An Unusual Laboratory Accident: Bromine Burn
Hasan Basri Cetinkaya and Harun Gunes

Department of Emergency Medicine, Balikesir University School of Medicine, Balikesir, Turkey

ABSTRACT
Bromine is a water-soluble, severely toxic element. It leads to tissue injury by causing the release of radical oxygen species from mucosal membranes. Redness or brownish discoloration of the skin, pain, measles-like rash, vesicles, blisters, pustules, furuncles, burns, and ulcers may be seen in the acute phase. A 32-year-old male presented to the emergency department after an accidental spill of bromine on his left forearm. Erythematous skin, including brownish discoloration and occasional small blisters, were seen on the forearm and wrist. The affected extremity was washed with plenty of water. The lesions were covered with antibiotic cream and wrapped with sterile gauzes; they healed without any complications. Mild burn scars with slightly pale discoloration of the affected skin remained after the lesions healed. Although bromine burn is rare, it causes severe damage to the skin, and injury starts insidiously without causing a visible skin reaction at the beginning. Irrigation with plenty of water in the early period is critically important in reducing the severity of the injury.

Key Words: Bromine, Burn, Skin, Radical oxygen species.

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INTRODUCTION
Bromine (Br₂), a member of the halogen group, is a reactive element, which is in the liquid phase at room temperature. It is a water-soluble, severely toxic substance that has a brownish-red color and a smell resembling that of bleach. It is used, as an alternative to chlorine, in swimming pools. Bromine-containing products are also used in flame retarders and agricultural fields. Most of the victims are exposed to Br₂ accidentally. After exposure, it reacts with tissue components like respiratory epithelium and dermal keratinocytes. It causes tissue injury by triggering the release of radical oxygen species (ROS) from mucosal membranes. Besides, hydrobromic and hypobromous acids, which appear when Br₂ reacts with water in tissues, contribute to secondary damage. In the case of contact with the skin, Br₂ may cause erythema or brownish discoloration of the skin, pain, measles-like rash, vesicles, pustules, furuncles, burns, and deep ulcers in the acute phase. It does not lead to systemic effects in the acute phase; however, various systemic symptoms may appear several months after exposure to Br₂ vapor. Cough, dyspnea, chest tightness, eye irritation, headache, dizziness, fatigue and disorders of memory, sleep and sexual functions may be observed 6 to 8 weeks after exposure. A patient with skin exposure to liquid Br₂, leading to 2nd degree burns in the acute phase, is presented in this report.

CASE REPORT
A 32-year-old male presented to the emergency department (ED) after an accidental spill of Br₂ on his left forearm while working in the chemistry laboratory one hour before. He stated that he felt pain in his skin nearly 30 minutes after the exposure. Erythema, including brownish discoloration and occasional small blisters (some of which had burst), were seen on the forearm and wrist (Figure 1). The left upper extremity was washed with plenty of water for the purpose of dilution and removal of the chemical. The lesions were covered with antibiotic cream and wrapped with sterile gauzes. Tetanus toxoid was given intramuscularly. The patient was consulted with the Plastic and Reconstructive Surgery Department, and an out-patient follow-up visit was arranged for the next day. He was advised to re-admit to the ED in the case of new or worsening symptoms. His lesions healed without any complications. Mild burn scars with slightly pale discoloration of the affected skin remained after the lesions had healed (Figure 2). No additional problems have developed during the 6-month out-patient follow-up.

DISCUSSION
Br₂ burns start insidiously without causing a visible skin reaction at the beginning. So, this delay in the development of signs and symptoms should be taken into consideration while dealing with the injuries caused by Br₂ or its compounds. Symptoms of the present patient, who had skin exposure to liquid form of Br₂, started 30 minutes after the exposure. Kim and Seo reported 4 cases of possible Br₂ exposure through skin contact with waste chemicals. The patients developed skin lesions 1 to 5 days after the exposure. Their lesions included grouped bullae and lichenified hyperpigmented patches.
In conclusion, it should be kept in mind that tissue injury caused by Br₂ exposure may be started already though there are no visible lesions at the time of admission to the ED. Besides, the patient should be informed and warned about possible alarming signs and symptoms, which may appear later, and an out-patient follow-up visit should be arranged for the next day before discharge from the ED.

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Literature review and data collection were performed by both authors. The first draft of the manuscript was written by Hasan Basri Cetinkaya, and Harun Gunes commented on previous versions of the manuscript. Both authors read and approved the final manuscript.

REFERENCES