Journal of Advanced Laboratory Research in Biology
E-ISSN: 0976-7614
Volume 5, Issue 2, April 2014
PP 27-28
https://e-journal.sospublication.co.in

Research Article

Response to autotomy in anesthetized freshwater crab, *Paratelphusa hydrodromous* (Herbst)

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Abstract: To extend the knowledge of amputation and induction of autotomy, the freshwater crab *Paratelphusa hydrodromous* (Herbst) was chosen as a model system. Amputation of different legs of *Paratelphusa hydrodromous* (Herbst) was done in two conditions; normal and anesthetized crab. Autotomy of the amputated legs under normal condition was induced autotomy within seconds (1.6 to 37 seconds). However, the amputation conducted in ice cold anesthetized crab showed delayed autotomy in a wide range of time from 10.2 ± 0.83 minutes (cheliped) to 114.8 ± 4.3 minutes (2nd walking leg). The observations suggest that ice cold anesthesia lowers the signaling of pain to the brain and delays autotomy, the voluntary mechanism to escape from the predator/pain or frightened force.

Keywords: *Paratelphusa hydrodromous*, Amputation and Autotomy.

1. Introduction

Autotomy or self-amputation is a behavior of animals to shed or discard its appendages or body part as a self defense mechanism (Congdon *et al*., 1974; Kelehear and Webb, 2006). Autotomy is mostly happened by a response to mechanical stimulation during capture by a predator. The lost body part of the animal may regenerate later (Skinner *et al*., 1992; Mykles, 1992; Hopkins, 1993; Wheatly, 1996). Crustaceans exhibit remarkable regeneration capacity and used as a self-replenishing source of food by humans by removing one or both claws from the live animal and returning it to its habitat where it can regrow the lost limb. However, mortality associated with declawing was reported by Davis *et al.*, as early as 1978. *Paratelphusa hydrodromous* (Herbst), the burrowing freshwater crab is commonly found in the rice fields at relatively low elevation throughout Kerala, The species is widely distributed in different parts of South India and grows up to a size of 4.5 to 4.8cm carapace width. The crab exhibit remarkable regeneration capacity (Bliss, 1950) but very few works have been conducted in the mechanism of autotomy and regeneration.

2. Materials and Methods

Paratelphusa hydrodromous (Herbst) was collected from the paddy field near to the campus of the University of Calicut, Malappuram, Kerala and brought to the laboratory. The crabs were reared in cement tanks (2.5' X 2.5' X 2.5') provided with clay bed, pebbles and aquatic plants. The crabs in the culture were provided with grass shoots and Ox liver as food in every alternate day. The crab is acclimatized for two weeks and used for the conduct of experiments. The freshwater crab, *P. hydrodromous* of 3.5 to 4cm carapace width was used for the present study. The five numbers of uniformly sized crabs were selected for each experiment. The experiment was conducted in such a way that the legs of the normal and anesthetized crabs were amputated. Ice cold water was used for anesthetizes the crab. After amputation, the respective crabs were kept in clean troughs separately for observation and to avoid any infections. Each leg including Chela was amputated separately to see the occurrence of autotomy after amputation or cut. Five replicates were kept in normal and anesthetized conditions in each case such as Chela, first, second, third and forth walking legs.

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Table 1. Data on time taken for induction of autotomy after amputation of various legs of normal and anesthetized the freshwater crab, *Paratelphusa hydrodromous.*

S. No.	Area of amputation	Condition	Time taken for Autotomy
1	Chelate Leg	Normal	1.6±0.55 sec
		Anesthetized	10.2±0.83 min
2	1st Walking leg	Normal	1.6±0.55 sec
		Anesthetized	41.4±3.1 min
3	2nd Walking leg	Normal	2.6±0.54 sec
		Anesthetized	114.8±4.3 min
4	3rd Walking leg	Normal	2.4±0.54 sec
		Anesthetized	93.0±2.9 min
5	4th Walking leg	Normal	37 sec
		Anesthetized	40 min

3. Result and Discussions

Autotomy appears to be a means of adaptation to escape from predators and also from skipping loss of hemolymph and energy and ultimately from death Raja *et al*., (1976). Data observed on time is taken for the induction of autotomy after amputation at the second joint of different appendages of normal and anesthetized crabs were provided in Table 1. Amputation of the chelate legs in the normal crab showed autotomy of the leg within 1-2 seconds time. Autotomy induction in the amputated chelate leg of the anesthetized crab taken more than 10 minutes, whereas in the normal crab it was completed within 1-2 seconds time. Induction of autotomy in the first walking leg of the normal crab occurs in 1-2 seconds, whereas those of the anesthetized crab taken more 41 minutes to shed their amputated leg. Amputation of the second walking leg of anesthetized crab shows highest extended time (114.8 ± 4.3 minutes) for the induction of autotomy.

The results show that the cut/amputation in any of the legs of the Normal crab induces instantaneous autotomy and that of the anesthetized crab induces delayed autotomy. Anesthetizing the crab always slows the process of induction of autotomy. Amputation after anesthetizing the crab took more than 110 minutes (second walking leg) to induce autotomy. The autotomy in crustaceans has been reported as a natural behavior against pain and also a phenomenon to escape from a predator. The present study shows that the anesthetizing the crab with ice cold water lowers the signaling of pain to the brain and hence it significantly extends the time of induction of autotomy for its escape from danger. The observations of the present study open the possibility of further investigations to the induction of autotomy in crab and other crustaceans.

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