

# Burns from ignited household aerosols in the kitchen: a case series

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## Abstract

Aerosol sprays are commonly used products in daily living. Aerosols in kitchen products have prompted for use of 'food grade' or chemically inert propellants; however, they commonly contain gases or gaseous mixtures such as butane, propane and dimethyl ether that are flammable. When such sprays are used near heat sources, such as kitchen appliances, combustibles in these products can result in ignition and burn injury. Given the ubiquity of such sprays, surprisingly burns sustained from household aerosols are not characterised in the literature. We conducted a retrospective search of all burn patients treated at our hospital which contains a burn unit. Three patients were identified with burn wounds due to household aerosol sprays. All three occurred in the kitchen. and were characterized as first-degree and second-degree burns over the head and neck or upper extremities with one requiring inpatient admission. Where it may be perceived a cause of minor injury, household aerosol burns may result in significant burn injury and hospital admission. Household aerosols and burn injury are reviewed.

## Keywords

Burns, aerosol, spray, propellant, kitchen, inner city, flame, flammable, accident, injury, cooking burns, household burns

## Introduction

The aerosol market was estimated at US\$68.76 billion globally, with its use in personal care, household and food products accounting for more than 75% of global consumption in 2015.<sup>1,2</sup> Aerosol use in food and cooking sprays has prompted for use of 'food grade' or chemically inert propellants from a toxicological point of view. However, despite CO<sub>2</sub> and nitrous oxide, other flammable gases such as butane, propane and dimethyl ether (DME) are commonly used in aerosol food sprays.<sup>2</sup> These combustible propellants may ignite around heat sources leading to burn injury. Given the ubiquity of such products, surprisingly, burns sustained from household aerosols are not characterised in the literature. In our hospital, which has a burn unit, we conducted a retrospective review to investigate burn wounds

secondary to household aerosol use. In this series, we review and characterise these burn injuries.

## Methods

A retrospective chart review of all emergency room and clinic visits of patients at our institution using keywords 'burn and spray', 'aerosol', 'perfume',

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‘propellant’, ‘repellent’ and ‘flammable liquid’ for the years 2000–2017 was performed. Three patients with burn wounds due to aerosol spray use were identified. All were noted to have occurred in the kitchen. These cases were reviewed for depth and extent of burn, treatment, need for admission, duration of hospital stay, time to recovery, other complications and outcomes.

## Results

All three patients with burn injuries due to aerosol use had first-degree or second-degree burns to either the head and neck region or the upper extremities. Two out of three patients were discharged from the emergency room with topical silvadene and/or bacitracin. One patient with multiple co-morbidities and with a history of delayed presentation was admitted for wound care and debridement and was discharged after 12 days. All patients healed within two to three weeks from presentation to emergency room with no significant scarring or contractures.

### Case 1

A 51-year-old woman with past medical history of hypertension was brought in by emergency medical services after sustaining burns to the forearms. The patient reported using aerosol cooking oil spray that ignited the flames. Examination revealed second-degree burns to the bilateral volar aspect of forearms and the dorsal aspect of bilateral hands with scattered regions of bullae, accounting for a burn area of around 4%. The patient was discharged from emergency room with topical silvadene for wound care. At the follow-up visit one week later the burn wounds were noticed to have healed well.

### Case 2

A 31-year-old woman with no significant past medical history presented to the emergency room with a complaint of burn wounds secondary to a flash fire. The patient reported to have used an air freshener near a burning stove, which flared up the fire causing burns to her right face, lips, neck, breast and bilateral shoulders. Examination revealed superficial second-degree burns to the right face and neck, first-degree burns to the right axilla, small second-degree burns of the right breast and both anterior shoulders, accounting for an approximate burn surface area of 5%. She was discharged with topical



**Figure 1.** Second-degree burns to the left forearm sustained from ignited aerosol from the kitchen stove.

silvadene and bacitracin prescriptions and was referred to follow-up as an outpatient. She came back to clinic after three days; examination suggested similar findings, blisters were debrided and she was recommended to continue topical silvadene application. At the follow-up visit after ten days from the initial insult, the burn wounds were noticed to have healed well with no prominent scarring.

### Case 3

A 66-year-old man with past medical history of diabetes mellitus, schizophrenia and chronic alcoholism presented to the emergency room five days after using a repellent aerosol spray next to the stove which was ignited. The patient reported that initially he tried to treat the burns with local home wound care and decided to come to the emergency room when he could no longer tolerate pain. Examination revealed second-degree burns to the lower lip, nasal ala, forehead and cheeks, first-degree burn to the right upper extremity on the anterior forearm, and on the left upper extremity there were deeper second-degree burns on the forearm, extending from the hand to the elbow with scattered bullae noted on the dorsum of the hand and elbow region, accounting for a burn surface area of approximately 7% (Figure 1). The patient was subsequently admitted to Burn ICU, where bullae were un-roofed, treated with local wound care using topical silvadene and bacitracin, and supportive care (Figure 2). The patient was discharged on hospital day 12 with burns reported to be fully healed.

## Discussion

An aerosol is a colloid of solid particles or liquid droplets of size smaller than 1  $\mu\text{m}$  suspended in air or other gases. Gases such as butane, propane and DME are used as a propellant in most aerosol canisters which makes the fumes flammable. Use of food grade incombustible propellants such as  $\text{CO}_2$  and nitrous oxide have been advocated in



**Figure 2.** Healing second-degree burns to the left forearm due to ignited aerosol after topical silvadene and local debridement at bedside seven days after admission to the burn unit.

manufacturing food and cooking-related aerosol products; however, combustible gaseous propellants are still used in 90% products which have a tendency to ignite fire near burning stoves or appliances causing flame burns.<sup>2-4</sup> Given the ubiquity of these items and their casual use, spray ignition from nearby heat sources resulting in burn injury is likely seldom considered by most in daily living routines. Carelessness of the use of aerosols in the kitchen or aerosol use by those suffering from impaired mental awareness or increased age may be at higher risk.

## Conclusion

With widespread availability and convenience of use of aerosol sprays in kitchen products and other household items containing flammable propellants, there is a need for awareness regarding potential combustion when used in approximation to heat sources such as cooking appliances.

Despite being a less commonly thought of mechanism of injury, household aerosol sprays commonly contain combustibles that may ignite around heat sources, such as kitchen appliances, resulting in significant burns and may potentially lead to hospital admission.

## Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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