



F9 The Role of the Skin in Bite Marks, Part IV: Clothing Weave Transfer

Benjamin G. Phillips, BS, and Peter J. Bush, BS, Laboratory for Forensic Odontology Research, School of Dental Medicine, State University of New York at Buffalo, B1 Squire Hall, South Campus, Buffalo, NY 14214; and Raymond G. Miller, DDS, 122 Covington Road, Buffalo, NY 14216; Robert Dorion, DDS, 1 Place Ville-Marie, Suite 11238, Montreal, PQ H3B 3Y1, CANADA; and Mary A. Bush, DDS, State University of New York at Buffalo, B1 Squire hall, 3435 Main Street, Buffalo, NY 14214*

After attending this presentation, attendees will gain an understanding of the appearance of fabric weave transfer to human skin when a bite mark occurs through clothing. An examination of the microscopic characteristics of various fabrics will be evaluated with regard to Optical and Scanning Electron Microscopy (SEM). These microscopy techniques will also be used to view the transfer of the fabric patterns to human skin.

This presentation will provide the forensic community with knowledge of the microscopic appearance of common fabrics once they have been impressed upon human skin by means of a bite mark. The time persistence of these impressions in skin as well as the specific weave pattern and fiber diameter will be discussed.

Bite marks are associated with violent crimes. Sometimes the victims of these violent crimes are found deceased and clothing is absent. It is common practice to swab the bitten area for DNA evidence. However, if the victim was bitten through clothing, saliva may be absent from the skin. The physical appearance of the bite mark itself may be a poor indicator if clothing was present or not at the time of the bite. If microscopic analysis of the bite can demonstrate that the bite occurred through a fabric, then investigators may have an additional clue, since it is likely that salivary DNA from the perpetrator would exist on the clothing.

Human Subject Review Board (HSRB) exemption was applied for and waived for this project. A polyvinylsiloxane (PVS) impression was collected from an individual who was to serve as the biter. This impression was poured with low viscosity metallographic epoxy resin under vacuum. It was articulated and then mounted onto hand held vice grips. The bite force was measured and determined to be within the range of a human bite.

Various fabrics were collected. These included polyester (100%), nylon (90%)/ spandex (10%) blend, nylon (80%)/ spandex (20%) blend, and polyester (64%)/ nylon (36%) blend. All of the fabrics exhibited different weave patterns with varying primary fiber diameters. Bites were inflicted through each fabric on human cadavers. The cadavers were stored at 4C and had no apparent tissue breakdown. Immediately following the bite, a photograph was taken with a Canon Rebel XTi 10.1 MP digital camera. The photographs and impressions were made in the same position in which the bite occurred. Each bite was impressed with Extra Low Viscosity polyvinylsiloxane (XLV PVS). Due to the ambient temperature, the PVS required 20 minutes to fully set. This process was repeated at 1 hour, 24 hours, and 96 hours after infliction of the bite.

The PVS impressions were cleaned with alcohol and poured under vacuum with light viscosity metallographic epoxy resin. Due to the thin consistency of the epoxy, no backing was required as the impressions maintained their curvature reminiscent of the location of the body in which they occurred. Once fully set, the epoxy exemplars were trimmed on a band saw and coated with gold for inspection with SEM. A sample of each fabric was also prepared for examination with SEM. Each exemplar and fabric sample was examined at 30x, 100x, 200x, and 500x magnifications.

Unlike the irregular detail seen on tooth surfaces, fabric possesses two recognizable geometric properties. One is the primary fiber diameter, and the second is the geometric nature of the weave. It is these features that transfer to and are recognizable in the skin. One or the other of these properties may dominate in the bite mark imprint, depending on the relative sizes of these features. In this case, the fabric pattern dominates over the skin pattern when superimposed.

In this study it was seen that the fabric weave imprint in cadaver skin persisted long after the bite mark had rebounded and had become invisible by conventional photographic means. A correlation was demonstrated between the attributes of the fabric's material and weave pattern to the time persistence of the bite mark. The use of the SEM proved to be an invaluable tool in visualizing the patterns after a period of time as they become essentially invisible to the eye.

This study demonstrates that additional information may be obtained from microscopic analysis and best practice exemplar fabrication. It indicates that there may be hidden information present on the skin surface that may persist and be recognizable for some time period after death.

Bite Marks, Bite Mark Research, Fabric Weave Pattern