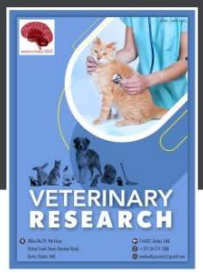
VETERINARY RESEARCH
SINCE 2000
MEDWELL PUBLICATIONS



Effects of Different Doses of Viper *Cerastes cerastes* Crude Venom on the Serum and Some Enzyme Activities in Male Guinea Pigs at Different Times

Muhammad M.A. Salman
Department of Zoology, Faculty of Science, South Valley University, Qena, Egypt

Key words: Viper *Cerastes cerastes* venom, biochemical parameters, enzyme activities, guinea pigs, post-injection, triglycerides

Corresponding Author:
Muhammad M.A. Salman
Department of Zoology, Faculty of Science, South Valley University, Qena, Egypt

Page No.: 37-44
Volume: 15, Issue 4, 2015
ISSN: 1993-5412
Veterinary Research

Abstract: The desert horned vipers (*C. cerastes* and *C. gasperettii*) are the most familiar snakes of the great deserts of North Africa and the Middle East. In the present study, the effects of Cerastes crude venom on serum biochemical parameters of Guinea pigs. Female Guinea pigs (300±30 g B.W.) were divided into three groups (10 each). In the control group, Guinea pigs were interaperitoneally (ip) injected with 100 μL saline solution. The second group was ip., injected with 0.2 μ g^{-1} B.W. of crude venom in 100 μL saline solutions. The third group was ip., injected with 0.4 μgm g^{-1} B.W. of crude venom in 100 μL saline solution. The results indicated that the single dose of crude venom induced a significant decrease in total serum protein, albumin, globulin cholesterol, triglycerides and uric acid within 12 and 24 h. After injection of crude venom of the viper *C. cerastes*. However, the levels of glucose, urea, creatinine, Alanine aminotransferase (ALT), Aspartate aminotransferase (AST) and Alkaline Phosphatase (ALP) were elevated in envenomated Guinea pigs after 12 and 24 h post-injection of crude venom. Viper *C. cerastes* crude venom caused hepatic and renal dysfunction in envenomated Guinea pigs. These disturbances are remaining for 24 h after envenomation of Guinea pigs at least, regardless the using dose.

INTRODUCTION

There are approximately, 420 venomous species of snakes living on the Earth (Lewis and Gutmann, 2004). It is worthy to mention that intra-specific venom disparity takes place among individual snakes due to seasonal variation, diet, habitat, age and sexual dimorphism venom variability occurs at a number of ambits including inter-and intra-species variations (Sasa, 1999). Additionally, venom components may be altered by the geographical location and habitat of the snake (Zingali *et al*., 1993; Sasa, 1999; Salazar *et al*., 2007). Further, more that zoological distribution and environmental condition could influence the overall biological behavior of snake venoms of the same species (Hassan *et al*., 1980; Warrel, 1997).

The desert horned vipers (*C. cerastes* and *C. gasperettii*) are the most familiar snakes of the great deserts of North Africa and the Middle East (Gasperetti, 1988; Schneemann *et al*., 2004). Viper snakes

are widely distributed snakes in Africa (Marsh *et al*., 1997a, b). Viper *C. cerastes* is commonly known as desert-horned or Egyptian Sand Viper (Soslau *et al*., 1988; Chippaux *et al*., 1991). It is a poisonous snake and as its name implies, inhabits the sandy deserts of Egypt (Zimmerman *et al*., 1981). Several studies have been made on the metabolic, cardiovascular and hematological effects of viper venoms on man and animals (Tilbury *et al*., 1987; Soslau *et al*., 1988; Abu-Sinna *et al*., 1993; Abdel-Nabi *et al*., 1997; Fahim, 1998; Al-Jammaz *et al*., 1999). In contrast, there is a paucity of information on the effects of the viper *C. cerastes* crude venom on biochemical parameters of Guinea pigs. The present study is planned to investigate the effects of different doses of the viper *Cerastes cerastes* crude venom on the serum biochemical parameters of Guinea pigs.

MATERIALS AND METHODS

Crude venom was obtained from the viper *C. cerastes* kept in a serpentarium at the Department of Zoology, Faculty of Science and South Valley University. The snakes were collected from the Qena region of Egypt. Venom was milked, lyophilized, stored in a desiccator at 4°C in the dark and reconstituted in saline solution prior to use. LD_{50} crude venom was determined as described by Meier and Theakston (1986).

Study design: Thirty male Guinea pigs weighing 300±30 g were used. Guinea pigs were obtained from the animal house facility of the Egyptian Organization for Biological Products and Vaccines (VACSERA), Helwan, Cairo, Egypt. Animals were housed in standard condition and fed with normal diet and water *ad libitum*. The experimental procedures, animal care and research ethics has been approved by the scientific committee at the Faculty of Science, South Valley University. The Guinea pigs were divided randomly into three groups.

Group 1: Ten animals were injected interaperitoneally (ip) with 100 µL physiological saline (0.9% Na Cl) and served as a control.

Group 2: Ten animals were received a single low dose (0.2 µgm g^{-1} B.W.) of viper *C. cerastes* crude venom in 100 µL saline solution interaperitoneally (ip).

Group 3: Ten animals were received a single high dose (0.4 µgm g^{-1} body weight) of viper *C. cerastes* crude venom in 100 µL saline solution interaperitoneally (ip) according to Salman (2009, 2010). Five animals of each group (1-3) were sacrificed at 12 and 24 h, respectively post-injection of crude venom (Al-Jammaz *et al*., 1999; Salman, 2009).

Serum analysis: The animals were sacrificed and blood was collected from each animal into plain centrifuge tubes, left for 1 h at room temperature to clotting. Serum was separated by centrifugation at 3000 g for 30 min and analyzed for the concentration of total protein, albumin, globulin, ALT, AST, ALP, urea, creatinine, uric acid, glucose and cholesterol and triglycerides determination. Kits were purchased from Spinreact, S.A. Ctra. Santa Coloma, Spain. All other chemicals used were of analytical reagent grade. Glucose determination was carried out according to the method Trinder (1969). Determination of total serum protein was estimated according to Peters (1968) method. Serum albumin was determined according to the method described by Doumas *et al*. (1971) and Doumas and Biggs (1972). Serum globulin was obtained from the difference between the total serum protein and serum albumin. Cholesterol was determined by enzymatic method as described by Richmond (1973) while triglycerides were determined by the enzymatic colorimetric method as described by Young. Creatinine was determined by kinetic method described by Hare (1950) while determination of urea was according to the enzymatic method of Patton and Crouch (1977). Serum uric acid was determined by quantitative determination method by Fossati *et al*. (1980). The principle of determination of transaminases (ALT and AST) activities was based on the methods of Reitman and Frankel (1957) while determination of Alkaline Phosphatase (ALP) activities in serum was done according to the enzymatic method by El-Aaser and El-Merzabani (1975).

Statistical analysis: Data were statistically analyzed using SPSS Software and presented as means and standard error (Mean±SE). Parameters of groups 2 and 3 were compared to control group using one way analysis of variance test. Results were considered significant when $p<0.05$.

RESULTS

The LD_{50} of venom was found to be 0.66 µgm g^{-1} of Guinea pigs.

Effects of the different doses (ip) injection of viper *C. cerastes* crude venom on the levels of serum total protein, albumin and globulin

Serum of total protein content: Administration of single dose crude venom 0.4 µgm g^{-1} B.W. (group 3) led to decrease in serum total protein level at the 12 and 24th h after injection. These decreases were 21.57% ($p<0.05$) and 28.46% ($p<0.01$) at the 12 and 24th h, respectively after injection. However, the injection of crude venom 0.2 µgm g^{-1} B.W. (group 2) serum total

Table 1: The effects of the different (i.p) injected doses of viper *Cerastes cerastes* crude venom on the levels of serum total proteins (mg dL^{-1}), albumin (mg dL^{-1}) and globulin (mg dL^{-1}) in guinea pigs at the 12 and 24 h after crude venom injection

		Experimental groups and doses		
Time (Variables)	Parameters	Group 1 control	Group 2 (0.2 µgm g^{-1})	Group 3 (0.4 µgm g^{-1})
12 hours post-injection crude venom (Total protein)	Means±SE (mg dL^{-1})	6.63±0.43	6.5±0.33	5.2±0.32
	Change (%)		-1.96	-21.57
	p-values		N.S.	p<0.05
Albumin	Means±SE (mg dL^{-1})	3.45±0.41	3.37±0.32	3.00±0.23
	Change (%)		-2.32	-13.04
	p-values		N.S.	p<0.05
Globulin	Means±SE (mg dL^{-1})	3.18±0.34	3.13±0.31	2.2±0.23
	Change(%)		-1.57	-30.82
	p-values		N.S.	p<0.01
24 h post-injection crude venom (Total protein)	Means±SE (mg dL^{-1})	6.43±0.42	5.11±0.34	4.6±0.34
	Change (%)		-20.53	-28.46
	p-values		p<0.05	p<0.01
Albumin	Means±SE (mg dL^{-1})	3.41±0.24	3.00±0.21	2.6±0.22
	Change(%)		-12.02	-23.75
	p-values		p<0.05	p<0.01
Globulin	Means±SE (mg dL^{-1})	3.01±0.121	2.11±0.111	2.00±0.211
	Change (%)		-29.90	-33.55
	p-values		p<0.01	p<0.01

N = 5 animals were used in each group; P = significantly different from the control; NS = Insignificant different from the control

protein level insignificant decreased (1.96%) after 12 h but it was significant decrease 20.53% ($p<0.05$) at the 24th h as compared with those of control animals.

Serum albumin content: In group 3 serum albumin level significantly decreased, the decreases were significant 13.04% ($p<0.05$) at the 12th and 23.75% ($p<0.01$) at the 24th h post-injection. Meanwhile, serum albumin level in (group 2) decreased at 12th, the decrease was insignificant while at the 24th the decrease of serum albumin was significant 12.02% ($p<0.05$) as compared with those of control (Table 1).

Serum globulin content: Serum globulin levels significantly reduced ($p<0.01$) the decreases were (30.82 and 33.55%) at the 12 and 24th h, respectively in envenomed Guinea pig in group 3. However, in group 2 there was insignificant decrease at the 12th but this decrease was statistically significant decrease 29.90% ($p<0.01$) at 24th, post-injection as compared with those of control (Table 1).

Effects of the different doses (ip) injection of viper *C. cerastes* crude venom on the levels of creatinine, urea and uric acid

Serum creatinine content: All groups (groups 2 and 3) showed an increase in serum creatinine at the 12 and 24th h, post-injection as compared with those controls. In group 2 statistically significant increases in serum creatinine were 22.22 ($p<0.05$) and 75.51% ($p<0.01$) after 12 and 24th h, respectively. In group 3, the increases were 77.78 ($p<0.01$) and 165.31% ($p<0.001$) after 12 and 24th h, respectively post-injection as compared with those controls (Table 2).

Serum urea: Statistically significant changes in serum urea levels were found increase in groups 2 and 3. Serum urea levels increased at the 12 and 24th h as compared with those of control. The increases in group 2 were 51.26% ($p<0.01$) and 112.43% ($p<0.001$) after 12 and 24th h, respectively. Also, the increases in group 3 were 86.16% ($p<0.01$) and 141.12% ($p<0.001$) after 12 and 24th h, respectively after injection as compared with those of control Guinea pigs (Table 2).

Serum uric acid content: The levels of serum uric acid in (groups 1 and 2) decreased at the 12 and 24th h in envenomed Guinea pigs. Statically significant difference was observed in group 2 at the 12 and 24th h 18.75 ($p<0.05$) and 35.29% ($p<0.01$), respectively. The decreases in group 3 were 37.5 ($p<0.05$) and 50% ($p<0.01$) after 12 and 24th h, respectively pos-injection as compared with those of control (Table 2).

Effects of the different doses (ip) injection of viper *C. cerastes* crude venom on the levels of serum glucose, cholesterol and triglycerides

The levels of serum glucose: Serum glucose levels increased at the 12 and 24th h, post-injection in groups 2 and 3 compared with those of controls. Statistically significant changes in serum glucose levels were found in group 2 significant increase at the 12th (21.63%) and (18.97%) at 24th h ($p<0.05$). However in group 3 the increases were significantly at the 12th (42.57%) and (47.36%) 24th h, ($p<0.01$) as compared with those of control.

The levels of serum cholesterol: The venom effects on serum cholesterol levels led to decreases after 12 and

Table 2: The effects of the different (i.p) injected doses of viper *Cerastes cerastes* crude venom on the levels of serum creatinine (mg dL^{-1}), urea (mg dL^{-1}) and uric acid (mg dL^{-1}) in guinea pigs at the 12 and 24 h after crude venom injection

		Experimental groups and doses		
Time (Variables)	Parameters	Group 1 control	Group 2 (0.2 µgm g^{-1})	Group 3 (0.4 µgm g^{-1})
12 hours post-injection crude venom (Creatinine)	Means± SE (mg dL^{-1})	0.45±.060	0.55±0.04	0.8±0.05
	Change (%)		22.22+	77.78+
	p-value		p< 0.05	p<0.01
Urea	Means±SE (mg dL^{-1})	35.33±2.6	53.44±3.7	65.77±2.4
	Change (%)		51.26+	86.16+
	p-value		p<0.01	p<0.01
Uric acid	Means±SE (mg dL^{-1})	1.6±0.06	1.3±0.08	1.0±0.03
	Change (%)		-18.75	-37.5
	p-value		p<0.05	p<0.05
24 h post-injection crude venom (Creatinine)	Means±SE (mg dL^{-1})	0.49±0.07	0.86±0.04	1.3±0.08
	Change (%)		75.51+	165.31+
	p-value		p<0.01	p<0.001
Urea	Means±SE (mg dL^{-1})	40.22±3.3	85.44±2.4	96.98±3.8
	Change (%)		112.43+	141.12+
	p-value		p<0.001	p<0.001
Uric acid	Means±SE (mg dL^{-1})	1.7±0.07	1.1±0.08	0.85±0.04
	Change (%)		35.29-	-50
	p-value		p<0.05	p<0.01

N = 5 animals were used in each group; P = significantly different from the control; NS = Insignificant different from the control

Table 3: The Effects of the different (i.p) injected doses of viper *Cerastes cerastes* crude venom on the levels of serum glucose (mg dL^{-1}), cholesterol (mg dL^{-1}), and triglycerides (mg dL^{-1}) in guinea pigs at the 12 and 24 h after crude venom injection

		Experimental groups and doses		
Time	Parameters	Group 1 control	Group 2 (0.2 µgm g^{-1})	Group 3 (0.4 µgm g^{-1})
12 h post-injection crude venom (Glucose)	Means±SE (mg dL^{-1})	95.0±5.31	115.55±6.11	135.44±7.22
	Change (%)		21.63	42.57
	p-value		p<0.05	p<0.01
Cholesterol	Means±SE (mg dL^{-1})	83.00±5.33	55.88±3.14	42.36±8.13
	Change (%)		32.67-	48.96-
	p-value		p<0.05	p<0.01
Triglycerides	Means±SE (mg dL^{-1})	87.89±8.11	57.44±8.14	52.31±4.21
	Change (%)		34.65-	-40.48
	p-value		p<0.05	p<0.01
24 h post-injection crude venom (Glucose)	Means±SE (mg dL^{-1})	98.6±5.41	117.30±6.34	145.30±4.11
	Change (%)		18.97	47.36
	p-value		p<0.05	p<0.01
Cholesterol	Means±SE (mg dL^{-1})	86.0±6.41	64.50±5.52	60.32±5.24
	Change (%)		25-	29.86-
	p-value		p<0.05	p<0.05
Triglycerides	Means±SE (mg dL^{-1})	82.42±5.11	62.34±6.42	58.22±7.11
	Change (%)		24.36-	29.36-
	p-value		p<0.05	p<0.05

N = 5 animals were used in each group; P = significantly different from the control; NS = Insignificant different from the control

24th h post-injection in group 2. The statistically of these decreases were (32.67%; p<0.05 and 25%; p<0.05), respectively as compared with those of control. Meanwhile in group 3 serum cholesterol changes were significant 48.96 (p<0.01) and 29.86% (p<0.05) after 12 and 24 h, respectively as compared with those of control (Table 3).

The levels of serum triglycerides: The injection of crude venom 0.2 (group 2) and 0.4 µgm g^{-1} B.W. (group 3) led to decreases in serum triglycerides levels at the 12 and 24th h after injection. These decreases of group 2 was 34.65% (p<0.05) at 12 and 24.36% at 24th h post-injection. The decreases in serum triglycerides of group 3 were 40.48 (p<0.01) and 29.36% (p<0.05) at 12 and 24th h post-injection, respectively when compared to those of control (Table 3).

Effects of (ip) injection of different doses of viper *C. cerastes* crude venom on the levels of serum Alanine aminotransferase (ALT), Aspartate aminotransferase (AST) and Alkaline Phosphatase (ALP) Serum Alanine aminotransferase (ALT): The injection of crude venom 0.2 (group 2) and 0.4 µgm g^{-1}

Table 4: The Effects of (i.p) injection of different doses of viper *Cerastes cerastes* crude venom on the levels of serum alanine Aminotransferase (ALT; U L^{-1}), aspartate Aminotransferase (AST; U L^{-1}) and alkaline phosphatase (ALP; U L^{-1}) in male Guinea pigs at 12 and 24 h after injection

		Experimental groups and doses		
Time (Variables)	Parameters	Group 1 control	Group 2 (0.2 μgm g^{-1})	Group 3 (0.4 μgm g^{-1})
12 h post-injection crude venom				
Alanine Aminotransferase (ALT)	Means±SE (U L^{-1})	62.53±5.31	120.45±7.21	150.54±6.54
	Change (%)		92.63	140.75
	p-value		p<0.01	p<0.001
Aspartate Aminotransferase (AST)	Means±SE (U L^{-1})	112.41±5.22	144.21±4.14	154.14±6.72
	Change (%)		28.29	37.12
	p-value		p<0.05	p<0.05
Alkaline Phosphatase (ALP)	Means±SE (U L^{-1})	170.66±7.12	248.42±8.66	270.42±5.21
	Change (%)		45.56	+58.46
	p-value		p<0.01	p<0.01
24 h post-injection crude venom				
Alanine Aminotransferase (ALT)	Means±SE (U L^{-1})	65.32±4.44	112.55±7.8.22	148.78±6.42
	Change (%)		72.31	127.77
	p-value		p<0.01	p<0.001
Aspartate Aminotransferase (AST)	Means±SE (U L^{-1})	115.41±7.25	141.87±8.70	151.88±7.54
	Change (%)		22.93	31.60
	p-value		p<0.05	p<0.05
Alkaline Phosphatase (ALP)	Means±SE (U L^{-1})	177.47±7.14	247.87±7.57	256.78±6.69
	Change (%)		39.67	44.69
	p-value		p<0.05	p<0.01

N = 5 animals were used in each group; P = Significantly different from the control; NS = Insignificant different from the control

B.W. (group 3) led to increases in serum Alanine aminotransferase (ALT) levels at the 12 and 24th h after injection. These increases of group 2 were 92.63 (p<0.01) and 72.31% (p<0.01) at 12 and 24th h, respectively after injection and the increases of group 3 were 140.75 (p<0.001) and 127.77% (p<0.001) at 12 and 24th h, respectively post-injection as compared with those of control guinea pigs (Table 4).

Serum Aspartate aminotransferase (AST): The injection of crude venom 0.2 (group 2) and 0.4 μgm g^{-1} B.W. (group 3) led to increases in serum Aspartate aminotransferase (AST) levels at the 12 and 24th h after injection. These increases of group 2 were 28.29 (p<0.05) and 22.93% (p<0.05) at 12 and 24th h, respectively and the increases of group 3 were 37.12 (p<0.05) and 31.60% (p<0.05) at 12 and 24th h, respectively post-injection as compared with those of control (Table 4).

Serum Alkaline Phosphatase (ALP): The injection of crude venom 0.2 (group 2) and 0.4 μgm g^{-1} B.W. (group 3) led to increases in serum Alkaline Phosphatase (ALP) levels at the 12 and 24th h after injection. These increases of group 2 were 45.56 (p<0.01) and 39.67% (p<0.05) at 12 and 24th h, respectively and the increases of group 3 were 58.46 (p<0.01) and 44. 69% (p<0.01) at 12 and 24th h, respectively post-injection as compared with those of control guinea pigs (Table 4).

DISCUSSION

It is well known that serum proteins are synthesized and secreted by several cell types depending on the nature of the individual serum protein. The major function of these proteins is maintenance of the intravascular osmotic pressure and hence, maintenance of the blood pressure and fluids in the circulation. They also carry out transport and storage function for several minerals, growth factors and hormones. Another strategic function of serum proteins is a defensive function mediated by γ-globulins produced by mature β-lymphocyte (West, 1985; Marinova *et al*., 1991; Guyton and Hall, 2000). The present study revealed that the injection of crude venom of viper *Cerastes cerastes* causes a reduction in serum total proteins, albumin, globulin and uric acid in envenomated guinea pigs. These findings are in agreement with other investigators who reported that the reduction in serum total proteins, albumin, globulin and uric acid in envenomated rats was in laboratory animals injected with viper snake venoms (Abdel-Nabi *et al*., 1997; Fahim, 1998; Al-Jammaz *et al*., 1998, 1999). It might be assumed that the reduced levels of these serum constituents could be due to disturbances in renal functions as well as haemorrhages in some internal organs. In fact, the increasing in vascular permeability and haemorrhages in vital organs due to the toxic action of various snake venoms were described by Meier and Stocker (1991) and Marsh *et al*. (1997a, b). Furthermore, the viper bites will cause toxic effects on victims due to the presence of lipolytic and proteolytic enzymes in their

venoms (Tan and Ponnudurai, 1990). It worthy to mention that several studies have been made on the metabolic, cardiovascular and hematological effects of viper venoms on man and experimental animals (Tilbury *et al*., 1987; Soslau *et al*., 1988; Abu-Sinna *et al*., 1993; Abdel-Nabi *et al*., 1997; Fahim, 1998) and found that various venoms viper cause alterations of rat metabolism (Al-Jammaz *et al*., 1998, 1999). Furthermore, several workers reported that acute renal failure characterized by vascular lesions and tubular necrosis in the renal cortex following various snake bites (Tilbury *et al*., 1987).

In the present study, the rise in serum urea and creatinine levels indicates impairment of renal function. Similar observations were reported in rats following administration of various viper venoms (Abdel-Nabi, 1993; Rahmy *et al*., 1995; Omran *et al*., 1997; Abdel-Nabi *et al*., 1997; Schneemann *et al*., 2004). Such increased vascular permeability, together with renal damage would further aggravate the accompanying hypoproteinemia and hypoalbuminaemia. Furthermore, the rise in serum urea and creatinine associated with the reduction of serum uric acid level observed in the present study, supports the proposed impairment of renal function. Similar observations were reported following various viper envenomation of rats (Sant and Purandare, 1972; Rahmy *et al*., 1995; Abdel-Nabi *et al*., 1997; Omran *et al*., 1997).

In the present study, snake venoms caused an increase in serum glucose level in the envenomated animals. Snake venoms were found to produce hyperglyceamia in rats and mice (Mohamed *et al*., 1980; Abdel-Nabi *et al*., 1997; Fahim, 1998; Al-Jammaz *et al*., 1999; Pung *et al*., 2005; Sleat *et al*., 2006). In the present study, the levels of serum glucose were significantly increase after 12 and 24 h in the envenomated Guinea pigs. The increases in serum glucose levels could be attributed to the effects of the venom on glycogen metabolism in the hepatocytes, muscle fibers and medullary catecholamines that stimulate glycogenolysis and gluconeogenesis in those tissues (Ohhira *et al*., 1991; Abdel-Nabi *et al*., 1997; Marsh *et al*., 1997a, b).

The present study has revealed decreases in serum cholesterol and triglycerides levels in envenomated Guinea pigs following viper *Cerastes cerastes* injection. These findings are in agreement with other investigators who reported that the decreases in serum cholesterol and triglycerides levels envenomated rats was in laboratory animals injected with viper snake venoms (Abdel-Nabi *et al*., 1997; Al-Jammaz, 2002). They suggested that the snake venom might have mobilized level lipids from adipose and other tissues lipolytic enzymes could have split tissue lipid with the liberation of free fatty acids (Abdel-Nabi *et al*., 1997; Al-Jammaz, 2002). In the present study could be due to the hepatocytes damage rendering them unable to phosphorylate the increasing amounts of fatty acids, hence leading to fatty liver and alteration of cell membranes of tissues (El-Asmar *et al*., 1979). Such disturbances of serum electrolytes were reported in rats following various snake's venom injections (Mohamed *et al*., 1964; Al-Jammaz, 1995). Furthermore, Meier and Stocker (1991) suggested that these disturbances might be due to acute nephropathy following viper bites. In addition, Mohamed *et al*. (1980) speculate that this effect was brought about by stimulation of adrenal cortex leading to aldosterone secretion.

Measurement of the serum enzyme activities are important in assessment of vital organs and crude snake venoms have been shown to affect the activities of several serum enzymes (Mohamed *et al*., 1980; Al-Jammaz *et al*., 1992; Abdel-Nabi *et al*., 1997; Fahim, 1998). Those enzyme activities fluctuate following the damage to liver, myocardial and skeletal muscles (Mohamed *et al*., 1981). In the present study, the rise in the activities of ALT, ALP and AST indicate the damage of liver, heart and other organs brought about by the venom. Such findings are in agreement with previous reports on venoms of other snake species (Abdel-Nabi *et al*., 1997; Fahim, 1998; Mohamed *et al*., 1981; Al-Jammaz *et al*., 1992).

CONCLUSION

The measurements of biochemical parameters following viper *C. cerastes* crude venom injection, clearly demonstrate the disturbances of vital organs, especially liver, kidney and muscles. Such these disturbances are remaining for 24 h after envenomation of Guinea pigs at least, regardless the using dose.

REFERENCES

Abdel-Nabi, I., R. Awadalla and I. El-Shamy, 1997. Biochemical effects of intraperitoneal injection of rats with the venom of the snake *Echis carinatus*. Egypt. J. Zool., 29: 195-205.

Abdel-Nabi, I.M., 1993. Effect of crude *Cerastes cerastes* venom and fraction B on the clinical biochemical parameters of white rat. J. Egypt. Ger. Soc. Zool., 10: 315-326.

Abu-Sinna, G., A.S. Al-Zahaby, A.A. El-Aal, A.A. El-Baset and N.A. Soliman, 1993. The effect of the viper *Cerastes cerastes cerastes* venom and venom fractions on carbohydrate metabolism. Toxicon, 31: 791-801.

Al-Jammaz, I., 1995. Effects of the venom of Walterinnesia aegyptia and Echis coloratus on solute levels in the plasma of albino rats. J. King Saud Univ. Sci., 1: 63-69.

Al-Jammaz, I., M.I. Al-Ayed and H. Al-Yahya, 1998. Effect of acute envenomation with LD_{50} of *B. arietans*. Ain. Shams. Sci. Bull., 36: 207-222.

Al-Jammaz, I., M.K. Al-Sadoon and A. Fahim, 1999. Effect of LD5o dose of echis coloratus venom on serum and tissue metabolites and some enzymes of male albino rats. J. King Saud Univ. Sci., 11: 61-68.

Al-Jammaz, I., M.K. Al-Sadoon, M.A. Attia and A. Fahim, 1992. Effect of Walterinessia aegyptia venom on serum, tissue metabolites and some enzyme activities in male albino rats I. Enzyme activities. Ain Shams Sci. Bull., 30: 207-222.

Al-Jammaz, I.A., 2002. Effects of envenomation by *Cerastes vipera* crude venom on plasma and tissue metabolites of rats. Kuwait J. Sci. Eng., 29: 111-119.

Chippaux, J.P., V. Williams and J. White, 1991. Snake venom variability: Methods of study, results and interpretation. Toxicon, 29: 1279-1303.

Doumas, B.T. and H.G. Biggs, 1972. Determination of Serum Albumin. In: Standard Methods of Clinical Chemistry, Cooper, G.A. (Ed.). Vol. 7, Academy Press, New York, pp: 175-188.

Doumas, B.T., W.A. Watson and H.G. Biggs, 1971. Albumin standards and the measurement of serum albumin with bromcresol green. Clinica Chimica Acta, 31: 87-96.

El-Aaser, A.B.A. and M.M. El-Merzabani, 1975. Simultaneous determination of 5'-nucleotidase and alkaline phosphatase activities in serum. Clin. Chem. Lab. Med., 13: 453-460.

El-Asmar, M.F., R.M. Farag, S. Shoukry and I.R. El-Shimi, 1979. Effect of scorpion *Leivrus quinquestriatus* H and E venom on lipid metabolism. Toxicon, 17: 279-283.

Fahim, A., 1998. Biological effects of the viper *B. arietans*, crude venom on albino rats. Egypt. J. Zool., 30: 35-54.

Fossati, P., L. Prencipe and G. Berti, 1980. Use of 3,5-dichloro-2-hydroxybenzenesulfonic acid/4-aminophenazone chromogenic system in direct enzymic assay of uric acid in serum and urine. Clin. Chem., 26: 227-231.

Gasperetti, J., 1988. Snakes of Arabia. Fauna Saudi Arabia, 9: 169-450.

Guyton, A.C. and J.E. Hall, 2000. The Microcirculation and the Lymphocytic System: Capillary Fluid Exchange, Interstitial Fluid and Lymph Flow. In: Medical Physiology, Guyton, A.C. and J.E. Hall (Eds.). 10th Edn., Chapter 16, W.B. Saunders Co., New York, pp: 162-174.

Hare, R.S., 1950. Endogenous creatinine in serum and urine. Proc. Soc. Exp. Biol. Med., 74: 148-151.

Hassan, F., M.F. El-Hawary, A. Gazawi, A. Anis and S. Wanas, 1980. Biochemical properties of Egyptian Cerastes venoms in relation to geographic distribution. Zeitschrift fur Ernahrungswissenschaft, 19: 259-265.

Lewis, R.L. and L. Gutmann, 2004. Snake venoms and the neuromuscular junction. Semin. Neurol., 24: 175-179.

Marinova, T.S., R. Georgieva and T. Pantev, 1991. Protein synthesis changes in peripheral blood leucocytes following *in vivo* and *in vitro* irradiation mammalian spermatogonia. Rentgenologiya i Radiologiya, 30: 63-66.

Marsh, N.A., T.L. Fyffe and E.A. Bennett, 1997a. Isolation and partial characterization of a prothrombin-activating enzyme from the venom of the Australian rough-scaled snake (*Tropidechis carinatus*). Toxicon, 35: 563-571.

Marsh, N., D. Gattullo, P. Pagliaro and G. Losano, 1997b. The Gaboon viper, Bitis gabonica: Hemorrhagic, metabolic, cardiovascular and clinical effects of the venom. Life Sci., 61: 763-769.

Meier, J. and K. Stocker, 1991. Effects of snake venoms on hemostasis. Toxicology, 21: 171-182.

Meier, J. and R.D.G. Theakston, 1986. Approximate LD_{50} determinations of snake venoms using eight to ten experimental animals. Toxicon, 24: 395-401.

Mohamed, A.H., M.S. El-Serougi and A.M. Kamel, 1964. Effect of Walterinnesia aegyptia venom on blood sodium, potassium and catecholamines and urine 17-ketosteroids. Toxicon, 2: 103-107.

Mohamed, A.H., S. Foaud, F. Abbas, A. Abdel-Aal and A.A. Baset *et al*., 1980. Metabolic studies of the Egyptian and allied African snake venoms. Toxicon, 18: 381-383.

Mohamed, A.H., S. Fouad, S. El-Aasar, A.M. Salem and A. Abdel-Aal *et al*., 1981. Effects of several snake venoms on serum and tissue transaminases, alkaline phosphatase and lactate dehydrogenase. Toxicon, 19: 605-609.

Ohhira, M., S. Gasa, A. Makita, C. Sekiya and M. Namiki, 1991. Elevated carbohydrate phosphotransferase activity in human hepatoma and phosphorylation of cathepsin D. Br. J. Cancer, 63: 905-908.

Omran, M.A., I.M. Abdel-Nabi and M.H. El-Naggar, 1997. Serum biochemical and hormonal parameters as biomarkers for the toxic effects of Egyptian cobra (Naja haje) envenmation. J. Nat. Toxins, 6: 69-83.

Patton, C.J. and S.R. Crouch, 1977. Spectrophotometric and kinetics of berthelot reaction for determination of ammonia. Anal. Chem., 49: 464-469.

Peters, T., 1968. Proposals for standardization of total protein assays. Clin. Chem., 14: 1147-1159.

Pung, Y.F., P.T. Wong, P.P. Kumar, W.C. Hodgson and R.M. Kini, 2005. Ohanin, a novel protein from king cobra venom, induces hypolocomotion and hyperalgesia in mice. J. Biol. Chem., 280: 13137-13147.

Rahmy, T.R., R.A. Ramadan, T.M. Farid and M.F. El-Asmar, 1995. Renal lesions induced by cobra envenomation. J. Egypt. Ger. Soc. Zool., 17: 251-271.

Reitman, S. and S. Frankel, 1957. A colorimetric method for the determination of serum glutamic oxalacetic and glutamic pyruvic transaminases. Am. J. Clin. Pathol., 28: 56-63.

Richmond, W., 1973. Preparation and properties of a cholesterol oxidase from *Nocardia* sp. and its application to the enzymatic assay of total cholesterol in serum. Clin. Chem., 19: 1350-1356.

Salazar, A.M., A. Rodriguez-Acosta, M.E. Giron, I. Aguilar and B. Guerrero, 2007. A comparative analysis of the clotting and fibrinolytic activities of the snake venom (*Bothrops atrox*) from different geographical areas in Venezuela. Thrombosis Res., 120: 95-104.

Salman, M.M., 2009. Physiological effects of envenomation by two different doses of the viper *Echis coloratusis* crude venom on biochemical parameters in serum of Ginea pigs at different times. Egypt. Acad. J. Biol. Sci., 1: 21-31.

Salman, M.M., 2010. Biochemical studies on the effects of the crude venom of the scorpion *Buthus occitanus* on the serum of guinea pig. Egypt. J. Nat. Toxins, 7: 86-102.

Sant, S.M. and N.M. Purandare, 1972. Autopsy study of cases of snake bite with special reference to the renal lesions. J. Postgrad. Med., 18: 181-188.

Sasa, M., 1999. Diet and snake venom evolution: Can local selection alone explain intraspecific venom variation? Toxicon, 37: 249-252.

Schneemann, M., R. Cathomas, S.T. Laidlaw, A.M. El-Nahas, R.D.G. Theakston and D.A. Warrell, 2004. Life-threatening envenoming by the Saharan horned viper (*Cerastes cerastes*) causing micro-angiopathic haemolysis, coagulopathy and acute renal failure: Clinical cases and review. Q. J. Med., 97: 717-727.

Sleat, D.E., Y. Wang, I. Sohar, H. Lackland and Y. Li *et al*., 2006. Identification and validation of mannose 6-phosphate glycoproteins in human plasma reveal a wide range of lysosomal and non-lysosomal proteins. Mol. Cell. Proteomics, 5: 1942-1956.

Soslau, G., M.F. El-Asmar and J. Parker, 1988. Cerastes cerastes (Egyptian sand viper) venom induced platelet aggregation as compared to other agonists. Biochem. Biophys. Res. Commun., 150: 909-916.

Tan, N.H. and G. Ponnudurai, 1990. A comparative study of the biological properties of venoms from snakes of the genus *Vipera* (true adders). Comp. Biochem. Physiol. B, 96: 683-688.

Tilbury, C.R., M.M. Madkour, D. Saltissi and M. Suleiman, 1987. Acute renal failure following the bite of Burton's carpet viper *Echis coloratus* Gunther in Saudi Arabia: Case report and review. Saudi Med. J., 8: 87-95.

Trinder, P., 1969. Enzymatic colorimetric method for glucose determination. Ann. Clin. Biochem., 6: 24-27.

Warrel, D.A., 1997. Geographical and Intra species Variation in the Clinical Manifestation of Envenoming by Snakes. In: Venomous Snakes: Ecology, Evolution and Snake Bite, Thorpe, R.S., W. Wuster and A. Malhotra (Eds.). Clarendon Press, Oxford, pp: 189-203.

West, J.B., 1985. Blood and the Plasma Proteins: Function and Composition of Blood. In: Best and Taylor's Physiological Basis of Medical Practice, West, J.B. (Ed.). 11th Edn., Williams and Wilkins, Baltimore, pp: 334-340.

Zimmerman, J., G. Mann, H.Y. Kaplan and U. Sagher, 1981. Envenoming by *Cerastes vipera*-a report of two cases. Trans. R. Soc. Trop. Med. Hyg., 75: 702-705.

Zingali, R.B., M. Jandrot-Perrus, M.C. Guillin and C. Bon, 1993. Bothrojaracin, a new thrombin inhibitor isolated from *Bothrops jararaca* venom: Characterization and mechanism of thrombin inhibition. Biochemistry, 32: 10794-10802.