

## Case Report

# An outbreak of *Paederus* dermatitis in a tertiary care hospital in the North-Eastern part of Jharkhand, India: a case report

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## ABSTRACT

In October 2024, students at a tertiary-care medical college in North Eastern India reported skin lesions with burning pain. An outbreak investigation suggested that the rashes were caused by acid fly toxin from *Paederus* beetles, such as the Nairobi. Female rove beetles release the toxin paederin when they are crushed or brushed against the skin. A blistering rash typically appears 24-48 hours after contact and may take several weeks to resolve. Outbreaks of *Paederus* dermatitis are most commonly reported in Europe and Asia, but have also occurred in other countries. When the region was examined for such flies, *Paederus fuscipes* was identified as the causative agent. The height of the buildings, night illumination, and monsoon climate were potential risk factors. Preventive measures such as keeping lights off at night when possible, staying indoors during late evening and night, and wearing long-sleeved shirts and pants were recommended.

**Keywords:** *Paederus* dermatitis, Paederin toxin, Rove beetle, Nairobi fly, Blistering rash, Burning sensation, Night burn, Kissing lesions, Monsoon climate, Illumination light

## INTRODUCTION

Paediatera is a type of beetle in the Coleoptera order with a wide distribution range. There are more than 600 species in the genus Paediatera, of which more than 20 are toxic and can cause dermatitis.<sup>1,2,3</sup> The genus *Paederus* belongs to the family Staphyllinidae, order Coleoptera, class Insecta and consists of over 622 species which are distributed worldwide. *Paederus fuscipes* was named by the British entomologist John Curtis in 1826 and was documented in Curtis's Atlas of Rove Beetles (Staphyllinidae) in 1840. It belongs to the family Staphyllinidae under the order Coleoptera. In 1950, Malcolm Cameron synonymised *Paederus abyssinicus*

with *Paederus*. *Paederus* beetles are known to cause dermatitis outbreaks in various countries, including Australia, Malaysia, Sri Lanka, Nigeria, Kenya, Iran, Central Africa, Uganda, Okinawa, Sierra Leone, Argentina, Brazil, France, Venezuela, Ecuador and India.<sup>4</sup> *Paederus* beetles live in moist habitats and feed on debris. Although these insects can fly, they prefer to run and are highly 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 substrate and generally develop into larvae and adults within 3-19 days. *Paederus* beetles contribute positively to agriculture by consuming crop pests. The species most frequently

responsible for *Paederus* dermatitis in India is *Paederus melampus*.<sup>1,4</sup>

*Paederus* dermatitis is found in all zoogeographic regions worldwide except Antarctica and is more common in tropical and subtropical regions.<sup>5-7</sup> There have been reports of paederus dermatitis in multiple countries around the world, primarily those in tropical and subtropical regions.<sup>4,8</sup> Outbreaks have been reported mainly from the southern regions of Europe and Asia, and in other continents at lower latitudes.<sup>9</sup>

*Paederus* dermatitis is a form of irritant contact dermatitis caused by the toxin pederin, a potent vesicant. This chemical is produced by *Pseudomonas* bacteria within the haemolymph and is released by the female *Paederus*.<sup>5</sup> This beetle does not bite or sting, but accidental crushing or brushing against the skin causes direct contact with beetle secretions, which causes release of its hemolymph-containing pederin toxin. Vesicant pederin is predominantly released at toxic doses by female rove beetles that bear endosymbiotic bacteria, *Pseudomonas* species.<sup>10</sup>

Distribution of pederin toxin is highest in the most exposed skin areas, such as the face, neck, and arms, and lowest in eyes and genitals. Here, pederin toxin induces release of epidermal proteases and loss of intercellular connections, thereby inhibiting protein, DNA, and mitotic synthesis. This results in the sudden onset of erythematous skin with vesicles and bullae, accompanied by severe burning and stinging. Finally, it causes painful necrotic blisters.<sup>11,12</sup> The most typical symptom of paederus dermatitis is burning pain, followed by itching.<sup>13</sup> The typical skin lesions present as erythema and pustular-like changes in the centre of the erythema, followed by new keratinocytes maturing at the bottom of the pustule, forming a scab.<sup>14</sup> When the lesion exhibits “linear” or “kissing” lesions, it needs to be differentiated from herpes zoster, bullous pustulosis, and other related diseases.<sup>15</sup>

For the treatment, immediate scrubbing of damaged skin with a 5% sodium bicarbonate solution is required. Oral antihistamines combined with topical calamine lotion and glucocorticoids are a safer and more effective strategy. For patients with mild conditions, mometasone furoate cream can be used as a local topical hormone, which belongs to the category of moderately effective glucocorticoids. It is anti-inflammatory and antiallergic, and after absorption, it can effectively relieve itching and reduce exudation. However, long-term use carries the risk of skin atrophy and secondary infection. Topical antiseptic solutions also treat ulcerative lesions caused by insects of the *Paederus* genus.<sup>16</sup> For patients with orbital lesions, oral steroid hormone therapy is given, while benzoic acid cream is used externally. Butyrhethinic acid cream is a nonsteroidal anti-inflammatory drug with anti-inflammatory and antiallergic functions. Patients with poor tolerance to mupirocin can choose fluoxetine cream.

Phimosi is a self-limited disease with a course of 7 to 10 days, but it can cause complications such as pigmentation, secondary infection, extensive desquamation, and ulcerative dermatitis.<sup>17</sup> In addition, potassium permanganate is a powerful oxidant with excellent antibacterial activity. It also promotes the formation of collagen and granulation tissue, which favours wound healing.<sup>16</sup>

## CASE REPORT

In October 2024, a lesion outbreak was identified among medical students at a northeastern Indian tertiary hospital. The students identified these flies in the affected floors, as shown in the figure. When questioned about other affected students and examined the place, the causative agent that caused the attack was identified as *P. fuscipes*.

A 19-year-old male student, a resident of the 19<sup>th</sup> floor of the students’ hostel, reported skin lesions with a burning sensation. He noted that in the first 24 hours, it started as a lesion with a mild burning sensation.

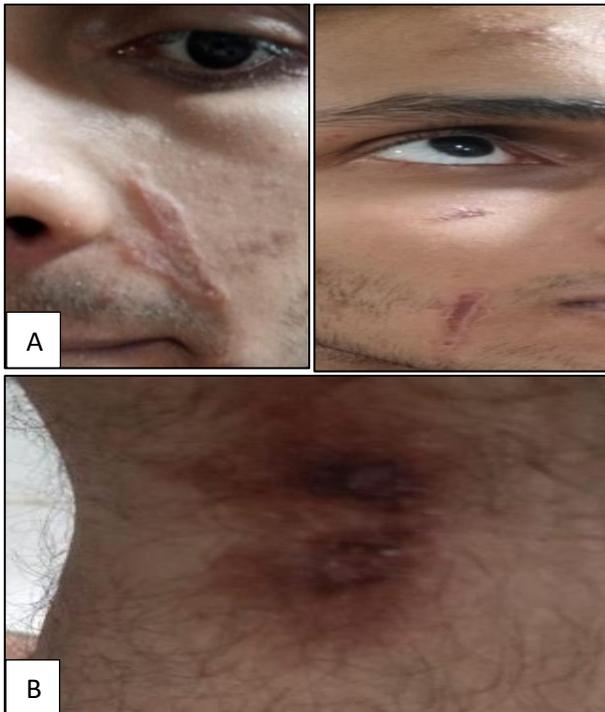


**Figure 1: Insect fly.**

\*Picture taken by the medical students on the affected floor.



**Figure 1: Reference picture of *Paederus fuscipes*-dorsal and ventral view, respectively.<sup>1</sup>**



**Figure 3 (A and B): Lesions on the face and knee fold.**

Over the next 24 hours, it developed into a superficial blister, typically in a linear or kissing pattern between flexures. It was diagnosed as *Paederus* dermatitis. Management of the lesions involved cold saline compresses applied two to three times daily for soothing, as the irritations were superficial and non-inflammatory. Desonide cream (0.05%) and topical antibiotics, such as fusidic acid, were also prescribed twice daily. Lesions crusted in 2-4 days and healed in 4-6 days, leaving post-inflammatory hypopigmentation. On follow-up, the patient showed symptomatic improvement with a reduction in erythema and pruritus, and no new lesions, indicating a favourable response to treatment. Figure 3 shows the lesions caused by this insect in our study.

## DISCUSSION

The affected student resided on the second-highest floor of a medical college hostel within a tertiary care hospital situated in northeastern India. Upon investigation and site examination, the causative agent responsible for the incident was identified as *Paederus fuscipes*, as illustrated in Figure 2. Our investigation confirmed the species as *Paederus fuscipes*.

In this study, in the month of October 2024, the outbreak of *Paederus* dermatitis was observed. This month, the temperature and humidity in the region were higher than in previous years. Previous reports have shown a close correlation between the number of adult beetles and moisture, and humid climate conditions are conducive to the large-scale reproduction of beetles. During the months of September to November, harvesting, cutting of rice

stalks and straw, and ploughing of the fields resulted in the disruption of fields and deprived the adult beetles of their main foraging sites. Dispersal of *P. fuscipes* occurred mainly due to the rainy humid season, destruction of habitat, especially deforestation and non-availability of food. After an initial migration to non-harvested areas, *P. fuscipes* then spread to residential areas at dusk.<sup>18</sup>

In our study, the lower storeys of the buildings were relatively spared, and only the 16<sup>th</sup> and 17<sup>th</sup> storeys were affected, showing that *Paederus* has a preference for higher storeys.

The clinical presentation of the cases in our investigation was very similar to that reported from Kerala Medical College. During the monsoon season, large numbers of flies and insects enter the corridors of the top floors, attracted by the lights in the late evening and night hours. *Paederus* is attracted towards bright illumination, which is the main reason for its dispersal to buildings at night.

## Outcomes

Future outbreaks of *Paederus* dermatitis are possible in the region. Awareness regarding the condition and its symptoms can help prevent misdiagnosis. Early diagnosis and prompt treatment improve prognosis. Preventive measures include keeping windows and doors shut during the evening and night and using pest repellents. Control prevention of disease includes controlling the insect population, avoiding contact with skin, and minimising the release of toxins after exposure to skin and minimising skin lesions.<sup>4,5,19</sup>

During outbreaks such as the monsoon season, public awareness of insect habitats-especially their attraction to artificial lights-and exposure routes to toxins is crucial for primary prevention. Applying deltamethrin dust to surrounding vegetation can reduce beetle populations. Verma and Agarwal suggest routine applications of pyrethroids and 50% malathion sprays in infested areas to mitigate insect occurrence.<sup>20</sup>

To minimise insect contact with human skin in endemic areas, especially during the monsoon season, several precautions are advised. Windows should be closed before activating artificial lighting in the evening to prevent insect entry, as these pests are most active from an hour after sunset until midnight. Installing mesh screens on doors and windows can facilitate ventilation while keeping insects out. Avoid standing or sleeping near fluorescent lights during the rainy season, as most encounters occur then. Nets placed beneath lights can prevent beetles from falling onto individuals. Rooms may be treated with insecticides, but caution is necessary to avoid crushing dead beetles, which can release toxins. Using mosquito nets, whether treated with permethrin or untreated, can reduce insect bites during sleep. Ultraviolet light trap devices and sticky or glue-based traps are

effective for attracting and capturing insects. Pheromone baits assist with monitoring. Short-term application of insect repellents can be practical when working in heavily infested areas. Long-sleeved shirts, hats, and gloves provide additional protection during high beetle prevalence, and goggles can prevent ocular contact when travelling in open vehicles. Special care is required when handling insects with a red or orange abdomen to avoid crushing. If a *Paederus* beetle is collected and preserved in alcohol, caution must be exercised to prevent skin contact, as pederin is soluble in alcohol.<sup>21</sup>

If a beetle is found on the skin, it should be gently removed to prevent toxin release. You can blow it away, flick it off, or carefully lift it with a piece of paper or another object, taking care not to crush it. Once exposure to the toxin has occurred, primary lesions should not be scratched. If the beetle has already been crushed, the skin must be washed immediately with soap and water to remove as much of the toxin as possible, because the toxin takes time to penetrate the skin. This can be followed by cold compresses and calamine lotion. Tincture of iodine has a theoretical use as it has been shown to destroy pederin. Thoroughly washing the eyes with water can minimise ocular reactions.<sup>6,22,23</sup>

## CONCLUSION

*Paederus* dermatitis is an acute condition caused by beetles that primarily inhabit tropical regions. Acquiring the ability to identify *Paederus* beetles and refraining from handling or crushing them by blowing them off the skin could help mitigate outbreaks. Additionally, closing doors and windows and turning off lights in sleeping areas may decrease exposure to these insects. A clinical understanding of the numerous morphological patterns of *Paederus* dermatitis, as well as the correlation of key points from the patient's history, will enable the physician to make an accurate diagnosis, thereby enhancing the patient's treatment outcome and preventing misdiagnosis.

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