

Frontier Analysis, Ltd

TECHNICAL SERVICE RESPONSE NO.: UT056

Subject: Identification of a Substance found in Hair, Pillow and Sheet after a Bizarre Spraying Event (July 24, 2008 Wilcox, Arizona)

Date: August 28, 2008

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BLT Research

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Background/Objective:

A woman woke up on July 34, 2008 around 1-2 a.m. in Wilcox, Arizona. She heard a loud spraying noise which lasted about 30 seconds and felt mist on her face. She was alone and turned on the night. The noise stopped. Her hair, pillowcase and sheet were wet. The hair stuck together similar to the effect that a mousse/gel would impart. Following is a narrative written by Nancy Talbott along with a photograph of the back of house showing the three bedroom windows from the outside. The objective is identify the substance imparting the stickiness to the hair and stains on the pillowcase and sheet.



Witness' drawing showing how she was lying on bed (face-down) & direction of wetness coming at her. All 3 windows were closed, the blinds were up on the 3rd window. When she raised up upon hearing a deep-pitched, very loud "spraying" noise, she realized a wet mist was coming at her more or less horizontally.

It was raining outside - she reached over to bedside table & turned on light & spraying stopped (it had lasted maybe 30 seconds). She checked ceiling, walls for leaks, but could find none. Seeing nothing out of the ordinary she went back to sleep.

Wilex, AZ.
3 bedroom windows
from outside



Conclusions:

- The analysis identifies the foreign substance causing the hair to clump, and stains on the pillowcase and sheet, as a carbohydrate which is probably starch. It is speculated that an aqueous solution of starch (spray starch) was sprayed on the witness.
- Shampoo residue (major component sulfonate detergent) and mousse/gel components (major components are usually synthetic polymers e.g. acrylates are a common type) are not detected on the hair.

Procedure:

The following samples were submitted and received on August 7, 2008.

- Hair clipping with material on the surface (clumpy hair). It's consistency is typical of that imparted by application of a mousse/gel.
- Hair clipping from unaffected area for reference.
- Shampoo used by the woman for reference.
- Pillowcase with stain. This was submitted on the pillow. The pillow was not analyzed because there was no apparent stain.
- Sheet with stain

Infrared spectra were obtained from all the 'as received' samples. Specifically scanned were: the clumpy' hair; the unaffected hair; the shampoo after water removal; the stain on the pillowcase; unaffected pillowcase area, the stain on the sheet; unaffected sheet area. The data were collected on Thermo Electron's Avatar 360 spectrometer using the Smart Harrick diamond SplitPea[®] sampling accessory.

The clumpy hair, the pillowcase stained area and unstained areas, and the sheet stained area and unstained areas were then extracted with distilled water. The water was removed, and infrared spectra were acquired from the five extracts.

A commercial spray starch (Niagara) was sprayed on a piece of cloth and allowed to dry. After a few days it was extracted with water. An infrared spectrum was obtained of the extract for reference.

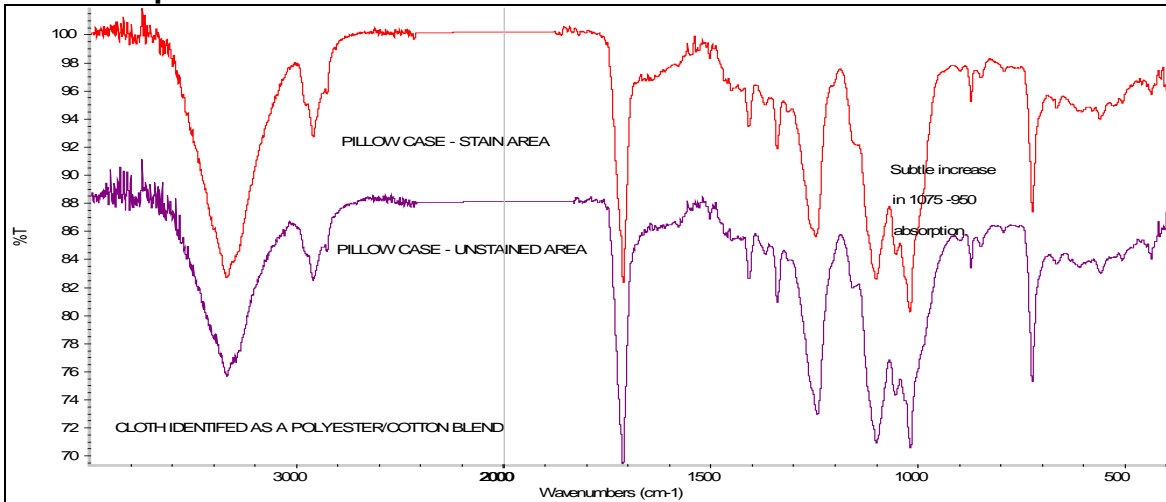
Results:

The results of the individual tests done on the samples follow. These results are summarized in the conclusions section on the page three of this report.

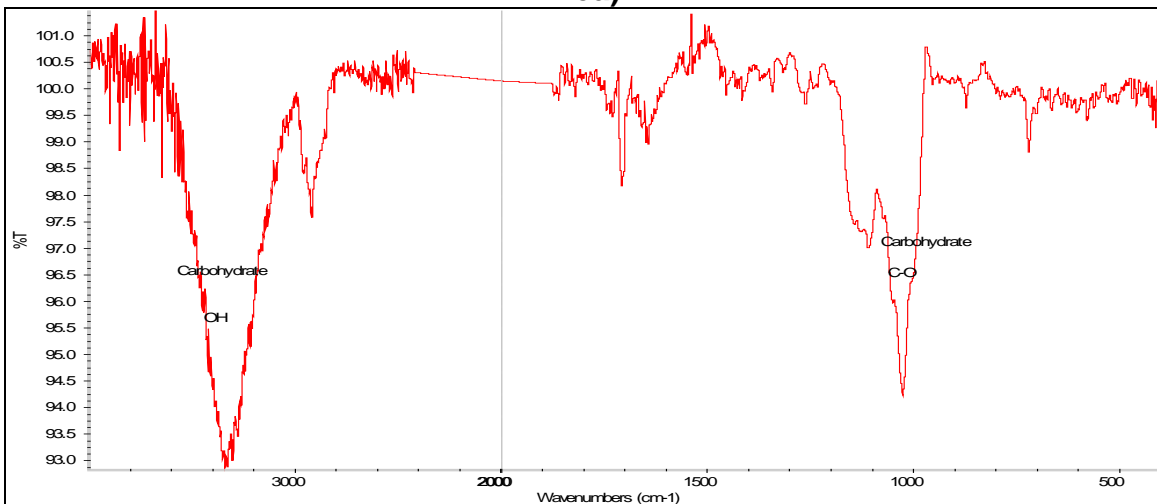
Analysis of the Pillowcase Stain

An infrared spectrum of the 'as received' pillowcase stain area shows primarily absorption bands from the cloth. The spectrum identifies the cloth as a cotton/polyester blend. The cloth absorption happens to mask similar absorption from the component causing the stain (identified in the water extract discussed below). However, when compared to a spectrum from an area free of the stain, subtle additional absorption is detected between 1075-950 cm^{-1} . A difference spectrum generated between the two spectra nulls the cloth interference and enhances the bands due to the stain. This spectrum shows bands, which indicate a carbohydrate type material. Displayed are the spectra of the pillowcase stain area and an unstained area, followed by the difference spectrum.

Infrared Spectra of 'As Received' Pillowcase Stain area and Unstained Area

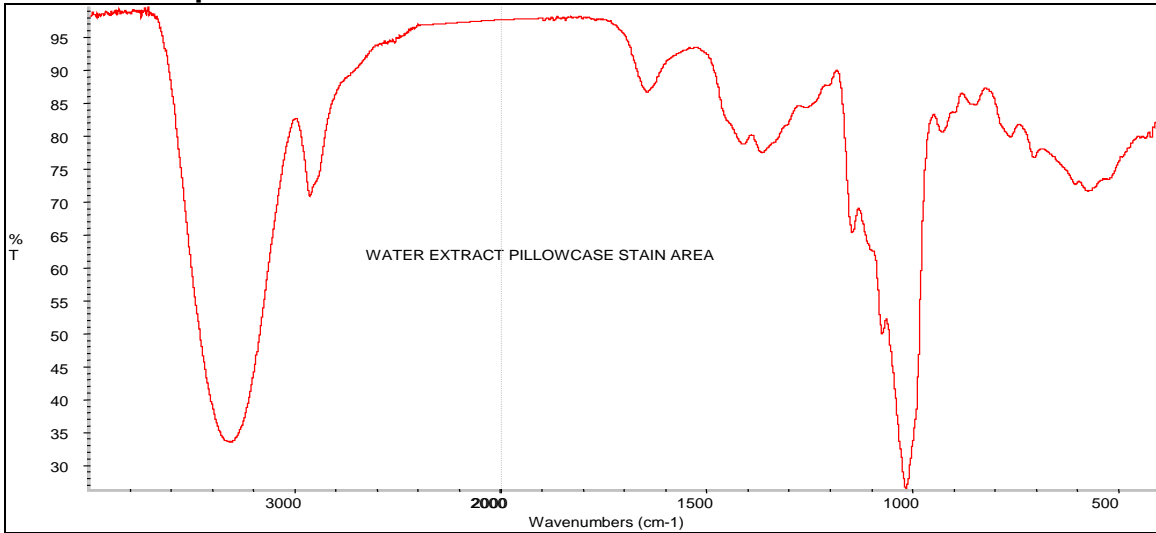


Infrared Difference Spectrum (Pillowcase Stain Area Versus Unstained Area)

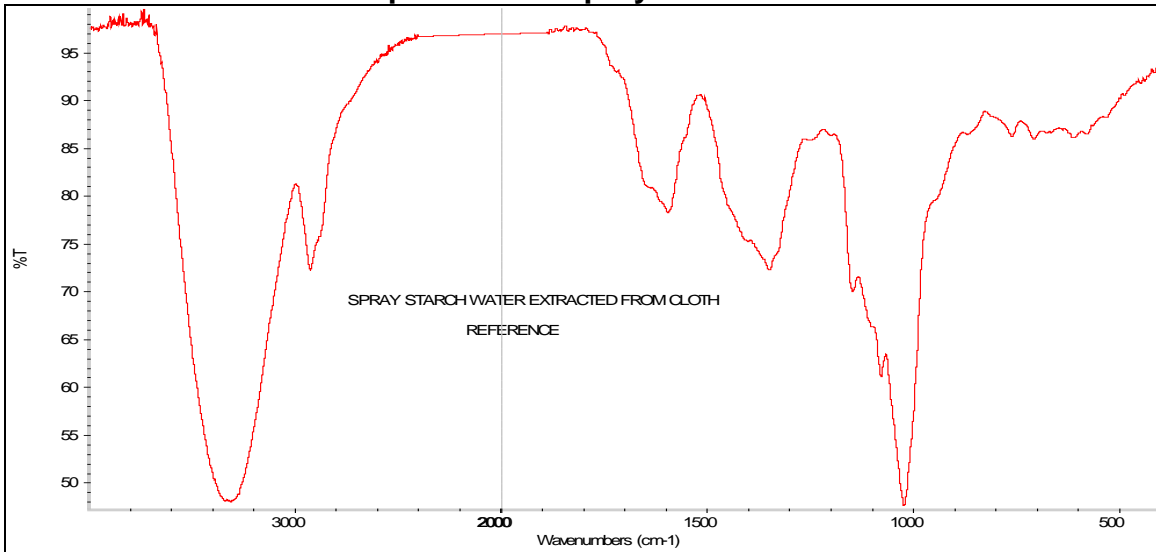


The infrared spectrum of the water extract from the pillowcase stain confirms the presence of a carbohydrate structure. Specifically, it is very similar to an infrared reference of a water extract from cloth that was pretreated with spray starch. A water extract of the unstained area, which was in very small amounts does not show this substance. Respiration products are the primary products and inorganic sulfate. The extract spectra from the stained area, followed by the spray starch reference, and by extract from the unstained area are displayed below.

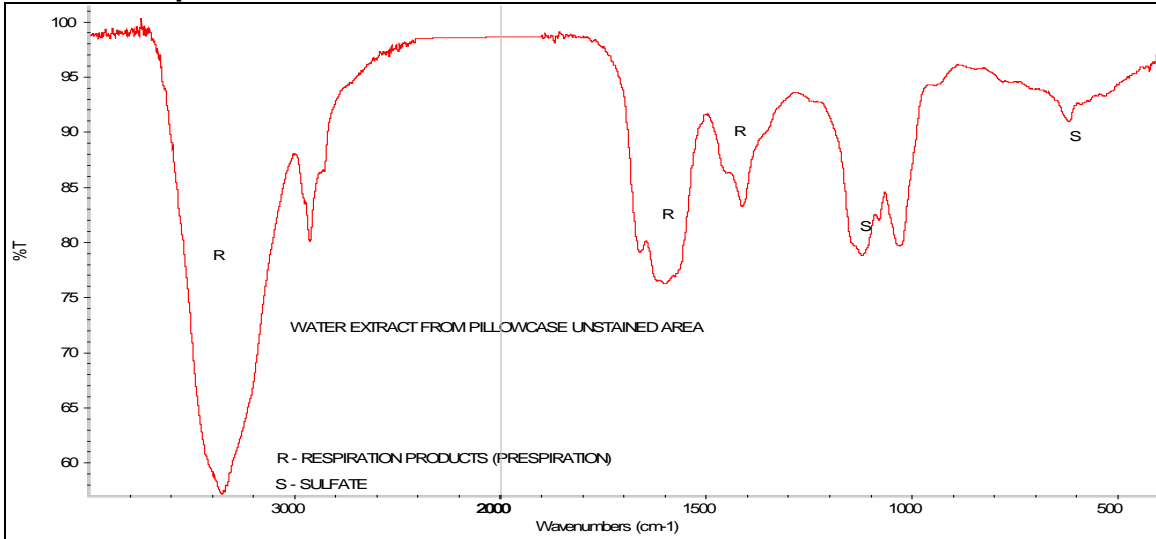
Infrared Spectrum of a Water Extract from the Pillowcase Stained Area



Infrared Reference Spectrum of Spray Starch Extracted from Cloth



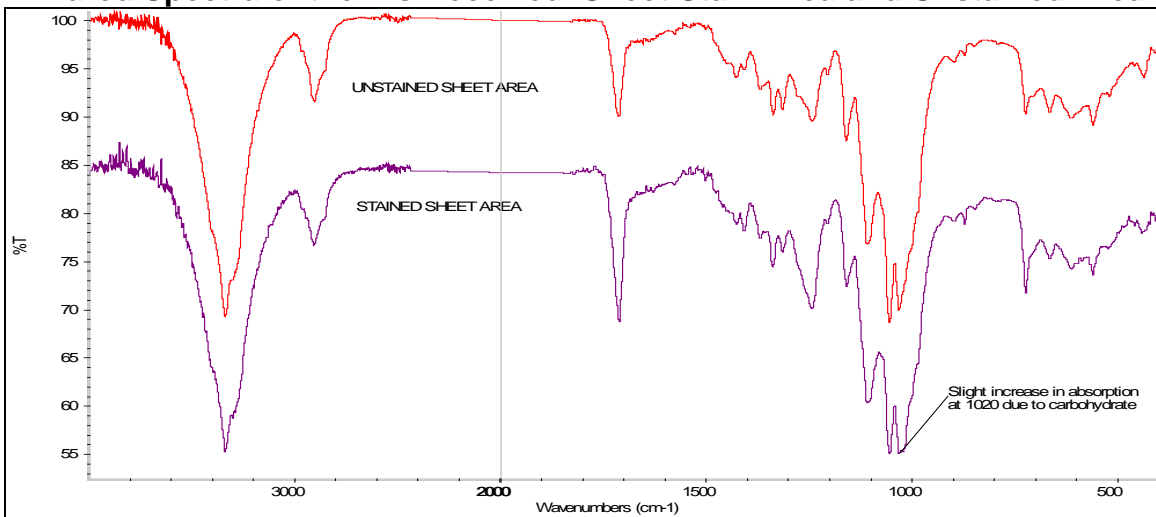
Infrared Spectrum of a Water Extract from the Pillowcase Unstained Area



Analysis of the Sheet Stain

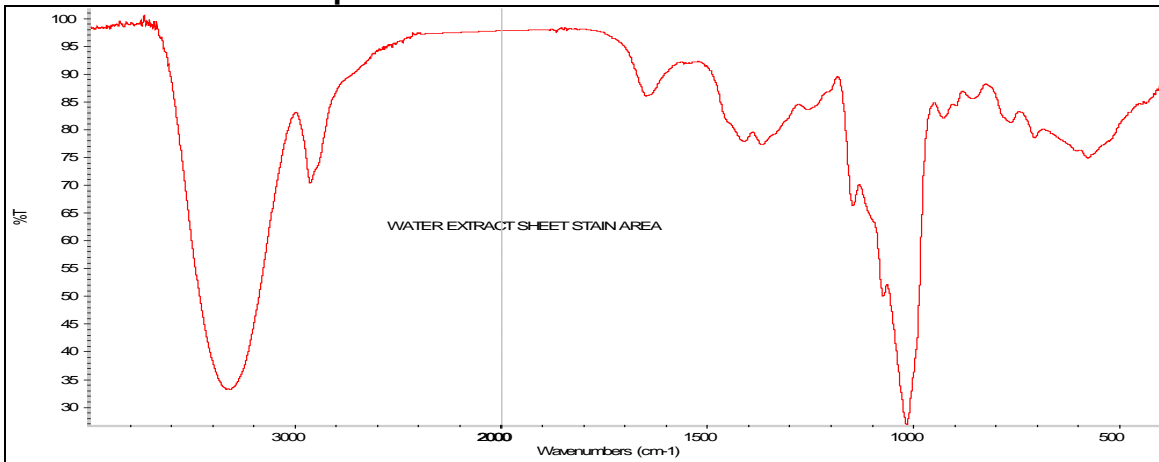
The infrared spectrum of the 'as received' stained sheet area expectedly shows absorption from the cloth which is a polyester/cotton blend like the pillowcase. (There appears to be slightly less polyester than the pillowcase.) This absorption also masks the absorption of the substance causing the stain. A difference spectrum was not obtained (between the spectra of the stain area versus the unstained area) due to the results observed for the pillowcase, i.e. identification of a carbohydrate material. And, there is a subtle increase in absorption in the 1020 cm^{-1} region in the spectrum of the stain area, which is due to the carbohydrate, as shown below in the water extract. Spectra of the stain region and unstained region follow showing the subtle difference.

Infrared Spectra of the 'As Received' Sheet Stain Area and Unstained Area

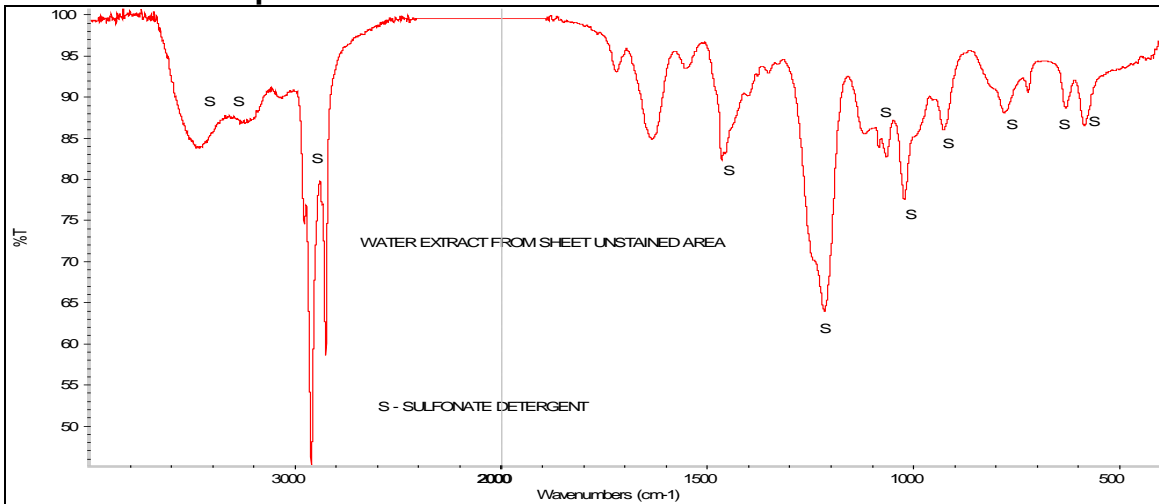


A water extraction isolated the material causing the stain. An infrared spectrum of the extract matches that of the pillowcase stain extract, identifying it as a carbohydrate. Specifically, the spectrum compares to a reference of starch, which was water extracted from a piece of cloth. An extract from the unstained area is present in very small amounts and is primarily detergent residue (sulfonates). The spectra of the water extracts from the stained and unstained regions of the sheet follow. The reference spectrum of starch extracted from cloth can be found on page five for comparison to the stained extract.

Infrared Spectrum of Water Extract from Sheet Stain



Infrared Spectrum of Water Extract from Unstained Sheet Area

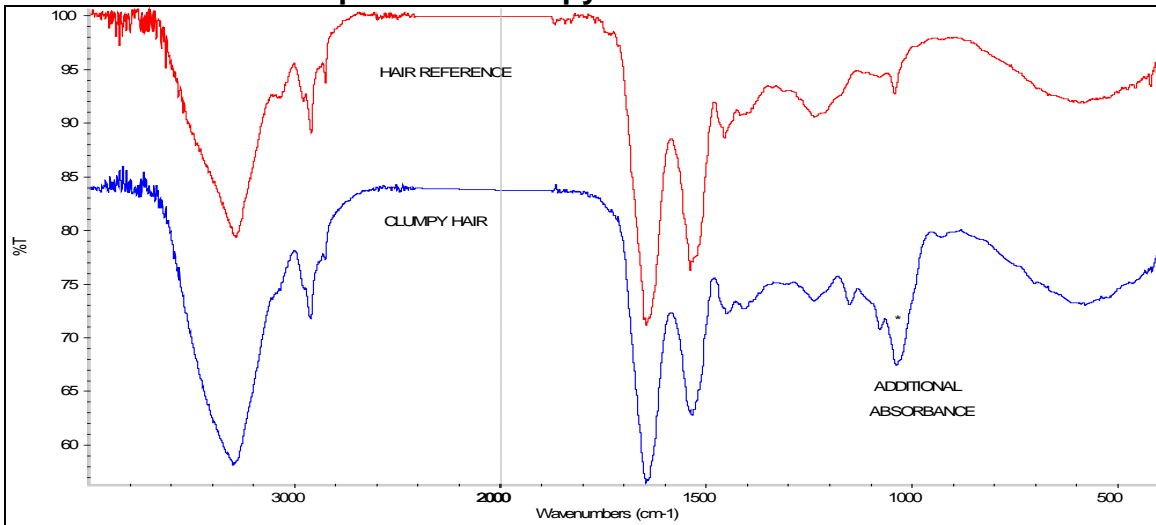


Analysis of the Clumpy Hair

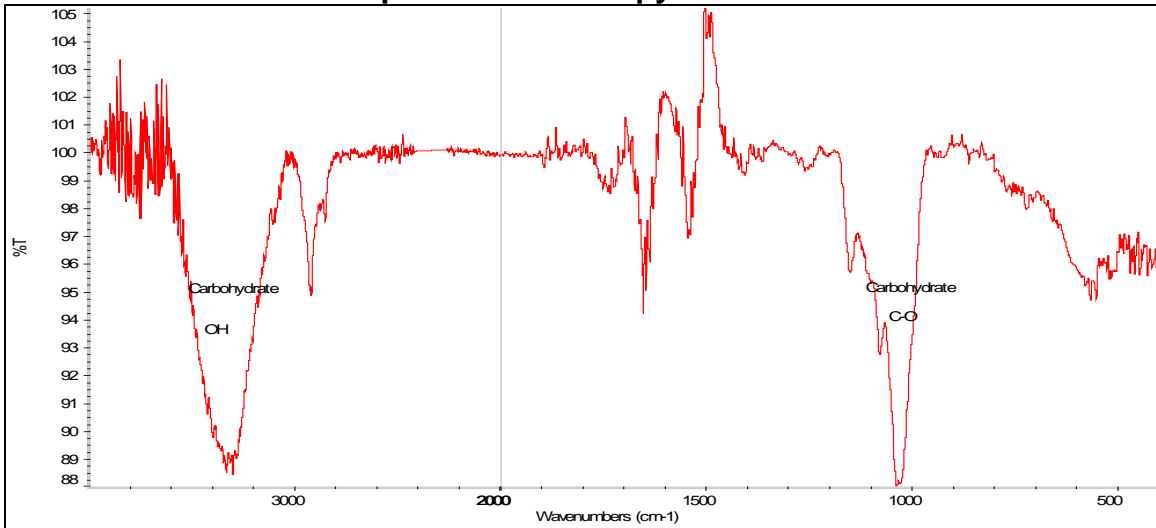
Infrared spectra taken from the clumpy hair and the unaffected hair show there are differences. Clearly, another substance is on the hair. It is identified as the same carbohydrate observed on the pillowcase and sheet stains. A difference

spectrum was generated between the two spectra. This effectively nulled the interfering bands from the hair and enhanced the additional bands due to the carbohydrate, further confirming the structure. Displayed below are the spectra of the two hair samples, followed by the difference spectrum.

Infrared Spectra of Clumpy Hair and Hair Reference

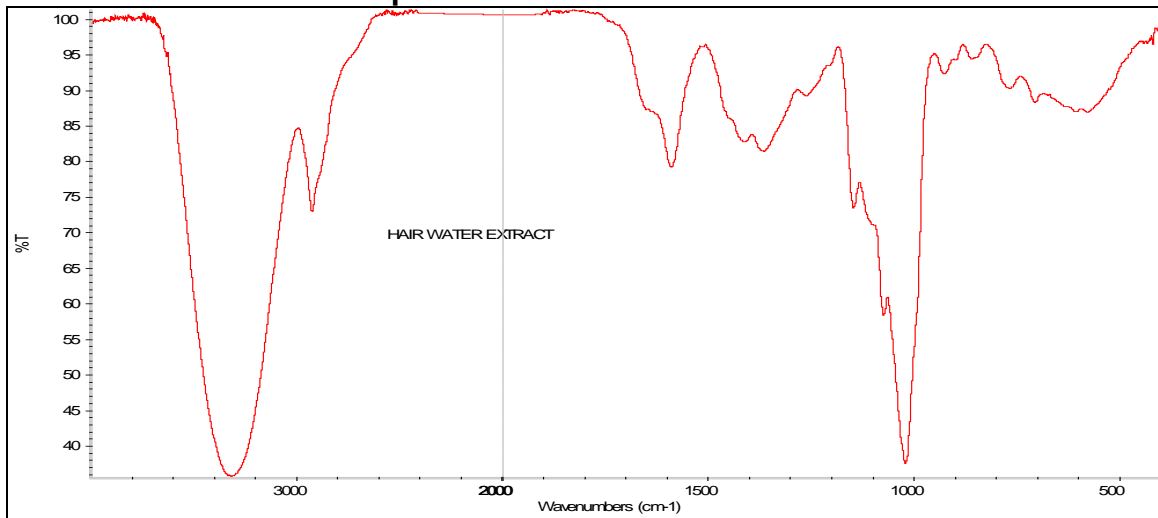


Infrared Difference Spectrum of Clumpy Hair Versus Hair Reference



The clumpy hair was extracted with water to isolate the material causing the stiffness. The infrared spectrum of the extract expectedly shows carbohydrate, which appears to be the same starch-type observed in the extracts of the pillowcase and the sheet. Following is the spectrum. Compare this to a reference of spray starch, which was water-extracted from a piece of cloth on page five.

Infrared Spectrum of Water Extract from Hair



FILE: UT056

Phyllis A. Budinger