

TECHNICAL NOTE

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The Use of Hydrogen Peroxide to Visualize Tattoos Obscured by Decomposition and Mummification

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ABSTRACT: Tattoos are distinctive, potentially important acquired identifying features that last for the life of the bearer, and persist into the postmortem period. However, the accumulation of decompositional pigments in the skin and subcutaneum will obscure tattoo designs. By treating the area with 3% hydrogen peroxide, the dark red-black decomposition products are temporarily removed, allowing underlying tattoos to be located, and photographed for identification purposes.

KEYWORDS: forensic science, tattoos, identification, decomposition, mummification, post-mortem change

Tattoos are acquired integumentary designs that are created by repeatedly perforating the epidermis and superficial dermis with a needle-bearing instrument or machine containing India ink or metallic salt pigment particles. They remain with the superficial dermal layers permanently. Tattoos are an important potential identifying feature, especially in cases of unknown or questionable identity. Individual designs may carry names, Social Security numbers, records of military service, or be so unique in artistic content that they can be used to establish possible, probable, or even conclusive identity.

As tattoo pigments are deposited within the dermis, they persist after death, despite advancing decomposition, even when the superficial epidermal layers slough from the body surfaces. Unless putrefaction has progressed to destroy the soft tissues, tattoo designs will remain. During decomposition, hydrogen sulfide is produced by bacteria in the gastrointestinal tract. As these bacteria spread throughout the body through the tissues and vascular channels, the accumulated hydrogen sulfide reacts with hemoglobin to produce sulfmethemoglobin and iron sulfide, which creates colors that vary from an initial dirty crimson or light green to dark green, brown, or black [1,2]. These substances gradually diffuse into the subcutaneous tissues and accumulate, accounting for the dark green-black discoloration that dominates the external appearance of decomposing human bodies. This discoloration may become quite dark, especially if accompanying tissue

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dehydration (especially in arid climates) superimposes an element of mummification. The decompositional pigment concentration may become so intense that tattoos are obscured or seemingly obliterated.

Method

The area of skin in a decomposing body that is to be checked for tattoos, or where there is a partially obscured tattoo design, is gently cleansed with water to remove remaining detritus. Warm, soapy water may be used, especially if oily decomposed fatty tissue remnants are abundant. Then, a quantity of cotton or a soft cloth is saturated with 3% hydrogen peroxide (this may be purchased at any drugstore or grocery store; inexpensive, generic brands are quite effective), and this is placed over the questioned area on the body. The cloth or cotton may be gently rubbed against the underlying tissues, to enhance hydrogen peroxide penetration, and the area can be visually checked as necessary. The time required is usually 2 to 10 min, within this period, the accumulated dark decompositional pigments gradually fade, and the dermis is rendered a pale pink-tan. Any tattoos that are within the exposed dermal regions will be readily identified, and may then be photographed. Left undisturbed, the decompositional compounds gradually diffuse back into the "developed" area, eventually reobscuring the exposed tattoo over several hours.

Case Reports

Case 1:

This 75-year-old male was discovered in his home following an approximate three week postmortem period during the latter part of July and early August. Relatives described two tattoos, one over each deltoid region, including "a complex design with a sailing ship and flags" on the right and a red rising sun with the legend, "Home at Last," on the left. The former tattoo was slightly visible (Fig. 1a), whereas the latter was completely obscured (Fig. 1c). Topical application of 3% hydrogen peroxide yielded highly visible tattoos after 15 min. (Fig. 1b and 1d).

Case 2

A 27-year-old white male was discovered in his apartment approximately six days following his death. Decomposition was characterized by green to black discoloration, blistering, skin slip and purging. No fingerprints were available locally, and efforts to obtain antemortem dental or skeletal documentation proved futile. Family and missing person reports included descriptions of a "peace sign" tattoo on the right shoulder. However, this area was darkly discolored by decompositional alterations (Fig. 2a). However, when a 3% hydrogen peroxide pack was applied for 3 min, the tattoo was exposed (Fig. 2b).

Discussion

Establishing identity can be difficult in cases where the usual identifying features are obscured, altered, or obliterated. In many instances, externally visible identifying marks will allow tentative identification, which may then be confirmed through other means if the external marks are themselves not unequivocally unique. If there are no records or reports of missing individuals for comparison, it can be very difficult or even impossible to conclusively identify a body.

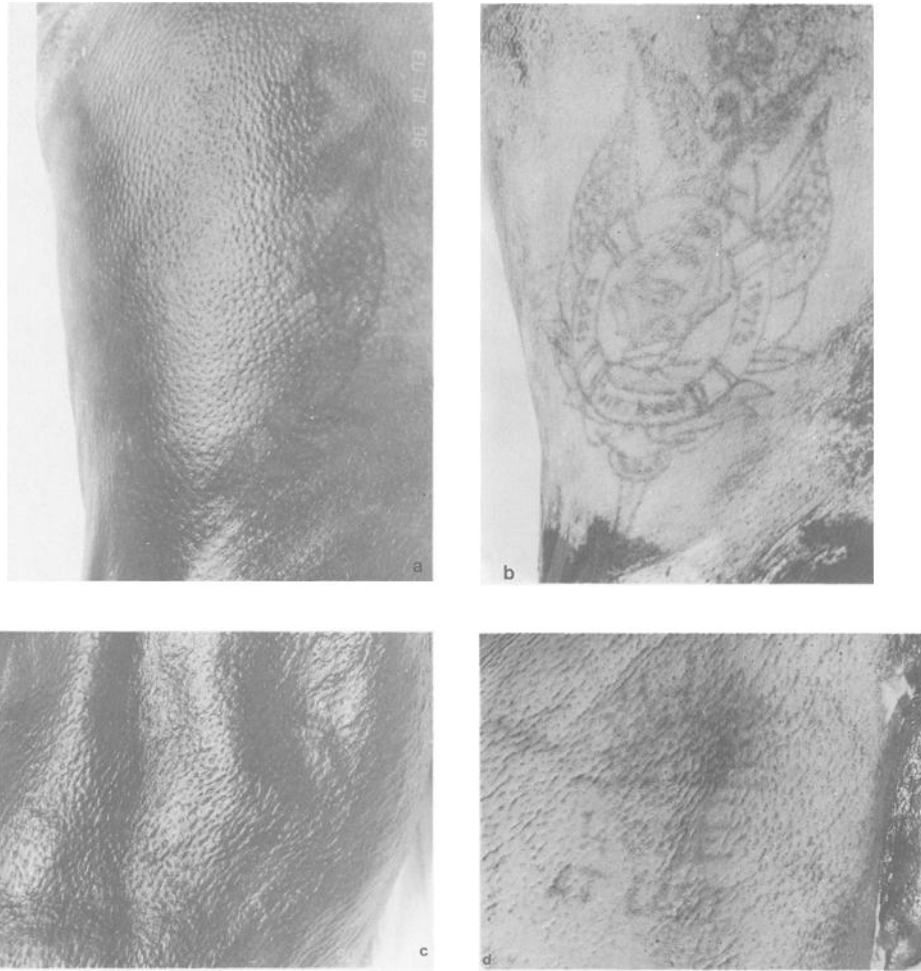


FIG. 1—Case 1. Untreated areas on the right (a) and left (c) shoulder regions. A tattoo is barely visible on the right shoulder, but completely obscured on the left. After treatment with 3% hydrogen peroxide (b and d), both are clearly visible, and the details readily discernible.

The exact chemistry of the hydrogen peroxide reaction which appears to bleach away the decompositional compounds that diffuse into the skin and subcutaneum is not known, at present. However, as these compounds are composed predominantly of degenerating sulfmethemoglobin derivatives, it is probably that the peroxide reduces the bonds within their structures that allow detection in the visible light spectrum.

The technique described and illustrated here allows for both quick and easy exposure of tattoos that are obscured by decomposition. Hydrogen peroxide is inexpensive, non-toxic, noncaustic, readily obtainable in the 3% concentration, stable when kept in closed bottles away from light, and works very well to temporarily bleach away decompositional discoloration.

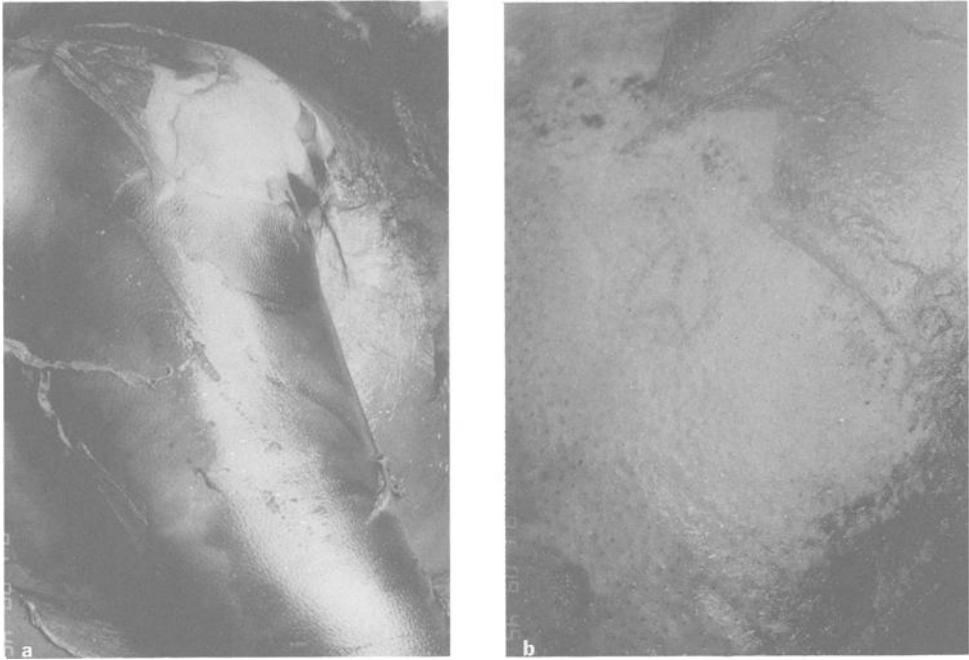


FIG. 2—Case 2 Before (a) and after (b) depictions of the right shoulder, showing the tattoo that was revealed following treatment with 3% hydrogen peroxide. This allowed positive identification of the decedent.

Acknowledgments

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