Title:

The Canine DNA Recovery Project: Current Findings and Next Steps

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Introduction:

In the United Kingdom, livestock attacks are a 'non-recordable' offence, meaning that Rural Crime Police do not routinely record their frequency. Insurance claims suggest thousands of attacks occur each year [1] costing an estimated £2.4 million in 2023 alone [2]. Due to low numbers of Rural Crime Police and the perceived low priority of the crime, police often take 3-4 days to attend the scene, in which time the deceased livestock is decomposing, reducing the value of any forensic evidence. Livestock owners or vets in attendance also lack formal training for forensic evidence collection. This means that DNA evidence from the attacking dog is rarely collected from the attacked livestock. When canine DNA is collected, it is sent to a forensic laboratory together with a suspect canine reference sample for analysis.

Background:

The canine forensic DNA testing pipeline (Figure 1) in the United Kingdom is underdeveloped and poorly characterised, with little published data to support the use of the methods currently employed investigating livestock attacks [3].
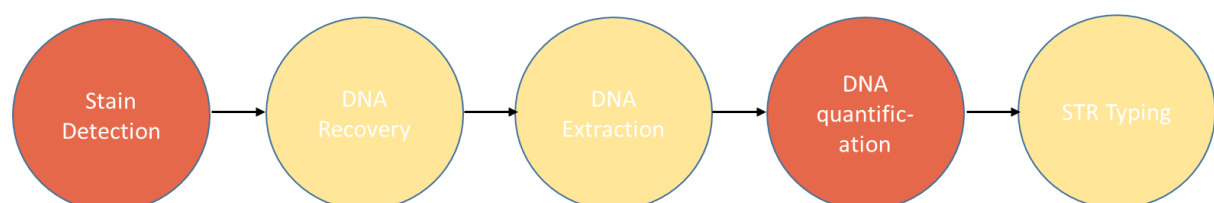

Figure 1: Canine DNA Pipeline showing areas for development. Red, method does not exist; yellow, method needs assessment and optimisation.

Recent developments:

We have started the Canine DNA Recovery Project (CDnaRP), the aim of which is to connect and work with relevant stakeholder groups to *develop, promote, and apply* best practice methods for the collection and analysis of canine DNA from attacked livestock and wildlife. It is a multi-phase, multi-stakeholder, UK based collaborative project led by Liverpool John Moores University.

To begin optimising the Canine DNA Pipeline, a robust qPCR method was first developed and validated for use. This triplex assay amplifies MC1R for autosomal detection, SRY for male detection, and a synthetic IPC to detect the presence of inhibitors (Figure 2). The assay was suitably sensitive and specific, and passed all common validation studies [4].
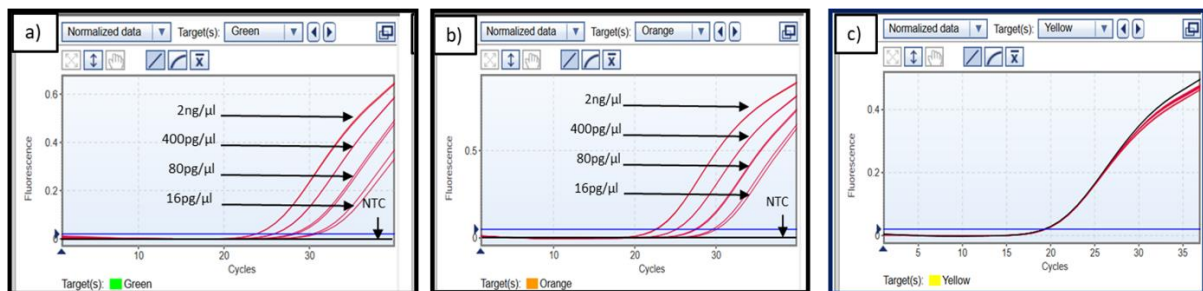

Figure 2: qPCR of three traces showing amplification of a) MC1R, b) SRY and c) IPC.

The qPCR assay was used to compare different DNA recovery methods from both laboratory prepared samples and real attacks. The methods were; a) swabbing wool, b) mini-taping wool, c) cutting wool. Data showed there was significantly greater recovery of canine DNA using scissors and that swabbing was the worst recovery method (Figure 3). Canine DNA recovered from real attacks was approximately 20-fold less than the 'mock' attack samples, highlighting the need to collect as much DNA as possible.
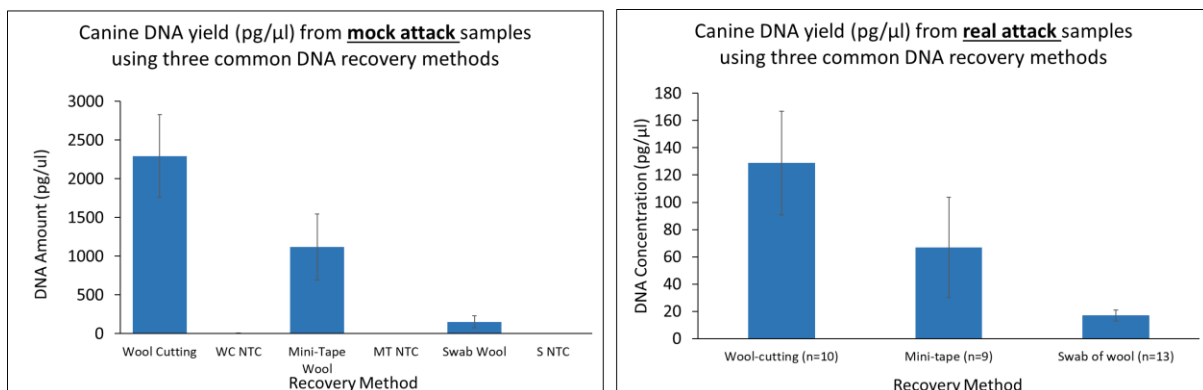

Figure 3: Recovery of Canine DNA from mock samples (left) and attack samples (right).

Potential future developments:

Building on Phase One data and to begin addressing the issue of samples going uncollected, the CDnaRP has developed LAW DOG DNA Recovery Kits (swab kit, mini-tape kit, scissor kit) and is providing 2500 kits and training to rural crime police, vets and livestock keepers in across 10 policing regions in the UK (Figure 4). This 'citizen science' approach will use samples collected by these groups to assess the three common recovery methods across multiple user groups. Early training data shows no significant difference in the way each group perceive and handle the kit with DNA from livestock attacks being collected across 10 policing regions until September 2026.
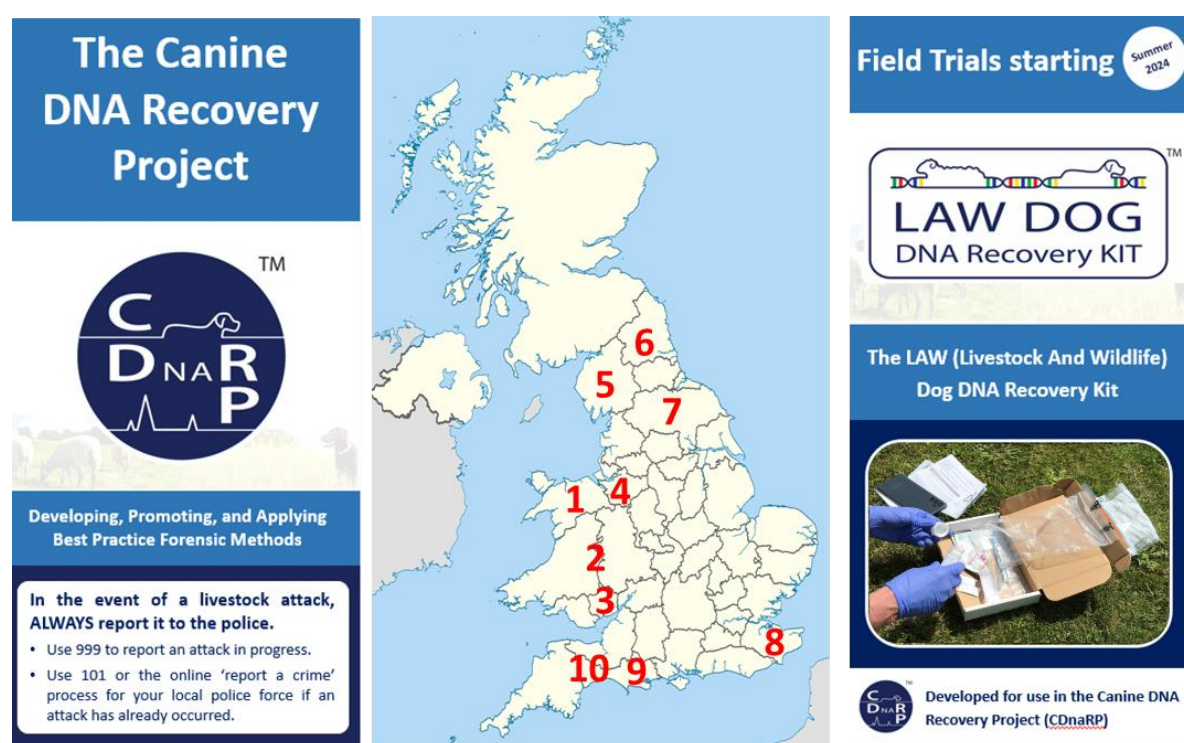

Figure 4: (left) The Canine DNA Recovery Project, (middle) areas where kits are being trialled, (right) LAW DOG DNA Recovery Kit

References:

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[3] Dawnay 2023. Optimising the collection of canine DNA from worried livestock for forensic identity testing. DEFRA Report. Available on request.

[4] Dawnay et al 2024. Development of a qPCR assay for the quantification of canine autosomal DNA recovered from livestock attacks. Science and Justice, under review.

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