

Frontier Analysis, Ltd

TECHNICAL SERVICE RESPONSE NO.: UT089

Subject: Analysis of a Tee Shirt Worn by an Experiencer during an Event on the Morning of February 6, 2014 (Winnipeg, Canada)

Date: March 1, 2016

Requested By: Kathleen Marden
MUFON
Director of Abduction
Research

Reported By: P. A. Budinger
Analytical Scientist

Background/Objective: The witness of this event is an experiencer who has had multiple paranormal events most of his life. A strange occurrence happened February 6, 2014 around 4:50 a.m. He woke up quite early (4:30), retrieved the newspaper from the mailbox, poured a glass of water, and sitting on the edge of the bed began to read the paper. The next conscious memory was waking up at 8:30 or 8:45 feeling disorientated. Shaking and trembling went on for 5-10 minutes. When he went to the bathroom he noticed that the *tee shirt he was wearing was turned inside out and backwards*. It was placed in a paper bag and stored in a dark warm closet. He also noted a red v-shaped mark on his scalp. Also his cell phone with camera was on. The 1 minute 2 second video recorded a blackened dark room with neon blue/purple lights at the very end. The sounds, besides the television and his heavy breathing, included ruffling, static, clicks and noises of some kind. He noted there was pink discoloration on the shirt. Some of it appeared to fade over time. The shirt was sent to Kathleen Marden and she noted that it faded even more. Also, there was no fluorescence under UV light.

There are two objectives. The first is to look for any anomalous substances on the tee shirt which can be related to an alien experience. The second is to compare these results to those reported in the analysis of the dress worn by Betty Hill during her abduction¹.

Following is Kathleen Marden's report of the T-shirt history.

¹ Frontier Analysis Technical Service Report Number: UT025.

“I asked him if the shirt had been bleached and he replied that it had not been. He stated that the shirt had definitely changed color and was not pinkish prior to the event on 2-6. I asked him to take photos of the shirt and gave him instructions on how to mail it to me in the paper bag. I worried that the evidence might be lost if the package was lost in the mail, so I asked him to cut a 2” swatch from the pink discolored portion of the shirt and a 2” swatch from the tan part of the shirt and retain them at his home. He mailed the shirt to me inside the paper bag that he had placed in a large, padded plastic post office mail bag. It was probably exposed to the cold during transport.

3-13-2014: I received the tee shirt in the mail. I removed it from the bag and laid it out on the paper bag that I placed on a towel. I noticed faint pink discoloration on the front shoulder areas and near the emblem on the shirt front, and two short lines of intense pink discoloration on the sleeve. I had anticipated seeing more discoloration than I observed, as the photos I’d received showed a definite pink discoloration. I turned the shirt inside out and inspected it. Pink staining was visible near the shoulders, on the sleeves and on the lower part of the shirt.

*I wrote an inquiry to the witness and he replied as follows: “As I mentioned, when I took pictures it really stood out. I put it back in the bag and when I pulled it out again it didn’t seem as stained as before. The pictures were normal, untouched photos. Try taking some pictures and the areas should come out on film. When I took it out of the bag after 2 weeks it was visible almost everywhere, I took my photos right then and there.” (*I decided not to take photos of the pink stains, as I feared that the flash might destroy whatever evidence might be on the shirt.)*

3-20-2014: I inspected the shirt again, before I mailed it to the chemist, and the pink discoloration seems to have faded even more. It did not fluoresce under a UV light. I mailed it to analytical chemist Phyllis Budinger in hopes that some of the pink substance has remained on the shirt.”

When the tee shirt arrived at Frontier Analysis very faint indications of pink remained. Over time, ‘almost’ all the tee shirt restored to its original color. Photographs were taken of the shirt, and it was secured in a resealable plastic bag for several days. A trace of gray material seemed to deposit on the bag. On opening the bag it quickly disappeared/evaporated. Therefore, no testing could be done on it. It was most likely moisture, because it was cooler when the shirt was sealed, and then placed into a warmer environment.

Conclusions:

- No physical substance could be identified as the cause of the fading/staining on the tee shirt. If a physical substance is the cause, it is either below the detection limits of the testing (trace amounts) or not there at all. It could have dissipated. Another cause may be exposure to some sort of a high energy source. Perhaps the source effected ionization to a higher energy state, on returning to a lower state over a period of time most of the original color of the tee shirt was restored. It was noted a cell phone, which

happened to be on during the experience, recorded neon blue/purple lights at the very end of the recording.

- The tee shirt is made of cotton. Mostly respiration products, such as perspiration (urea derivatives, acid salt) and skin oil (glycerol fatty acids) are on the shirt. There are indications of detergent residue (carboxylic acid salts, sulfate). Trace amounts of contaminants, such as paraffinic oil and a possible food crumb (particle comprised of protein, carbohydrate plus other components) are also present.

- It was noted the respiratory products are more prevalent on the inside of the tee shirt. And, there were more on the inside back than the inside front. It is known that the witness found he was wearing the tee shirt inside out with the back in front of him when he regained consciousness. This suggests that major perspiration occurred prior to when the tee shirt was removed, i.e. in the beginning of the event.

- There is no connection to the cause of the staining between the tee shirt and the Betty Hill dress. Something different happened to the tee shirt. Following is a table comparing various features of the tee shirt and the dress.

Tee Shirt	Betty Hill Dress
The tee shirt fiber is cotton. It has been worn and laundered.	Dress fiber is cellulose acetate. It is a new dress worn once and never laundered.
The fiber is intact. Dye was temporarily attacked.	Both fiber and dye were permanently attacked.
There are very few particulates.	Particulates are quite prolific.
Predominating are respiratory products in the stain as well as other areas. Carboxylic acid salts (residual detergent and/or respiration) are occasionally detected.	Mildew-like residue predominates in the stain areas.
It is unknown what caused the discoloration.	Mildew type material is speculated to have caused the stain/discoloration.
Trace common mundane contaminants are detected, such as a small oil stain and probable food crumb.	Common dust components and pet hair are found.

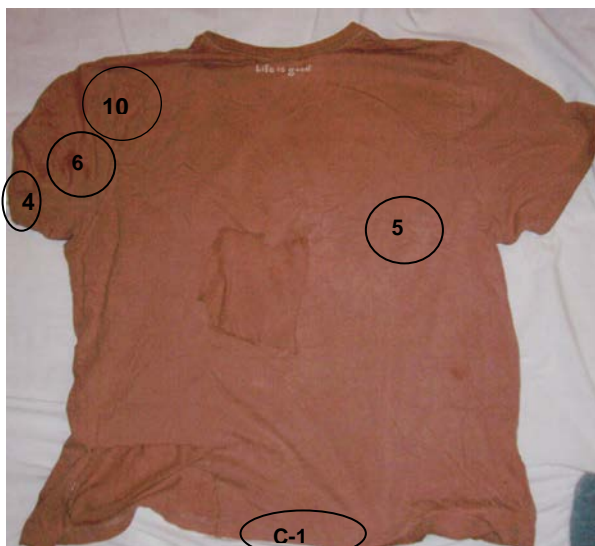
- Finally, this report really presents on-going research that should be built on in future testing of experimenter clothing. Future testing can be related back to the findings of this report.

Procedure:

Sample: The tee shirt was received on March 24, 2014.

Numerous infrared spectra were obtained directly from various inside and outside areas of the T-shirt. Selected swatches from these areas were extracted with water and methylene chloride. Infrared spectra were taken of the extracts. The FT-IR (Fourier Transform-Infrared) spectra² were acquired on the Thermo Electron Avatar 360 spectrometer using the Smart Herrick diamond sampling accessory. Optical microscope photographs were obtained using a Canon A520 digital camera interfaced to a Leica GZ6 microscope. Various swatches of the shirt were exposed to gaseous ammonia, iodine vapor, ultraviolet light, infrared light, intense white light, microwave radiation, laser light and elevated heat.

Following are photographs of the tee shirt taken a day after receipt, and locations designated where the swatches were obtained. Some were selected based on visual appearances. For example, there's and oil-like stain (6), an enmeshed particulate (7), and light stain areas (3, 4,10).



Samplings:

- #1 Front, 1 o'clock of logo
- #2 Front, above logo underneath hem
- #3 Front, center of left sleeve, has stain on both sides of the swatch
- #4 Back, left sleeve hem area, has stain on both sides of the swatch
- #5 Back just right of middle.
- #6 Back, center of left sleeve has oil-appearing spot.

² **FT-IR (Fourier Transform Infrared Spectroscopy):** Infrared spectroscopy is used for the molecular structure identification and quantification of solids, liquids, and gases. An infrared spectrum is the result of light (in the 2 to 25 micron wavelength range) interacting with the vibrations of molecules. The particular set of vibrations of a molecule gives rise to specific spectral absorption bands, often referred to as the "fingerprint" spectrum.

#7 Front, Lower left side, has white debris on the surface (not on the back of the swatch)

#8 Front, the logo area

#9 The left armpit.

#10 Back, left sleeve seam area, has stain on both sides of swatch

Results:

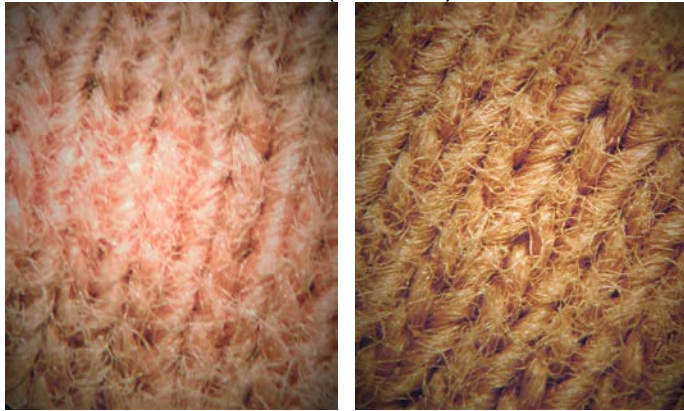
The detailed results of the individual tests done on all of the swatches excised from the tee shirt follow. These results are summarized in the conclusions section on page two of this report. The analysis of swatches 1, 2, 3, 4, 5, 8, 9 and 10 are similar to each other and are reported together. Swatch 6 and 7 contain other extraneous materials and their analysis is reported at the end.

Swatches 1, 2, 3, 4, 5, 8, 9, 10

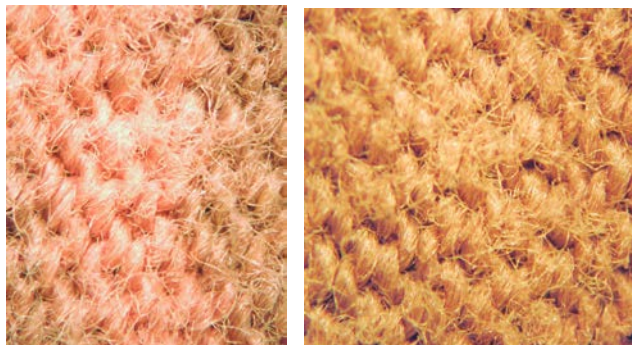
Microscopic Examination

Swatch 3 contained a very obvious stain and had an unstained area. Both areas (front and back) were examined under the microscope. Following are photographs.

Front (Outside)



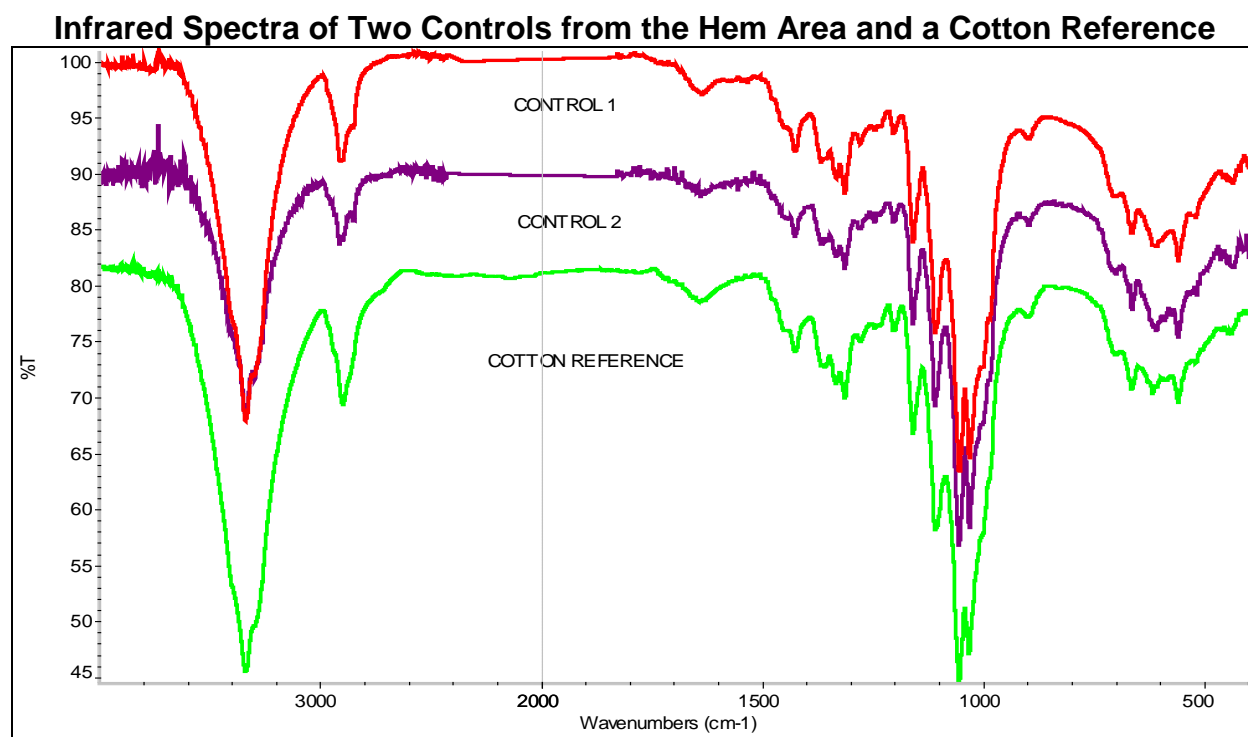
Back (Inside)



The microscope photographs of the faded area on the front of the swatch do not show significant disruptions of the weave rows. So, the fiber itself was not attacked. However, because of the discoloration some reaction with the dye must have occurred. The photographs of the discoloration area of the back display the same results.

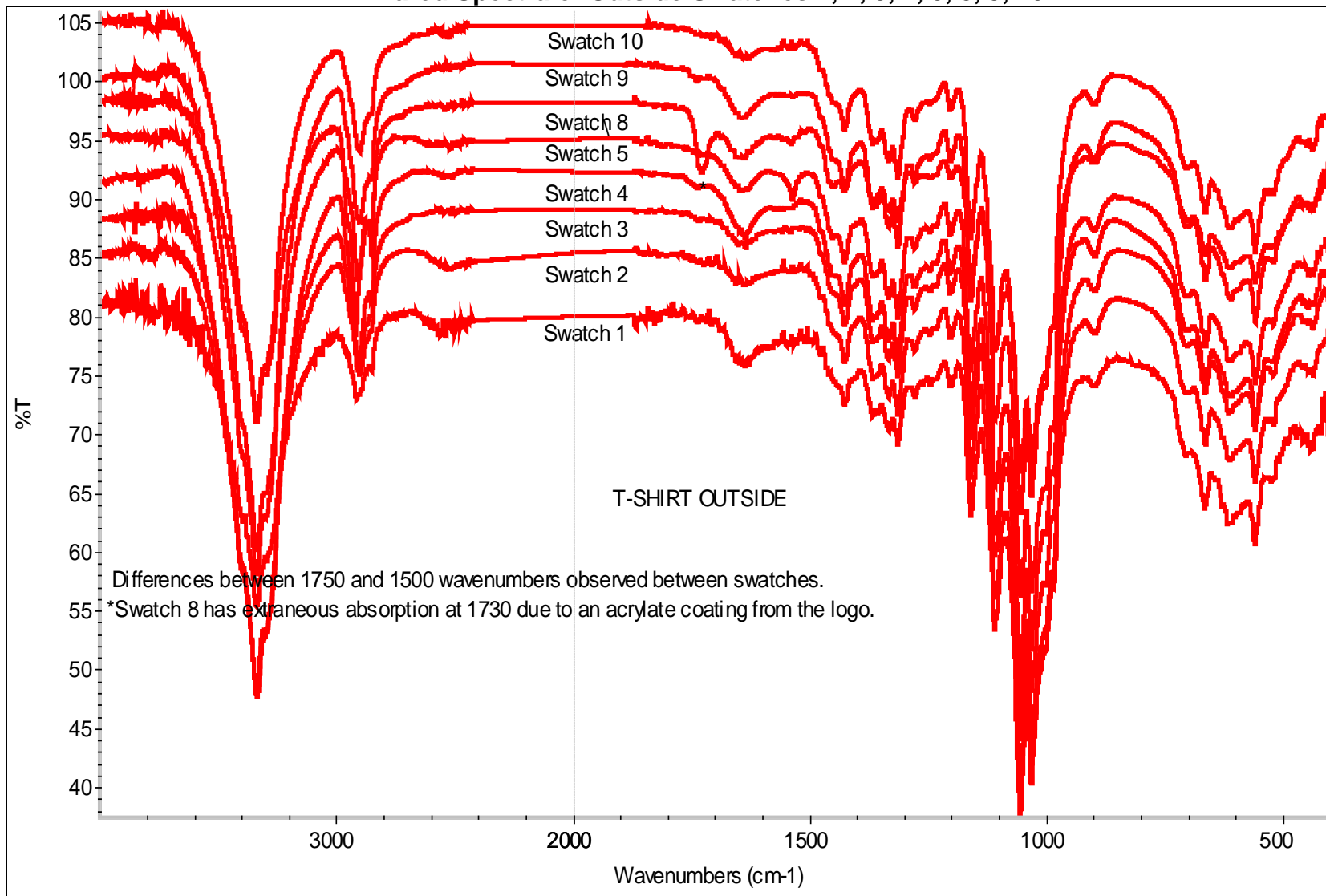
Infrared Analysis of 'As Received' Swatches 1, 2, 3, 4, 5, 8, 9, 10

Infrared analysis of the tee shirt shows it is made of cotton. Spectra of two controls, cut from the hem area which were assumed to be the least contaminated, are compared to a cotton reference. They all match confirming the identification of cotton. Following are the spectra of the controls and of cotton for comparison.

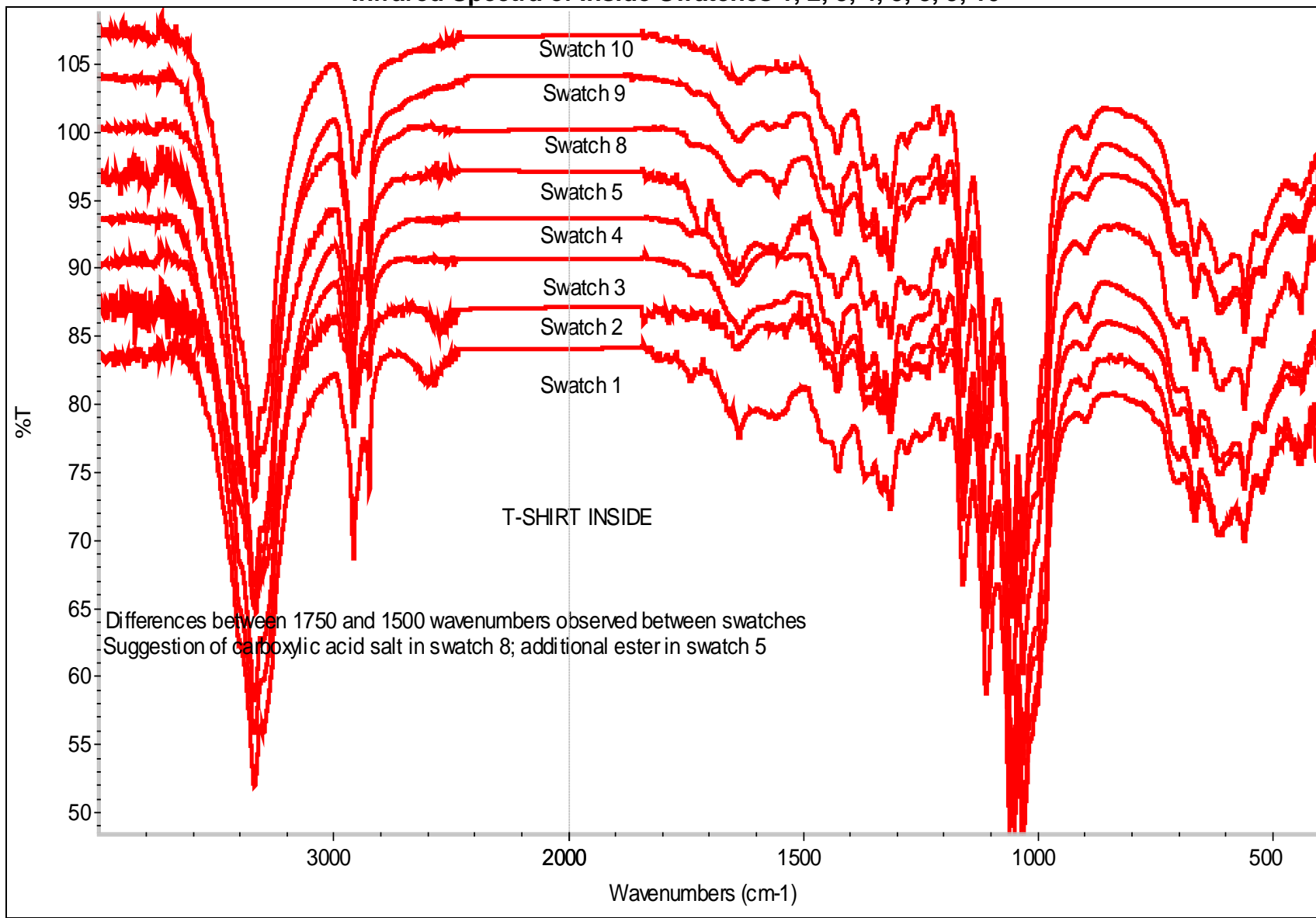


Spectra of swatches 1, 2, 3, 4, 5, 8, 9 and 10 taken from the outside and inside of the tee shirt were compared to those of the controls and a cotton reference. Increased absorption 1750 and 1500 cm^{-1} was noted in the spectra of some swatches due to extraneous materials. For the most part, these are found to be nitrogen derived derivatives suggestive of perspiration and in some instances a carboxylic acid salt. Difference spectra were generated between the swatches and that of Control 1 to null as much as possible the interfering cotton absorption and enhance these extraneous absorption bands. This was an aid in identifying these materials. These spectra are shown in the appendix. Identifications for any extraneous materials can be found in the table on page nine. The original spectra follow.

Infrared Spectra of Outside Swatches 1, 2, 3, 4, 5, 8, 9, 10



Infrared Spectra of Inside Swatches 1, 2, 3, 4, 5, 8, 9, 10



Examination of band area ratios indicate the relative amount of extraneous substances on both sides of the tee shirt swatches. The areas between 1800 - 1520 cm^{-1} (extraneous absorption plus minimal cotton absorption) and between 1400 - 1290 cm^{-1} (cotton absorption only) were measured. The ratios of these areas suggest that respiratory products are more prevalent on the inside back of the tee shirt. The following table shows the area measurements, the ratios 1800 - 1520 cm^{-1} / 1400 - 1290 cm^{-1} and the identification of extraneous materials in the 1800 - 1520 cm^{-1} region. Besides the ratios from selected swatches, those from reference cotton on a Q-Tip and a designated "control" swatch from a clean area of the T-Shirt are included for comparison.

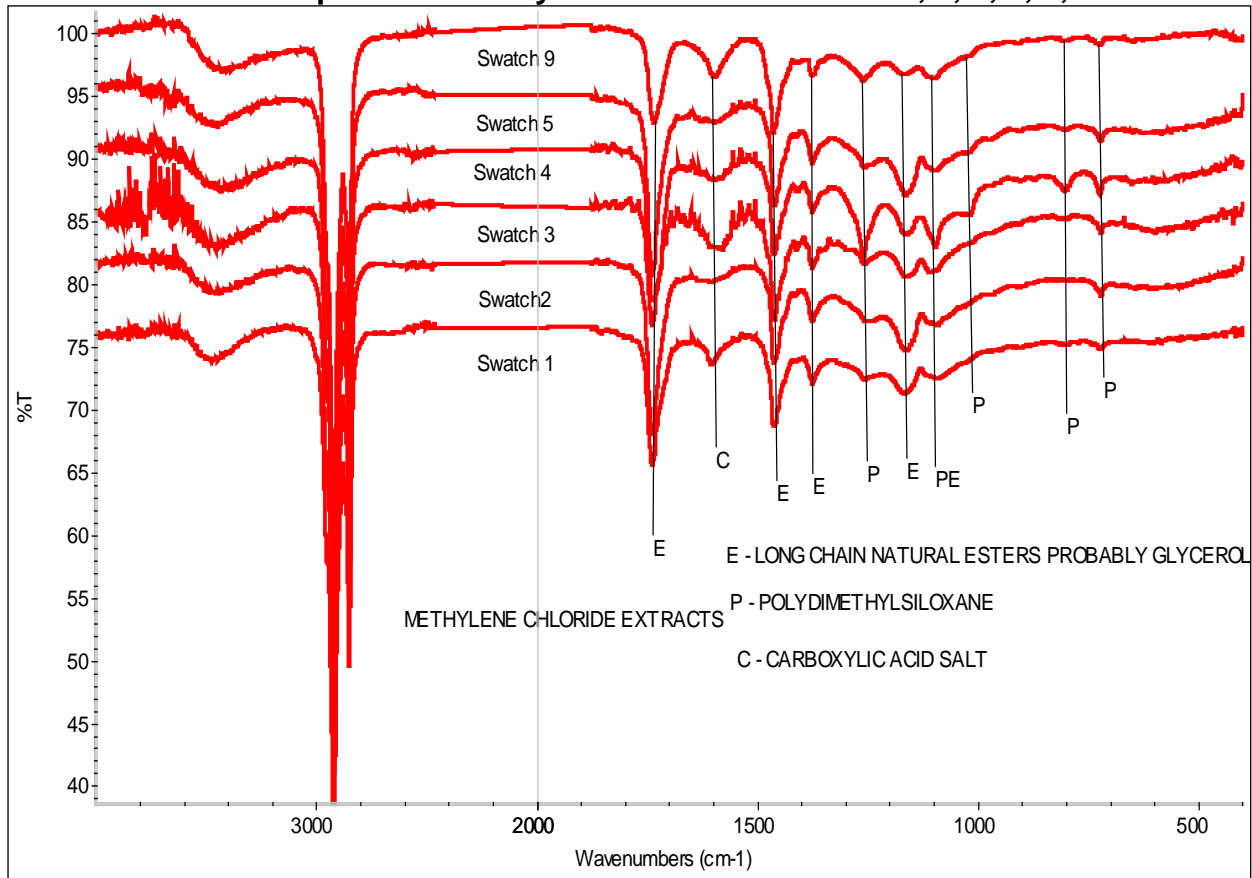
Sampling	Area 1800-1520 cm^{-1}	Area 1400-1290 cm^{-1}	Ratio 1800-1520 cm^{-1} / 1400-1290 cm^{-1}	Identification
References				
Q-Tip Cotton (Ref.)	1.16	1.54	0.75	
Control Swatch	1.03	0.92	0.75	
Outside (Front)				
#1	0.51	0.35	1.46	Trace $-(\text{C}=\text{O})\text{NH}-$ containing material (maybe from perspiration)
#2	0.71	1.16	0.69	Nothing significant
#3	0.78	1.74	0.44	Nothing significant
#8	-	-	-	Acrylate coating from logo
Outside (Back)				
#4	1.74	2.35	0.74	Trace $-(\text{C}=\text{O})\text{NH}-$ containing material (maybe from perspiration)
#5	0.86	1.23	0.70	Trace carboxylic acid salt (possible detergent or perspiration component)
#10	0.86	1.27	0.68	Nothing significant
Outside (Underarm)				
#9				
Run 1	4.14	6.60	0.63	Nothing significant
Run 2	4.14	5.93	0.70	Nothing significant
Inside (Front)				
#1	0.83	0.51	1.63	$-(\text{C}=\text{O})\text{NH}-$ containing material (maybe from perspiration); trace ester
#2	0.23	0.27	0.85	Nothing significant
#3	1.37	1.05	1.30	$-(\text{C}=\text{O})\text{NH}-$ containing material (maybe from perspiration); trace ester
#8	-	-	-	Carboxylic acid salt (possible detergent or perspiration component)
Inside (Back)				
#4	1.34	2.01	0.67	Trace $-(\text{C}=\text{O})\text{NH}-$ containing material (maybe from perspiration)
#5	1.15	0.40	2.88	$-(\text{C}=\text{O})\text{NH}-$ containing material (maybe from perspiration); Ester: Carboxylic acid salt (possible detergent or perspiration component)

#10	0.65	0.93	0.70	Nothing significant
Inside (Underarm) #9				
Run 1	4.14	5.93	0.70	Trace carboxylic acid salt (possible detergent or perspiration component)
Run 2	5.39	6.38	0.84	Trace carboxylic acid salt (possible detergent or perspiration component)

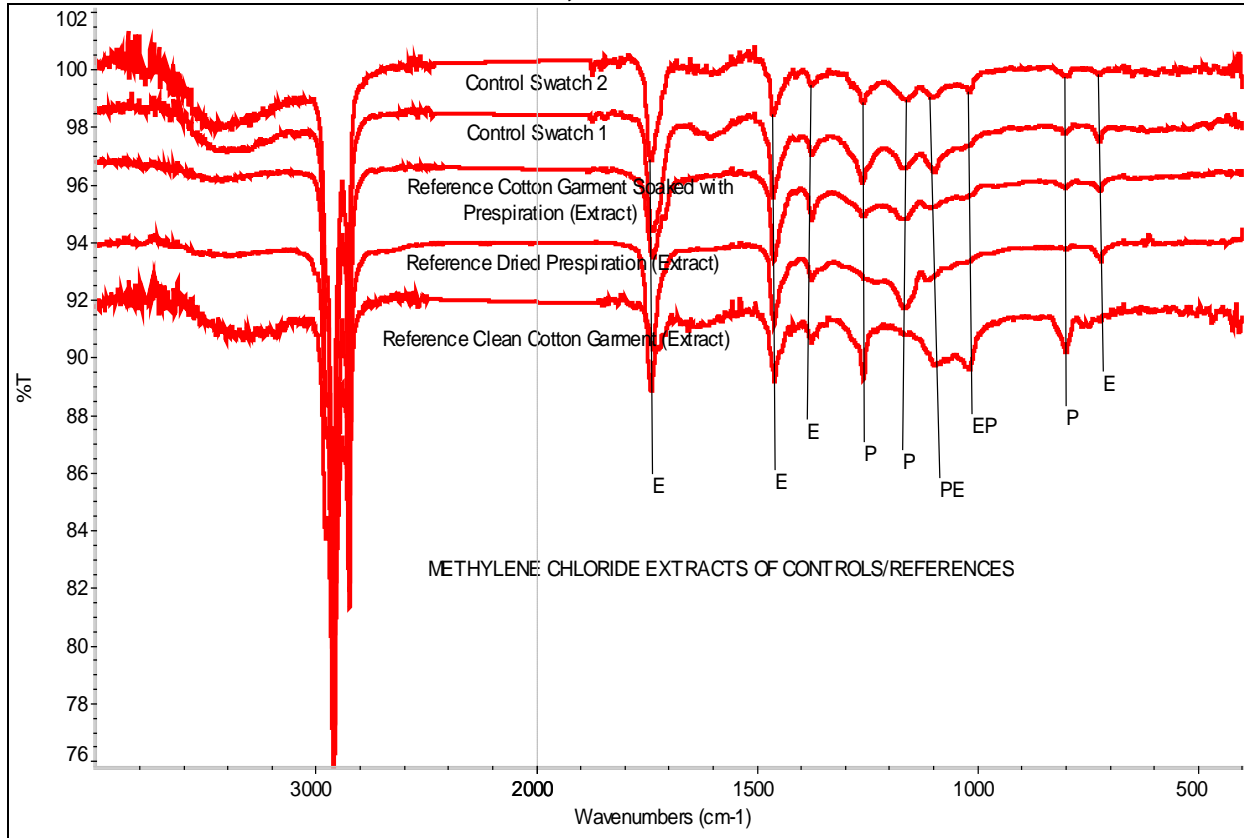
Infrared Analysis of Methylene Chloride Extracts 1, 2, 3, 4, 5, 9

Methylene chloride solvent extractions were done on selected swatches in an attempt to isolate debris/residues from the tee shirt. It was hoped that this procedure would help to specifically identify them. Trace amounts of materials were extracted. Infrared analysis suggests all were of similar composition though their amounts varied. The components were not unusual. These consist of long chain natural esters which are probably glycerol types (possibly a respiration product), polydimethylsiloxanes (most likely silicone contaminant from aluminum containers used in the analysis) and a carboxylic acid salt (possible detergent and/or perspiration product). Following are the spectra of each extract along with controls and reference. Also there is a table showing the infrared interpretation each swatch.

Infrared Spectra of Methylene Chloride Extracts 1, 2, 3, 4, 5, 9



Infrared Spectra of Methylene Chloride Extracts for References: Clean Cotton Garment; Dried Perspiration, Cotton Garment Soaked in Perspiration; T-shirt Control Swatch 1; T-Shirt Control Swatch 2



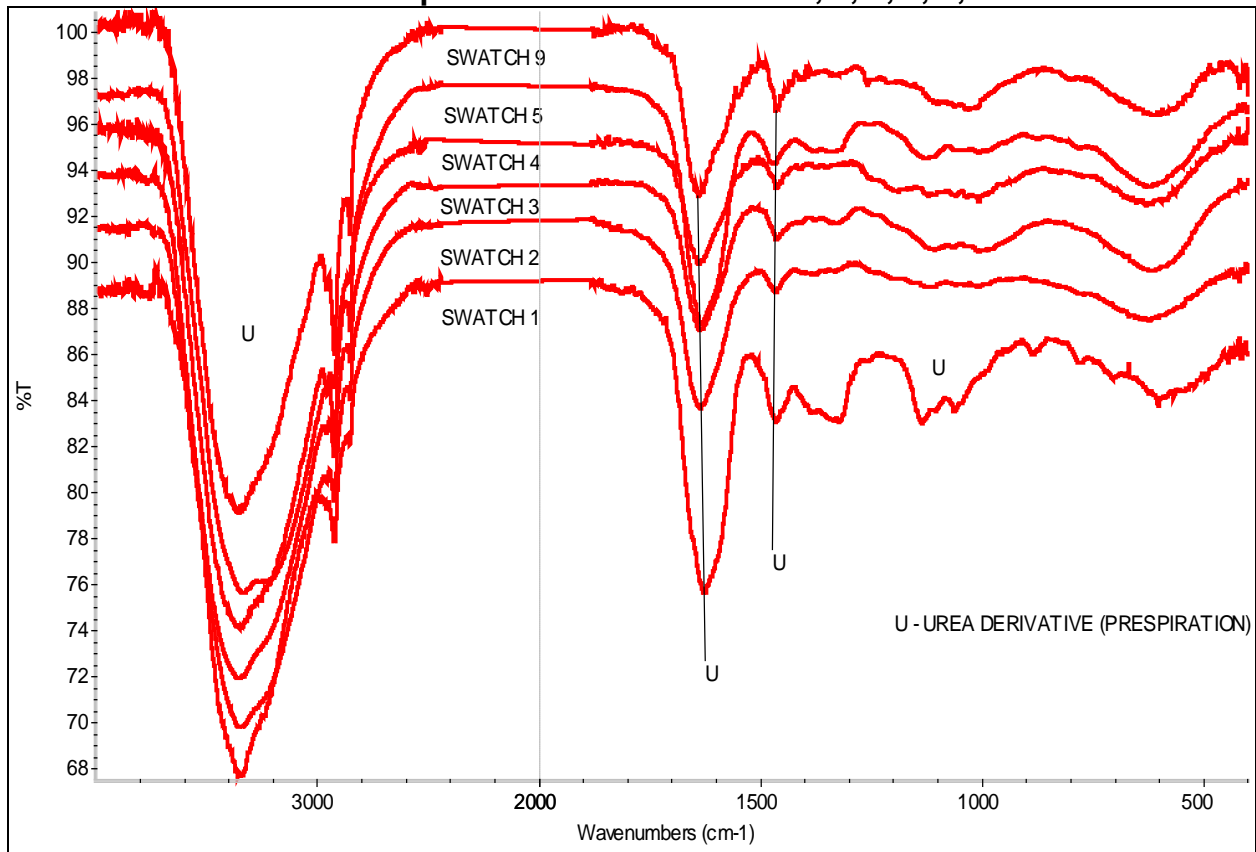
Methylene Chloride Extract Identification

Sampling	Identification
Clean Cotton Garment Reference	Natural Ester; Polydimethylsiloxane.
Control 1	Natural Ester; Polydimethylsiloxane
Control 2	Natural Ester; Polydimethylsiloxane
1	Natural Ester; Polydimethylsiloxane; Carboxylic Acid Salt (detergent or respiratory Product)
2	Natural Ester; Polydimethylsiloxane
3	Natural Ester; Polydimethylsiloxane; Carboxylic Acid Salt (detergent or respiratory product)
4	Natural Ester; Polydimethylsiloxane;
5	Natural Ester; Polydimethylsiloxane.
9	Natural Ester; Polydimethylsiloxane; Carboxylic Acid Salt (detergent or respiratory Product).

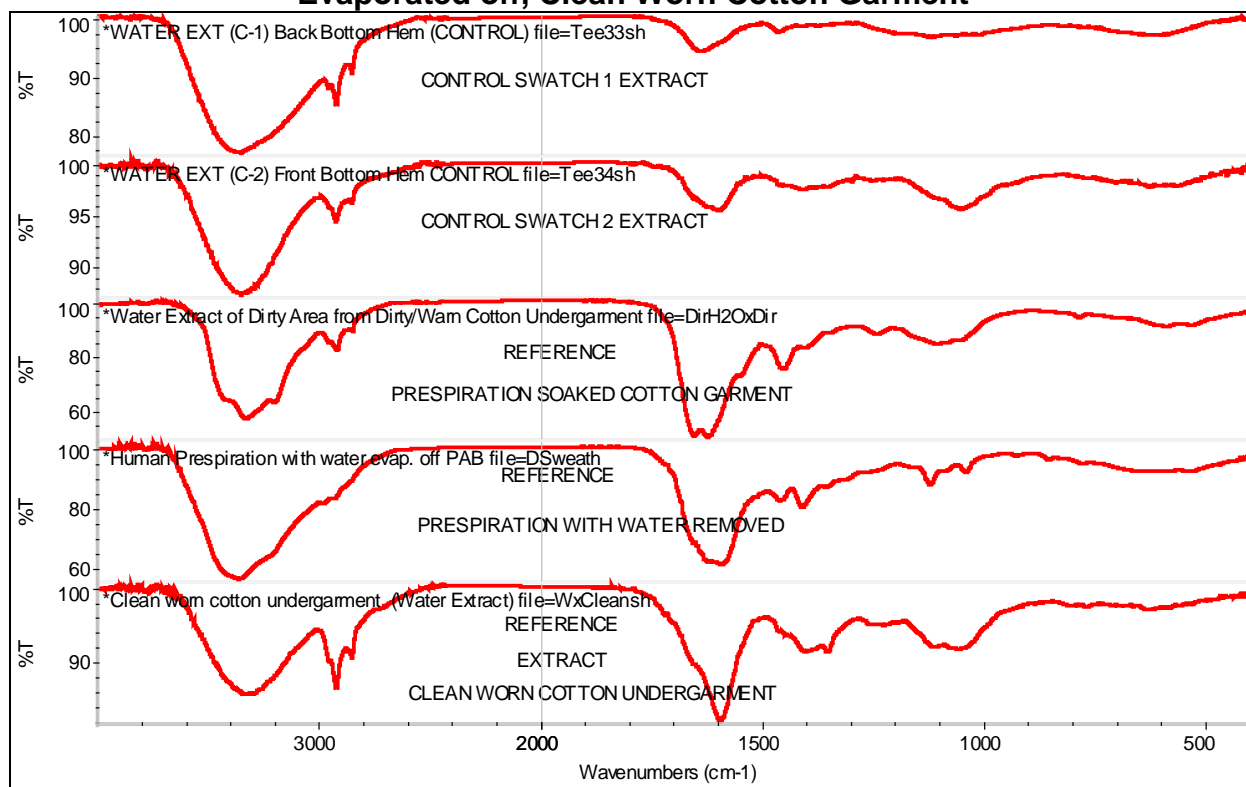
Infrared Analysis of Water Extracts

Selected swatches (1, 2, 3, 4, 5, 9) were also extracted with water. Significantly more material was extractable than with methylene chloride. Infrared analysis detects primarily urea derivatives that are typical components of perspiration. The spectra of the swatches follow as well as reference spectra of a water extract of a perspiration soaked cotton garment and perspiration with moisture evaporated off for comparison.

Infrared Spectra of Water Extracts 1, 2, 3, 4, 5, 9



Infrared Reference Spectra of a Water Extracts from Both Control Swatches and References of a Perspiration Soaked Cotton Garment, Perspiration with Moisture Evaporated off, Clean Worn Cotton Garment



Water Extract Identifications

Sampling	Identification
Clean Worn Cotton Garment	Detergent/soap components such as carboxylic acid salt and sulfate.
Control 1	Perspiration components
Control 2	Detergent/soap components such as carboxylic acid salt and sulfate
1	Perspiration components.
2	Perspiration components.
3	Perspiration components.
4	Perspiration components.
5	Perspiration components.
9	Perspiration components.

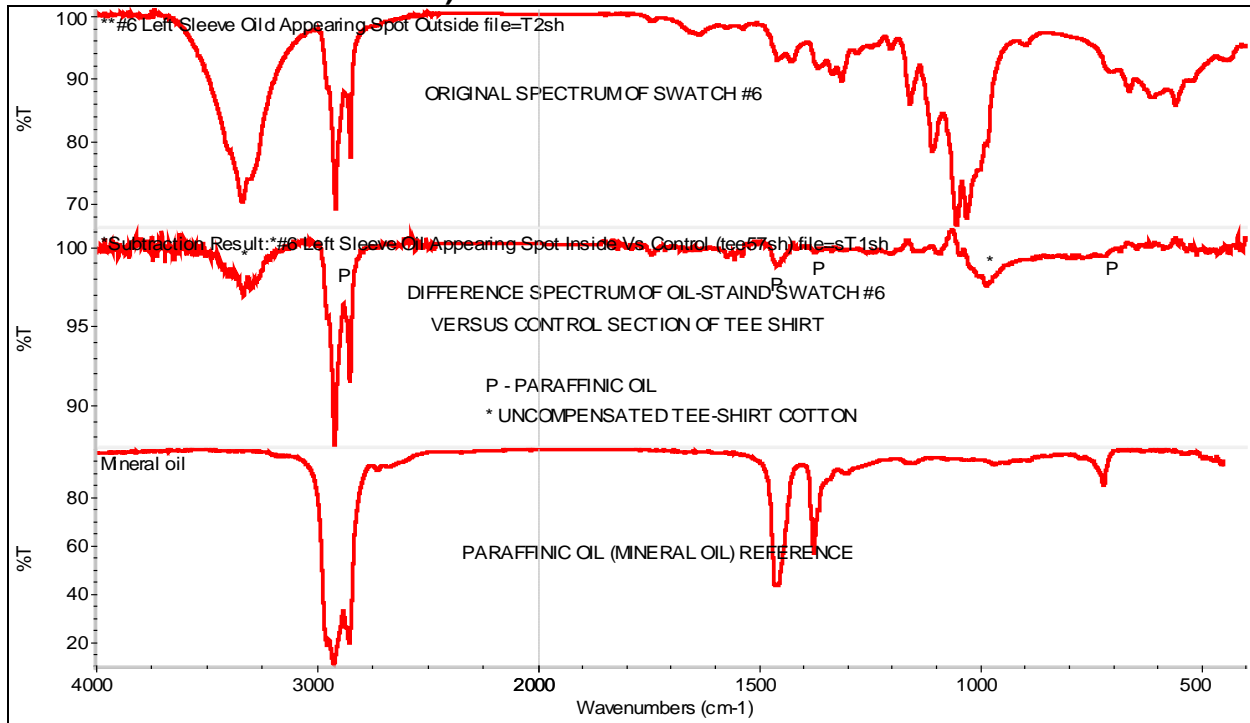
Additional infrared spectra were acquired from selected water extracted swatches to determine whether any insoluble materials remained. None were detected.

Swatches #6 and #7 Analysis

The analysis of swatches 6 and 7 are discussed separately from the rest of the samplings because of the visual appearance of outside contamination and their identifications.

The swatch 6 oil-appearing stain is in trace amounts. Infrared analysis identifies a paraffinic oil, i.e. possibly from lubricant or mineral oil contamination. A difference infrared spectrum was generated between Swatch 6 and Control Sample C-1 to enhance the oil bands. Following are the original spectrum, the difference spectrum, along with a reference spectrum of a paraffinic oil.

Infrared Spectra of: Swatch #6 (Original), Difference spectrum (Original Versus Control 1) and Reference of a Paraffinic Oil

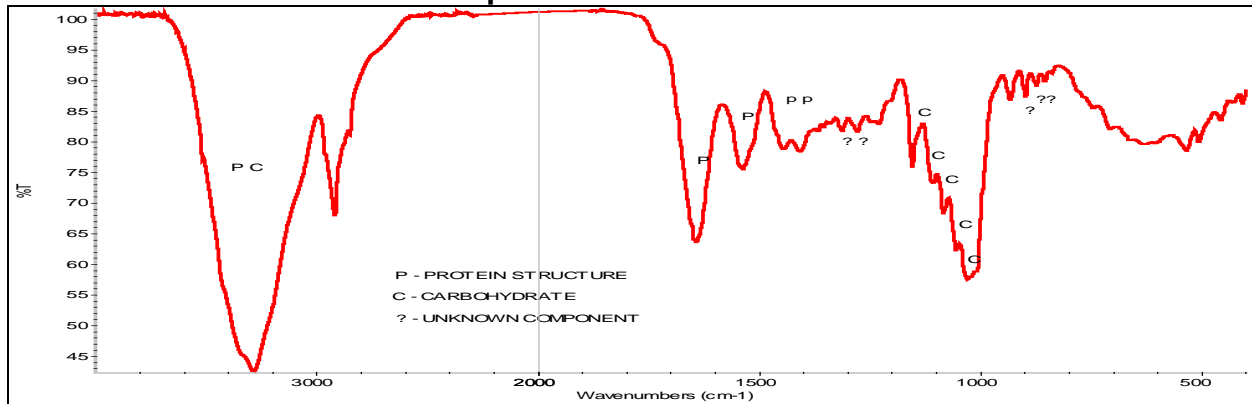


The particle matter on swatch #7 was more of a challenge to identify. This was the only solid particulate observed on the tee shirt. Following is a microscope photograph.

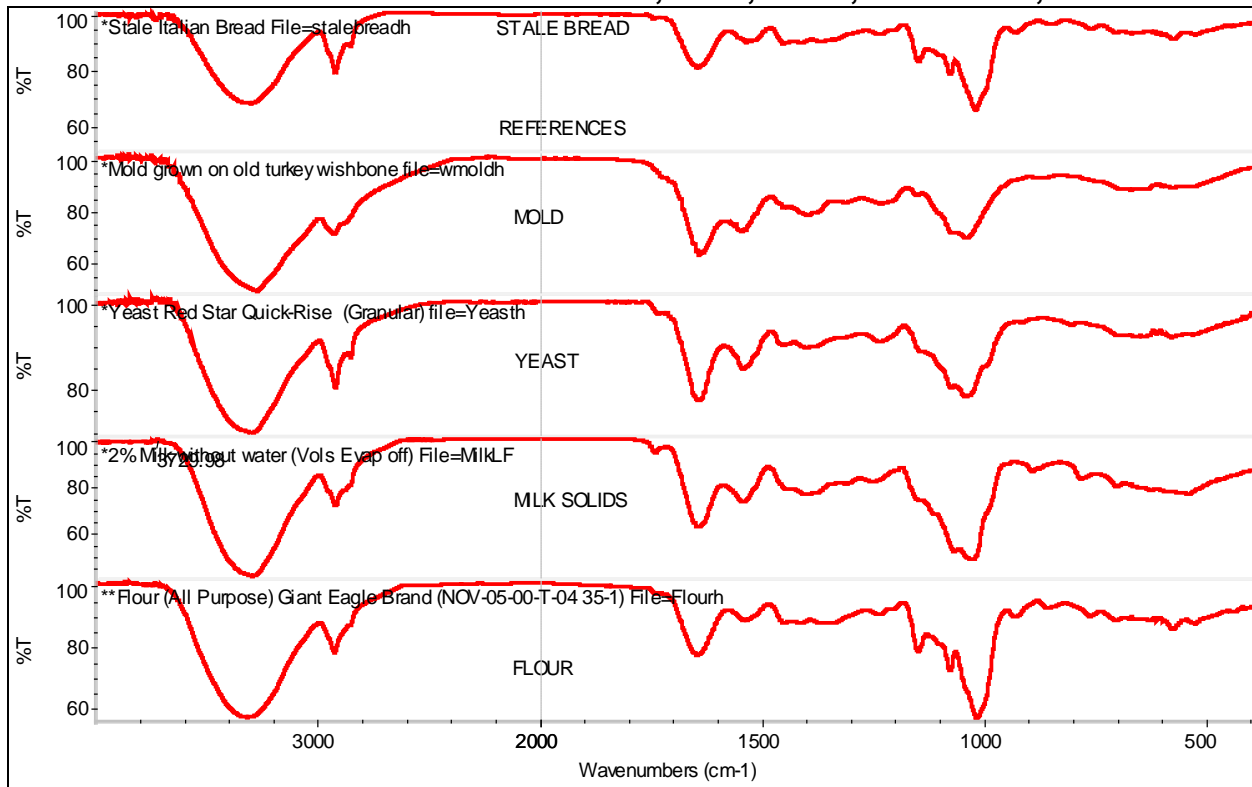


Infrared analysis of the material shows it is a composite of components which consist mostly of a protein (usually animal origin) and carbohydrate (plant origin) plus small amounts of other unidentified materials. These latter materials could not be identified because some pertinent bands are masked by the protein and carbohydrate. The protein structure could represent anything from meat, human skin to gelatin. The carbohydrate could be from flour, bread, or even paper. Some glycerol ester is also suggested. It is speculated this material may be from a food crumb. Following is the spectrum.

Infrared Spectrum of Swatch #7 Debris



Infrared References of Stale Bread, Mold, Yeast, Milk Solids, Flour



File: UT089

Other Testing

A swatch of material from an unfaded area of the tee shirt failed to discolor when exposed to gaseous ammonia, ultraviolet light, infrared light, intense white light, microwave radiation and elevated heat. Swatch #10, which has a discolored area, was exposed to iodine vapor to determine whether there was any extraneous substance which would stain. No iodine stain resulted.

Phyllis A. Budinger

APPENDIX

Difference Spectra from Swatches 1, 2, 3, 4, 5, 8, 9, 10

The difference spectra were generated by subtracting control spectrum 1 from the 'in-situ' swatch spectra. Note: most absorption between 1200-1000 cm^{-1} can be attributed to uncompensated cotton absorption.

