Data Quality at the Core

Seamless Solutions from Sample Prep to Data Acquisition for Animal Genomics Workflows

ANIMAL GENOMICS

ACCELERATING *answers*

BECKMAN COULTER
Life Sciences

Advancing Animal Genomics through Reliable Lab Automation Solutions and High-Quality Reagents

Since 1986, Beckman Coulter Life Sciences has been providing tools for animal researchers, beginning with the groundbreaking Biomek 1000 automated workstation. Today, thanks in part to our experience and expertise in lab automation and reagents, we're helping researchers accelerate answers in:

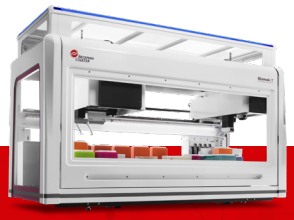
- Animal breeding
- Biomarker development
- Trait discovery
- Livestock health
- Pest and disease research

In this era of machine learning (ML) and artificial intelligence (AI), the role of lab automation solutions and high-quality reagents is paramount in animal genomics. AI and ML models require high-quality, well-characterized datasets for accurate predictions and training. By combining our robust lab automation, genomic extraction and clean up solutions, you can generate the reproducible data needed for these training sets. With these models unlocked, you'll be able to accelerate answers in animal genomics, leading to improved breeding programs, disease management and overall livestock health.

The Animal Genomic Workflows That We Automate

- Nucleic Acid Extractions
- Assay Miniaturization – Miniaturized NGS, NanoGBS
- CRISPR/CAS-9
- Genotyping by Sequencing (GBS)
- Transcriptome Sequencing
- Quantitative PCR Evaluation
- Nucleic Acid Quantification and QC
- Nucleic Acid Cleanup
- Whole Genome Sequencing (WGS)
- Epigenetic Studies
- High-Throughput PCR Setup
- NGS Library Preparation

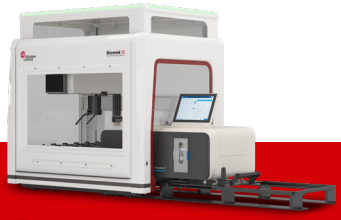
The Solutions That Make It Happen



Biomek Automated Workstations

Echo Acoustic Liquid Handlers

Biomek Echo One Workstation



Integrated Workstations

Automated Liquid Handling Software

High-Throughput Genomic Reagent Solutions
(AMPure XP, RNAClean XP, DNAdvance, RNAdvance Blood, RNAdvance Cell, RNAdvance Tissue, RNAdvance Viral, GenFind V3)

Tips

Empowering Animal Genomics Through Automation

With intuitive lab automation solutions and high-quality reagents, you can push the boundaries of genetic research and make significant advancements in understanding and improving animal health, productivity and traits.

Our automation solutions streamline and optimize critical processes such as sample preparation, reliable data tracking and seamless integration with other analytical instruments.

By reducing human error, increasing throughput and improving data quality, you can extract meaningful insights from your genomic data to make significant advancements in animal genetics, breeding programs, and pest and disease research.

What Sets Our Liquid Handlers Apart

Accuracy, Precision and Reproducibility

- The Span-8 pipettor on Biomek Automated Workstations enables low-volume transfers of 0.5 µL with inaccuracy of less than 0.12% and CV* less than 4.58%, and high-volume transfers of 900 µL with inaccuracy of less than 0.102 % and **CV* less than 0.392%**.
- For the low-volume transfer of 0.5 µL using the 384 Multichannel Head, the mean transfer volume for each individual head was less than 0.38% for inaccuracy and CV* was less than 5.06%. The 96 Multichannel Head transferred a high volume of 950 µL with inaccuracy of 0.1% and **CV* less than 0.28%**.
- Echo Acoustic Liquid Handler allows for precise, contact-free acoustic transfers in **volumes as small as 2.5 nL**.
- The Echo 650 Series can lower assay replicate requirements through increased assay precision.

Throughput

- Large deck capacity and on-deck device utilization.
- Selective tip feature of the multichannel head provides flexibility for both low- and high-throughput applications.
- Echo Acoustic Liquid Handler allows for fast any-well-to-any-well transfers, enabling previously **hours-long** DNA/RNA normalization, barcoding, and pooling of libraries down to **minutes-scale**.

Scalable and Modular

- Our experts have integrated **300+** different third-party devices from **over 60 manufacturers** to transform our liquid handlers into advanced lab automation solutions.

Sustainable and Cost-Reducing

- Echo Acoustic Liquid Handlers:
  - Decrease plasticware costs by **75% per year** through reduced reaction volumes.
  - Reduce dependency on single-use plastic pipette tips with tip-less and contact-free automated liquid handling.
  - Enables reuse of Echo-qualified plates, which helps minimize plastic waste.
- Biomek Automated Workstations:
  - Biomek software enables **tip reuse** for reduced plastic tip usage.
  - Biomek tips and consumables are recyclable polypropylene code #5.
  - Eligible for recycling through trade-up programs**
- Partnership with Polycarbin to drive sustainability through closed-loop recycling solutions and low-carbon lab products***

Scan the QR code to learn more about our liquid handlers through selected research publications

Case Study

A Robust and Efficient Approach for High-Throughput DNA Extraction and Genotyping of Fish and Animal Samples using the Biomek i7 Automated Workstation

Experimental Setup

- An automated method for DNA extraction and genotyping across diverse sample types like **Rabbit, Duck, Goose, Lizard, Oyster, Trout,** was carried out.
- The method involved using the **DNAdvance extraction kit**—which is based on SPRI technology—on a **Biomek i7 Automated Workstation**.

Workflow

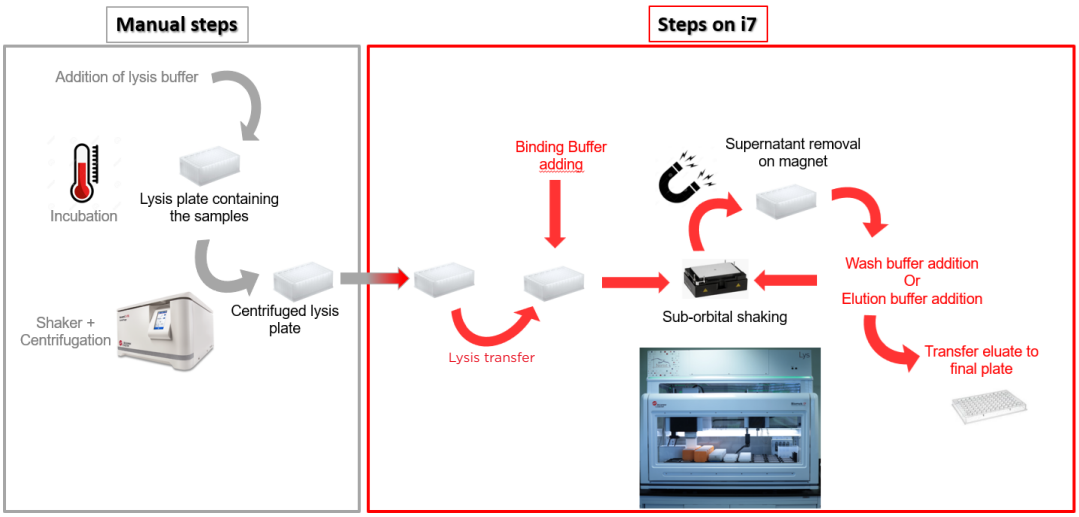


Figure 1. Automated DNAdvance Extraction On Biomek i7 automated workstation Workflow.

Left: manual sample process. Right: automated extraction process on the Biomek i7 Automated Workstation.

Results

Species	Tissue type	Elution Vol. (µL)	Avg Yield (ng/µL)	No. Of Samples
Rabbit	Tail Biopsy	80	99	11
Lizard	Ear Biopsy	80	113	372
Oyster	Mantle Biopsy	80	120	1152
Trout	Egg	80	120	701
Sea bream	Fin (Punch)	80	90	1344

Table 1. Average DNA Yield From Tested Samples.

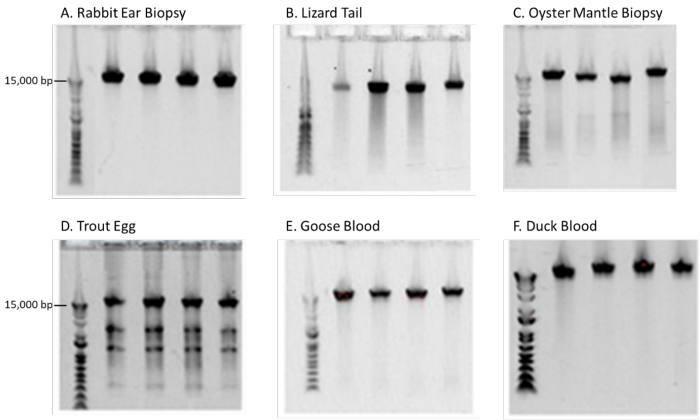


Figure 2. The DNA Size Extracted From Tested Samples.

The size of extracted DNA is measured using a 1% agarose gel, and a 1 Kb Plus DNA ladder (ThermoFisher Scientific, MA, USA, Cat# 10787018) is also used. The size of DNA from the same sample type is consistent (Figure 2). We have observed that the DNA size from all the samples is above 15,000 bp. (A. Rabbit ear biopsy, B. Lizard tail, C. Oyster mantle biopsy, D. Trout egg, E. Goose blood, and F. Duck blood). The uniformity in DNA size across all the samples indicates that high-quality DNA has been successfully extracted.

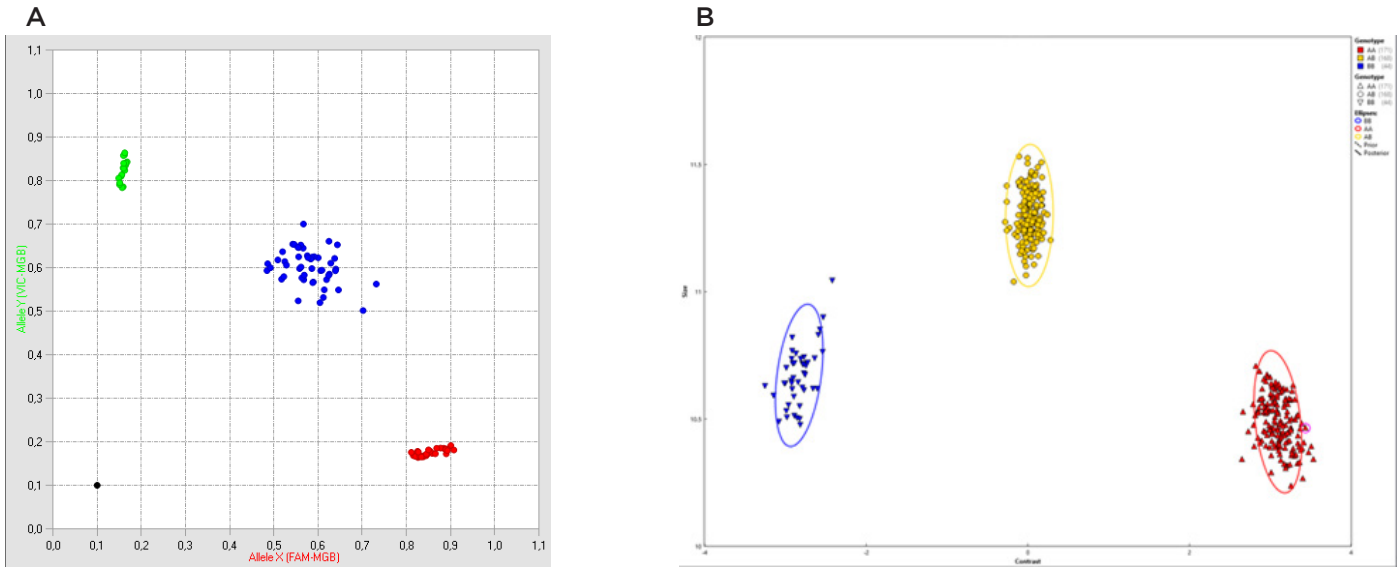


Figure 3. SNP Genotyping Data Analysis.

Genotyping plots from the **(A)** SNP Genotyping Analysis software and **(A)** Fluorescence values obtained using Biomark EP1 system. Y-axis represents VIC fluorescence intensity, x-axis represents FAM fluorescence intensity. Both intensity values normalized by ROX fluorescence. Different color dots indicate different genotyping result: No Call (black), HOM A (green), HOM B (red), or HET (blue), enabling gender concordance to be established.[5] HOM = homozygous, HET = heterozygous. B. Polymorphic, high-resolution clusters.[6] **(B)** Axiom Analysis Suite Software.

Species	Tissue
Fish: sea bream, sea bass, trout, sturgeon, meager, minnow, turbot, bleak, chub	Punch of flipper, egg, sperm
Poultry: duck, goose, chicken, quail, partridge	Inter-palmar, ergot, blood
Lizard	Biopsy of tail
Rabbit	Biopsy of the ear
Horse	Blood
Oyster, clam	Gills, coat
Shrimp	Whole Shrimp
Soldier fly	Larva, whole fly
Human	Saliva

Table 2. Automated Extraction Method Tested on Additional Sample Types

Conclusions

- Successful DNA extraction from various tissue types, surpassing the 20 ng/µL yield cutoff, demonstrates the effectiveness of the DNA extraction process.
- Uniformity in DNA size across all samples indicates the high quality of the extracted DNA.
- 10 minutes of hands-on time for deck setup on the Biomek i7 Automated Workstation makes this process time efficient.
- Extraction of 2000 samples per day showcases the productivity and scalability of this method.

Genomic Reagents That Enable Real Discoveries

Our nucleic acid cleanup and extraction reagents—powered by SPRI technology and widely known as the science behind the AMPure XP reagent—deliver accurate and reproducible results. These automation-ready paramagnetic bead based chemistries bind nucleic acids enabling you to obtain high-quality genomic data..

Our genomic reagents are the gold standard in nucleic acid purification and cleanup technology. They've helped generate research in over 20,000 scientific publications and are suggested for use in over 200 library preparation kits, including kits from trusted sequencing companies like Illumina©, Oxford Nanopore Technologies, and Pacific Biosciences (PacBio), among others.

What Sets Our Genomic Reagents Apart

High-Performance Chemistries

- Ideal for nucleic acid extraction, DNA/RNA from cells, tissue, blood and even challenging formalin-fixed, paraffin-embedded (FFPE) samples.
- SPRI technology enables our chemistries to deliver high-performance isolation, purification and cleanup protocols supporting workflows such as Genotyping-by-Sequencing (GBS), next-generation sequencing (NGS), transcriptome sequencing, nucleic acid quantification and QC, and quantitative PCR to name a few.

Versatile and Customizable

- Researchers have successfully extracted small and large nucleic acids from a variety of sample types from several different organisms. Our genomic reagents even have the ability to extract DNA and RNA from a single sample.

Sustainability

- Renewable, recyclable paper is used for void fill in packaging.

Scan the QR code to learn more about our reagents through selected research publications

Cleanup, Purification, and Size Selection Reagents

SPRI Bead-Based Nucleic Acid Cleanup and Size Selection Reagents		Input Material	Output	Applications
	**AMPure XP** Maximizing recovery, consistency, and speed to facilitate the entire NGS workflow, AMPure XP reagent meets the stringent needs of today's genomic applications and minimizes the risk of losing important genetic information. It's the gold standard in bead-based, next-generation sequencing cleanup—in fact, it's suggested in over 200 library preparation kits.	PCR Products, Fragmented DNA	DNA	• PCR Purification • NGS Cleanup
	**RNAClean XP** RNAClean XP reagent enables the purification of RNA and cDNA from common enzymatic reactions, ensuring efficient recovery of your samples.	RNA and cDNA	DNA	• RNA Cleanup • cDNA Cleanup • IVT Cleanup

Genomic Extraction Chemistries

SPRI Bead-Based Nucleic Acid Extraction Reagents		Input Material	Output	Applications
	**GenFind V3** GenFind V3 reagent isolates high-quality gDNA from whole blood and serum and efficiently removes common anticoagulant and contaminants, such as citrate, EDTA and heparin.	Blood, Cells	DNA	• PCR‡ • NGS‡
	**DNAdvance** Compatible with a variety of downstream analysis tools, DNAdvance reagent consistently delivers superior recovery of nucleic acids and purification of high-quality DNA.	Tissues, Swabs	DNA	• PCR‡ • qPCR‡ • SNP Genotyping‡ • NGS‡
	**RNAdvance Blood** RNAdvance Blood reagent isolates RNA from various RNA preservation tubes and ensures optimum RNA integrity throughout the extraction process.	Blood	RNA	• RNA Extraction • NGS‡
	**RNAdvance Cell V2** Known for its ability to consistently deliver pure nucleic acid of the highest quality and yield, RNAdvance Cell V2 reagent enables the extraction of RNA from cells without the need for filtration or centrifugation.	Cells	RNA	• RNA Extraction • NGS‡
	**RNAdvance Tissue** Known for its ability to consistently deliver pure nucleic acid of the highest quality and yield, RNAdvance Cell V2 reagent enables the extraction of RNA from cells without the need for filtration or centrifugation.	Tissues	RNA	• RNA Extraction • NGS‡ • qPCR
	**RNAdvance Viral** With a demonstrated limit of detection (LoD) of 1 copy/µL for viral RNA, RNAdvance Viral reagent purifies intact RNA suitable for downstream PCR-based applications.	Swabs, Transport Media	RNA	• RNA Extraction • PCR‡ • qPCR‡

*The Artel Multichannel Verification System (MVS®) is routinely used to verify accuracy and precision in volume transfers across liquid handlers. It is a NIST (National Institute of Standards and Technology) traceable system. The Artel company has successfully shown low-volume pipetting with calibrating techniques by adjusting offsets and slopes.
**This trade-up program is ONLY available in North America
*** This partnership is ONLY available in North America
‡ Examples of downstream uses for isolated nucleic acids.

Beckman Coulter makes no warranties of any kind whatsoever express or implied, with respect to this protocol, including but not limited to warranties of fitness for a particular purpose or merchantability or that the protocol is non-infringing. These methods are for demonstration only and are not validated by Beckman Coulter.

The Biomek Automated Workstations and Echo Liquid Handlers are not intended or validated for use in the diagnosis of disease or other conditions.

BECKMAN COULTER
Life Sciences

danaher

For Beckman Coulter's worldwide office locations and phone numbers, please visit Contact Us at beckman.com

2024-GBL-EN-105901-v1