

Effect of Boldenone Undecylenate on Haematological and Biochemical Parameters in Veal Calves

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Abstract: Hormones were naturally produced by humans and animals resulted in morphological, physiological and biochemical changes. Boldenone Undecylenate (BOL) is an anabolic steroid for veterinary usage. This study was conducted to investigate the effect of BOL administration on the body performance, haematological and biochemical parameters in veal calves. Twenty one apparent healthy male veal calves were divided into three groups. The first group kept as normal control. The second and third groups were administered with Boldenone Undecylenate, by 200 mg and 400 mg respectively. Results showed a significant increase in daily gain response and final body weight accompanied with hyperproteinemia and Hyperglobulinemia after administration of BOL particularly in the third group. Haematological analysis on BOL administered groups, revealed a significant increase in RBCs, Hb and PCV while a decrease in total leucocytic count with lymphopenia. On the other side biochemical studies showed a rise in serum activities of ALT, AST, creatinine and MAD levels especially in third group when compared with the control group. It concluded that, using of BOL in veal calves enhanced body weight gain, but it has side effects on the liver and kidneys.

Key words: Biochemical • Body gain • Boldenone • Calves • Haematology • Hormone • Growth promoters

INTRODUCTION

Hormones were naturally produced by humans and animals. It induces morphological, physiological and biochemical changes [1]. In animal species, the male testes produce hormones, mainly testosterone that plays vital roles as animals grow to maturity [2]. Androgenic steroids are synthetic agents related to the male sex hormone, testosterone. Their biological activities include the anabolic effect and encouraging muscle growth [3], behavioural effect, causing aggressiveness among others and haematopoietic effect. It is practiced to enhance durability and endurance in canine, equine and human athletes by increasing muscle protein production [4].

Boldenone Undecylenate (BOL) is one of these agents that developed for veterinary use. Even so, BOL is used as a growth promoters on farms which improves growth and feed conversion in veal calves [5], increasing the muscle size by stimulating protein production and reducing protein destruction [6]. In the most rural areas worldwide, BOL is forbidden for meat production and human uses [7]. In the USA, it is not indicated for use in

humans and is only available through veterinary clinics [8]. The abuse of androgenic steroids can lead to detrimental organ damage [9].

Nowadays, in the developing countries with the rapid growth of population, like Egypt, there is a more demand for edible protein than supply. BOL is used heavily in Egypt, not only in the field of veterinary practice, but also by athletes and bodybuilders. So, BOL has dual effects on humans, both directly and indirectly; directly through injection to build muscles and indirectly by consuming meat of BOL treated animals [10, 11]. Thither are a few subjects which have investigated the effects of BOL administration. Thus the purpose of this study to investigate the effect of BOL administration on the body performance, haematological and some biochemical parameters.

MATERIALS AND METHODS

Twenty one apparent healthy male veal calves (bull calves) in a private farm in Sharkia government, Egypt. (5-6 month age old with average 171.26 ± 1.95 Kg.

initial body weight) were divided into three equal groups. The first group was kept as control. The second and third groups were administered with Equi-gan® (Boldenone Undecylenate), by 200 mg and 400 mg respectively [12] (Equi-gan®, Boldenone Undecylenate 50 mg / 1ml and sesame oil up to 1 ml) was obtained from; Lab Tornel, Co., Mexico. Calves were administered by intramuscular route twice / four week intervals. All calves were weighted before BOL administration and at slaughter.

Blood Sampling: Blood was collected from all calves fourteen days afterwards the second dose into two samples. Blood samples were collected in tubes with and without EDTA for haematological and biochemical investigations respectively.

Haematological Examination: The measurement of the total and differential leucocytic count, erythrocytes (RBCs), packed cell volume (PCV) and haemoglobin (Hb) were assessed in an automatic cell counter (Hospitex Hemascreen 18, Italy)

Biochemical Examination: The serum total protein and serum albumin levels were measured [13, 14]. The serum globulin level was computed by subtracting the albumin from the total protein [15] and serum activities of alanine and aspartate aminotransferase (ALT & AST) were determined [16], serum creatinine level was estimated [17]. While malondialdehyde (MDA) were determined colorimetrically [18]. Serum level of calcium (Ca), phosphorous (P) were measured in full automated biochemistry analyzer (chemray 240. USSR)

Statistical Analysis: Data obtained from this investigation were statistically analysed using the one way analysis of variance (ANOVA) using SPSS 8.0 for windows [19]. Means at the same column followed by different letters were significantly different and the highest value was represented with the letter (a).

RESULTS AND DISCUSSION

Androgenic hormone is the broad term for whatever natural or synthetic derivatives, usually a steroid hormone, which stimulates or controls the maturation and maintenance of male characteristics in vertebrates. This includes the body process of secondary male sex organs and development of male secondary sex characteristics [20]. Boldenone (1, 4-androstadiene-3-one-17-ol, available as the undecylenate ester), also known under the trade name Equi-gan®, is an anabolic steroid for veterinary use [3].

In the present study there were a significant increase in gain response and final body weight after administration of BOL particularly in the third group (Table 1) that was in agreement with Thabet *et al.* [21] which may be due to enhancing the building process of body tissue by BOL as a consequence of increasing the muscle size is due to the promotion of positive nitrogen balance by stimulating protein synthesis and reducing protein destruction [22] and also mentioned the increase in body weight gain may be ascribed to the increment in serum total proteins and globulin, which indicated improvement in wellness and immunity, in this study, the levels of total proteins and globulin concentrations were significantly increased, Our results are in agreement with El-Moghazy *et al.* [5] who showed that the total protein concentrations were significantly increased after BOL administration in male rabbits. While Heitzman [23] reported that sex hormones may increase the cellular protein biosynthesis indirectly by stimulation of growth hormone and insulin like growth factor secretion, or equally a result of skeletal muscle hypertrophy [24]. In other side Reiter [25] concluded that anabolic steroids provide a significant economic benefit by enhancing both rate and efficiency of muscle growth in cattle; and, therefore, such compounds are widely utilized as growth promoters in the beef cattle industry. Nevertheless, the mechanisms by which anabolic steroids enhance bovine muscle growth remain unclear.

Table 1: Effect of Boldenone Undecylenate on body performance, total proteins, albumin and globulin in veal calves (Mean ±SE).

Groups	Parameters				
	Initial body weight / Kg	Final body weight / Kg	Total proteins g/dl	Albumin g/dl	Globulin g/dl
Control	170.80 ^a ±2.47	406.4 ^a ±4.86	6.54 ^b ±0.16	3.84 ^a ±0.10	2.70 ^b ±0.24
BOL 200 mg	171.20 ^a ±1.82	440.8 ^b ±7.57	7.70 ^a ±0.25	3.90 ^a ±0.18	4.00 ^a ±0.27
BOL 400 mg	171.80 ^a ± 1.56	497.4 ^a ±2.24	8.02 ^a ±0.14	3.86 ^a ±0.09	4.16 ^a ±0.19
F test	N.S	**	**	N.S	**
LSD	5.89	15.83	0.57	0.40	0.71

Means in the same column with different superscript letters are significantly different and the highest value was represented with the letter.

** Highly significant difference at p<0.01

BOL Boldenone Undecylenate

LSD least significant difference

N.S not significant

Table 2: Effect of Boldenone Undecylenate on haematological parameters in veal calves (Mean ±SE)

Parameters	Groups			F test	LSD
	Control	BOL 200 mg	BOL 400 mg		
RBCs (×10 ⁶ /μl)	6.65 ^a ±0.08	7.42 ^b ±0.11	8.05 ^a ±0.06	**	0.26
Hb gm%	9.2 ^a ±0.06	10.9 ^b ±0.25	11.74 ^a ±0.02	**	0.44
PCV (%)	30.44 ^a ±0.38	34.20 ^b ±0.54	37.12 ^a ±0.33	**	1.27
TLC (× 10 ³ /μl)	9.62 ^a ±0.14	7.10 ^b ±0.14	7.04 ^b ±0.16	**	0.45
LYM (× 10 ³ /μl)	5.60 ^a ±0.28	3.04 ^b ±0.24	2.89 ^b ±0.26	**	0.78
GRA (×10 ³ /μl)	2.63 ^b ±0.34	3.31 ^{ab} ±0.18	3.47 ^a ±0.16	**	0.71
MID(10 ³ /μl)	1.39 ^a ±0.03	0.74 ^b ±0.05	0.67 ^b ±0.04	**	0.14

Means in the same row with different superscript letters are significantly different and the highest value was represented with the letter (a).

**Highly significant difference at p≤0.01

LSD least significant difference

Hb haemoglobin

TLC total leukocytic count

GRA neutrophil, eosinophil and basophil

BOL Boldenone Undecylenate

RBC total erythrocytic count

PCV packed cell volume

LYM lymphocytes

MID monocytes and some eosinophil

Table 3: Effect of Boldenone Undecylenate on some biochemical parameters in veal calves (Mean ±SE).

Groups	Parameters					
	ALT (U/l)	AST (U/l)	Cratinine (mg/dl)	MDA (nmol/L)	Calcium (mg/dl)	Phosphorus (mg/dl)
Control	22.00 ^a ±0.89	45.20 ^a ±1.46	0.57 ^b ±0.05	0.87 ^b ±0.07	9.86 ^b ±0.21	5.18 ^b ±0.13
BOL 200 mg	36.20 ^b ±1.82	66.60 ^b ±1.36	1.30 ^a ±0.04	1.36 ^a ±0.03	11.14 ^a ±0.47	6.50 ^a ±0.15
BOL 400 mg	46.00 ^a ±1.30	76.00 ^a ±2.19	1.38 ^a ±0.05	1.49 ^a ±0.04	11.78 ^a ±0.07	6.52 ^a ±0.45
F test	**	**	**	**	**	**
LSD	4.12	5.06	0.15	0.14	0.89	0.84

Means in the same column with different superscript letters are significantly different and the highest value was represented with the letter (a).

** Highly significant difference at p≤0.01 BOL Boldenone Undecylenate

LSD least significant difference

ALT alanine aminotransferase

AST aspartate aminotransferase

MDA malondialdehyde

Haematological studies (Table 2) revealed a significant increase RBCs, Hb and PCV in BOL administered groups as compared to the control one which, anabolic steroids could be stimulate erythropoiesis [26, 27]. Large doses of androgens have been employed in the treatment of refractory anemias and have resulted in some increase in Hb [28]. Conversely, there are a significant decreases in total leucocytic count in contrast with Urhausen *et al.* [29] who reported a higher increase in athletes were still abusing androgenic steroid. While Saad *et al.* [30] showed lymphopenia that suggested lymphocyte redistribution may occur among the various compartments of the body as the main effect of hormone induced lymphocyte redistribution, although the mechanism in mammals is not yet understood.

Androgenic steroids could cause adverse effects on liver, kidneys and endocrine system [31]. Results of liver and kidney function tests (Table 3) are in agreement with Tousson [32] who reported that the BOL induced hepatotoxicity and nephrotoxicity in New Zealand rabbits. Present results showed that BOL administration caused a substantial elevation in serum activities of ALT,

AST and creatinine level that more pronounced in the third group when compared with the control group. These consequences are in agreement with Urhausen *et al.* [29] and Gabr *et al.* [27] who reported that the liver and kidneys functions test were significantly increased after intramuscular BOL administration on weaned male lambs. BOL administration can induce an oxidative stress in the liver and kidney as indicated by elevation of serum MAD level. Administration of the anabolic steroid BOL induced changes in oxidative stress biomarker levels and antioxidant defense systems in the liver and kidney [5]. A significant increase in serum levels of Ca and P were estimated in BOL administered groups, which could be due to retention of calcium and phosphorus in the body [5] or as a result of decrease urinary excretion [33].

CONCLUSION

In spite of using BOL in veal calves breeding enhances body gain, it showed side effects on the liver and kidneys that, estimated by a rise in serum activities of ALT, AST and levels of creatinine and MAD.

ACKNOWLEDGEMENT

I would like to thank Abd-El-atif Abo Qassem the owner of animals for valuable help.

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