A131 Avian Olfaction in Forensic Context: A Preliminary Analysis of Naturally Occurring Volatile Organic Compounds Associated With Feathers From Procellariiforms

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After attending this presentation, attendees will have a better understanding of avian olfaction as another form of biological detection within a forensic context.

This presentation will impact the forensic science community by providing a foundation of work to understand avian olfaction.

Biological detection, particularly using canines, is in high demand because of its proven detection capabilities for a variety of forensic specimens including drugs and explosives. This work lays the foundation for a potential alternative means of biological detection through avian olfaction. Little is known about the behavioral and physiological sensitivity of birds to a wide range of odorants, and specifically, whether olfactory behaviors can be tuned and directed for applied uses as is the case with canines. A preliminary foundation for this work entails an instrumental evaluation of naturally occurring volatile organic compounds (VOCs) of feather samples to identify naturally occurring chemicals to further the understanding of the types of compounds that are present in their environment prior to explore their potential use in the detection of forensic odorants.

The instrumental evaluation of these biological samples collected from the field is conducted using solid-phase microextraction in conjunction with gas chromatography/mass spectrometry (SPME-GC/MS) utilizing Gould's petrel feather samples. These birds belong to the species of seabird in the Procellariidae family. They have the largest olfactory bulbs among all birds and thus represent an extreme class with a potentially high olfactory capability. They rely on olfactory cues both for foraging and navigation, and are thought to use individual-specific olfactory cues for rapidly and accurately relocating their home burrow when returning to the colony at night during the breeding season. The importance of olfaction in birds remains a matter of controversy. However, experimental behavioural studies regarding the use of olfaction in birds have found evidence of olfactory capability in birds of a variety of species of procellariformes that use the olfactory sense in several different functional contexts including orientation, reproduction, and even for some social aspects such as individual recognition and mate choice. Virtually nothing is known about the behavioral and physiological sensitivity of petrels to either synthetic or naturally occurring odorants, or what types or combinations of volatile organic compounds they naturally encounter. As a first step, the authors are conducting a preliminary analysis of volatile organic compounds found in 84 feather samples collected from Australia. The identification of over 100 compounds has been achieved using heated headspace extraction methodologies with sensitive instrumental detection. A comparison of the levels of the most common occurring volatile compounds (such as pristane) is being studied to understand olfaction in natural processes such as kin recognition. Thus far, significant levels of common forensic odorants such as those previously identified for drugs and explosives have not been observed. The importance of understanding avian olfaction in a natural habitat is a crucial first step in the exploration which may lead to potential future use of these animals as another form of biological detection for forensic purposes like national security that has been affected due to the increased threats of violence. Often times these threats are carefully hidden from human detection. To address this need, this investigation is a laboratory effort to develop science-based solutions that can be effectively deployed and used in a variety of real-world settings such as the detection of explosives.

Olfaction, Forensic Context, Feathers

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