

CASE REPORT

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Appearance of Chemical Burns Resulting from the Washing of a Deceased Body with Bleach

ABSTRACT: The authors report on a case of postmortem washing of a body with bleach. An adult female victim was found nude in an alleyway with both hands removed in the City of Westminster, CO. Cause of death was attributed to severe blunt force trauma to the head. The victim had been dumped in the alleyway within 7 h of discovery. Evidence discovered at the crime scene and autopsy indicated that the murder and subsequent washing of the body with bleach occurred at a secondary location(s). The victim was wet to the touch, presenting a strong odor of bleach. Several "ribbon"-like burn patterns were observed on the victim's back and upper thighs. These burn marks were replicated by dowsing a deceased pig with an over-the-counter concentration of bleach.

KEYWORDS: forensic science, homicide investigation, death investigation, sodium hypochlorite, bleach, dismemberment

Bleach is a common cleaning product that may be used to clean up trace evidence at crime scenes or on bodies. The destructive nature of bleach can pose several challenges to the crime scene reconstructionist. Cleaning a crime scene or body with bleach may alter or destroy the original condition of certain evidence such as bloodstain patterns (1–3). Bleach is a volatile liquid, however, and may quickly evaporate from a crime scene environment depending on the environmental conditions. As such, investigators may need to search for bleach-damaged items to confirm the presence of a bleach source before their examination. Recognizing that bleach has been used by a suspect may help to explain why evidence is found in altered conditions, or not found at all. In October of 2004, the senior author responded to the scene of a deceased adult female who had been dumped nude in an alleyway. Based on eyewitness accounts, the time between the dumping and discovery of the body was less than 12 h. The victim was nude and her body was wet to the touch with a strong odor of bleach. The victim's body also contained a "ribbon"-like "burn" pattern along the areas of her shoulders, lower back, and back of the thighs. The skin in this area had a dried reddish/brown appearance similar to a ligature that one might find associated with a hanging victim. The defects also resembled postmortem abrasions that are often described as yellowed with a parchment-like appearance. None of the investigators or analysts consulted on this case had seen injuries like these in previous case work. Based on the location and appearance of the burn marks on the female victim, it was hypothesized that liquid bleach had been poured over the top of the victim's body while she was in a supine position, causing these characteristic burn marks (Fig. 1). In order to test this hypothesis,

an experiment was set up to see whether the burn marks could be replicated by pouring liquid bleach over a deceased body.

Research Methods

A 100-pound adult pig (deceased) was used to test the effects of pouring bleach on a body. Pigs have been commonly used as human models due to the similarities they have with skin to tissue ratios and the fact that they are large, mostly hairless, mammals. The pig was killed with a bolt gun and taken to the Arapahoe County Coroner's Office. The pig was kept in refrigeration for several days before testing. The pig was allowed to reach room temperature before the experiment was begun. The pig was then placed on its right side inside a large wash basin area. The basin area had a smooth cement floor with a central floor drain. The pig was lightly washed with water to remove dried blood and debris. Approximately 2 gallons of undiluted *Clorox* brand bleach (6.15% sodium hypochlorite) was poured over the body. While a majority of the liquid drained off, a small band of bleach was stopped by the interface between the body and the cement. This created a damming effect that kept the bleach in contact with the skin for several minutes. The pig was left in this position for *c.* 60 min before it was rolled over and photographed. The burning effect was seen along the skin/cement interface at the 30-min interval but the pig was not rolled to avoid prematurely losing the damming effect. It was noticed that prolonged exposure to air, dried the burned area of skin, making it appear darker (red) in color (Fig. 2). Telmon et al. (4) noted similar-appearing chemical burns on a child who was bathed in a bleach solution. After initial photography of the pig and its burns, a cross-section of the epidermis was cut out for histology. The sample crossed both healthy tissue as well as the area containing the burn mark. The sample was processed and examined at the Arapahoe County Coroner's Office Histology Lab. Hematoxylin and eosin-stained sections revealed zones of epidermal erosion and debridement, with extension to involve the papillary dermis (Fig. 3). These areas were well

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Received 24 June 2006; and in revised form 7 Oct. 2006; accepted 29 Oct. 2006; published 5 April 2007.



FIG. 1—"Ribbon"-like burn marks on the victim's back and upper thighs.

demarcated and confined to areas of bleach application; hair shafts in these areas were also absent. Areas of unaffected skin adjacent to the burn area were also documented (Fig. 4). Stutgen et al. (5) reports a case of acute hair loss after exposure to sodium hypochlorite. As expected with any post-mortem cutaneous injury, there was no associated vital reaction (edema or inflammatory infiltrate). Several authors have also commented on injuries associated with sodium hypochlorite (6–9).

Discussion

Household bleach solutions (sodium hypochlorite) are available in various concentrations and intended for dilution with common use. In commercial concentrations (6.15% as used in the current experiment), sodium hypochlorite is a corrosive alkaline agent that can cause chemical burns with prolonged exposure. Reports of ingestion of bleach solutions describe resultant esophageal erosions (10,11). Commercial concentrations are commonly used in endodontic therapy, and complications resulting from accidental exposures or improper irrigation, including severe mucosal and soft tissue damage, are well documented in the literature. Numerous *in vivo* animal experiments and *in vitro* experiments using



FIG. 2—"Ribbon"-like burns replicated on a pig washed with sodium hypochlorite.

cultured human fibroblasts document the toxicity of various concentrations of sodium hypochlorite, with well-documented inhibition of fibroblast activity and fibroblast cytotoxicity.

This study made no attempt to quantify the elapsed time of tissue damage due to the unknown crime scene factors of liquid volume, dilution, time of exposure/contact, and chemical composition of the bleach used on the female victim. The goal of the research was simply to determine whether exposure to liquid bleach could create the characteristic chemical burn artifacts observed on the human victim at the crime scene. The minimum

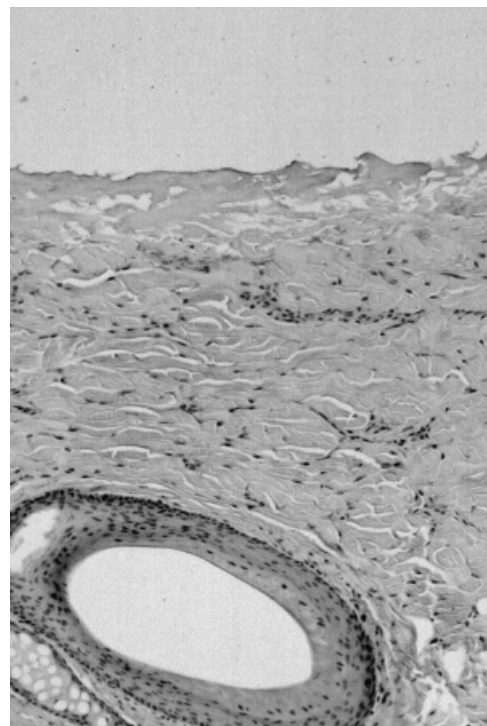


FIG. 3—Bleached skin with erosion of the epidermis and papillary dermis; absence of hair shafts in follicles within affected areas (hematoxylin and eosin, 10 × magnification).

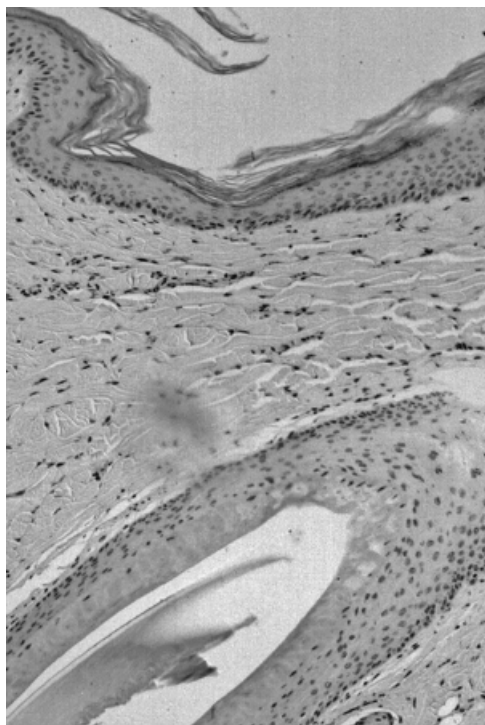


FIG. 4—Unaffected skin with intact epidermis and hair shafts (hematoxylin and eosin, 10 × magnification).

time of development for bleach artifacts is unknown and may be significantly less than the time observed in this study. This artifact is not a vital injury. One interesting observation is that no other area of skin over which the bleach was poured showed visual evidence of these bleach artifacts. From this observation, it is apparent that it is the prolonged and direct exposure of liquid bleach to the skin that causes these artifacts to be created. Another interesting observation was that the pig's hair was completely removed from the artifact area upon initial inspection. This may be significant for investigators who find shed body or head hair with similar characteristic at a crime scene with no body. While

the victim's hair in this case was wet to the touch and smelled like bleach, it was neither discolored nor easily removed. Just as with the body hair on the pig, this may be the result of insufficient contact or immersion in the bleach liquid. Similar cases should be reported to broaden our understanding and recognition of cases involving the postmortem washing of a victim with bleach.

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