# Your DNA goes places you have never been: What does this mean for forensic scientists interpreting DNA found at a crime scene?

During a criminal investigation, items are commonly examined for DNA to try to identify a potential suspect (Fig. 1). But is this DNA really from someone involved in the crime or has it got there through innocent means? In recent years, the sensitivity of DNA profiling technology used by forensic casework laboratories has increased dramatically. This means that we can now detect very small traces of DNA. Such DNA is commonly referred to as ‘touch DNA’, but since touching is not the only way to leave DNA, the term ‘trace DNA’ is more appropriate.

Fig. 1. A crime scene investigator retrieving a jumper from the crime scene; but can forensic scientists reliably interpret the DNA recovered from it?

Although TV shows would have us believe that the DNA always comes from the culprit, in reality, there are various ways DNA can be left on an item (Fig. 2a), many of which may have nothing to do with the crime in question. DNA can be left on surfaces directly through physical contact, such as handling a knife or wearing a jumper, or through activities, such as speaking and coughing. DNA can also be transferred indirectly (Fig. 2b). Scientific research has shown that DNA from a person can end up on items that they have never touched, and in some situations, in a room they have never been to. Whilst it is known that such transfers can occur, scientific research is only just starting to understand the effect indirect transfer has on the interpretation of DNA from a crime

scene.

It is our view that, under many casework situations, there is currently insufficient published research to support the formation of an opinion on how DNA came to be on a surface of interest. Let us take so-called ‘wearer DNA’ as an example. In casework, items of clothing are routinely examined with the view of recovering DNA from the wearer of those clothes (Fig. 1). However, with only a handful of research papers published on this subject, it is unclear whether the DNA recovered comes from the regular wearer of the clothing, the most recent wearer (i.e. the wearer at the time the crime) or indirect transfer events. This issue is further complicated by the finding of DNA mixtures, that is, DNA from more than one person. Forensic scientists are therefore left with the question: ‘Which DNA profile was deposited at the time of the crime and how did it get there?’

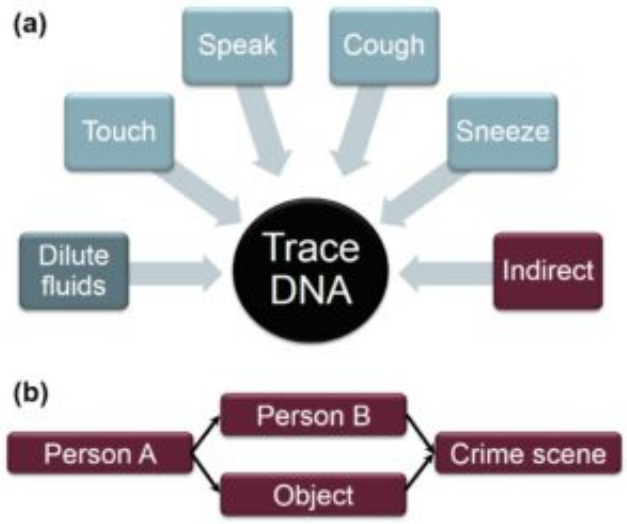


Fig. 2. Trace DNA can be transferred to a surface at a crime scene through a variety of ways. (a) Transfer includes the deposit of dilute body fluids (e.g. blood that is so dilute we cannot detect it as blood), direct contact, activities in the vicinity of the surface, and indirect transfer. (b) Indirect transfer occurs when DNA from a person is transferred to a surface via an intermediate person or object, or indeed people or objects.

When a forensic scientist addresses this question for the court, it is imperative that their testimony is derived from empirical data and not solely a personal opinion. Such empirical data should ideally be published so that the data are subjected to the scientific peer review process. This process is designed to ensure that only rigorously conducted research is made available to the scientific community. Publication therefore enables only good quality data to be relied upon by forensic scientists when they interpret evidence.

Despite the lack of published research, scientists working for providers of forensic science to the

police in the UK and Ireland argue that a reliable dataset is available for the interpretation of ‘wearer DNA’. Their claim comes from their reliance on those few published papers, unpublished data and their casework experience. There are serious issues with relying on unpublished data, as the data have not undergone peer-review, nor has the research been shared with the scientific community. This tends to deny scientists working for the defence a proper consideration of the scientific case against the defendant. Reliance on casework experience to support expert opinion is even more dangerous. A forensic scientist should not provide the reason for their opinion as ‘x years of casework experience’ without actually explaining how this experience can inform their interpretation of the evidence.

To attempt to reconstruct a crime, it is our opinion that experimental data are needed to distinguish between the different ways that DNA can be deposited. Our research at UCL’s Centre for the Forensic Sciences aims to provide that data, by looking at various scenarios that affect how DNA can be deposited on items commonly found in casework, to see whether the DNA recovered can give clues as to how it got there.

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## Publication

A response to a response to Meakin and Jamieson DNA transfer: Review and implications for casework.
Meakin GE, Jamieson A
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