

Performance Validation Report

MagPure Forensic DNA Kit (D6359D)

1. Report Scope

This report summarizes validation data for MagPure Forensic DNA Kit (D6359D), a magnetic bead-based DNA extraction kit designed for forensic sample materials such as bone, tooth, hair, fingernail, seminal stain and tissue samples. The validation covers tooth DNA extraction, bone DNA extraction, representative animal tissue extraction, STR compatibility with difficult forensic samples and analytical DL2000 marker recovery. The results should be interpreted under the tested conditions, with sample preservation, grinding quality, digestion efficiency and input amount considered in final performance evaluation.

2. Tooth DNA Extraction Performance

Human tooth material was evaluated as a representative mineralized forensic sample. Tooth inputs of 100 mg, 50 mg and 25 mg were processed with the D6359D magnetic workflow and eluted in 60 μ L. DNA recovery was assessed by Nanodrop, and amplifiability was evaluated by qPCR.

Input	Human qPCR Ct	Conc. (ng/ μ L)	Yield (μ g)	A260/A280	A260/A230
100 mg	17.46	77.31	4.64	1.90	1.51
	17.94	75.74	4.54	1.88	1.48
	16.54	80.42	4.83	1.91	1.59
	17.05	78.04	4.68	1.94	1.51
50 mg	19.33	46.59	2.80	1.85	1.03
	18.14	43.39	2.60	1.84	1.03
	19.26	44.89	2.69	1.84	1.05
	19.58	49.68	2.98	1.90	1.08
25 mg	18.79	22.88	1.37	1.83	0.49
	18.09	20.58	1.23	1.91	0.56
	19.50	18.83	1.13	1.84	0.46
	19.61	23.16	1.39	1.81	0.46

Table 1. DNA recovery and qPCR results from human tooth samples using D6359D.

As tooth input increased from 25 mg to 100 mg, DNA concentration and total yield increased accordingly. The 100 mg input produced 4.54–4.83 μ g DNA, the 50 mg input produced 2.60–2.98 μ g DNA, and the 25 mg input produced 1.13–1.39 μ g DNA. A260/A280 values were generally within 1.81–1.94. All tested tooth DNA extracts produced qPCR amplification, with Ct values ranging from 16.54–19.61 under the tested conditions, supporting recovery of amplifiable DNA from mineralized forensic material.

3. Bone DNA Extraction Performance

Bone material was evaluated using an 80 μL elution volume. Single-well binding and Dual-well binding automated magnetic workflows were compared to assess whether increased binding exposure improved recovery from aged mineralized material.

Binding format	Conc. (ng/ μL)	Yield (μg)	A260/A280	A260/A230
Single-well binding	52.84	4.23	1.84	1.57
	56.89	4.55	1.82	1.58
	50.04	4.00	1.85	1.54
	61.30	4.90	1.86	1.61
Dual-well binding	112.62	9.01	1.92	1.89
	100.53	8.04	1.90	1.85
	106.98	8.56	1.94	1.84
	108.74	8.70	1.92	1.84

Table 2. DNA recovery from bone samples using single- and Dual-well binding conditions.

Single-well binding extraction produced 4.00–4.90 μg DNA, while Dual-well binding extraction produced 8.04–9.01 μg DNA under the tested conditions. A260/A280 values remained within 1.82–1.94, supporting acceptable protein removal. The electrophoresis result showed detectable DNA signal with slight smearing, which is consistent with the aged nature of the tested bone sample.

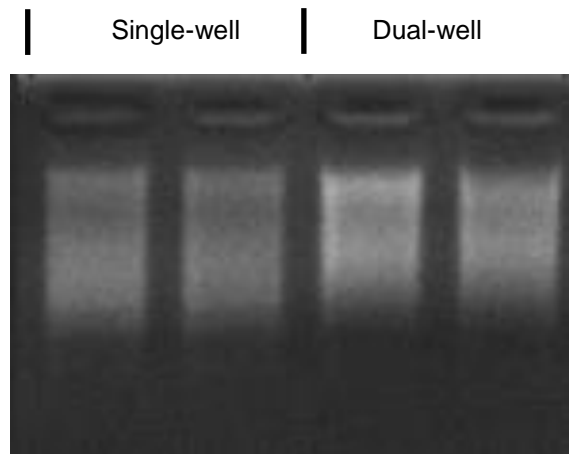


Figure 1. Electrophoresis analysis of D6359D-extracted bone DNA.

4. Animal Tissue DNA Extraction and Automation Support

A representative animal tissue sample was processed according to the alternative forensic sample workflow using the S16 automated magnetic extractor. The elution volume was 50 μL . Single-well binding and Dual-well binding conditions were compared to evaluate automated workflow consistency.

Binding format	Conc. (ng/ μL)	A260/A280	A260/A230	Yield (μg)
Single-well binding	130.79	1.88	1.60	6.54
	132.07	1.89	1.65	6.60
	134.66	1.86	1.69	6.73
Dual-well binding	135.43	1.86	1.37	6.77
	131.38	1.82	1.39	6.57
	137.98	1.87	1.41	6.90

Table 3. Automated animal tissue DNA extraction results using D6359D.

Animal tissue extraction showed consistent concentration and yield across both single-well binding and dual-well binding conditions. Single-well binding extraction produced 6.54–6.73 μg DNA, while Dual-well binding extraction produced 6.57–6.90 μg DNA. A260/A280 values were 1.82–1.89. Electrophoresis showed clear genomic DNA bands without obvious degradation smearing, supporting automated magnetic handling consistency under the tested conditions.

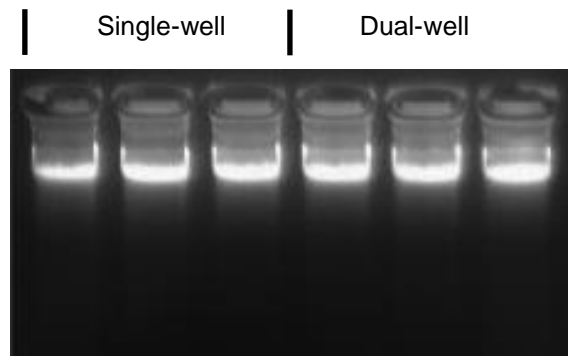



Figure 2. Electrophoresis analysis of D6359D-extracted animal tissue DNA.

5. STR Compatibility with Difficult Forensic Samples

STR workflow compatibility was evaluated using DNA extracted from difficult forensic sample materials. The applicable D6359D data summarized below focus on tooth material and fingernail material. Amplification was performed using a forensic STR amplification workflow, and capillary electrophoresis was used to assess locus detection. Results are reported as detected loci out of 25 loci.

Sample material	Input amount	Detected STR loci	Representative STR Profile
Fresh tooth root powder	0.08 g	24 / 25	

Sample material	Input amount	Detected STR loci	Representative STR Profile
Aged tooth root powder	0.08 g	9 / 25	
Aged tooth powder	0.10 g	14 / 25	
Fresh tooth powder	0.10 g	23 / 25	
Aged fingernail material	approx. 30 μ L fragments	25 / 25	
Fresh fingernail material	approx. 30 μ L fragments	25 / 25	

Table 4. STR locus detection results from D6359D-extracted difficult forensic samples.

Under the tested conditions, D6359D supported complete 25-locus detection from both fresh and aged fingernail materials. Fresh tooth materials produced near-complete STR profiles, with 23–24 detected loci. Aged tooth materials produced partial STR profiles, with 9–14 detected loci in the tested 25-locus workflow. These results show that D6359D can recover amplifiable DNA from difficult forensic materials, while STR outcome from aged mineralized samples remains strongly affected by preservation history, sampling position, grinding quality and available template amount.

6. Analytical DNA Marker Recovery

Analytical marker recovery was evaluated using approximately 50 ng DL2000 DNA marker under S16 automated magnetic extraction conditions. The elution volume was 50 μ L, and recovery was measured by Qubit. In parallel, a 20 μ L DL2000 marker gel was used as macroscopic electrophoresis support for fragment recovery and band integrity.

Input	Binding format	Qubit (ng/ μ L)	Yield (ng)	Recovery
~50 ng DL2000 marker	Single-well binding	0.942	47.10	92.35%
		0.964	48.20	94.51%
		0.961	48.05	94.22%
	Dual-well binding	0.866	43.30	84.90%
		0.834	41.70	81.76%
		0.857	42.85	84.02%

Table 5. Analytical DL2000 marker recovery using the automated D6359D magnetic workflow.

For approximately 50 ng DL2000 marker input, single-well binding recovery was 92.35–94.51%, while dual-well binding recovery was 81.76–84.90%. The macroscopic DL2000 marker electrophoresis result showed complete marker band patterns without obvious diffusion or degradation, with band brightness interpreted as above 80% under the tested conditions. These data support the magnetic binding, washing and elution design of the automated D6359D workflow.

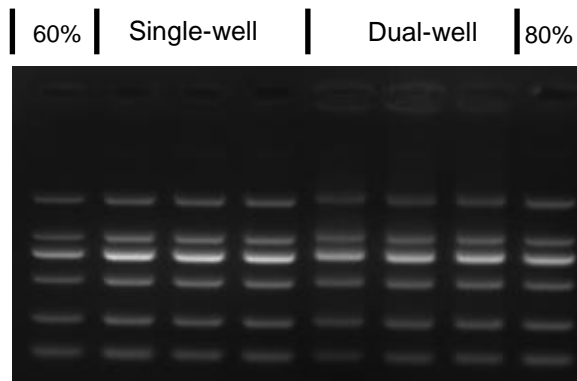


Figure 3. DL2000 marker recovery support for D6359D magnetic binding and washing conditions.

7. Summary

The validation data support D6359D as a magnetic bead-based forensic DNA extraction workflow for difficult sample matrices. Key evidence includes qPCR-amplifiable DNA recovery from human tooth samples, improved bone DNA recovery under the dual-well binding configuration, consistent automated animal tissue extraction, complete STR detection from fingernail materials, near-complete STR profiles from selected fresh tooth materials and above-80% analytical DL2000 marker recovery. These results show that D6359D can recover amplifiable DNA from difficult forensic matrices, while STR interpretation for aged mineralized materials should consider preservation history, sampling position, grinding quality and available template amount.