Researchers offer taphonomic degradation processes for mammalian hair

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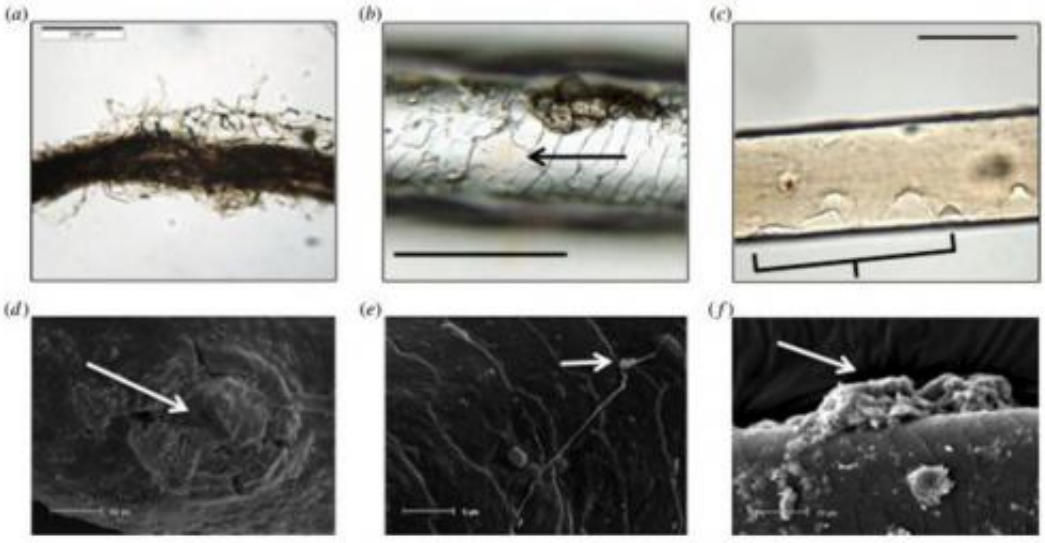

Fungal invasion of hairs. (a) Woolly Mammoth (Jarkov) hair engulfed by hyphae, (b,c) partial removal of cuticle (arrow) and dissolution of cuticle (bracketed) on Q8 woolly mammoth (Jarkov) hair, (d) SEM image of a penetrating organ (arrow) embedded in a woolly rhino hair. (e) SEM image of a lateral fungal hypha with an eroding frond (arrow), (f) mycelial mass (arrow) on shaft of woolly mammoth (M10) hair. Scale bars: a ¼ 200 mm, b,c ¼ 100 mm, d ¼ 50 mm, e ¼ 5 mm, f ¼ 20 mm. Credit: *Proceedings of the Royal Society B*, Published 22 October 2014 doi: 10.1098/rspb.2014.1755

(Phys.org) —A team made up of researchers from the U.S. and Australia has put together what they describe as a complete outline of the taphonomic (post-mortem) degradation processes for mammalian hair.

In their paper published in *Proceedings of the Royal Society B: Biological Sciences*, the group outlines the current state of post-mortem analysis of mammalian hair, including human and also offers some opinions on possible misinterpretations at both crime and archeology sites.

The authors note that while the taphonomic degradation process for teeth and bones has been well documented, the same cannot be said for mammalian hair. Their paper serves to fill that void.

The research team notes that on its own, mammalian hair doesn't degrade much, allowing samples to survive for thousands of years. But most hair is not left to its own devices, it comes in contact with soil (quite often due to burial) that harbors fungi that do break down hair—they've provided photos of individual hairs with holes along their length to demonstrate what happens. That fungi breaks down hair is not new information—archeologists and law enforcement have both known about it for quite some time and have used the process to further their goal of trying to understand what happened at a particular site. But, the researchers contend, not all information gleaned from such sites is interpreted correctly. They note for example that if crime scene investigators find a hair that has experienced degradation due to fungi, it doesn't necessarily mean that the victim died, was buried (putting them in contact with soil fungi) and then dug up again, as has been assumed in many such cases. Instead they note, soil fungi can degrade hair on living mammals, including people—if a child plays in the dirt for example. They suggest the only true evidence of death of a victim using a hair sample is what is known as post-mortem banding, where bacteria leave a dark band at the root of the hair when someone dies.

The team also notes that examination of hair at crime scenes, particularly from victims that have been buried or left on the ground can offer less obvious clues, such as how long the hair has been exposed to the fungi or whether it existed in a warm humid climate, versus one that was cool or

dry.

The researchers also note that many examples of mammalian samples from archeological sites that suggest the original owner had red hair, such as those for many woolly mammoths, are inaccurate. Tests have shown that most such instances are due to contamination of the hair after death, from bacterial biofilms or other processes—woolly mammoth hair had no pigment, after all.

More information: Interpreting biological degradative processes acting on mammalian hair in the living and the dead: which ones are taphonomic? *Proceedings of the Royal Society B*, Published 22 October 2014 DOI: 10.1098/rspb.2014.1755

Abstract
Although the taphonomic (post-mortem) degradation processes relevant to teeth and bones have been well described, those taking place with regards to mammalian hairs have not been characterized to the same extent. This present article describes, in detail, microscopic changes resulting from the actions of biological agents that digest and degrade hairs. The most noteworthy and prevalent agents responsible for the destruction of hair structure are fungi, which use a range of strategies to invade and digest hairs. One of the most important finds to emerge from this study is that taphonomic structures and processes can easily be interpreted by the unwary as 'real', or as class characteristics for a particular animal taxon. Moreover, under certain conditions, 'taphonomic' processes normally associated with the dead are also present on the hairs of the living. This work will improve the reliability of hair examinations in forensic, archaeological and palaeontological applications—in addition, the finding has relevance in the protection of mammalian collections susceptible to infestation. This article also addresses the popular myth that ancient peoples were often red-haired and discusses phenomena responsible for this observation. Insights

gained from detailed characterization of taphonomic processes in 95 hairs from a variety of species demonstrate the range and breadth of degradative effects on hair structure and colour. Lastly, the study demonstrates that hairs often tell a story and that there is value of extracting as much morphological data as possible from hairs, prior to destructive sampling for biomolecules.