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# **Case Report**

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# Outbreak investigation of acid fly attack among residential students in a tertiary care centre in South India

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#### **ABSTRACT**

Paederus dermatitis is the skin irritation resulting from contact with the haemolymph of certain rove beetles, a group that is comprised by the genus Paederus. In May 2018, there was an increase in the number of residential students reporting with burning skin lesions. In this context, an outbreak investigation was conducted. A team of public health specialists visited these residential buildings and premises. The inmates who were affected were interviewed and examined. Suspected insects were collected and entomologically evaluated by the Zoological Survey of India. On examination of the affected individuals, it was observed that the rashes were very much suggestive of acid fly toxin induced lesions. Inspection of the premises, revealed small heaps of dried leaves with moisture at two sites which could have served as a suitable environment for acid fly multiplication. Our study concluded that Paederus fuscipes as the causative agent. Top storeys of buildings, illuminated at night, facing potentially wet areas were considered to be the potential risk factor. Fly proofing of the building, cleaning the institution premises and chemical treatment was suggested as appropriate control measures.

Keywords: Outbreak investigation, Acid fly, Paederus dermatitis

### INTRODUCTION

Insects represent more than half of all known living organisms and potentially represent more than 90% of the differing life forms on Earth. Hence, human contact with insects is unavoidable. Though insects bite or sting, they are not serious and will get better within a few hours or days. However, occasionally they can cause severe allergic reactions resulting in anaphylaxis, or can become infected, and can even result in the spread of serious diseases such as malaria, dengue and leishmaniasis. Literature reveals that bugs that bite or sting are most

often wasps, hornets, bees, horseflies, ticks, mosquitoes, fleas, bedbugs, spiders and midges.<sup>2</sup>

Insect bite reactions are common in India, but information about their prevalence is limited. In a dermatology outpatient clinic in Pondicherry, insect bite reactions had a prevalence of 5.3% among children less than 14 years of age. Children less than five years of age attending skin outpatient clinic in Calcutta had 10.6% prevalence of papular urticaria, with seasonal variation (rainy season 16.7%, summer 6.7%, winter 5.8%).

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*Paederus* dermatitis (also called linear dermatitis or dermatitis linearis) is the skin irritation resulting from contact with the haemolymph of certain rove beetles, a group that is comprised by the genus *Paederus*. Other local names given to *Paederus* dermatitis include spiderlick, whiplash dermatitis and Nairobi fly dermatitis.<sup>4,5</sup>

The species commonly causing *Paederus* dermatitis are *Paederusmelampus* in India. As *Paederus* are nocturnal and attracted by incandescent and fluorescent lights, they inadvertently come into contact with humans. Haemolymph of the beetle contains paederine (latigaza) which is released on crushing of the insect onto the skin due to the reflex brushing away of the insect by humans.<sup>6</sup>

It was reported that since the last 17 years, there has been sporadic cases of acid fly attack in our setting. However, this year there has been an increase in the number of cases, and administrators of the student residential buildings were of the opinion that about 20% of the students had complained about rashes on skin with burning sensation. In this context, an outbreak investigation was conducted in the month of May in 2018.

#### **CASE REPORT**

The outbreak setting was three student residential buildings of a tertiary healthcare institution in Central Kerala, which were situated on the banks of backwaters with the intervening area being a swamp. There were a total of three residential buildings exclusively for girls, two of which were facing the swamp of which one was just adjacent to the swamp. A team of community medicine specialists, a senior entomologist and a public health specialist visited the residential buildings and its premises. All the affected storeys and rooms were inspected. The affected residents were interviewed and examined. The insects on the floors of different rooms, light bulb cases and window panes were then collected and were entomologically evaluated. Suspected insects were then mounted and sent to the zoological survey of India for species identification.

In the residential building, which was mainly affected, more cases were from the rooms facing the swamp and were situated between the 6<sup>th</sup> and 16<sup>th</sup> storeys. Cases were also reported from the second residential building which was also had rooms facing the swamp. It was observed that there was no case reported from the third residential building which was situated immediately behind the most affected first residential building, which prevented the third residential building from directly facing the swamp. The first residential building had large ventilation openings for cross ventilation in the corridors was where students spent most of their time reading with lights in the evening and night hours, which could have acted as an attractant for the flies. The affected rooms and the corridors inspected by the investigation team had a high

number of flies of different species, both dead and alive. Residents who reported to have been attacked by acid fly and present at the time of investigation were interviewed, and rashes were examined by the experts in the team, for verification and confirmation of diagnosis. Rashes were very much suggestive of acid fly toxin induced lesions as seen in Figure 1. With the help of residents and the residential building administrators, the investigation team collected dead and live samples of acid flies from the hostel. For further investigation, the samples were preserved, mounted and forwarded to Zoological survey of India, Calicut. Most of the residential premises were observed to be kept clean, however there were potential breeding areas. There were small heaps of dried leaves with moisture in two places which could have served as suitable environment for acid fly multiplication. Outside the compound wall, in the swamp area adjoining the backwaters, there were big heaps of dried leaves and vegetation. There was also a small artificial pond with stagnant water in the premises.



Figure 1: Lesion due to acid fly exposure.

Students giving a history of lesions starting as erythematous swellings with burning sensation which eventually developed into a superficial blister in 24 -48 hours, in a linear pattern or a kissing pattern between flexures, Acid fly attack diagnoses were clinically made. Management of the lesions usually involved cold saline compress two to three times a day for soothening, as irritations were superficial and non-inflammatory. Topical antibiotics like mupirocin or fusidic acid were

also applied two times a day as and when required. Lesions crusted in 2-4 days and healed in 4-6 days, sometimes leaving post inflammatory hypopigmentation. Very rarely systemic antibiotics were required in immuno- suppressed patients who scratched and caused secondary infection.



Figure 2: Paederus fuscipes.

Note: Curtis, 1840- Atlas of rove beetles (Staphylinidae). Volgograd Prov., Sr. Akhtuba, 7.VII.1994, K.A. Grebennikov. Photo from the site of Konstantin Grebennikov http://rove.front.ru

The species which caused attack was identified as *Paederus fuscipes* by a team at St. Joseph's college Devagiri, Calicut, to whom the zoological survey of India had forwarded our samples. A reference image from the Atlas of rove beetles is depicted in Figure 2.

#### **DISCUSSION**

*Paederus fuscipes*, was named by the British entomologist John Curtis in 1826 and it was documented in Atlas of Rove Beetles (Staphylinidae), by Curtis in 1840. It belongs to the family Staphylinidae under order

Coleoptera. *Paederus abyssinicus* was a synonym contributed by Malcolm Cameron in 1950 for the same species.

The genus *Paederus* belongs to family Staphyllinidae, order Coleoptera, class Insecta and consists of over 622 species which are distributed worldwide. *Paederus* beetles have been associated with outbreaks of dermatitis in various countries including Australia, Malaysia, Sri Lanka, Nigeria, Kenya, Iran, Central Africa, Uganda, Okinawa, Sierra Leone, Argentina, Brazil, France, Venezuela, Ecuador and India.

*Paederus* beetles live in moist habitats and feed on debris. Although these insects can fly, they prefer to run and are extremely agile. They have a characteristic habit of curling up their abdomen when they run or are disturbed and this habit allows an 'on the spot' identification on many occasions. Eggs are laid singly on a moist substance and typically develop in 3-19 days to larvae and adults. *Paederus* beetles are beneficial to agriculture because they eat crop pests.<sup>6</sup>

The species commonly causing *Paederus* dermatitis are *Paederus melampus* in India. However in our investigation, the species was identified to be *Paederus* fuscipes. The clinical presentation of the cases in our investigation were very similar to those reported from Mysore in Karnataka and Jabalpur in Madhya Pradesh, though in those studies, species identification was not done. Another investigation in Turkey, which too had similar clinical presentations had identified the organism as *Paederus fuscipes*.

In our study, the lower storeys of the buildings were relatively spared and only the 6<sup>th</sup> to 16<sup>th</sup> storeys were affected, showing that *Paederus* has a preference for higher storeys. *Paederus* is attracted towards bright illuminance, which is the main reason for its dispersal to buildings at night. These findings were established in a study conducted in Malaysia. <sup>10</sup>

The artificial pond in the premises could also act as a potential source, since a study conducted in Orissa has shown that *Paederus* beetles thrive in stagnant water. <sup>11</sup> The weather changes like El-nino phenomenon and changes in rainfall has also been documented to alter the vegetation and support fly breeding. <sup>12</sup>

A limitation of our study was, that we did not isolate the rove beetles from its suspected sources in the swamps, dried leaves and the artificial pond due to lack of time and human resources.

### **CONCLUSION**

Our study concluded that *Paederus fuscipes* was the causative agent and it was identified as a problem species in Central Kerala. Top storeys of buildings, illuminated at

night, facing potentially wet areas were seen to be affected more.

As a preventive measure, the investigating team suggested 'fly proofing' of the entire Hostel building under the advice of an engineering expert since the parts of the building which needed to be screened involved complicated architecture. Residential premises and the swamp area were suggested cleaning on a war-footing, followed by appropriate pyrithroid fogging. Insecticide spraying was advised to be done regularly in the surrounding areas and in the hostel.

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