EFFECT OF EXCENEL™ (CEFTIOFUR SODIUM) ON THE BODY WEIGHT GAIN, AND IMMUNE ORGANS OF BROILER CHICKEN

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ABSTRACT: *This experiment was designed to study the effect of EXCENEL™, on the immune system of broiler. Day old chicks 504 were divided into 6 groups and were given necessary vaccination, antibiotics and immunosuppressant drugs (Cyclophosphamide) in accordance with experimental design. Weekly observation on the live and dressed body weight of the birds were observed. The result showed that the new antibiotic was safe to be used, helped in the study of the immunosuppressive effects of the antibiotic EXCENEL™. This study indicated that treatment of birds with EXCENEL™ did not adversely affect the body weight gains of the birds. The weight gains of the ceftiofur sodium treated birds were in fact higher than the non treated birds throughout the study period at different ages.*

INTRODUCTION

The immune system evolved as the body's protective mechanism against invasion by pathogens such as viruses, bacteria, and fungi. It provides immunity through the interaction of cells and antibodies. The immunity provided to the host may be known as humoral immunity, cell mediated and/or mucosal immunity. Humoral immunity is the one which is mediated by soluble protein molecules called antibodies in body fluids, and the cellular immunity is carried by surface receptors on the circulating cells.

The immune system is a complex, integrated process which can and does go haywire whenever there is complication. When the animals's body cannot combat a pathogen or an antigen then the disease process will commence. To control and cure the disease, drugs are administered, and this is referred to as chemotherapy.

Immunemodulation is deviation from the normal immune response. When immunoregulation processes are increased, the activity of immune organs is also increased. This condition is known as immunostimulation.

When the functioning of immunoregulatory organs such as bursa of fabricius, thymus and spleen is decreases the condition is known as immunosuppression [1]&[2].

Immunosuppression may be permanent when the essential elements of immunity such as bursa of fabricius or thymus are fully damaged. For example the infectious bursal disease virus can destroy the bursa and cause immunosuppression.

Both the bursa and thymus must be intact for optimal immune responses i.e. cellular and humoral immunity. Damage to primary and secondary lymphoid organs will result in impaired immune functioning.

Most of the viruses can however, cause temporary damage to immune organs and impair the normal cellular interaction and antibody production resulting into susceptibility to a variety of microbes [3]&[2].

Immunostimulation potentiate the antibody synthesis at a rapid rate, resulting in enhanced graft versus host reactions, increased phagocytosis by macrophages and/or inhibition of tumor growth [4].

Many chemicals, drugs, antibiotics, bacteria and viruses can act as immunomodulatory agents in animals and poultry [4]&[2].

Since long, antibiotics have been used for the treatment of bacterial diseases in man and animals. Antibiotics are also used in viral infections to avoid bacterial super infection.

Cephalosporins are a major group of antibiotics derived from species of cephalosporium which was originally cultivated from sewage water. These are with a broad antibacterial range against both the gram-positive and gram-negative bacteria. These antibiotics are not readily affected by cephalosporinase or penicillinase enzymes produced by certain bacteria [5].

Excenel™ (Ceftiofur Sodium) has recently been marketed for use in poultry industry in Pakistan. The manufacturer recommends its use for prevention of early chick mortality due to Collibacillosis, Salmonellosis, Streptococcosis, Staphylaococosis, Pasteurellosis and Citrobacter, Enterobacter, Bacillus and Proteus spp. Infections.

Antibiotics such as chloramphenicol have been reported as immunomodulating agents [2]. The present study was designed to investigate whether Excenel™ (Ceftiofur Sodium) has any immunomodulatory effects when used in broiler chicks at different dosage levels.

The parameter in this study is as under:

1) Effect of EXCENEL™ (Ceftiofur sodium) on total body weight gain in 49 days.
2) Effect of EXCENEL ™ (Ceftiofur Sodium) on weights of Thymus & Bursa of Fabricius

MATERIALS AND METHODS

Chicks

A Total of five hundred and four, day old, Hubbard x Hubbard broiler chicks were procured from a local hatchery and were reared under standard conditions of management and husbandry at the experimental animal house, in College of Veterinary Sciences, Lahore (now called University of Veterinary and Animal Sciences, Lahore).

Drug

EXCENEL™ (Ceftiofur Sodium) is a new Beta-Lactam, cephalosporinase resistant antibiotic from the third generation of the cephalosporins, chemically ceftiofur is the sodium salt of (6R,7R)-7{[(2-amino-4thiozolyl)-Z-(methoxyimino)acetyl]amino}-3-{[(2-furanylcarbonyl)thio]-8-oxo-5-thia-1-azabicyclo[4.2.0]oct-2-ene-2-carboxylate and is being marketed by Upjohn with the drugs name as EXCENEL™.

Groupings

These chicks were divided into six groups from Group A through Group F as follows.

Groups A, B, C, D, E, and F each containing 84 chicks each.

Observations

The birds were observed for 49 days. Birds were weighed and bled weekly and sera analyzed through Haemeagglutination Inhibition test and Agar Gel precipitation tests. All survivors were killed on day 49 and their live and dressed body weight and weights of spleen, thymus, bursa and liver were recorded.

Group A

Feed and Water were given Ad Libitum from day 1 to 49. The birds received New Castle Disease Virus vaccination on days 5 and 21 and received infectious bursal disease virus vaccination on days 10 and 26.

Group B

Feed and Water were given Ad Libitum from day 1 to 49. The birds received New Castle Disease Virus vaccination on days 5 and 21 and received infectious bursal disease virus vaccination on days 10 and 26. Each bird received 0.20 mg of EXCENEL™ (Ceftiofur Sodium) at day 1 (one) of age.

Group C

Feed and Water were given Ad Libitum from day 1 to 49. The birds received New Castle Disease Virus vaccination on days 5 and 21 and received infectious bursal disease virus vaccination on days 10 and 26. Each bird received 0.40 mg of EXCENEL™ (Ceftiofur Sodium) at day 1 (one) and 2 (two) of age.

Group D

Feed and Water were given Ad Libitum from day 1 to 49. The birds received New Castle Disease Virus vaccination on days 5 and 21 and received infectious bursal disease virus vaccination on days 10 and 26. Each bird received 1.00 mg of EXCENEL™ (Ceftiofur Sodium) at day 1 (one) and 1.20 mg of EXCENEL™ (Ceftiofur Sodium) on day 14 (fourteen) of age.

Group E

Feed and Water were given Ad Libitum from day 1 to 49. All the birds received New Castle Disease Virus vaccination on days 5 and 21 and received infectious bursal disease virus vaccination on days 10 and 26. Half of the birds received 0.3 mg of cyclophosphamide at day 1, 2 and 3. The other 50% of the birds received 0.20 mg of EXCENEL™ (Ceftiofur Sodium) at day 1 (one). This group was further divided into E1 and E2.

Group F

Feed and Water were given Ad Libitum from day 1 to 49. All the birds in this group were not vaccinated against New Castle Disease Virus and Infectious bursal disease virus. No medication of any sort was carried out. Post challenge mortality, sero-conversion and in addition their live and dressed body weight and weights of spleen, thymus, bursa and liver were also recorded. Post challenge signs and lesions were also recorded.

Statistical Analysis

The data obtained in this study was analysed statistically with analysis of variance technique. Statistically significant differences among the various treatments means were determined by using Least Significant Difference (LSD) test at 5% level of probability.

RESULTS

The study indicated that the administration of EXCENEL™ to chicks during early life significantly affected the body weight at various age intervals.

Body Weight Gains

The differences in the weight were significant at 5% probability level ($P<0.05$). The body weight of birds in group B was higher than the birds in all other groups. The mean body weight of birds in groups A and B were significantly higher than the birds in group E1 ($P<0.05$) which was the cyclophosphamide treated group.

On day 49, the mean body weight of the chicks in the various groups A, B, C, D, E1, E2 and F were 1989.70 ± 16.16; 2063.40 ± 14.40; 1916.00 ± 8.81; 1982.30 ± 11.56; 1977.50 ± 11.31; 1853.70 ± 11.85; and 1973.90 ± 10.18 grams, respectively. (Table 1)

The differences in the weight were significant at 2% probability level ($P<0.02$). The mean body weight of birds in group B was significantly higher than the birds in all the groups ($P<0.05$). The mean body weight of the birds in Group E2 was significantly lower ($P<0.05$) than the mean body weight of birds in other groups.

EFFECTS ON LYMPHOID ORGANS

Bursa of Fabricius

The effects of EXCENEL ™ (Ceftiofur sodium) on the development of bursa of fabricius of chicks were recorded from day 28 onwards. For this purpose Cyclophosphamide treated, Sodium Ceftiofur treated, and untreated and unvaccinated and untreated birds were used for the comparison of their bursae.

The differences in the mean bursa weight of chicks in groups A and B was significantly ($p < 0.05$) higher than those of the other groups. However the mean bursa weight of chicks in group B was non significantly ($p > 0.05$) higher from group A.

On day 28, the difference in the mean bursa weight of chicks in. groups was significant at 5% probability level ($p < 0.05$).

On day 35 the mean bursa weight ratios of chicks in group B was non significantly ($p> 0.05$) higher from group A, C, D, and F. The lowest Bursal of fabricius was recorded in cyclophosphamite treated birds.

The difference in the mean bursa weight of chicks in groups Band E1 was significant ($p < 0.05$). However the mean bursa weight of chicks in group B was non significantly ($p> 0.05$) higher from group A, C, D, and F.

Thymus

The mean body weights of thymus in birds in various treatment groups were determined on days 28,35 and 49. For this purpose five birds were selected from each group and were sacrificed and the thymus lobes from each of the thymus lobes from each of the experimental birds were removed, cleared off the excessive fats and tissue and weighed.

The differences in the mean thyme weights were significant ($p < 0.000$) and the mean thyme weights of the group A and B were significantly higher than the mean thyme weight of birds in group C,D, E1, E2, and F. ($p < 0.005$).

The differences in the mean thyme weights of the group A, B and C were significantly higher than the mean thymus weight of birds in group D, E1, and E2. ($p> 0.005$).

The differences in the mean thyme weights of birds in group A, B, were significant from those in group C, D, E1, E2 and F. (p> 0.005).

Table 1: Effect of EXCENEL^{TM} (Ceftiofur Sodium) on the weight gain of broiler chicks.

Groups	Day 1	Day 7	Day 14	Day 21	Day 28	Day 35	Day 42	Day 49
Group A	43.80 ±1.74	104.53 ±3.36	224.87 ±6.11	476.27 ±6.90	784.40 ±8.76	1150.90± 8.94	1627.60± 13.50	1989.70 ±16.16
Group B	42.27 ±1.38	111.20± 3.52	227.80 ±5.77	534.27 ±6.84	856.07 ±8.14	1187.80 ±9.17	1632.70 ±11.34	2063.40 ±14.40
Group C	43.00 ±1.45	105.13 ±2.90	223.00 ±4.82	506.07 ±5.62	755.87 ±8.95	1134.20 ±8.94	1562.00 ±8.52	1916.00 ±8.81
Group D	43.53 ±1.29	108.93 ±2.87	210.20 ±4.60	457.93 ±5.08	725.67 ±7.50	1082.00 ±10.95	1570.00 ±9.25	1982.30 ±11.56
Group E1	43.67 ±1.38	102.50 ±2.63	216.25 ±2.70	457.88±6. 38	718.75 ±6.76	1026.20 ±11.95	1492.50 ±11.50	1977.50 ±11.31
Group E2	42.67 ±1.48	101.87 ±3.41	215.50±2. 50	468.25±3. 75	717.37 ±6.96	1109.70 ±8.64	1567.50 ±9.63	1853.70 ±11.85
Group F	42.67 ±1.48	107.13 ±2.19	220.87 ±4.60	480.93 ±5.87	793.47 ±9.00	1099.70 ±10.46	1608.10 ±9.55	1973.90 ±10.18

Table 2: Effect of ceftiofur sodium on the weight of the bursa of fabricius of the broiler chickens.

Groups	28 DAYS	35 DAYS	49 DAYS
Groups A	4.10 ± 0.74	3.95 ± 0.85	2.25 ± 0.25
Groups B	4.38 ± 0.63	4.56 ± 0.61	1.30 ± 0.10
Groups C	3.58 ± 0.53	4.04 ± 0.35	2.25 ± 0.25
Groups D	3.58 ± 0.53	2.80 ± 0.82	1.75 ± 0.25
Groups E1	2.85 ± 0.70	2.00 ± 0.70	1.50 ± 0.00
Groups E2	2.70 ± 0.65	1.65 ± 0.46	0.75 ± 0.01
Groups F	2.69 ± 0.56	3.54 ± 1.20	2.25 ± 0.25

Table 3: Effect of ceftiofur sodium on the weight of the thymus of in the broiler chicks.

GROUPS	28 DAYS	35 DAYS	49 DAYS
A	5.05 ± 0.7	7.8 ± 0.97	9.00 ± 0.83
B	5.20 ± 0.70	8.03 ± 0.62	7.50 ± 0.83
C	4.27 ± 0.37	5.52 ± 0.87	4.00 ± 0.83
D	4.20 ± 0.57	5.52 ± 0.33	2.00 ± 0.83
E1	3.83 ± 0.87	3.50 ± 0.15	4.10 ± 0.00
E2	3.75 ± 0.59	5.25 ± 0.25	2.85 ± 0.00
F	4.00 ± 0.63	4.88 ± 0.76	4.00 ± 0.83

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