical respiratory and nervous clinical signs have been recorded after concomitant ORT and VVND infection together with classical postmortem lesions of these pathological agents (El-Gohary and Awaad, 1998 and Alexander, 1997) . These clinical signs, mortality and postmortem lesions varied in severity in different experimental groups with maximum extreme in non-vaccinated non-treated infected groups, and minimum extreme in vaccinated volatile oils plus amoxicillin treated groups (fig.1,4,5,6) . Already , Alexander (1998) mentioned that nervous signs may be seen with both VVNDV and NVNDV, but VVNDV is distinguished by the production of hemorrhagic lesions which are often most evident in the mucosa of the gastrointestinal and respiratory tracts of inoculated chickens. These results are in complete accordance with our findings . The significant improve in ORT and VVND pathological picture recorded in volatile oils with or without amoxicillin treated groups is supposed to its possible bactericidal and vericidal action of volatile oils that might influence virulence of the challenging agents . Perhaps , also attributed to their effect on cell mediated immunity which has been shown to play a part in clearing virus from the tissues (Cargill, Vaccination at work in commercial broilers- MERIAL) . It could be their protective action on ciliary apparatus of the respiratory tract as it is already established that the highly ciliostatic nature of many pathologic agents in the poultry field predisposes birds to infection with other opportunistic respiratory pathogens (such as Mycoplasma gallisepticum , ORT and E.coli) , resulting in drastic synergistic effects (Cargill) . These assumptions of mode of action need further investigation to be clarified. Bragg et al. (1999) concluded that use of volatile oils in the drinking water of layers could greatly assist in the control of infectious coryza, even in birds, which have been vaccinated against this disease .

Regardless of NDV vaccination, milder respiratory clinical signs in volatile oils treated groups together with significant increase in the final body weight were recorded as compared with non-treated control groups. However, concomitant treatment of volatile oils and amoxicillin (specific antibiotic for ORT) gave the superior results in protection rate and performance including final body weight and relative weight gain percentage (Tables 1,2 and Figs 2-7) . It has been suggested by the manufactures that volatile oils liquefy thick and sticky mucous and shrink the mucous membranes which provides relief when breathing problems occur. Consequently, we presume that exudates will loosen and can be expelled and the burden of hypoxia in suffering birds will be relieved due to improved breath . This might have a direct effect on both the efficacious of the birds feed- intake and its zootechnical performance .

Our results illustrated in table 3 and fig.12 are clearly showing that volatile oils improved the immune response against NDV vaccination and that the increase in response was dose dependent. It has been demonstrated in this experiment that there are no negative effects of using this product at the recommended dose or even at the double dose .

Bragg et al. (1999) claimed that volatile oils has some effect on post vaccination reactions in the upper respiratory tract .

In spite of differences in final body weights between treated and untreated broiler chickens , statistic analysis of feed conversion ratio revealed no significant changes between all studied groups. This might be attributed to lower feed consumption because of anorexia associated with infection in the untreated control groups .

Eventually, the present investigation is clearly showing that the treatment of the drinking water of the birds with volatile oils significantly reduced the impact of the challenge by ORT and VVND .

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