ABSTRACT
The majority of forensic hair comparison requests involve human hair. If deemed necessary, animal hair comparisons could also be submitted and analyzed. This case study explores the microscopic characteristics utilized in an alpaca hair comparison. The unknown hairs in this case were microscopically compared to known alpaca hair standards from both Huacaya and Suri alpacas. Interestingly, the medullas of the observed alpaca hair resemble human hair medullas with their amorphous appearance.

Keywords: Hair Comparisons, Alpaca, Microscopic Characteristics, Medulla

INTRODUCTION
For several months, a woman’s farm animals had been found deceased. One morning she found her only alpaca lifeless as its neck had been broken. Her first suspicion was her estranged husband, against whom she had filed a restraining order. She contacted the local sheriff’s office to report the alleged crime.

The husband’s work boots were confiscated by officers. They wanted to determine if alpaca hair was present on the boots to place the husband at the farm, which the restraining order prohibited. In addition, known hair samples were collected from the deceased alpaca.

MATERIALS AND METHODS
Field research was conducted in preparation for this case. A trip to the East Fork Alpaca Farm was warranted to collect known samples from the two types of alpacas: Huacaya and Suri. Characteristics of the Huacaya alpaca fleece include a crimpy appearance as it grows perpendicularly from the alpaca’s body, giving the hair a “poofy” or fluffed appearance [1]. Suri alpaca fleece, on the other hand, has characteristically long, lustrous locks or ringlets, which move freely as the animal walks [2]. Alpaca hair was collected from multiple
locations on the two types of animals including the back, belly, leg, neck, and wool cap, to account for any microscopic variation.

Alpaca hair typically consists of two different types of hair: guard hairs and fleece hairs. Guard hairs are stiff, straight, and highly medullated [3]. These medullated guard hairs are not desirable in finished products [4]. Fleece hairs are fine and light with little to no medullation, making them the desirable portion of the alpaca’s coat.

Known Huacaya and Suri hair standards were mounted on microscope slides and examined under a Leica DM2500P comparison microscope. The hair from the deceased alpaca, as well as the hair collected from the suspect’s boots, were mounted on microscope slides and compared to the known alpaca hair standards.

RESULTS AND DISCUSSION

Microscopic examination of thirty-one (31) hairs from the soles of the work boots were determined to be animal hairs. However, the medullas of these animal hairs were different than the medullas observed in the known alpaca hair standards. In human hairs, the medulla is generally amorphous in appearance, whereas in animal hairs, its structure is frequently regular and well defined [5]. Thick, vacuolated medullas were noted in the animal hairs from the work boots, while the medullas of the known alpaca hair standards appeared more human-like with amorphous medullas. These amorphous medullas were observed in both the Huacaya and Suri alpaca hair standards and in both the guard and fleece hairs. The amorphous medullas also appeared in all locations of the alpaca’s body. As expected, the hair from the deceased alpaca also exhibited amorphous medullas.

![Figure 1: Unknown hair from boot, exhibiting a uniserial–ladder medulla.](image)
Figure 2: Unknown hair from boot, exhibiting a thick, vacuolated medulla.

Figure 3: Known hair from a Huacaya alpaca, exhibiting an amorphous medulla.

Figure 4: Known hair from a Suri alpaca, exhibiting an amorphous medulla.

Figure 5: Known hair from the deceased alpaca, exhibiting an amorphous medulla.
CONCLUSIONS

Due to the differences observed in the medullation of the animal hair from the boots, a correspondence to the deceased alpaca could not be made.

Despite the similarities in the medullation of alpaca hairs and human hairs, differences are still observable. Diameter and scale casts could be useful if assistance in discrimination if necessary.

Figure 6: Human hair scale cast.

Figure 7: Known hair from Huacaya alpaca scale cast.
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