minutes at room temperature with 1400 rpm agitation. The swab and excess liquid was placed in a spin basket and spun for 5 min at 7000xg. Liquid that passed through was transferred to a clean low bind tube. ACD was added to achieve a 1:1 molar ratio of ACD:SDS and incubated for 10 minutes at room temperature. The sample was brought up to 500 ul total volume using 4.2x concentrated binding buffer, such that the final buffer concentration was 50mM Tris HCl, pH 8, 150mM NaCl, 1mM EDTA, trace detergent. Beads were then added to the sample and incubated for 30 minutes at room temperature, following the standard binding and elution protocol.

Semen isolation protocol: Semen was purchased from Innovative Research (#IRHUSMS1ML). Up to 2 ul of semen was lysed in 20 ul of 0.4% SDS, 10mM Tris, 1mM EDTA, 40mM DTT and placed in a thermomixer at 45C for 30 min at 900rpm. 2.5µL of lysate from step 1 was added to the binding reaction with 70µg of washed beads in TNT up to 500µL (50mM Tris, 150mM NaCl, 1mM EDTA, trace detergent). Sample was vortexed and briefly centrifuged, then placed in a thermomixer at room temperature at 900 rpm for 30min. Beads were then added to the sample and incubated for 30 minutes at room temperature, following the standard binding and elution protocol.

Touch sample isolation protocol: Touch samples from volunteer donors were deposited on glass, polypropylene, or brass using an IRB approved protocol. Volunteers were asked to wash their hands with soap and water, then air dry their hands for 2 minutes. Donors then rubbed their hands and fingers together vigorously and touched their nose and forehead to apply sebum onto their fingers. Donors then touched the surfaces firmly while rolling their fingers and thumb on the surface (using a process similar to fingerprints taken by police). A Copan FLOQ swab was pre-wet with 20 ul of 0.01% SDS in 10 mM Tris HCl pH 8 and 1mM EDTA. The swab was immersed in 80 ul of 5-10 mM DTT in 10 mM Tris HCl pH 8 and 1mM EDTA to for 30 minutes at 45 degrees C, with 1400 rpm agitation. The swab and excess liquid was placed in a spin basket and spun for 5 min at 7000xg. Liquid that passed through was transferred to a clean low bind tube. The sample was brought to 500 ul total volume in 1.3x concentrated binding buffer, such that the final buffer concentration comes to 1x concentration (50mM Tris HCl, pH 8, 150mM NaCl, 1mM EDTA, trace detergent). Beads were then added to the sample and incubated for 30 minutes at room temperature, following the standard binding and elution protocol.

Summary of results

Trace DNA binding and elution: In order to establish protocols for binding and elution of DNA, >50kb genomic DNA was sheared to 4 to 10 kb size as this represents the DNA size that frequently is found in forensic environmental samples. These experiments established a robust and reproducible protocol for binding and elution (depicted in figure 1) consisting of up to a 30 minute room temperature incubation of beads in 50 to 500 ul of binding buffer, then use of a Dynamag magnet to collect the nucleic acid bound beads for approximately 30 seconds. Subsequently, the supernatant containing unbound protein and metabolites is collected and then the nucleic acid is eluted off the bead using 0.5 to 1.2 M NaCl at room temperature for up to 30 minutes.

The recovery efficiency of 10 to 100 ng input DNA starting amounts was similar to 500 pg trace DNA recovery. Comparing to PrepFiler beads (Figure 2), we found comparable or better elution, and more consistent performance, from our prototype beads (>90% elution at input amounts as low as 500 pg DNA) than from the standard PrepFiler protocol (70-80% elution, more inconsistent). The initial and eluted DNA was run on an agarose gel to assess any bias in

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