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The role of Allicin compound in reducing the negative effects of scorpion venom and antivenom on some hematology and immunity

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Abstract

This study was conducted to identify the role of allicin compound in reducing the negative effects of scorpion venom and antivenom on some blood and immune parameters, as 42 white rats weighting 160-180 g and their ages between 10-12 weeks were used in the experiment, the animals were taken care of in the animal house of the Department of biology / College of Education / University of Qadisiyah, the animals were randomly divided into seven groups, each group includes (6) rats As follows: the control group dosed with physiological solution throughout the experiment, the first group (T1): animals are injected with scorpion venom at a concentration of (0.5) µg / g once and blood is drawn from them (every three animals after 8 hours and 24 hours), the second group (T2): animals are injected with antivenom at a concentration of (0.5) µg/g once and blood is drawn from them (every three animals after 8 hours and 24 hours), the third group (T3): Animals are dosed with allicin at a concentration of (50) mg/g every six hours and blood is drawn (every three animals after 8 hours and 24 hours), The fourth group (T4): animals are injected with scorpion venom at a concentration of (0.5) µg / g once and dosed with allicin at a concentration of (50) mg/g after injecting the venom half an hour and every six hours and drawing blood (every three animals after 8 hours and 24 hours), Group V (T5): animals are injected with antivenom at a concentration of (0.5) µg/g once and dosed with allicin half an hour after injecting the antidote and every six hours and blood is drawn (every three animals animals after 8 hours and 24 hours), Group F (T6): Animals are injected with scorpion venom at a concentration of (0.5) µg / g once and injected with antivenom at a concentration of (0.5) µg / g once and blood is drawn (every three animals after 8 hours and 24 hours,

The results showed no significant differences in the average number of red blood cells in all treatments compared to control in 8 hours, a significant decrease in the concentration of hemoglobin, packed cell volume and platelet rate in the treatment T1 and T6 in 8 hours, and there were no significant differences in the concentration of hemoglobin and the packed cell volume in T2, T3, T5 in 8 hours, and a significant increase in the rate of platelets in T2, T3,T5 and a decrease in T4, a decrease in the rate of red blood cells, the concentration of hemoglobin and the packed cell volume in T1 in 24 hours and no significant differences in T2, T3, T5, the results also showed a significant increase in white blood cells in T1, T4, and there were no significant differences in T2, T3, T5, an increase in neutrophils in T1, a decrease in lymphocytes and eosinophils in 8 hours, and the results showed a significant increase in the number of leukocytes and neutrophils in T1 and a decrease in lymphocytes and eosinophil in 24 hours.

Keywords: Venom,Antivenom, Red blood cell,Allicin, White blood cell

Introduction

Medicinal plants have been used since ancient times in the treatment of many diseases, and this led to interest in studying them by using them directly or extracting active substances from them for the purpose of using them in treatment, medicinal plants are an important component in medical treatments because they contain active substances with beneficial effects, unlike chemotherapy with a harmful effect (Srivastava, 2018). Allicin is an active compound that is not thermostationary, as it reacts with other compounds to form many products, and allicin reacts with itself to form the anticoagulant compound Ajoene, where it forms a currency similar to aspirin that works to inhibit platelet formation through its binding with Fibrinogen receptors (Borlinghaus et al., 2014).

Scorpions are arthropods that have a pair of canine suffixes Chelicerae and a pair of forceps suffixes Pedipalp and are characterized by the presence of four pairs of arthropods that they use to enter dark areas, scorpions are more dangerous than snakes and insects for animals and humans because they are always offensive behavior and all are poisonous, as 1400 species of scorpions were recorded in the world, including 25 species belonging to eight genera The most dangerous and toxic and cause death directly to humans (Chippaux and Goyffon, 2008).

Symptoms of poisoning vary according to the type of scorpion, the severity of the venom and the immune system of the bitten person, the symptoms appear immediately after the bite and the condition develops a maximum within five hours, during this period the victim suffers sweating, nausea, severe convulsions, difficulty breathing and tachycardia (Dehghani and Fathi, 2012). An antivenom is made by collecting scorpion venom and injecting small amounts of venom into a domestic animal whose blood is able to produce antibodies and then purifying the antibody from the animal's serum through multiple processes (Jalali et al., 2012).

Materials and methods

Scorpion venom was obtained from Sigma-Aldrich in powder powder at a concentration of 10 mg, the dose was prepared at a concentration of (0.5 µg/g) (Adi-Bessalem et al., 2008), and allicin allicin at a concentration of (50) mg/g (Emam and Al-Otabi, 2022), and anti-toxin obtained from the emergency of Afak General Hospital in the form of liquid ampoules with a concentration of 5 mm, the results were read by device Mindray Hematoiogy-BC-2800 Vet.

Experimentally animals

The rats Albino Rats were obtained from the Faculty of Veterinary Medicine / University of Al-Qadisiyah at an age ranging between (10-12) weeks and a weight between (160-180) g, they were raised in the animal house of the Department of biology / College of Education / University of Al-Qadisiyah.

Studied parameters

Hematological parameters (erythrocyte count, stacked cell volume, hemoglobin concentration, platelets). Immunological parameters (total and differential number of white blood cells, percentage of neutrophil, lymph, monocytes and eosinophils).

Experimental design

The experiment included (42) rats distributed to (7) groups, each group includes (6) rats, and the experiment lasted one day as follows: - Control group dosed with physiological solution throughout the experiment period. Group 1 (T1): Animals are injected with scorpion venom at a concentration of (0.5) µg / g once and blood is drawn from them (every three animals after 8 hours and 24 hours).
Group 2 (T2): Animals are injected with antivenom at a concentration of (0.5) µg / g once and blood is drawn from them (every three animals after 8 hours and 24 hours).

Group III (T3): Animals are dosed with allicin at a concentration of (50) mg/g every six hours and blood is drawn (every three animals after 8 hours and 24 hours).
Group IV (T4): Animals are injected with scorpion venom at a concentration of (0.5) µg / g once and dosed with allicin at a concentration of (50) mg/g after injecting the venom half an hour and every six hours and draw blood (every three animals after 8 hours and 24 hours).
Group V (T5): Animals are injected with antivenom at a concentration of (0.5) µg / g once and dosed with allicin after injecting the antidote half an hour and every six hours and blood is drawn (every three animals after 8 hours and 24 hours).
Group F (T6): Animals are injected with scorpion venom at a concentration of (0.5) µg / g once and injected with antivenom at a concentration of (0.5) µg / g once and draw blood (every three animals after 8 hours and 24 hours).

Results

Hematological parameters (8 hours)

Table (1) shows the role of Allicin in reducing the negative effects of scorpion venom and its antagonist on some blood parameters (red blood cell count, hemoglobin concentration in the blood, packed cell volume, platelet rate) in white rats for a period of eight hours, where the results of the current study showed that there were no significant differences (P>0.05) in the average number of red blood cells in all treatments and no significant differences were shown when compared with control (C).

The results of the current study also showed a significant decrease in the concentration of hemoglobin in the first treatment (T1) that injected the venom compared to the control, and the results also witnessed no significant differences in the concentration of hemoglobin in the second treatment (T2), the third (T3) and the fifth (T5), whose rates converged with each other compared to the control, and it was noted that their rates increased compared to the first treatment (T1) that was injected with venom, and we note that there were no significant differences in the concentration of hemoglobin in the blood in the fourth (T4) and sixth treatment (T6) whose rates converged with each other compared to the first tretment (T1) which is right ... The results of the current study also showed a significant decrease in the PVC in the first treatment (T1) that injected the venom compared to the control (C), and we note that there were no significant differences in the second (T2), third (T3), fourth (T4), fifth (T5) and sixth (T6) treatments, whose rates converged with each other compared to control, and a significant decrease was observed in the first treatment (T1) that injected venom compared to all treatments, whose rates converged with each other.

The presence of a significant decrease in the rate of platelets in the first treatment (T1) that injected the toxin compared to the control and the rest of the treatments, and the results also witnessed a significant increase in the rate of platelets in the second treatment (T2), the third treatment (T3) and the fifth (T5) with control, We also note a significant decrease in the fourth treatment (T4) compared to control and the second (T2), third (T3) and fifth (T5) treatments, whose rates converged with each other, and we note that there are no significant differences (P>0.05) in the sixth treatment (T6) compared to control (C), and we also note a significant decrease in the sixth treatment (T6) compared to the second (T2), third (T3) and fifth (T5) treatment.

Table 1: The role of Allicin in reducing the negative effects of scorpion venom and antivenom on some hematological parameters in white rats for 8 hours

Platelet count (platelet/ml^3)	Haematocrit (%)	Hemoglobin concentration (gm/100ml)	RBC count (cell/mm^3)	Parameters group
443.00±93.69 B	42.20±0.30 A	13.46±1.18 A	4.83±0.20 A	C
121.66±12.18 D	37.66±1.20 C	10.73±0.37 B	4.43±0.20 A	T1
571.00±11.54 A	41.66±0.33 A	12.06±0.60 A	4.60±0.10 A	T2
577.66±81.11 A	42.66±0.66 A	12.53±0.53 A	4.63±0.21 A	T3
255.33±31.33 C	40.33±0.66 B	11.16±0.12 B	4.76±0.08 A	T4
618.66±33.33 A	41.31±0.72 A	12.13±0.13 A	4.56±0.12 A	T5
357.66±21.96 B	40.86±0.49 B	11.13±0.56 B	4.46±0.20 A	T6
94.07	1.70	1.49	N.S	LSD

-Numbers indicate the rate± standard error
C : control group represents the group of rats that dosed physiosaline saline for the duration of the experiment (eight hours).
T1:The first treatment represents the group of rats injected with scorpion venom at a concentration of (0.5 µg/g) of body weight once for the duration of the experiment.
T2:The second treatment represents the group of rats that were injected with the antivenom at a dose of (0.5) µg/g body weight once for the duration of the experiment.
T3: The third treatment represents the group of rats dosed with allicin at a dose of (50) mg/g body weight every two hours for the duration of the experiment.
T4:The fourth treatment represents the group of rats injected with scorpion venom at a concentration of (0.5 µg / g) and then dosed with allicin compound at a dose of (50) mg / g
T5:The fifth treatment represents the group of rats dosed with allicin compound at a dose of (50) mg / g and then injected with antivenom at a dose of (0.5) µg / gram
T6: The sixth treatment represents the group of rats injected with scorpion venom at a concentration of (0.5 µg/g) and then injected with antivenom at a dose of (0.5) µg/gram
- Different letters indicate significant differences between the totals ($p<0.05$)
Similar letters indicate that there are no significant differences between the totals ($p>0.05$)

Hematological parameters (24 hours)

Table (2) shows the role of allicin compound in reducing the negative effects of scorpion venom and their antidotes on some blood standards (average red blood cell count, hemoglobin concentration in the blood, PVC, platelet rate) in leukophils for a period of twenty-four hours, where the results of the current study showed a significant decrease in the rate of red blood cell count in the first treatment (T1) that injected venom and the fourth treatment (T4) that injected the venom and dosed with allicin, whose rates converged with each other compared to With the control and the third treatment (T3), the fifth (T5) and the sixth (T6), whose rates converged with each other, and the results also witnessed a significant increase in the rate of the number of red blood cells in the second treatment (T2), which injected the antibody compared to the control and the rest of the treatments.

The results of the current study showed a significant decrease in the concentration of hemoglobin in the blood in the first treatment (T1) that injected the venom compared to the control and the second treatment (T2), the third (T3) and the fourth (T4), whose rates converged with each other, and the results also witnessed a significant decrease in the concentration of hemoglobin in the blood in the fifth treatment (T5) and the sixth (T6), whose rates converged with each other compared to the control and the second treatment (T2), the third (T3) and the fourth (T4), whose rates converged with each other, as witnessed The results

increased significantly in the second (T2), third (T3), fourth (T4), fifth (T5) and sixth (T6) treatment compared to the first treatment (T1).

The results of the current study also showed a significant decrease in the PVC in the first treatment (T1), which injected the venom compared to the control and the rest of the treatments, and the results also witnessed no significant differences in the second treatment (T2), the third (T3) and the fifth (T5), whose rates converged with each other compared to the (C), and the results also witnessed a significant decrease in the PVC in the fourth (T4) and sixth (T6) treatment compared to the control and the second treatment (T2), the third (T3) and the fifth (T5), which Their rates converged with each other. The results of the current study also showed a significant decrease in the rate of platelets in the first treatment (T1), Compared with control and the rest of the transactions, the results also witnessed no significant differences in the rate of platelets in the second treatment (T2) and the third (T3), whose rates converged with each other compared to control, and the results also witnessed a significant decrease in the fourth treatment (T4) and the fifth (T5), whose rates converged with each other compared to control, and the results showed a significant decrease in the rate of platelets in the sixth treatment (T6) compared to control (C), and the results also witnessed a significant increase in the rate of platelets in the second (T2), third (T3), fourth (T4), fifth (T5) and sixth (T6) treatments compared to the first treatment (T1).

Table 2: The role of Allicin in reducing the negative effects of scorpion venom antivenomon some hematological parameters in white rats for a period of 24 hours

Platelet count (platelet/ml^3)	Haematocrit %	Hemoglobin concentration (gm/100ml)	RBC count (cell/mm^3)	Parameters / Groups
536.00±5.77 A	42.44±0.23 A	13.40±0.50 A	4.40±0.25 B	C
156.66±16.58 D	38.6±0.88 C	11.13±0.39 C	4.01±0.12 C	T1
544.33±6.66 A	41.99±0.10 A	13.76±0.56 A	5.03±0.50 A	T2
558.66±16.47 A	41.13±0.78 A	13.35±0.57 A	4.34±0.26 B	T3
340.00±6.24 C	39.33±0.66 B	12.33±0.88 A	4.12±0.26 C	T4
307.00±27.05 C	42.33±0.66 A	12.66±0.66 B	4.33±0.23 B	T5
455.66±8.56 B	40.66±0.33 B	12.90±0.75 B	4.23±0.24 B	T6
35.8	1.46	0.78	0.22	LSD

Same information as below Table 1

Total and differential number of white blood cells. (for eight hours).

Table (3) shows the role of allicin compound in reducing the negative effects of scorpion venom and their antivenom on some immune parameters (total number of Red blood cells, percentage of neutrophil, lymphocytes, monocytes and eosinophils) in white rats, where the results of the current

study showed a significant increase in the total number of white blood cells in the first treatment (T1) that injected the venom and the treatment (T4) that injected the venom and dosed allicin, whose rates converged with each other compared to the control, and we note that there are no significant differences) In the total number of white blood cells in the (T2), treatment (T3) and (T5), whose rates converged with each other compared to the control, and the results also witnessed a significant increase in the total number of white blood cells in (T6) compared to the control and (T2), (T3) and (T5), whose rates converged with each other. We also note a significant decrease in the total number of white blood cells in the treatments (T2), (T3) and (T5), whose rates converged with each other and the treatment (T6) compared to the two treatments (T1) and (T4).

The results of the current study also showed a significant increase in the percentage rate of neutrophil cells in the treatment (T1) that injected the venom compared to the control, and we note that there were no significant differences in the percentage rate of neutrophil cells % in the first treatments (T1), treatment (T4) and T6 treatment, as well as It was noted that there were no significant differences in the rate of the percentage of neutrophil cells in the treatment (T2), (T3) and (T5), whose rates converged with each other compared to the control, and the results witnessed a significant decrease in the rate of the percentage of neutrophils in the treatment (T2), (T3) and (T5), and the results of the current study showed a significant decrease in the percentage rate of lymphocytes in the treatment (T1) compared to the control and (T2) and the third (T3), whose rates converged with each other.

The results saw a significant decrease in the percentage rate of lymphocytes in (T4), (T5) and sixth (T6) with control , (T2) and (T3). The results of the current study also showed a significant increase in the percentage rate of single cells in (T1) that were injected with venom and (T4) with control, and we note that there are no significant differences in the rate of percentage of single cells in (T2) and (T3), and we also note that there are no significant differences in (T5) compared to control, and we also note a significant decrease in (T6) compared to control, and we also note a significant decrease in (T2) and the third T3) and (T5) and (T6) compared to (T1) and (T4).

The results of the current study also showed a significant decrease in the rate of the percentage of acidic cells in (T1) that injected venom and (T4) and (T6) with control (C), and the results witnessed a significant increase in the rate of the percentage of acidic cells in (T2) compared with control and the rest of the transactions, and the results showed that there were no significant differences in (T3) and (T5) with control.

Table 3: The role of allicin in reducing the negative effects of scorpion venom and antivenomon the total and differential count of white blood cells in white rats for eight hours

Eosinophils (%)	Monocytes (%)	lymphocytes (%)	Neutrophils (%)	Count WBC(cell/mm^3)	Parameters / Groups
3.60±0.36 A	6.05±0.88 BC	53.10±0.58 A	37.16±0.33 C	10.11±0.65 C	C
2.09±0.40 B	7.13±0.66 A	46.65±0.30 C	44.16±0.60 A	22.32±0.40 A	T1
4.00±0.57 C	5.21±1.20 D	52.46±3.22 A	38.33±0.37 C	10.03±0.60 C	T2
3.33±0.57 A	5.18±0.57 D	54.44±6.11 A	36.96±1.66 C	10.76±0.90 C	T3
2.10±0.57 B	6.99±1.15 A	47.33±5.92 BC	43.66±2.84 A	23.22±0.38 A	T4
3.26±0.88 A	6.33±1.33 B	50.66±1.20 B	39.89±3.51 B	11.22±0.82 C	T5
2.60±0.30 B	5.96±0.66 C	49.11±1.52 B	42.30±0.33 A	19.89±1.23 B	T6

0.54	0.39	2.12	2.56	1.44	LSD

Same information as below Table 1

Total and differential number of white blood cells. (for twenty-four hours)

Table (4) shows the role of allicin compound in reducing the negative effects of scorpion toxins and their antibodies on some immune parameters (total number of white blood cells, percentage of neutrophil, lymph, monocytes and eosinophil) in white rats, where the results of the current study showed a significant increase in the rate of the number of white blood cells in the first treatment (T1) that injected the toxin compared to the control (C) and the rest of the treatments, and the results also witnessed no significant differences in the rate of the number of white blood cells in (T2) and (T5) with control (C), the results also showed a significant decrease in the rate of the number of white blood cells in (T3) compared to control and the rest of the treatments, and the results witnessed a significant increase in (T4) and (T6), which converged their rates with each other compared to control and (T2) and the fifth (T5) and (T3).

The results of the current experiment also showed a significant increase in the percentage rate of neutrophil cells in (T1) that injected the venom compared to control and the rest of the treatments, and the results also saw no significant differences in (T2), (T3) and (T5) with control, and the results showed a significant increase in (T4) and (T6) with control and (T2) and (T3) and the fifth (T5). The results of the current study also showed a significant decrease in (T1) and (T6) (T4), whose rates converged with each other compared to the control and (T2), (T3) and (T5). The results also witnessed no significant differences in (T4) and (T6) compared to (T1), and the results also witnessed significant differences in (T2), (T3) and (T5) compared to (C). The results of the current study also showed that there were no significant differences in the rate of the percentage of the only cells in (T1) and (T2), whose rates converged with each other compared to control (C), and the results showed a significant decrease in (T3) and (T6), which converged their rates with each other compared to control and (T1) and (T2), and the results witnessed a significant decrease in (T4) and (T5) with control. The results of the current study also showed a significant decrease in the rate of the percentage of acidophil cells in the first treatment (T1) and (T6), whose rates converged with each other compared to the control and the rest of the treatments, and the results witnessed no significant differences in (T2) compared to control (C), and the results witnessed a significant decrease in (T3) and (T5), and the results showed a significant decrease in T4 compared to control and (T2).

Table (4): The role of Allicin in reducing the negative effects of scorpion venom and antivenom on the total and differential count of white blood cells in white rats for a period of twenty-four hours

Eosinophils (%)	Monocytes (%)	lymphocytes (%)	(%)Neutrophils	Count WBC(cell/mm^3)	Parameter / Groups
4.20±0.36 A	7.06±0.13 A	51.11±0.33 A	38.16±0.31 C	10.46±0.47 C	C
2.06±0.13 D	7.33±0.32 A	35.40±0.22 B	55.16±0.10 A	32.53±0.20 A	T1
4.10±0.53 A	7.11±3.23 A	51.21±1.21 A	37.53±0.43 C	14.48±0.30 C	T2
3.78±0.34 B	5.99±0.17 BC	53.54±1.13 A	36.66±1.63 C	8.74±0.37 D	T3
3.12±0.12 C	6.22±2.11 B	38.33±1.93 B	52.36±2.33 B	26.15±1.12 B	T4

3.66±0.18 B	6.33±1.33 B	50.66±1.20 A	39.22±3.51 C	12.40±1.16 C	T5
2.40±0.11 D	5.66±0.61 C	39.91±1.12 B	51.88±0.33 B	23.00±1.18 B	T6
0.21	0.27	3.52	3.56	3.32	LSD

Same information as below Table (1)

Discussion

Hematological parameters

The results of the current study indicated that there were no significant differences (P>0.05) in the average number of red blood cells in all treatments (whose rates converged with each other) and no significant differences were shown when compared with control in eight hours and a significant decrease in 24 hours, and the concentration of hemoglobin decreased significantly in 8 and 24 hours in the first treatment (T1) that injected the venom, and these results were consistent with (Pipelzadeh et al.). 2006; Deghani et al., 2004; Salimian et al., 2002) who used rabbits and rats to document hemolysis due to Hemiscourpius lepturs in humans, as noted by Farzanpey, 1994) that people exposed to Hemiscourpius lepturs showed symptoms of low hemoglobin concentration and acute hemolysis, and the cause may be attributed to components of scorpion venom that have the property of hemolytic toxins (Mansour, 2008). Decreased food absorption due to poisoning may lead to a lack of proteinemia and proteinemia that may be a cause of low concentration of hemoglobin and other blood components (Patel et al., 2014).

The low concentration of hemoglobin is also attributed to the effect of toxin on the liver and the hepatotoxicity it causes (Ray, 1992). The decrease in hematogenous platelets can be explained by the occurrence of pulmonary hemorrhage that causes hematological platelet oligocytosis, and this is consistent with (Longenecker and Longenecker, 1981) who described hematogenous platelet accumulation and diffuse intravascular coagulation in dogs that have been subjected to experimental poisoning with scorpion venom Centrnroides sculpturatus. The results also showed a significant decrease (P<0.05) in the volume of the composite globule in 8 and 24 hours in the first treatment (T1) that injected the toxin, and this is consistent with (Valavi et al., 2008) who showed that Hemiscourpius lepturs scorpion venom causes pyleptic thrombocytopenia and volume Stacked globula, hemolytic anemia, liver intoxication. The antitoxin in the second treatment (T2) in 8 and 24 hours showed an improvement in the rate of blood cell count, hemoglobin concentration, PVC and platelet number of blood platelets, where the antivenom works to remove the effect of the venom and neutralize the currency and this is consistent with (Gueron et al., 1992) who showed the disappearance of the effect of the venom after injecting the victim with the antivenom in the treatment that injected the venom and the antidominant.

Allicin compound also showed an improvement in the rate of red blood cell count, hemoglobin concentration, platelet count and PCV in the third treatment (T3) in 8 and 24 hours, and these results were consistent with Coxeter et al., 2003), which showed an increase in the number of red blood cells, hemoglobin concentration, PVC and platelet number of local Iraqi sheep that dosed garlic extract, and the reason is due to the effect of garlic extract on substances that stimulate the digestive system and thus increase digestive enzymes and benefit from Allicin complex has effects on blood parameters due to the fact that garlic extract contains many antioxidants that play a major role in improving the blood picture and hemoglobin concentration, and the allicin compound regulates apoptosis in tissues by inhibiting oxidative stress (Mhyson, 2017).

It is also consistent with its findings (Farahi et al., 2010) that showed that the concentration of 3% of garlic extract added in trout diets achieved the best levels in blood cell rate, hemoglobin concentration, PCV and platelet number of blood platelets, and the reason may be attributed to the increased absorption of iron due to garlic extract, which also works to increase the absorption of vitamin C, which works to increase the number of blood cells, the size of the stacked pellet, the concentration of hemoglobin and the number of platelets (Sahu et al., 2007).

Total and differential number of white blood cells

The current study indicated a significant increase ($P<0.05$) in the average number of leukocytes, the percentage of lymphocytes, neutrophils and monocytes, and a significant decrease in 8 and 24 hours in the first treatment (T1) that injected the venom and the results were consistent with (Hadaddezfuli et al., 2015) who showed that the venom of the scorpion Hemiscorpius lepturus and Crassicanda droctonus stimulates the immune response by the production of IL-12, and the reason is that the injection of the venom has different effects on humans and animals, as it causes increased production of cytokines. With local and systemic inflammatory responses, these localized effects can lead to inhibition of the vascular endothelium, increased vascular permeability and migration of white blood cells to affected tissues (Saadi et al., 2015).

As the venom causes a total and differential leukocyte increase, increased cytokines, and increased production of γ IFN- and INF-α in people infected with the toxin, experimental scorpion poisoning amplified the inflammatory response with extensive cytokine secretion (Abdel-Haleem, 2006; Bahloul et al., 2005; Sofer et al., 1996) An increased number of white blood cells has also been observed in rabbits injected with scorpion venom (Bertazzi, 2003). It has also been suggested that excessive excretion of adrenaline caused by the injection of venom could play a role in inducing an increase in the number of white blood cells (Magalhaes et al., 1999; Meki and El-Dean, 1998).

The increase in the percentage of neutrophil cells is consistent with the results of (Dsuze et al., 2004) where this effect is due to the release of cytokines due to the toxin, where the release of IL-8 is a chemical activator of cells for neutrophils (Boujoukos et al., 1993). Activation of lymphocytes and neutrophils and the large number of white blood cells in different organs affected by scorpion venom leads to the events of systemic inflammatory response syndrome (SIRS), which is an inflammatory condition that affects the entire body as a result of blood poisoning that leads to a deterioration in the functions of two or more systems in the body and this is called multiple organ failure (MOF) (Novoa et al.). 2003

The injection of an antitoxin regulates the heart rate and stops the rise in different parameters, due to the ability of the antitoxin to neutralize the toxin and prevent further damage, and the release of acetylcholine (Gueron et al., 1993). Kumar et al. (2010) also pointed out that injecting male and female mice with antitoxin causes inflammation of the liver and kidneys, leading to increased white blood cells as a natural defense. An increase in the total number of white blood cells is a natural reaction to the entry of foreign bodies such as antibodies by injecting the body, as they change the basic pillar of the immune system, and this increase stimulates the bone marrow to produce new white blood cells (Segura et al., 2013). The increase in the total number of white blood cells is due to the effect of antitoxins on the liver, kidneys and other organs (Francisco et al., 2009). Antivenom is the only effective treatment for scorpion venom and side effects are controllable (Ismail, 1993), as noted (Jalali et al., 2015) that the use of polyvalent antivenom shortly after poisoning reduces inflammatory reactions and systemic changes due to increased cytokines by studying changes such as TNF-α, IL-6, IL-1 after injection of *Mesobuthus eupeus*.

Allicin improves the immune system by reducing oxidative stress, reducing inflammation, and protecting mitochondria (Bush et al., 2015). The protective effect of allicin is associated with reducing free radicals, increasing SOD (Superoxide dismutase), reducing glutathione activity, and the biological

balance of nitric oxide (NO)Nitric oxide and TNF-α(Tumor necroting factor) (Ma et al., 2018). Treatment with allicin can reduce the production of inflammatory factors and increase the production of anti-inflammatory factors, suggesting that allicin protects the body's organs by regulating oxidative stress and inflammatory factors (Garica Trejo et al., 2017).

References

Abdel-Haleem, A. H. A., Meki, A. R. M., Noaman, H. A., & ohamed, Z. T. (2006). Serum levels of IL-6 and its soluble receptor, TNF-α and chemokine RANTES in scorpion envenomed children: their relation to scorpion envenomation outcome. *Toxicon*, *47*(4), 437-444.

Adi-Bessalem, S., Hammoudi-Triki, D., & Laraba-Djebari, F. (2008). Pathophysiological effects of Androctonus australis hector scorpion venom: tissue damages and inflammatory response. *Experimental and toxicologic pathology*, *60*(4-5), 373-380.

Bahloul, M., Kallel, H., Rekik, N., Chelly, H., & Bouaziz, M. J. P. M. (2005). Cardiovascular dysfunction following severe scorpion envenomation. Mechanisms and physiopathology. *Presse Medicale (Paris, France: 1983)*, *34*(2 Pt 1), 115-120.

Bertazzi, D. T., de Assis-Pandochi, A. I., Azzolini, A. E. C. S., Talhaferro, V. L., Lazzarini, M., & Arantes, E. C. (2003). Effect of Tityus serrulatus scorpion venom and its major toxin, TsTX-I, on the complement system in vivo. *Toxicon*, *41*(4), 501-508.

Boujoukos, A. J., Martich, G. D., Supinski, E. L. I. Z. A. B. E. T. H., & Suffredini, A. F. (1993). Compartmentalization of the acute cytokine response in humans after intravenous endotoxin administration. *Journal of Applied Physiology*, *74*(6), 3027-3033.

Bush, S. P., Ruha, A. M., Seifert, S. A., Morgan, D. L., Lewis, B. J., Arnold, T. C., ... & Boyer, L. V. (2015). Comparison of F (ab') 2 versus Fab antivenom for pit viper envenomation: a prospective, blinded, multicenter, randomized clinical trial. *Clinical Toxicology*, *53*(1), 37-45.

Chippaux, J. P., & Goyffon, M. (2008). Epidemiology of scorpionism: a global appraisal. *Acta tropica*, *107*(2), 71-79.

Coxeter, P. D., Duke, C. C., McLachlan, A. J., & Roufogalis, B. (2003). Garlic-drug Interactions. *Journal of Complementary Medicine: CM, The*, *2*(6), 57-60.

Dehghani, R., & Fathi, B. (2012). Scorpion sting in Iran: a review. *Toxicon*, *60*(5), 919-933.

Dehghani, R., Khamechian, T., Vatandoost, H., Asadi, M. A., & Mosavi, G. A. (2004). The

effect of Hemiscorpius lepturus venom on pathologic changes of rat orangs. *Quarterly Research Journal of Lorestan University of Medical Sciences and Health Services*, *6*(22), 37-41.

Deitch, E. A. (1992). Multiple organ failure. Pathophysiology and potential future therapy. *Annals of surgery*, *216*(2), 117.

Dsuze, G., Salazar, V., Díaz, P., Sevcik, C., Azpurua, H., & Bracho, N. (2004). Histophatological changes and inflammatory response induced by Tityus discrepans scorpion venom in rams. *Toxicon*, *44*(8), 851-860.

Emam, N. M., & Al-Otabi, A. M. (2022). Protective Effects of Ambrosia maritima and Allium sativum Plant Extracts on Different Tissues of Envenomed mice with Leiurus quinquestriatus Scorpion Venom. *Journal of Bioscience and Applied Research*, *8*(1), 57-76.

Farahi, A., Kasiri, M., Sudagar, M., Iraei, M. S., & Shahkolaei, M. D. (2010). Effect of garlic (Allium sativum) on growth factors, some hematological parameters and body compositions in rainbow trout (Oncorhynchus mykiss). *Aquaculture, Aquarium, Conservation & Legislation*, *3*(4), 317-323.

Farzanpey, R. (1994). Scorpion sting and the fallowing of it. *Pajouhesh va Sazandegi*, *259*(3), 123-125.

Francisco, L. M., Salinas, V. H., Brown, K. E., Vanguri, V. K., Freeman, G. J., Kuchroo, V. K., & Sharpe, A. H. (2009). PD-L1 regulates the development, maintenance, and function of induced regulatory T cells. *Journal of Experimental Medicine*, *206*(13), 3015-3029.

García Trejo, E. M. Á., Arellano Buendía, A. S., Sánchez Reyes, O., García Arroyo, F. E., Arguello García, R., Loredo Mendoza, M. L., ... & Osorio Alonso, H. (2017). The beneficial effects of allicin in chronic kidney disease are comparable to losartan. *International journal of molecular sciences*, *18*(9), 1980.

Gueron, M., Ilia, R., & Sofer, S. (1992). The cardiovascular system after scorpion envenomation. A review. *Journal of Toxicology: Clinical Toxicology*, *30*(2), 245-258.

Gueron, M., Ilias, R., & Sofer, S. (1993). The management of scorpion envenoming syndrome. *Toxicon*, *31*, 1071-6.

Hadaddezfuli, R., Khodadadi, A., Assarehzadegan, M. A., Pipelzadeh, M. H., & Saadi, S. (2015). Hemiscorpius lepturus venom induces expression and production of interluckin-12 in human monocytes. *Toxicon*, *100*, 27-31.

Ismail, M. (1993). Serotherapy of the scorpion envenoming syndrome is irrationally convicted without trial. *Toxicon*, *31*(9), 1077-1083.

Jalali, A., Bavarsad-Omidian, N., Babaei, M., Najafzadeh, H., & Rezaei, S. (2012). The pharmacokinetics of Hemiscorpius lepturus scorpion venom and Razi antivenom following intramuscular administration in rat. *Journal of venom research*, *3*, 1.

Jalali, M. R., Jalali, M. T., & Mapar, Z. (2015). Evaluation of plasma cytokine levels in Mesobuthus Eupeus (Scorpionida: Buthidae) scorpion envenomation in rats treated with polyvalent antivenom. *Jundishapur Journal of Health Sciences*, *7*(1).

Kumar, B. K., Nanda, S. S., Venkateshwarlu, P., Kumar, Y. K., & Jadhav, R. T. (2010). Antisnake venom serum (ASVS). *International Journal of Pharmaceutical and Biological Research (IJPBR)*, *1*(3), 76-89.

Lefkowitch, J. H., Haythe, J. H., & Regent, N. (2002). Kupffer cell aggregation and perivenular distribution in steatohepatitis. *Modern Pathology*, *15*(7), 699-704.

Longenecker, G. L., & Longenecker Jr, H. E. (1981). Centruroides sculpturatus venom and platelet reactivity: possible role in scorpion venominduced defibrination syndrome. *Toxicon*, *19*(1), 153-157.

Ma, L., Chen, S., Li, S., Deng, L., Li, Y., & Li, H. (2018). Effect of allicin against ischemia/hypoxia-induced H9c2 myoblast apoptosis via eNOS/NO pathway-mediated antioxidant activity. *Evidence-based Complementary and Alternative Medicine*, *2018*.

Magalhaes, M. M., Pereira, M. E. S., Amaral, C. F., Rezende, N. A., Campolina, D., Bucaretchi, F., ... & Cunha-Melo, J. R. (1999). Serum levels of cytokines in patients envenomed by Tityus serrulatus scorpion sting. *Toxicon*, *37*(8), 1155-1164.

Mansour, S. A. (2008). Environmental impact of pesticides in Egypt. *Reviews of Environmental Contamination and Toxicology Vol 196*, 1-51.

Meki, A. R., & El-Dean, Z. M. (1998). Serum interleukin-1β, interleukin-6, nitric oxide and α1-antitrypsin in scorpion envenomed children. *Toxicon*, *36*(12), 1851-1859.

Mhyson, A. S. (2017). The effect of garlic and neomycin supplementation in diet on productive and some blood parameters of experimentally infected broiler chickens with Salmonella typhimurium. *energy (kcal/kg)*, *3079*, 3102-6.

Novoa, E., D'Suze, G., Winter, M., Crespo, A., Tortoledo, M. A., Marcano, H., ... & de León, R. S. (2003). The indirect effect of Tityus discrepans on rabbit pulmonary vasculature. *Respiratory physiology & neurobiology*, *134*(1), 33-41.

Obi, I. M., Chilaka, K. C., Unekwe, P. C., Chilaka, U. J., & Oyindamola, J. O. (2022). Evaluation of anti-microbial and anti-inflammatory properties of ethanol extract of Allium

sativum linn. *GSC Biological and Pharmaceutical Sciences*, *19*(2), 044-056.

Patel, N. N., Ghodasara, D. J., Pandey, S., Ghodasara, P. D., Khorajiya, J. H., Joshi, B. P., & Dave, C. J. (2014). Subacute toxicopathological studies of methotrexate in Wistar rats. *Veterinary World*, *7*(7).

Pipelzadeh, M. H., Dezfulian, A. R., Jalali, M. T., & Mansouri, A. K. (2006). In vitro and in vivo studies on some toxic effects of the venom from Hemiscorpious lepturus scorpion. *Toxicon*, *48*(1), 93-103.

Ray, G.(1992). Pollution and health. Wiley Eastern Ltd.New-Delhi p.45.

Razi Jalali, M., Fatemi Tabatabaei, R., Ahmadizadeh, M., & Mohseni, H. (2017). Effects of Hemiscorpius lepturus scorpion venom on hemogram and erythrocyte osmotic fragility and study the role of polyvalent antivenom in rat. *Iranian Veterinary Journal*, *13*(1), 41-51.

Rita, P., Animesh, D. K., Aninda, M., Benoy, G. K., Sandip, H., & Datta, K. (2011). Snake bite, snake venom, anti-venom and herbal antidote. A review. *Int J Res Ayurveda Pharm*, *2*(4), 1060-1067.

Roumen, R. M., Hendriks, T., van der Ven-Jongekrijg, J., Nieuwenhuijzen, G. A., Sauerwein, R. W., Van der Meer, J. W., & Goris, R. J. (1993). Cytokine patterns in patients after major vascular surgery, hemorrhagic shock, and severe blunt trauma. Relation with subsequent adult respiratory distress syndrome and multiple organ failure. *Annals of surgery*, *218*(6), 769.

Saadi, S., Assarehzadegan, M. A., Pipelzadeh, M. H., & Hadaddezfuli, R. (2015). Induction of IL-12 from human monocytes after stimulation with Androctonus crassicauda scorpion venom. *Toxicon*, *106*, 117-121.

Salimian, J., Zargan, J., Ebrahimi, F., Farahmandnejad, A., & Hajibeigi, A. (2002). Surveying of role Hemiscorpius lepturus scorpion venom in red cell haemolysis. *Kowsar Med. J*, *7*, 185-189.

Segura, Á., Herrera, M., Villalta, M., Vargas, M., Gutiérrez, J. M., & León, G. (2013). Assessment of snake antivenom purity by comparing physicochemical and immunochemical methods. *Biologicals*, *41*(2), 93-97.

Sofer, S., Gueron, M., White, R. M., Lifshitz, M., & Apte, R. N. (1996). Interleukin-6 release following scorpion sting in children. *Toxicon*, *34*(3), 389-392.

Srivastava, A. K. (2018). Significance of medicinal plants in human life. In *Synthesis of Medicinal Agents from plants* (pp. 1-24). Elsevier.

Theakston, R. D. G., Warrell, D. A., & Griffiths, E. (2003). Report of a WHO workshop on the standardization and control of antivenoms. *Toxicon*, *41*(5), 541-557.

Valavi, E., & Ansari, M. A. (2008). Hemolytic uremic syndrome following Hemiscorpius lepturus (scorpion) sting. *Indian journal of nephrology*, *18*(4), 166.