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RESEARCH ARTICLE

Evaluation of the IgE concentration in the clinically normal Arabian horses at different seasons, age and sex Nasir A. Alawwad¹, Mujtaba H. Alabd Ulazim², *Ahmed M. Alluwaimi³.

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Abstract

The IgE isotype is the prime factor of the type I hypersensitivity. Reports on the serum IgE concentration have indicated the exceptional high concentration in the clinically normal horses. In this study, similarly the IgE concentration in the clinically normal Arabian horses has registered high concentration. However, no differences in the IgE concentration were noticed between the different seasons and ages, whereas significant changes were recorded between females and males, despite the seasons and age differences. It was speculated that the high IgE concentration in the Arabian horses could be due to the continuous exposure to the environmental allergens and probably due to the insects that are incriminated in skin allergies. Further studies are necessary to reveal the nature of the allergen-IgE specificity in the Arabian horses.

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Introduction:-

The Arabian horses are referred to the horses that are considered one of the oldest breeds in the world (Głazewska, 2010). The Arabian horse was originated from different breeds and populations and the current Arabian horse breed was originated in about 200 years ago (Głazewska, 2010). In comparison of the genetic diversity of the Arabian horses of the Middle Eastern countries with that of the Western countries Arabian horses, it was noticed that the Middle Eastern populations revealed higher level of genetic background diversity than the Western populations (Khanshour et al., 2013).

The horse IgE constant region gene is located on chromosome 24. The constant region of the molecule is made of four domains. The heavy chain gene was shown to express at least four different alleles. The different alleles of heavy chain will result in amino acids variation of the constant heavy region of the IgE (Wagner, 2009).

The availability of anti-horse IgE antibodies made it possible to measure and detect the IgE in serum. The normal IgE concentration in clinically normal horses was seen one thousand times higher than the IgE concentration in human (Wagner, 2009).

The horse IgE antibody isotype is mainly involved in type I hypersensitivity and responses to parasite infestation (Wagner, 2009). IgE mediated sensitivity results in wide range of allergic diseases like atopic dermatitis, summer eczema, sweet itch and insect bite hypersensitivity. The IgE mediated hypersensitivity was reported in most of horse breeds including Arabian horses (Braverman, 1988; Steinman et al., 2003; Wagner, 2009). In general hypersensitivity is rare in horses before 3-4 years old (Wagner, 2009).

The high concentration of IgE in foals is due to the maternal transfer through the colostrum. However, foals are not capable of producing IgE until about 9-11 months of age (Wagner, 2009).

The normal concentration of IgE in the clinically normal Arabian horses at different seasons, age and sex was not addressed. The aim of this study was to reveal -if any- changes in the normal IgE concentration in Arabian horses due to the season's changes and different ages and sex in Saudi Arabia.

Materials and Methods:-

Arabian horses:-

The origin and the identity of the Arabian horses in this study was ascertained by examining the documents certified by the World Arabian horse organization (WAHO) and/or King Abdul Aziz Arabian horses center (KAAHC).

Blood Samples:-

The blood samples were collected from horses at summer (July) and winter (Nov to Feb). All blood samples that were collected at summer were from the same horses that were collected from at winter. The samples were grouped according to age and sex. The total collected blood samples were 60 samples. The detail of the collected blood samples according to season, age and sex are summarized in Table-1.

Analysis of the IgE concentration with anti- horse IgE ELISA test:-

The horse serum IgE concentration was analyzed using anti-horse ELISA kit (Abcam, Cambridge, USA). The serum samples were diluted to 1:20 or 1:40 to reduce the IgE concentration within the range of the IgE standard concentration. The analysis of the IgE concentration was carried out according to the manufacturer directions. The IgE concentration was acquired using SynergyTM Mx Monochromator-Based Multi-Mode Microplate Reader (Bio-Tek, USA).

The statistical analysis:-

Factorial design data of the 3 independent variables, season, age and sex were analyzed by the General Linear Model (GLM) procedure (SAS, 2002). Means $\pm$ standard errors were calculated and tested for significance using the "t" test. SAS, (2002), using Statistical Analysis System software (User's Guide. SAS Institute Inc., Cary, NC, USA).

Results:-

The overall results indicated the high concentration (ng/ml) of IgE in horse serum. The statistical analysis of the IgE at different seasons, sex and ages are summarized in Tables-2, 3, 4 respectively. The analysis of the IgE concentration indicated no differences between summer and winter and between the different ages. However the statistical analysis showed significant differences in the IgE concentration between the males and females despite the different ages and seasons.

Discussion:-

The results of the IgE concentration in the clinically normal Arabian horses are in accordance with the previous studies carried out on other horse breeds (Wagner, 2009; Wilkołek et al., 2014).

Explicit study on the nature of allergens-IgE specificity of the clinically normal horses has indicated the high IgE concentration to various allergens, like mites and to most popular insects involved in horse allergic dermatitis (Wagner et al., 2009; Wilkołek et al., 2014). It seems that the high allergens-IgE specific concentration in the clinically normal horses is mostly related to the continuous exposure to those allergens in their environment (Wagner et al., 2009) particularly in spring rather than winter (Wilkołek et al., 2014). Further analysis on the factors that stand for high allergens-IgE specific concentration revealed that horses kept indoors have manifested higher allergens-IgE specific concentrations than the horses that were raised outdoors (Wilkołek et al., 2014). Therefore, no seasonal differences in our findings can be justified because horses in Saudi Arabia are usually kept indoors.

The high IgE concentration could be due to the continuous exposure to different allergens. The high IgE concentration of the Arabian horses most probably is due to the non hygienic condition of the houses where they were kept. Most of these stables, where the samples collected from are established on the edge of the deserts. These houses are infested with different insects and environmental allergens. Steinman et al. (2003) have reported the prevalence of the horse skin allergies due to the *Culicoides* in Israel (Steinman et al., 2003). Species like *C. buettikeri*, *C. ibriensis* and *C. neoschultzei* which was seen associated with livestock dermatitis, were detected in different countries of the Arabian peninsula (Boorman, 1989).

Hence, this study has reported and for the first time the normal elevation of the IgE concentration in the clinically normal Arabian horses at different ages and seasons with marginal difference between males and females in Saudi Arabia. Further studies are necessary to establish the nature of the allergens that are the prime factors in sensitization of the Arabian horses and their major role in the prevalence of the most popular hypersensitivities in the Arabian horses in Saudi Arabia.

Table-1: The total blood samples collected according to season, age and sex

	Adult male	Adult female	Foal male	Foal female	Total
Summer	2	15	2	3	22
Winter	3	25	4	6	38

Table-2: The “t” test analysis of the IgE concentration means (ng/ml) between summer and winter using General Linear Model (GLM) procedure.

SEASON	AGE	No. of horses	Mean of IgE concentration (ng/ml)	SE ±	All Non Significant
Summer	10 up	3	3145	177.5	
Summer	1-4	11	2736	469.4	
Summer	5-9	8	2592	288.5	
Winter	10 up	7	2662	400.2	
Winter	1-4	24	2107	289.2	
Winter	5-9	7	2720	375.5	

Table-3: The “t” test analysis of the IgE concentration means (ng/ml) between females and males using General Linear Model (GLM) procedure.

SEASON	Sex	No. of horses	Mean of IgE concentration (ng/ml)	SE ±	Significance
Summer	Female	18	3031	235.2	a
Summer	Male	4	1426	605.6	b
Winter	Female	31	2113	219.8	b
Winter	Male	7	3251	476.0	a

a –b different letters are significant, different (P<0.05)

Table-4: The “t” test analysis of the IgE concentration means (ng/ml) between different ages using General Linear Model (GLM) procedure

SEASON	Age (years)	Sex	No. of horses	Mean of IgE concentration (ng/ml)	SE ±	Significance
Summer	10 up	Female	3	3145	177.5	
Summer	1-4	Female	8	3173	509.0	a
Summer	1-4	Male	3	1573	831.0	x
Summer	5-9	Female	7	2821	202.0	
Summer	5-9	Male	1	986	One observation	
Winter	10 up	Female	5	2423	512.7	
Winter	10 up	Male	2	3261	483.3	
Winter	1-4	Female	20	1842	278.0	b
Winter	1-4	Male	4	3436	833.7	y
Winter	5-9	Female	6	2758	442.0	
Winter	5-9	Male	1	2494	One observation	

a –b different letters are sign, different ($P<0.05$)

x –y different letters are sign, different ($P<0.05$)

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