Inside vs. Outside: Fact or Fiction?

FBI Laboratory, Trace Evidence Unit

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ABSTRACT

This study investigates the persistence of fibers on the inside and outside surfaces of ski masks during transit to the Federal Bureau of Investigation (FBI) Laboratory and during evidence processing to see if separate examination of the inside and outside is valuable and warranted. Twenty ski masks were seeded with test fibers on either the inside or outside only. The masks were then packaged, shipped and processed according to protocol, and the final recovery location of the fibers was documented. Results indicated that eleven (55%) of the ski masks showed evidence of test fiber transfer sometime during the study. An examiner therefore cannot be sure that fibers recovered in the Laboratory from the "inside" of an item were actually originally on the inside, and it is probably sufficient to process all surfaces of head coverings together.

INTRODUCTION

Locard's Exchange Principle states that whenever two objects come into physical contact, an exchange of materials takes place (Locard, 1920; Locard,1929). This material can take the form of textile fibers comprising their clothing, hairs from different body areas, chips of nail polish, etc. This principle is the foundation of trace evidence examinations. By examining evidentiary items for trace evidence, it may be possible to associate individuals involved in a crime.

Federal Bureau of Investigation (FBI) Laboratory's Trace Evidence Unit caseload is highly varied and includes robberies, rapes, and terrorist activities. These crimes are often committed with the perpetrator wearing head and/or facial covering in order to conceal their identity. Knit pull-over ski masks are often the covering of choice. When a ski mask is recovered, it is submitted to the FBI Laboratory for various analyses including hair and fiber examinations.

During a hair and fiber examination, evidence is processed to locate and recover potential hairs and fibers. Processing textile items in the FBI Laboratory most often involves the combination of scraping and picking techniques. For ski masks and other head or facial coverings, the outside and inside of the item are usually processed and examined separately. The reason for this is the notion that hairs recovered from the inside of the item are more likely to have originated from the person who was wearing it. The aim of this study is to determine whether trace evidence including hairs and fibers transfers between the inside and outside of an item during transit to the laboratory and/or during evidence processing. Specifically, we examine the transfer and persistence of fibers on ski masks to see if separate examination of the inside and outside is valuable and warranted.

MATERIALS AND METHODS

Twenty black ski masks (100% acrylic, Made in Vietnam, RN 97467) were purchased new and were not washed. Carpet fibers of approximately ¼" to ½" in length were counted into groups of 50 and planted on the ski masks which were assigned identification numbers one through twenty. Ski masks one through ten were seeded with

test fibers on the inside, and ski masks eleven through twenty were seeded on the outside. These fibers were selected because they fluoresce at 475nm using an Alternate Light Source (ALS) crime scope (SPEX CS-16-400 Model # 22F) making them easy to locate and identify when they are on the black ski masks whose fibers do not fluoresce (Figure 1). In a manner similar to that used by evidence recovery teams at a crime scene, each ski mask was packaged in a tape-sealed Tyvek envelope and labeled with its identification number. Envelopes were packaged in pairs in medium FedEx shipping boxes and shipped via FedEx from the FBI Laboratory to the home address of one of the authors (DDC).

The boxes containing the masks were transported by DDC via car to the Laboratory and processed by one of the authors (AMC) according to FBI protocol (Figure 2). The processing was begun with a clean lab coat and gloves, sanitized work area, and a clean piece of paper on the processing table. The packaging was opened in the processing room, and the ski masks were processed using a scraping technique. The outside of the mask was processed first, and any collected fibers were transferred to a pillbox and labeled with the mask's identification number and location of collection (inside or outside). A new sheet of brown paper was placed down, and lab coat and gloves were changed. The inside was then processed using the same technique. Between each ski mask, the work area and instruments were sanitized and new paper, lab coat and gloves were used.

Two of the authors (DDC, KLD) performed a pre-processing screen using ALS to see if any of the fibers had already transferred (Figure 3). After un-packaging but prior to scraping, the masks were examined using the ALS at 475nm with an orange filter.

Because the selected seeding fibers fluoresce, the location of the fibers could quickly and easily be determined. Any transfer of test fibers from their original location was noted.

When all of the processing was completed, the pill boxes containing the collected fibers were examined using the crime scope at the same wavelength. The total number of seed fibers recovered in each pillbox was counted and documented.

RESULTS

Eleven (55%) of the ski masks showed evidence of test fiber transfer sometime during the study (Table 1). For five (25%) of the masks, transfer was noted during the pre-processing screen. Figures 4 and 5 illustrate the number of fibers recovered from each item and their location. For masks seeded on the inside, the total number of fibers recovered from their original surface (the inside) ranged from twenty to forty-four of the original fifty. For masks seeded on the outside, the total number of fibers recovered from the outside ranged from twenty-two to thirty-eight of fifty. The majority of the fibers were recovered from their original surface location, but some were not recovered at all and others transferred from one surface to the other. Transfer may have occurred during packaging or shipping, or during the scraping and collection procedures. When transfer did occur, the number of transferred fibers was relatively small, ranging from one to three fibers.

CONCLUSION/DISCUSSION

Time is valuable in the Trace Evidence Unit of the FBI Laboratory, as it likely is in other forensic laboratories. In cases where evidence requires multiple types of

examinations, Trace Evidence is usually the first unit to receive evidence, and technicians and examiners must work quickly to ensure effective and efficient evidence flow throughout the lab in order to meet deadlines such as trial dates. Processing and examining the inside and outside surfaces of an item of evidence separately takes nearly twice as long compared to when the total surface area is processed collectively. Results from this study show a lack of persistence of fibers on one surface of a ski mask between the crime scene and the laboratory examiner, and suggest that collecting and examining from separate surfaces is thus probably unnecessary since an examiner cannot be sure that fibers recovered from the "inside" of an item were actually originally on the inside.

Moreover, trace evidence examiners should be careful making statements regarding the specific source of recovered trace evidence, and it may be unwise to state that a questioned hair or fiber came from the inside or outside of a submitted item. Additional research that includes hairs is needed, but our results indicate that it is probably sufficient to collect all trace evidence from head coverings together, and that it is best not to offer opinions on the specific source surface of trace evidence.

LITERATURE CITATIONS

Locard, E. (1920) *L'enquete criminelle et les methodes scientifiques*, Flammarion, Paris.

Locard, E. (1929) L'analyse des poussieres en criminalistique. *Revue Internationale de Criminalistique*, September, 176-249.

Figure 1: Fluorescing Test Fiber on Ski Mask

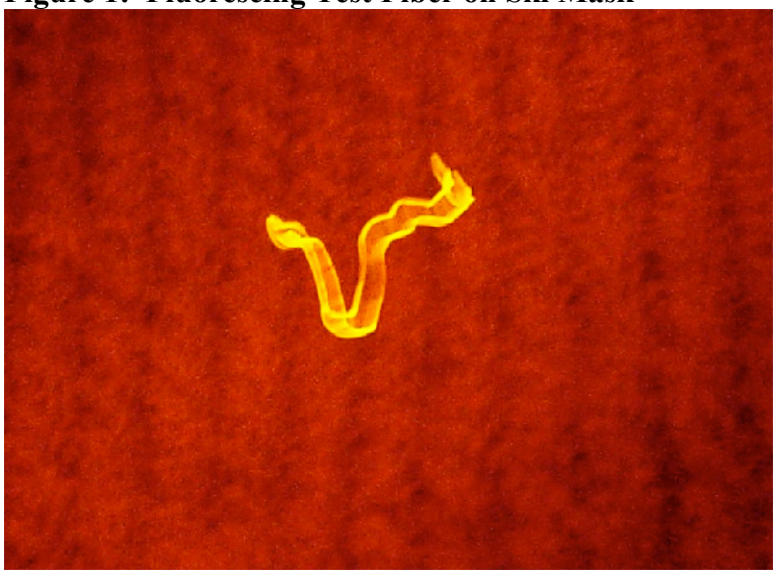

Figure 2: Processing Mask Using Scraping Technique

Figure 3: Pre-Processing Screen Using ALS

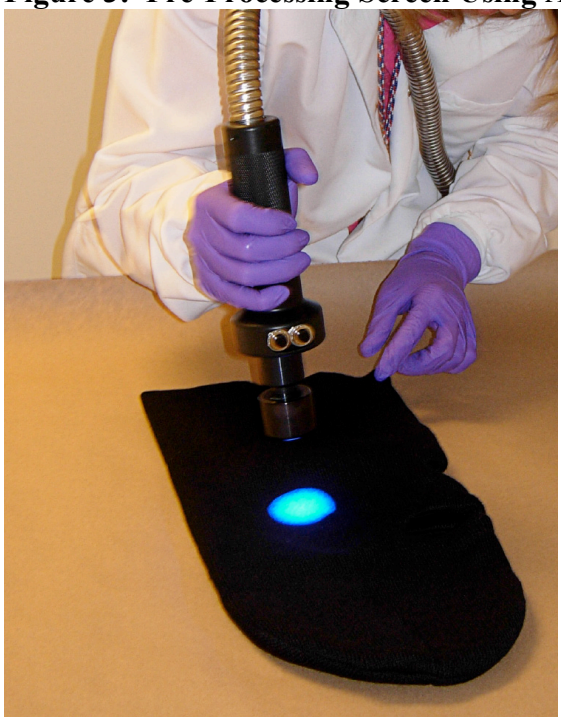

Figure 4: Test Fiber Recovery from Ski Masks Seeded on the Inside

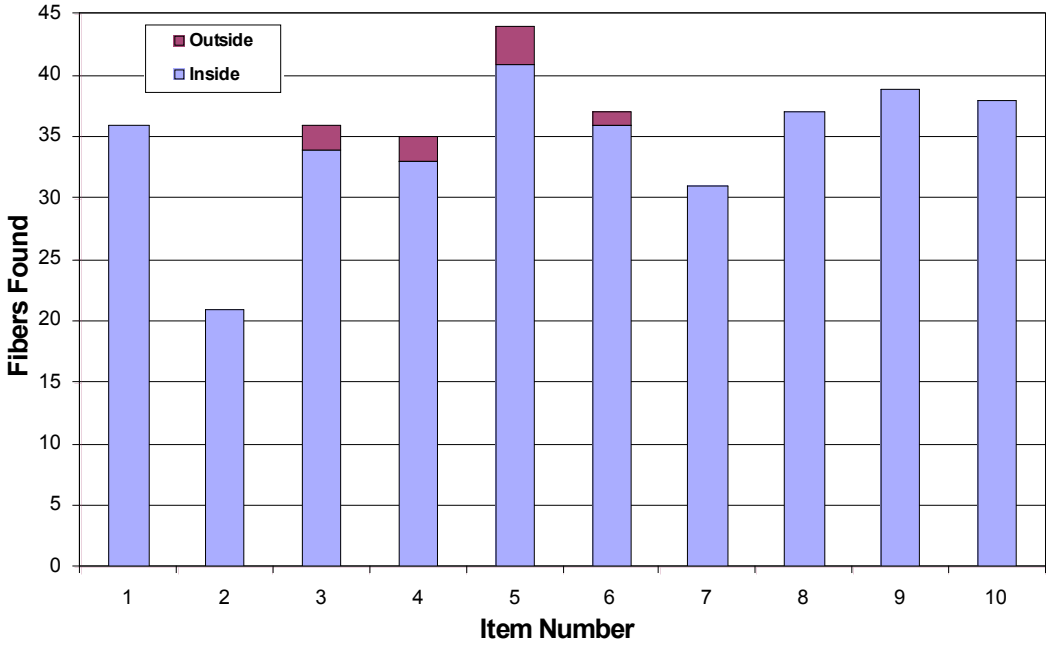

Figure 5: Test Fiber Recovery from Ski Masks Seeded on the Outside

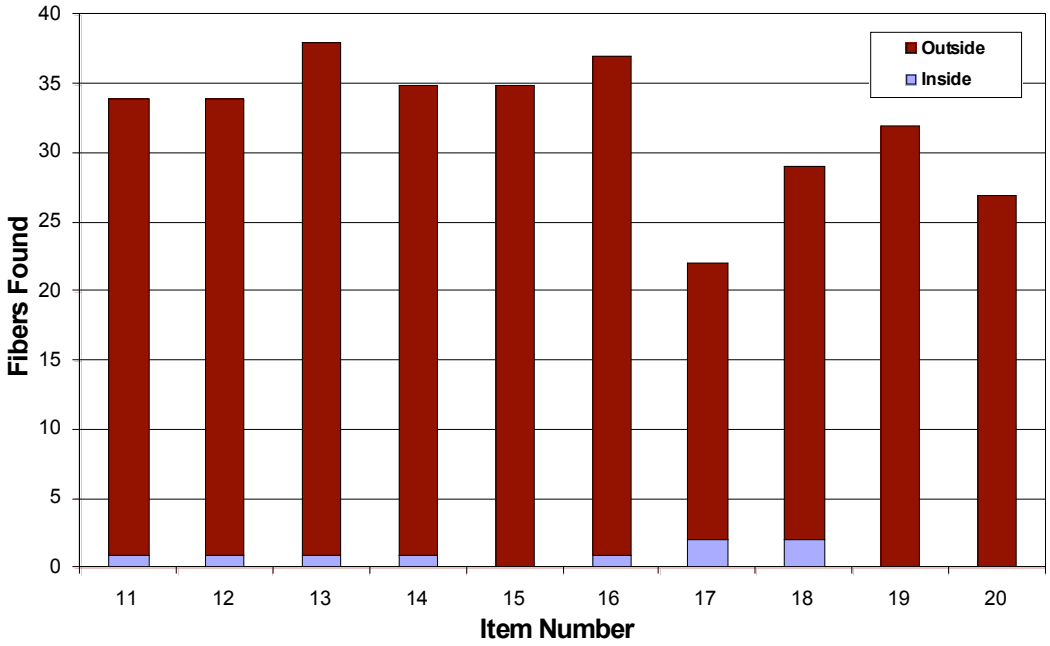

Table 1: Transfer of Seeded Test Fibers

Item Number	Transfer Noted?
1	N
2	N
3	Y
4	Y
5	Y
6	Y
7	N
8	N
9	N
10	N
11	Y
12	Y
13	Y
14	Y
15	N
16	Y
17	Y
18	Y
19	N
20	N
Total Transfer	11 (55%)