International Journal of Pharma and Bio Sciences V1(2)2010

HAEMATOLOGICAL CHANGES IN CHICKS UNDER THE INFLUENCE OF FUMONISINS

K. NARASIMHA RAO*, B. VIJAYAPAL REDDY, S. GIRISHAM AND S.M. REDDY

Department of Microbiology, Kakatiya University, Warangal – 506 009, (A.P.), India.

***Corresponding Author** *kollu2006@yahoo.com*

ABSTRACT

Haematological changes in chicks under the influence of fumonisins produced by *Fusarium moniliforme* was investigated. Fumonisins, besides causing dose dependent weight loss in chicks was responsible for decrease in serum protein, calcium, urea, albumins and bilirubins. On the other hand, an increase in activity of SGPT and SGOT was recorded.

KEYWORDS

Fusarium moniliforme, fumonisins, haematology, SGPT and SGOT

INTRODUCTION

Fumonisins are the main members of a recently discovered family of myco toxins produced by *fusarium moniliforme*[1]. They were first isolated by Gelder blom *et al*[2]. The involvement of food-borne *Fusarium* mycotoxins in haemorrhage feed-refusal, emetic, estrogenic, neurotoxic and pulmonary diseases in animals and the association of food-borne *Fusarium* mycotoxin with Alimentary Toxic Aleukia (ATA) and Encephalomalacia (EC) in humans have been reviewed by several workers. It is much more difficult to establish relation between human diseases and food-borne *Fusarium* toxins.

Out break of encephalomalacia due to the consumption of a mouldy corn has been known for several decades. Neurotoxic and hepatotoxic symptoms may occur singly or in combination in horses. Feed refusal, lameness, atoxia, oral and and facial paralysis and recumbency begins with in a few days after initial consumption moldy corn and rapidly followed by Seizers and Morbidity. Histopathology of liver shows centrilobular necrosis, fibrosis and bileduct proliferation with increased mitosis, acute inflammation and fatty degeneration in fumonisins fed horses. Marasas *et al*[3]. have experimentally induced leukoencephalomalacia in horses both by intravenous injection and oral feeding of fumonisins. Haschek *et al*[4]. experimentally induced pulmonary edema by administering higher doses of fumonisins, while at lower doses slowly progressive hepatic disease was most predominant. Gelderbloom *et al*[5]. induced liver lesions in rats with fumonisins B_1 and B_2. Wang *et al*[6]. discussed the mechanism of toxicity of fumonisins. Rats fed with *F. moniliforme* infested feed when examined revealed development of hepatic nodules cholantiofibrosis with in 6 months. They also showed development of liver tumors and primary hepatocellular carcinoma and chronic interstitial nephritic in kidneys. However, little information is available on the influence of fumonisins on haematology and, it was against this backdrop that the present investigation was undertaken.

MATERIAL AND METHODS

Seven-day old chicks were randomly assigned to different treatment groups that their initial average weights were the same. Different concentrations of fumonisins (20 & 40 µg), prepared in propylene glycol, were injected intravenously. Propylene glycol alone served as control. Chicks for each treatment were housed

HAEMATOLOGICAL CHANGES IN CHICKS UNDER THE INFLUENCE OF FUMONISINS

together. At the end of 5 and 10-d incubation, a set of chicks were sacrificed, and blood was collected for haematological and biochemical analyses.

Standard methods were followed for analysing blood iron and haemoglobin[7], serum proteins and albumins[8], serum bilirubins[9], serum urea[10], serum amylase[11], Serum Glutamate Pyruvate Transaminase (SGPT) and Serum Glutamate Oxaloacetate Transaminase (SGOT)[12]. RBC and WBC count was made with the help of haemocytometer. The body weight of chicks were also recorded. Rest of the details were similar to those described earlier[13].

RESULTS AND DISCUSSION

It is evidant from Table 1 that fumonisins caused significant weight loss in chicks. Weight loss increased with increasing fumonisins dose. Similarly, the serum iron, serum calcium, serum proteins, serum urea, serum albumins and serum bilirubins decreased with increasing dose. The activity of serum amylase was inhibited by fumonisins . The activity of SGPT and SGOT increased with increasing concentration of this toxin. Blood sugar and haemoglobin showed a gradual decrease under the influence of increasing concentration. Similarly, RBC and WBC decreased with increasing concentration.Onthe other hand, alkaline phosphatase activity increased under influence of fumonisins which was dose-dependant.

Table .1

Effect of fumonisins on haemotological and biochemical composition of blood of chick

Biochemical constituent	Control (untreated)	Fumonisins concentration (µg/ml)	
		20	40
Serum iron (µg/ml)	2.30	1.22	1.15
Serum calcium (mg/ml)	2.12	2.01	1.80
Serum protein (mg/100 ml)	1.02	0.73	0.49
Serum albumins (O.D.)	0.01	0.01	0.08
Serum amylase (units/ml)	0.83	0.83	0.85
Serum urea (mg%)	5.30	4.60	3.80
SGPT (units/ml)	18.00	25.00	26.00
SGOT (units/ml)	55.00	86.00	87.00
Serum sugars (mg/ml)	0.24	0.85	0.66
Total serum bilirubins (mg%)	0.16	0.39	0.43
Direct serum bilirubins (mg%)	0.36	0.38	0.40
Alkaline phosphatase (Units/ml)	310.00	427.00	440.00
Blood haemoglobin (g /100 ml)	19.21	15.37	15.67
Blood glucose (mg/ml)	28.00	24.00	18.00
WBC (mm^3) (in millions)	8.30	4.50	2.80
RBC (mm^3) (in millions)	6.30	5.83	5.64
Average body weight (in grams)	92.60	88.40	66.80

The present observations are in agreement with those of Singh *et al*[14]. who also recorded decrease in WBC count in blood of chick receiving aflatoxin B_1. Reddy *et al*[15]. have also recorded decrease in

HAEMATOLOGICAL CHANGES IN CHICKS UNDER THE INFLUENCE OF FUMONISINS

haemoglobin, albumins, proteins and reducing sugars of the blood under the influence of gliotoxin. The aflatrem was also responsible for decrease of these components of blood of chick[16]. Dimri *et al*[17]. have recorded changes in serum mineral profiles of chick under the influence of aflatoxin B_1. Verma *et al*[18]. reported significant changes in the blood of rat under the influence of aflatoxin. Laxma Reddy & Reddy[19] reported a number of histopathological changes in chick receiving satratoxin. Reddy *et al*[15]. have also recorded an increase in SGPT and SGOT of blood of chick under the influence of gliotoxin produced by *Trichoderma viride*.

REFERENCES

1. M.E. Cawood, W.C.A. Gelder blom, R. Vieggar, Y.Behrend, P.G. Thiel & W.F.O. Marasas. Isolation of the Fumonisins myco toxins. A quantitative approach. Journal of Agri. Food Chem. 39 : 1958-1962 (1991).
2. W.C.A. Gelderblom, K. Jackiewicz, W.F.O. Marasas, P.G. Thiel, R.M. Horak, R. Vieggar & N.P.J.Kriek. Fumonisins novel myco toxins with cancer promoting activity produced by *Fusarium moniliforme*. Appl. Envi. Microbiol. 54 : 1806-1811 (1988).
3. W.F.O. Marasas, P.E. Nelson & T.A. Tousoum. Reclassification of two important moniliformin producing strains on *Fusarium*. NRRL 61022 and NRRL 6322. Mycologia, 80 : 407 (1988)
4. W.N. Haschek, A.C. Waggoner, M.M. Mc Allister, S.H. Hsiao, G.W. Smith, J.H. Goreman, M.E. Tumblesm, R.M. Eppley & P.D. Constable. Abstracts of the papers presented at the workshop. Food. Addit. Contamin. 18 : 203 (1992).
5. W.C.A. Gelderblom, N.P.J. Kriek, W.F.O. Marasas & P.G. Thiel. Toxicity and carcinogenicity of the *Fusarium moniliforme* metabolite, fumonisins B_1 in rats. Carcinogenesis, 12 : 1247 (1991).
6. E. Wang, F. Ross, T.M. Wilson, R.T. Riley and A.H. Morril. Increase in serum sphingosine and sphinganine and decrease in complex sphingholipids in ponic given feed containing fumonisins mycotoxin produced by *F. moniliforme*. J. Nutrition, 122 : 1706 (1992).
7. Wong, Sanyin. Colorimetric determination of iron and haemoglobin in blood. J. Biol. Chem., 77 : 409 (1928).
8. G.R. Kingsley. Quoted from Haw's physiological chemistry, Benard, Loser (ed.) J. Lab. Clin. Med., 27 : 840-845 (1942).
9. Jendrassik, L. and Grof, P. (1965). Recommendation of uniform bilirubin standard – Methods of Clinical Chemistry, Academic Press, 5 : 55.
10. D.R. Wybenga, J.D. Giorigio & Vincent J. Pileggi. Manual and automated methods for urea nitrogen measurement in whole serum. Clin. Chem., 17 : 891 (1971).
11. J.W. Gomori. Assay of serum amylase with small amounts of serum. Am. J. Clin. Pathol., 27 : 714 (1973).
12. S. Reitman & S. Frankel. A colorimetric method for the determination of serum glutamic oxaloacetic and glutamic transaminases. Am. J. Clin. Pathol., 28 : 56 (1957).
13. P. Giridhar, G. Laxma Reddy, S.M. Reddy & M. Ather. Toxicological studies of cyclopiazonic acid on Broiler chicks. Indian J. Poult. Sci., 35 : 45 (2000).
14. A. Singh, K.C. Satija and S.K. Mahipal. Haematological and biochemical studies on broiler chicks fed aflatoxin B_1 and after its withdrawl. Indian J. Poult. Sci., 27 : 153 (1992).

HAEMATOLOGICAL CHANGES IN CHICKS UNDER THE INFLUENCE OF FUMONISINS

15. S.M. Reddy, D. Rajakumari & V. Krishna Reddy. Toxicological studies on gliotoxin produced by *Trichoderma viride*. Indian J. Poult. Sci., 32 : 169 (1997)
16. Md. Rafiyuddin, N. Janakirama Rao, S. Girisham & S.M. Reddy. Toxicology of tremorgenic mycotoxins on chicks. Natl. Acad. Sci. Lett., 29 : 311 (2006).
17. V. Dimri, V.N. Rao & H.C. Joshi. Effect of acute aflatoxin B_1 feeding on serum mineral profile in chicken. Indian J. Vet. Med., 13 : 64 (1991)
18. R.J. Verma, P.J. Raval & H.C. Dube. Aflatoxin cytotoxicity to human RBC and its prevention by ascorbic acid. Proc. Symp. Mycotoxin incidence and human health, Bhagalpur, pp. 43 (1991).
19. Laxma Reddy G. & S.M. Reddy. Biochemical and histopathological effects of trichothecene mycotoxin on chicks. In : Microbes and Man (eds.) Sudhir Chandra, K.K. Khannal. Bishen Singh Mahendrapal Singh, Dehradun, pp. 243-251 (1995)