Case Report

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Irritant contact keratitis caused by the bodily fluids of a brown marmorated stink bug

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Abstract:

PURPOSE: The brown marmorated stink bug is native to Asia (China, Taiwan, Japan, and the Korean peninsula). Its bodily fluids are toxic and irritating to the human skin and eyes. Human case reports are rare. Only one report of irritant contact dermatitis has been published. We report a case of irritant contact keratitis resulting from the chemical components of the bodily fluids of the bug.

MATERIALS AND METHODS: A case report.

RESULTS: A 74-year-old male presented to our emergency department with pain and redness in his right eye, which had been exposed to the bodily fluids of a brown marmorated stink bug. A patch of central corneal epithelial defect with conjunctival congestion and chemosis was found in his right eye. His best-corrected visual acuity (BCVA) (OD) was 6/20. We prescribed topical antibiotic and lubricant medications. The corneal epithelial defect recovered gradually over the course of several days. BCVA worsened to 2/60 but recovered gradually to 6/8.6 after the epithelial defect healed and after use of topical steroid for suppression of the local inflammation.

DISCUSSION: The adult brown marmorated stink bug is characterized by its shield shape and its dark, mottled, brown color. The stink bug ranges in length from 14 to 17 mm. A startled stink bug will react by biting or spraying a foul-smelling liquid from its thorax. When disturbed or crushed, the stink bug excretes a highly potent, odorous smell. The major component of the bodily fluids is trans-2-decenal and trans-2-octenal, chemicals that belong to the aldehyde group. Hydrogen ions (H^+) produced by reduction and oxidation of aldehyde can induce chemical burn injuries to the ocular surface. Irritant contact keratitis may occur through this mechanism.

CONCLUSION: Stink bugs excrete odorous bodily fluids as a defensive mechanism when threatened. If the toxic fluid gets into the human eye, it can cause unexpected chemical burns or injury. Patients whose eyes come into contact with these bodily fluids should rinse their eyes thoroughly and immediately seek medical attention.

Keywords:

Brown marmorated stink bug, chemical burns, contact keratitis, *Halyomorpha halys*

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Introduction

The brown marmorated stink bug, *Halyomorpha halys*, is native to Asia (China, Taiwan, Japan, and the Korean peninsula). The stink bug has also become a major agricultural pest and a nuisance to home and business owners in the Mid-Atlantic United States, including Maryland, Pennsylvania, and others.[1]

Although mostly a concern to agribusiness orchards,[2] such as for stone fruits and apples, and also seriously damaging to numerous other crops such as berries and oybeans, only few reports of human diseases, such as irritant contact dermatitis,[3] have been associated with the brown marmorated stink bug. We report a case of irritant contact keratitis resulting from the toxic chemicals released by the bug. For diagnosis of the chemical burns, we use organic chemistry concepts to explain the

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toxic reaction caused by the bodily fluids of the stink bug.

Materials and Methods

A case report.

Results

A 74-year-old male presented to our emergency department with pain and redness in his right eye, which had just been exposed to the bodily fluids of a stink bug. According to his statement, a stink bug ejected an amount of bodily fluids from its abdomen while he was trying to crush the bug.

On presentation, at the emergency department, a patch of central corneal epithelial defect with conjunctival congestion, and chemosis was found under slit-lamp [Figure 1]. The PH value was 6.0 noted at emergency department. After copious normal saline irrigation (2000 ml), test strips revealed a PH value change from 6.0 to 7.0. The patient's best-corrected visual acuity (BCVA) (OD) was 6/20 after testing on a Snellen chart, and the intraocular pressure was within the normal range. We prescribed chloramphenicol eye drops 0.25% administered every 6 h and erythromycin ointment 0.5% administered twice a day. We found mucoid discharge with conjunctival pseudomembrane on the 4th day. The pseudomembrane was removed under slit-lamp, and we added balanced salt solution administered every 2 h, keeping observation for reepithelialization. However, the BCVA had decreased to 2/60 at 1 week, with much discharge though the epithelium had gradually healed [Figure 2]. The balanced salt solution was kept for one additional week. The corneal epithelial defect recovered, with only some punctate epithelial erosions remaining, and BCVA was 6/15; we added fluorometholone 0.1% four times a day to reduce the inflammation. The BCVA recovered to 6/8.6 after 1 month [Figure 3], along with much improvement of the irritation, and only lubricant was continued for the clinical follow-up.

Discussion

The adult brown marmorated stink bug [Figure 4] is characterized by its shield shape and dark, mottled brown color.[4] The white banded antennae and dark banding on the edge of the wings are distinguishing characteristics. Stink bugs range in length from 14 to 17 mm. The brown marmorated stink bug belongs to the *Pentatomidae* family, of the genus *Halyomorpha* [Table 1].[5] A threatened stink bug will react by emitting a foul-smelling liquid from its scent gland on the thorax,[6,7] from which it can release its pungent, protective secretions. When disturbed or crushed, the stink bug excretes a highly potent, odorous smell.

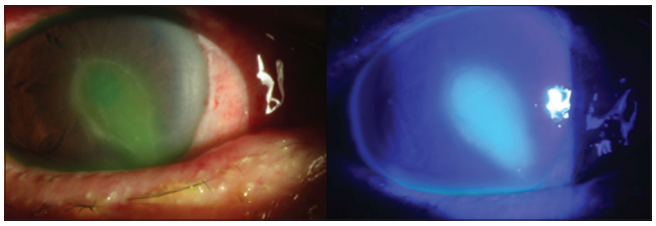

Figure 1: At the emergency department, a central ovoid shape corneal epithelial defect was found with a gravity-track appearance. Left picture: Gross figure under slit lamp. Right picture: Fluorescein dye staining picture

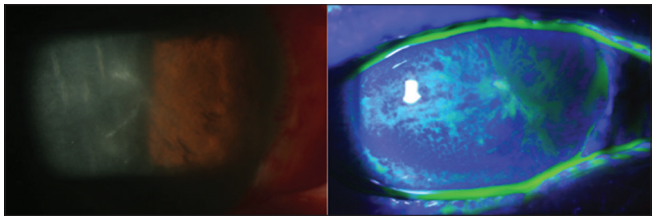

Figure 2: One week later, the best-corrected visual acuity worsened to 2/60. Left picture: Descemet's membrane folding was noted. Right picture: Mild mucus discharge could be seen. The epithelial defect healed gradually with a healing line

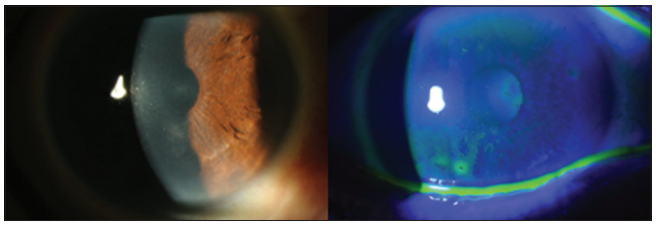

Figure 3: One month later, the epithelial defect healed gradually with some residual corneal opacity, and few punctate epithelial erosions remained. Left picture: Slit lamp picture. Right picture: Fluorescein dye staining picture

We reviewed the literature about chemical components of the secretions of the *Pentatomidae* family. Our results showed mixtures composed of aldehydes, esters, acids, and alcohols.[8] The major components responsible for the odor are trans-2-decenal and trans-2-octenal, which make up the majority of the bodily fluids, exhibiting properties as an aldehyde,[3,9,10] Aldehyde is a clear, colorless to light yellow liquid that boils at room temperature and is water soluble. Aldehydes are highly reactive and are active in many chemical reactions,[11] notably reduction, and oxidation. In reduction, the formyl group (-CHO) can be readily reduced to a primary alcohol (-CH_2OH). Typically, this conversion is accomplished by catalytic hydrogenation, either directly or by transfer hydrogenation. In oxidation, the formyl group of the aldehyde, can readily oxidizes to the corresponding carboxylic acid (-COOH),[12] which will release hydrogen ions (H^+) into human tears.

Hydrogen ions (H^+) are released onto the ocular surface and can cause acidic chemical burns to occur; this explains the PH value of approximately 6.0 discovered by our emergency department. This causes damage by

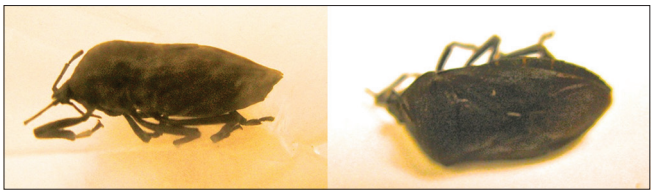

Figure 4: The stink bug, captured by our patient. the appearance of the adult stink bug characterized by a shield-shape and mottled brown color. Although the pictures were not clear due to photo by the patient unexpectedly, the white-banded antennae and dark bands on the edge of the wings could be seen

Table 1: General classification of stink bug

Common name	Brown marmorated stink bug
Family	*Pentatomidae*
Genus	*Halyomorpha*
Species	*Halyomorpha halys*

denaturing and precipitating proteins in the corneal tissues that the ions contact.

The coagulated proteins act as a barrier to prevent further penetration.[13,14] The mild concentration of alcohol causes solvent denaturation of the proteins on the ocular surface.[15] All of these conditions explain the patchy corneal epithelial damage, with the gravity tract-like effects over the areas where the chemicals flowed. In addition, the energy released by the chemical reaction, usually expressed as heat, may possibly induce thermal burns on the cornea. The mechanism described above could be responsible for inducing the irritant contact keratitis.

Returning to the overall course, the lubricants added a positive effect to the corneal epithelial recovery. However, the BCVA was still lowered due to the inflammatory process. In the case of chemical burn injuries, topical steroids should be considered early on while the epithelium is healing.

Conclusion

Stink bugs excrete odorous bodily fluids as a defensive mechanism when threatened. If the toxic fluids get into the human eye, they can cause unexpected chemical burns or injury. Patients whose eyes come into contact with these bodily fluids should rinse their eyes thoroughly with plenty of water and immediately seek medical attention to avoid potential visual impairment.

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Conflicts of interest

The authors declare that there are no conflicts of interests of this paper.

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