

Versatile, Robust, Low Cost Genomic DNA Extraction Solution for Use Across Multiple Sample Types and Downstream Genomic Platforms

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ABSTRACT

Obtaining a low cost and robust method for high throughput sample preparation upstream of genomic platforms is important for laboratories that need to run hundreds or thousands of samples a day. Many laboratories need to run a diverse set of sample types such as blood, hair, semen, and tissue. Low cost workflows often involve a crude lysate that can lead to poor results. The MagMAX™ CORE AgGenomic DNA Extraction Kit was designed to be a robust genetic DNA extraction kit that works with a diverse range of sample types yielding DNA that is suitable across multiple genomic platforms. This kit uses magnetic beads in conjunction with the KingFisher™ Flex Purification System to extract DNA. The total processing time from sample to purified DNA is around 1 hour. Here, we examine DNA isolated from bovine blood, blood cards, raw and extended semen, ear notch, and hair follicles isolated using the MagMAX™ CORE AgGenomic DNA Extraction Kit compared to a more expensive on market magnetic bead-based isolation kit. For downstream applications we tested capillary electrophoresis on an ABI 3500 Genetic Analyzer, Applied Biosystems™ Axiom™ Genotyping Arrays, and targeted GBS with AgriSeq™ HTS Library kits on an Ion GeneStudio™ S5. The data shows the MagMAX™ CORE AgGenomic DNA Extraction Kit was able to extract DNA from all sample types tested and is compatible with all the genetic platforms tested.

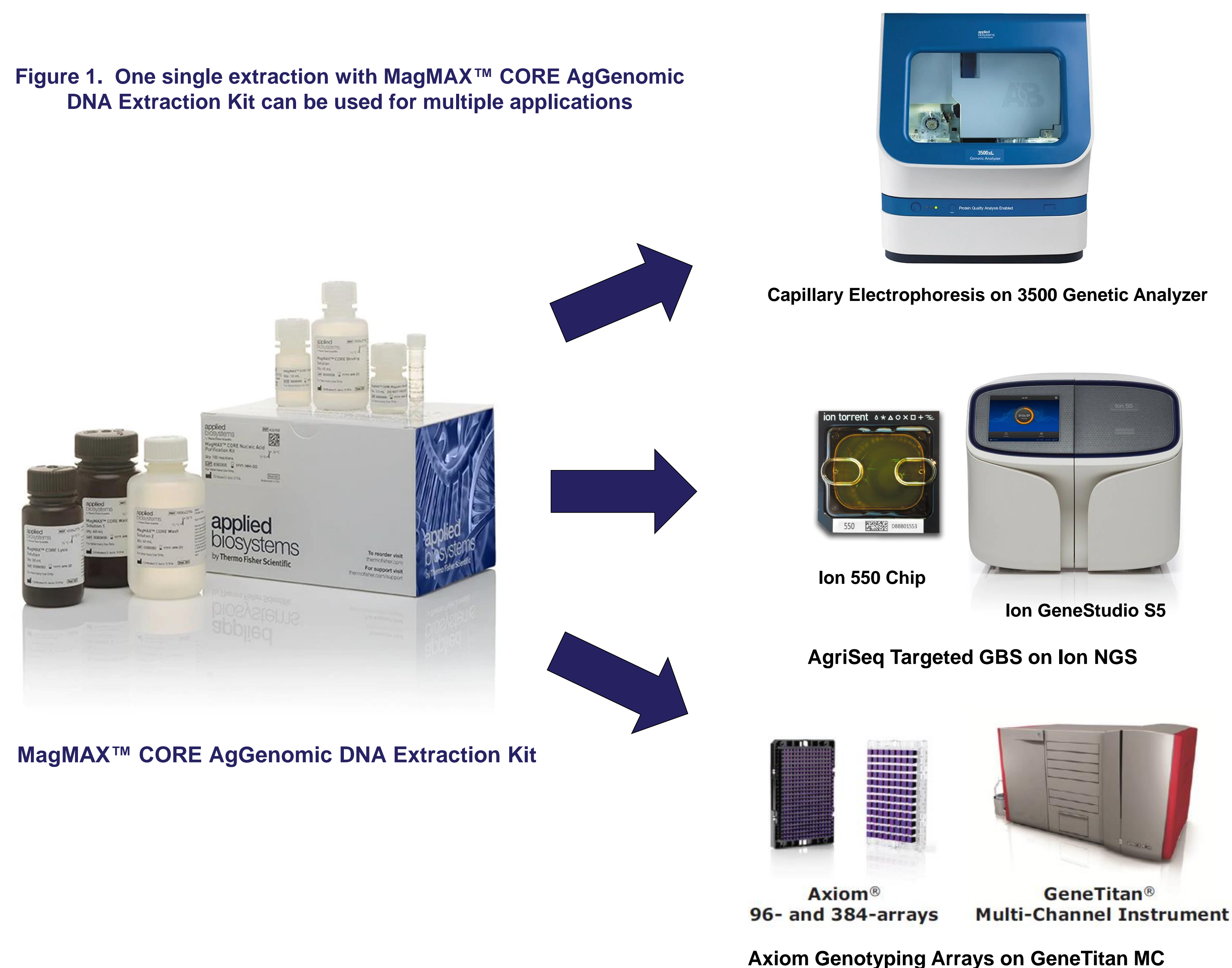
MATERIALS AND METHODS

Bovine and Canine genomic DNA samples were extracted using the MagMAX™ CORE AgGenomic DNA Extraction Kit from blood, semen, hair, ear punches, buccal swabs and FTA blood cards. The kit used magnetic beads in conjunction with the KingFisher™ Flex Purification System to extract DNA. The DNA eluate was used for genotyping and parentage testing with multiple platforms as summarized in the Table 1. DNA from same samples was extracted with similar DNA Extraction kits on the market, and performance was compared on the genotyping platforms.

Table 1. MagMAX™ CORE AgGenomic DNA Extraction Kit Evaluation for multiple applications

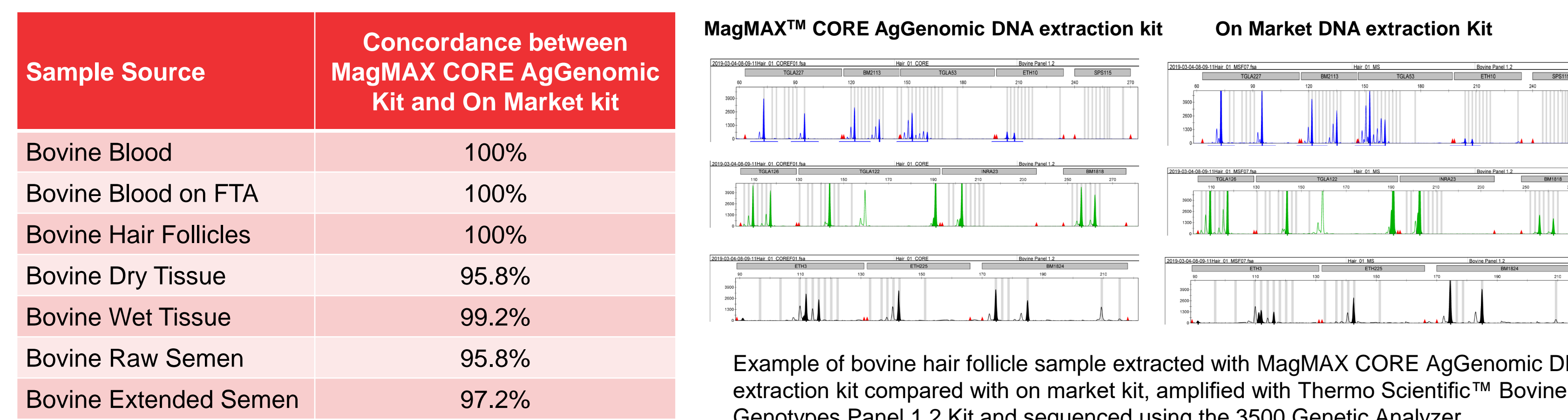
Species	Sample Type	Genotyping Platforms	Test panels
Bovine	Blood	1. Capillary Electrophoresis 2. Axiom Genotyping Microarrays 3. AgriSeq Targeted Genotyping by Sequencing (GBS)	1. Bovine Genotypes Panel 1.2 2. Axiom Bovine Genotyping v3 Array, 384 format 3. AgriSeq HTS Library Kit, Bovine ISAG Parentage Panel
	Wet Tissue – Ear Punches		
	Dry Tissue – Ear Punches		
	Raw Semen		
	Extended Semen		
	Hair Follicles		
Canine	FTA Blood Spots	1. AgriSeq Targeted Genotyping by Sequencing (GBS) 2. Axiom Genotyping Microarrays	1. AgriSeq HTS Library Kit, Canine SNP Parentage Panel 2. Axiom Canine HD Array, 384 format
	Buccal Swabs		

Figure 1. One single extraction with MagMAX™ CORE AgGenomic DNA Extraction Kit can be used for multiple applications



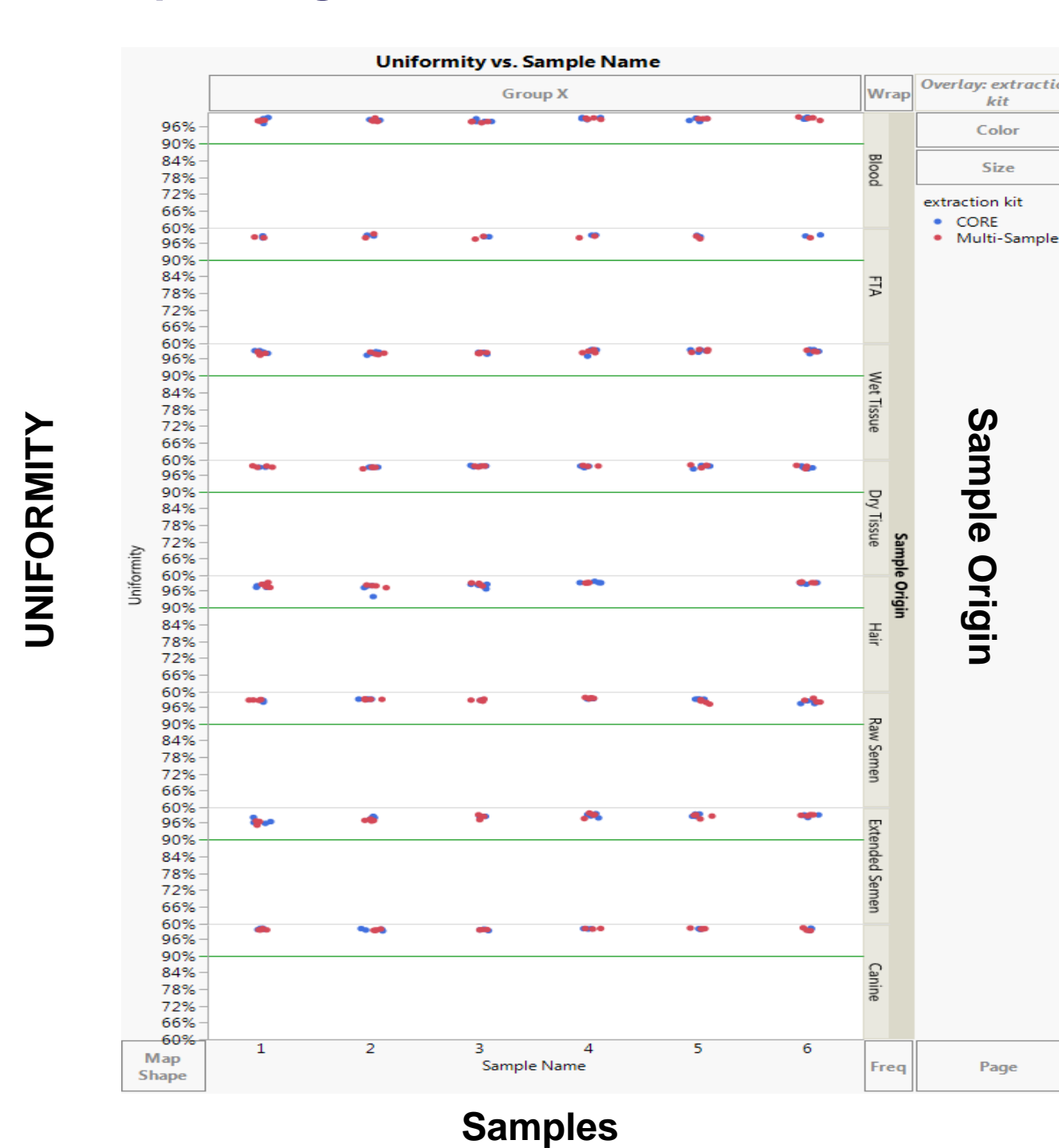
RESULTS

Figure 2. All Bovine Samples extracted with MagMAX™ CORE AgGenomic DNA Extraction kit are concordant on CE Platform



Example of bovine hair follicle sample extracted with MagMAX CORE AgGenomic DNA extraction kit compared with on market kit, amplified with Thermo Scientific™ Bovine Genotypes Panel 1.2 Kit and sequenced using the 3500 Genetic Analyzer.

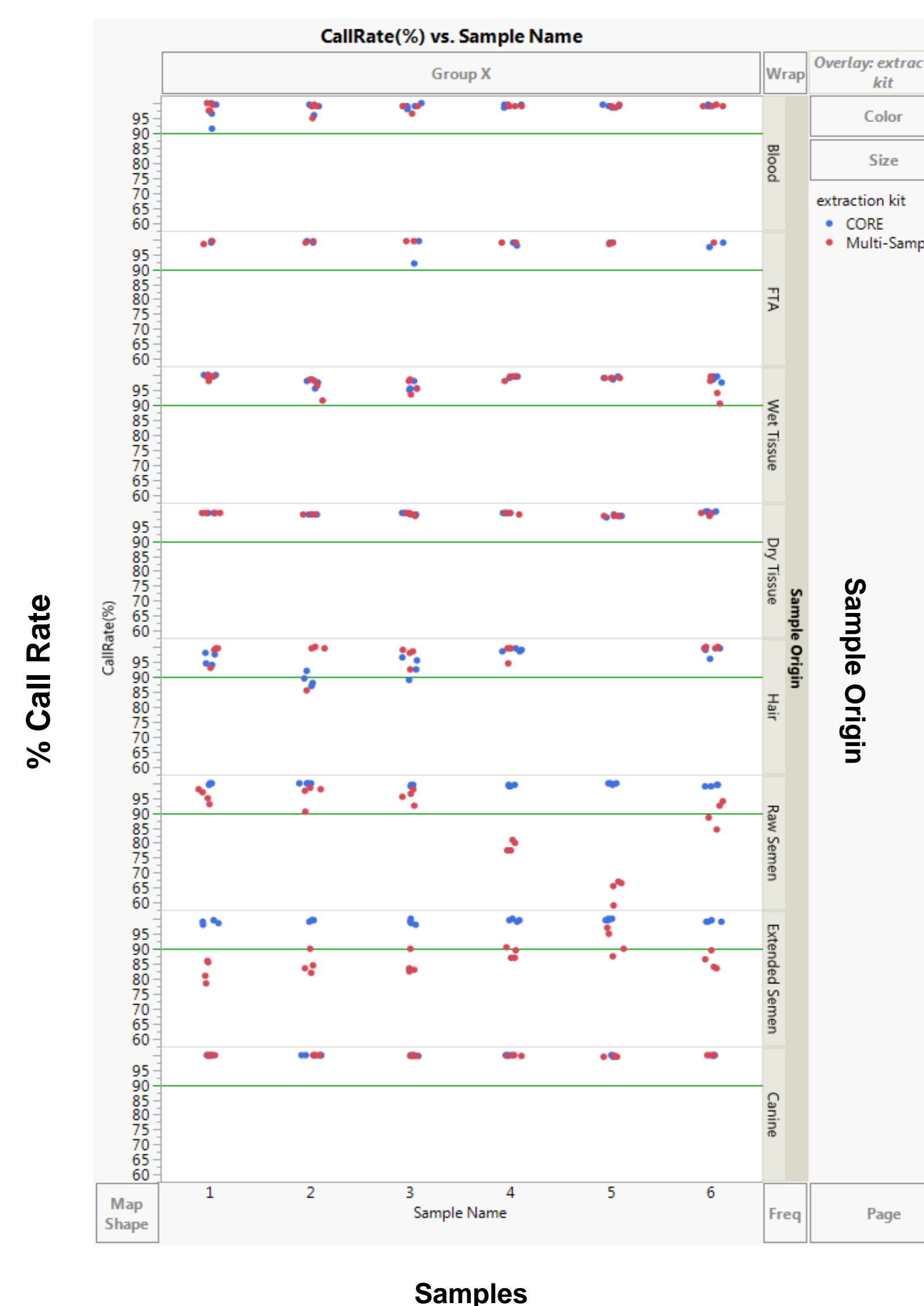
Figure 3. Bovine & Canine DNA Samples extracted with MagMAX™ CORE AgGenomic DNA Extraction kit have Uniformity of sequencing above the recommended 90% in the AgriSeq Targeted GBS Workflow



Sample Source	MagMAX CORE AgGenomic kit DNA Samples	On Market Kit DNA samples
Bovine Blood	98.5%	98.4%
Bovine Blood on FTA	98.5%	98.1%
Bovine Wet Tissue	98.4%	98.3%
Bovine Dry Tissue	98.9%	99.0%
Hair Follicles	97.9%	98.3%
Bovine Raw Semen	98.5%	98.5%
Bovine Extended Semen	98.0%	97.7%
Canine Oral Swabs	99.5%	99.5%

Figure 4. Bovine & Canine DNA Samples extracted with MagMAX™ CORE AgGenomic DNA Extraction kit have Sample Call rates above the recommended 95% in the AgriSeq Targeted GBS Workflow

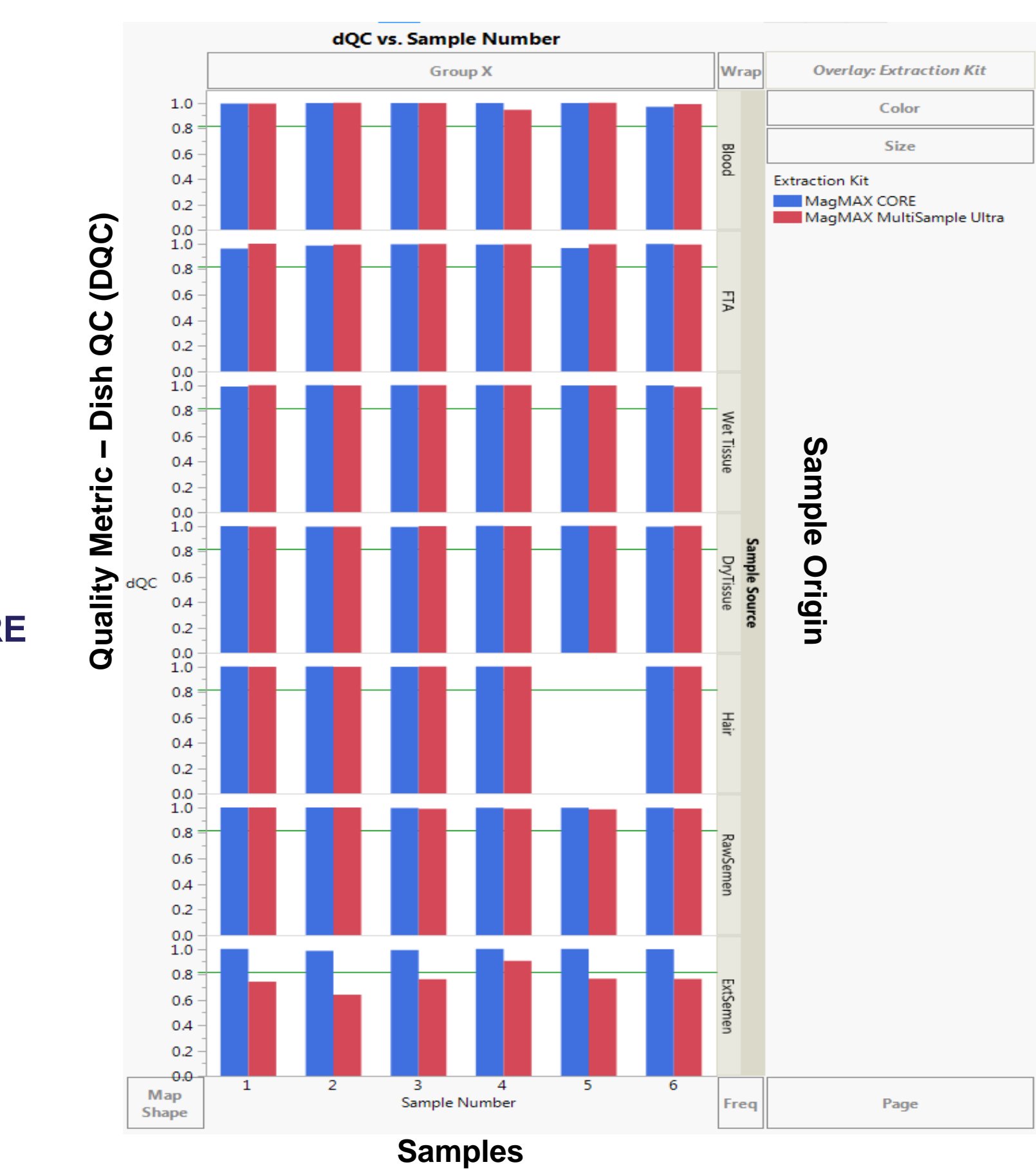
Sample Source	MagMAX CORE AgGenomic Kit DNA Samples	On Market Kit DNA samples
Bovine Blood	98.6%	98.7%
Bovine Blood on FTA	98.3%	99.1%
Bovine Wet Tissue	98.4%	97.6%
Bovine Dry Tissue	99.3%	99.1%
Hair Follicles	95.2%	97.8%
Bovine Raw Semen	99.6%	86.8%
Bovine Extended Semen	99.2%	86.5%
Canine Oral Swabs	99.9%	99.9%



Sample Source	Concordance between DNA samples extracted by MagMAX CORE AgGenomic Kit and On Market kit
Bovine Blood	99.1%
Bovine Blood on FTA	99.5%
Bovine Wet Tissue	97.4%
Bovine Dry Tissue	98.4%
Hair	95.3%
Bovine Raw Semen	92.0%
Bovine Extended Semen	90.2%
Canine Oral Swabs	99.9%

Figure 2. All Bovine Samples extracted with MagMAX™ CORE AgGenomic DNA Extraction kit show good resolution between non-polymorphic probes on Axiom Bovine genotyping v3 Array. Threshold is > 0.82

Sample Source	Average dQC MagMAX CORE AgGenomic Kit DNA Samples	Average dQC Market Kit DNA samples
Bovine Blood	0.992	0.988
Bovine Blood on FTA	0.983	0.996
Bovine Wet Tissue	0.998	0.997
Bovine Dry Tissue	0.997	0.998
Hair Follicles	1.00	0.999
Bovine Raw Semen	0.998	0.992
Bovine Extended Semen	0.996	0.764



Sample Source	Concordance between DNA samples extracted by MagMAX CORE AgGenomic Kit and On Market kit
Bovine Blood	97.2%
Bovine Blood on FTA	97.2%
Bovine Wet Tissue	98.7%
Bovine Dry Tissue	98.9%
Hair Follicles	99.1%
Bovine Raw Semen	97.1%
Bovine Extended Semen	76.0%

CONCLUSIONS

Genomic DNA isolated from a diverse set of bovine and canine samples using the MagMAX™ CORE AgGenomic DNA Extraction Kit is compatible with multiple genomic platforms from Thermo Fisher such as the 3500 Genetic Analyzer, Axiom microarrays and AgriSeq targeted GBS.

MagMAX Core AgGenomic DNA Extraction kit provides a cost-effective alternative for high throughput livestock agri-customers for Sample prep for genotyping applications.

TRADEMARKS/LICENSING

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The MagMAX CORE AgGenomic DNA Extraction kit is intended for Laboratory use including veterinary and environmental uses. All other Thermo Fisher products are supplied for research use and/or veterinary use only.