



Echo Acoustic Liquid Handlers

Amplifying impact across your entire workflow.

ACCELERATING
answers

 **BECKMAN
COULTER**
Life Sciences

From Acoustic Transfer to Workflow Transformation

Why Acoustic Liquid Handling Changes What's Possible

Early-stage drug discovery depends on running more experiments with greater precision, using less sample. From primary screening to dose-response and combinatorial assays, researchers are challenged to generate high-quality data at ever-increasing scale while controlling costs and sample consumption.



Magnet Biomedicine

A biotechnology company advancing molecular glue discovery through rational selection and design

"The Echo instrument streamlined our workflows, transitioning from a more manual process to a more automated system. It enables us to respond to requests with faster turnaround times, allowing Compound Management to increase bandwidth for new projects. This efficiently allows scientists to run their assays earlier and in turn access data more quickly to make informed decision making in our programs."

Acoustic liquid handlers overcome these limitations through noncontact acoustic droplet ejection, delivering precise, reproducible nanoliter-scale transfers across a wide range of fluid types. By dynamically adjusting to each well's fluid properties in real-time, acoustic technology ensures consistent dispensing without tips — minimizing cross-contamination, carryover, and matrix-dependent errors.

By enabling **miniaturized, automated, high-throughput workflows**, acoustic liquid handling maximizes the value of advanced analytical platforms, supports **micro-sampling strategies**, **reduces bioanalytical costs**, and **delivers higher-quality data from limited sample volumes**.

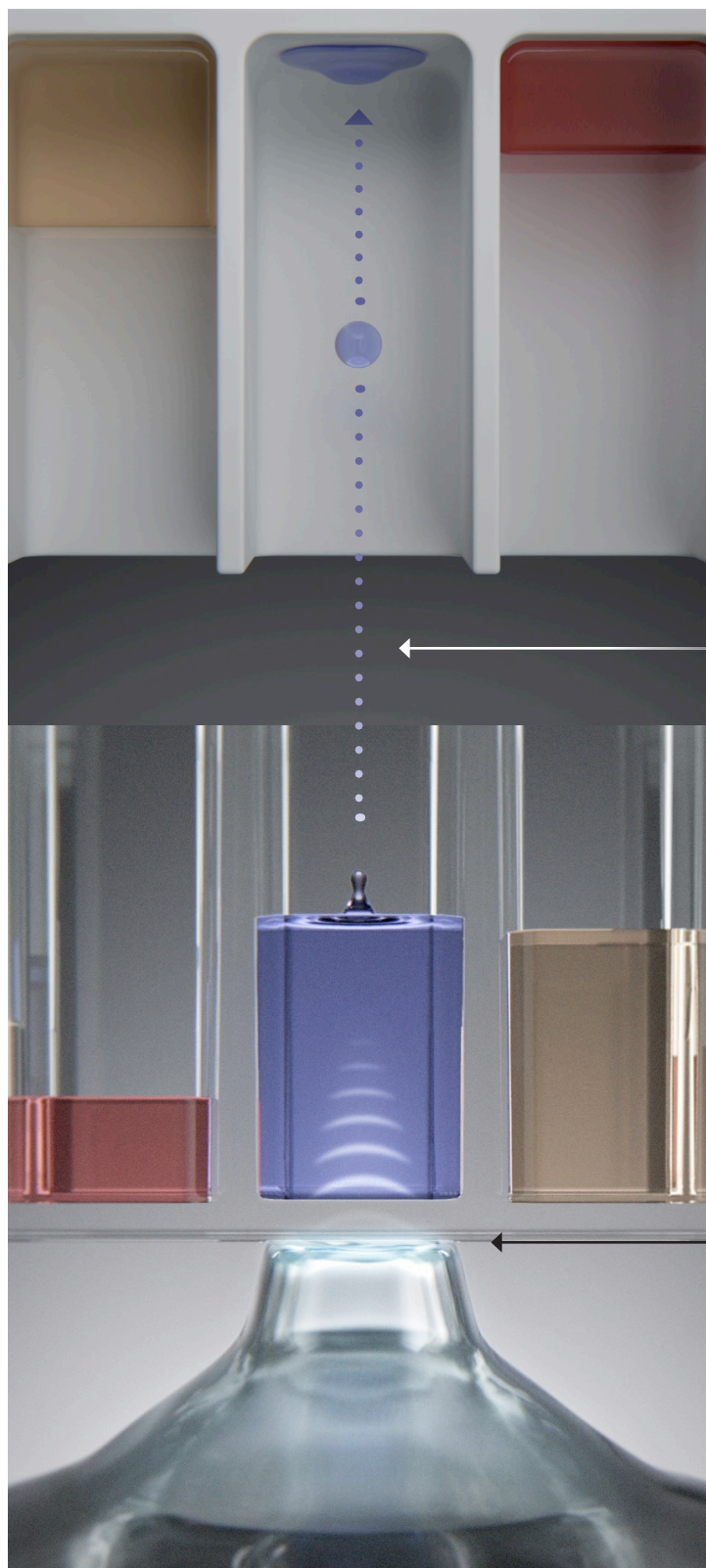
In 2004, Labcyte (now part of Beckman Coulter Life Sciences) changed the rules of liquid handling with the introduction of Acoustic Liquid Handling Technology — ushering in a new, contact-free way to move liquids with unprecedented precision. Scientists could now transfer samples:

- **Tip-free and contact-free**
- **Without dilution-induced variability**
- **At reliable, repeatable nanoliter volumes**

Today, Acoustic Liquid Handling Technology continues to accelerate discovery by enabling **more experiments, faster — and with less sample — without sacrificing data quality**.



Acoustic Droplet Ejection



Innovative Technology with Unparalleled Performance

Echo Liquid Handlers rely on patented technologies and novel methodologies to change how liquid handling is used in applications throughout life science. With Dynamic Fluid Analysis the Echo Liquid Handler enables researchers to transfer a broad spectrum of fluid types with a degree of flexibility and reliability that is not possible with traditional liquid handling technologies.

← Inverted destination plate

← 2.5 nL or 25 nL
Droplet transfers

← Source plate

← Transducer
Acoustic energy generator

Fluid TYPE A Fluid TYPE B Fluid TYPE C

Figure 1: Acoustic Droplet Ejection - The transducer is positioned below the source microplate well and emits focused sound energy repeatedly to the meniscus of the fluid to be transferred. A droplet train of 2.5 nL or 25 nL increments (model dependent) is reliably ejected into a well of an inverted destination microplate.

Dynamic Fluid Analysis

Acoustic Droplet Ejection Technology for Non-Contact Fluid Transfer

Echo Liquid Handlers rely on Acoustic Droplet Ejection, an innovative automated liquid handling technology that focuses ultrasonic energy at the meniscus of a fluid to eject small droplets of liquid from a source well to a destination well.

- Gentle enough to safely transfer cells, samples and reagents
- Precise and accurate transfers in 2.5 nL or 25 nL increments
- Non-contact transfer of a broad spectrum of fluid types using sound

Dynamic Fluid Analysis: Precision without Recalibration

Echo Liquid Handlers continuously adapt to changing fluid properties during transfer. Using **Dynamic Fluid Analysis (DFA)**, the system measures fluid composition, height, and acoustic response in real-time — automatically adjusting power to ensure consistent droplet formation.

What this means for you:

- Consistent volume transfer independent of fluid type
- Reliable handling of complex buffers, DMSO, and variable samples
- No manual recalibration required



Figure 2: Acoustic transducer moving below the source plate, ready to deliver acoustic energy through the plate and into the liquid.



Figure 3: Stroboscopic imaging of Acoustic Droplet Ejection, showing the formation of a microscopic mound. With precisely controlled power, a droplet lifts off—without any touch of the sample.

Next Generation Echo 650 Plus Series Liquid Handler

Versatile, High-Throughput Acoustic Liquid Handling down to 2.5 nL

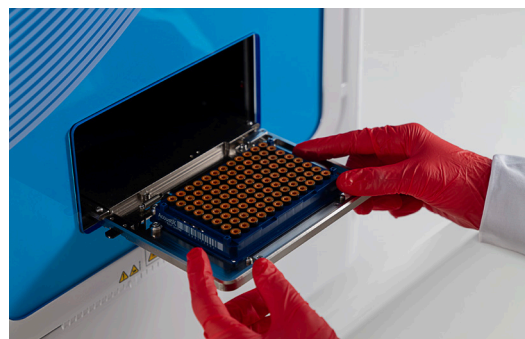
The Next Generation of Echo 650 Plus Series represents the most flexible platform for acoustic transfer of samples and reagents. Designed for demanding discovery and screening environments, the series combines speed, precision, and scalability with improved automation readiness.

One Echo system can replace multiple traditional liquid handlers by consolidating cherry picking, dose-response, normalization, and plate reformatting into a single, tipless platform.



Core capabilities:

- Transfer volumes as low as 2.5 nL
- True any-well to any-well dispensing
- High throughput for complex, multi-component assays
- Improved fluidics for simplified maintenance
- Enhanced robotics integration and quieter operation



Key Advancements:

- **Next Generation Transducer (NGT)** - Enables greater system stability, simplified operation, and faster readiness across workflows.
- **Updated Electronics Package:** Core electronics with enhanced reliability and faster real-time computation, while reducing power consumption by **54%** compared to legacy instruments.
- **Reduced Service Plan Costs:** Manufacturability improvements enable service plans priced lower than legacy Echo service agreements.
- **Dynamic Fluid Analysis 2 (DFA2)*:** Leveraging the Next Generation Transducer and core electronics, DFA2 enables machine learning-driven, real-time fluid analysis with advanced tools such as **Dynamic Plastic Analysis (DPA)** and **Dynamic Mound Analysis (DMA)**.

* Plate- and calibration-dependent

Enhanced Compound Yield & Potency

Acoustic Sample Tubes for Modern Compound Management

*Acoustic sample tubes enable direct dispensing from individually accessed tubes—preserving sample integrity and reducing library footprint.



Why tubes matter in drug discovery:

- Reduces compound consumption and storage requirements
- Enables direct cherry picking from tubes to assay-ready plates
- Minimizes freeze-thaw cycles and intermediate handling steps
- Allows the use of selected compound sets, preventing exposure of entire plate collections

Integrated sample management workflows — validated in large-scale industrial environments — demonstrate reliable long-term storage, stable compound integrity, and improved hydration control when operated under dry-air conditions.

**Sold by Azenta Life Sciences*

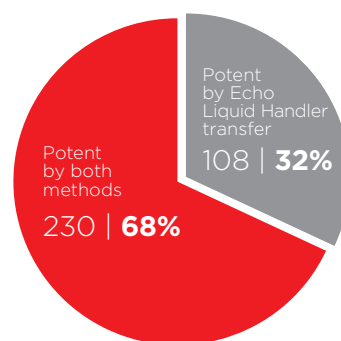
20 Years of Echo Technology: Reliability That Stands the Test of Time

Active Compound Yield Increased by 32%

By leveraging the Echo Liquid Handler, Bristol Myers Squibb uncovered 108 more hits in a 975-compound screen.¹

Achieve 259× Greater Potency

By transferring compounds directly with the Echo Liquid Handler, AstraZeneca obtained more precise compound potency than with a serial dilution process.²



Compound number	Echo Liquid Handler IC ₅₀ (μM)	Traditional Liquid IC ₅₀ (μM)
4	0.003	0.146
5	0.002	0.553
6	0.007	0.973
7	0.003	0.778
8	0.004	0.445
9	0.052	0.17
10	0.064	0.817
11	0.486	3.03

¹ Spicer, T. et al., Pharmacological evaluation of different compound dilution and transfer paradigms on an enzyme assay in low volume 384-well format Poster presented at Drug Discovery Technology, August 2005, Boston, MA.

² Barlaam, B.C. et al., U.S. Patent 7,718,653, 2010

What Powers the Echo 650 Plus Series

Dynamic Fluid Analysis Technology 2 (DFA2)

- Enhanced real-time processing in Echo **650 Plus** instruments enables **Dynamic Fluid Analysis 2 (DFA2)**
- **Machine learning-driven models** and real-time acoustic feedback optimize **Acoustic Droplet Ejection (ADE)** performance
- Automatically compensates for **source plate manufacturing variability**
- Dynamically evaluates **fluid surface response prior to each droplet ejection**
- Selects the **optimal ADE calibration for every well***
- Enhances **transfer reliability and long term consistency**
- Delivers robust performance across a **broad range of sample types**



Next Generation Transducer (NGT)

- **Titanium lens** for enhanced stability and performance
- **Extended dry out capability** allows the system to be safely powered down for long term storage
- **Rapid recovery:** instrument is transfer ready **within 16 hours** of power up after extended storage
- **Short downtime recovery:** after powering down for up to **4 days**, normal operation is restored **within 1 hour** — no special intervention required
- **Exceptional stability** eliminates the need for **focus calibration adjustments**

Figure 4: Next Generation Transducer (NGT)

Dynamic Plastic Analysis (DPA)

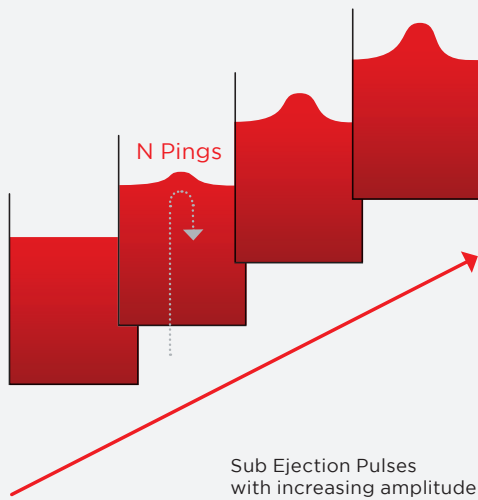
- Accounts for **plate manufacturing variability**, including mold, cavity, and resin differences
- Mitigates variability that can impact **acoustic droplet transfer performance**
- **DPA learns plate specific characteristics** and adjusts automatically
- Delivers **consistent volume accuracy and Acoustic Droplet Ejection (ADE) performance** across plate lots

* Plate- and calibration-dependent

Dynamic Mound Analysis (DMA)

- Probes fluid behavior using **sub ejection acoustic pulses**
- Scans each well prior to droplet ejection
- Compares fluid response against a **machine-learning model**
- Predicts key **fluid properties directly in the well**
- Automatically selects the **optimal sub-calibration**
- Delivers accurate calibration **without user input**

For a Single Well



Acoustic Signal

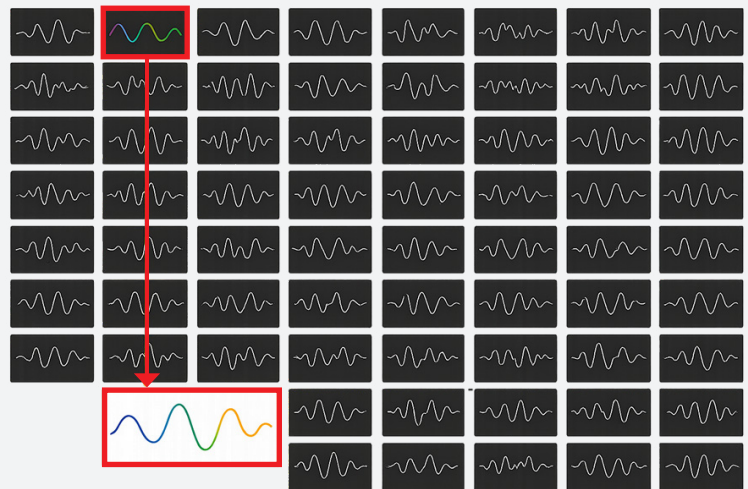


Figure 5:

Illustrates the method by which DMA acoustic data is collected, an acoustic pulse is transmitted to the fluid surface where, depending on the power supplied, a mound is formed. That mound is then interrogated by a number (N) of pings that captures important information about the fluid.

The scale and timing of the fluid's response is measured against a machine learning model that is trained on known outcomes. Using this data, DMA determines the optimal ADE sub-calibration for that specific well.

Direct Dilution for Superior Data Quality

Echo systems create dose-response and standard curves through direct dilution, transferring defined volumes directly from stock solutions into individual assay wells.

Advantages over serial dilution:

- Eliminates error carryover between concentration points
- Improves potency determination and assay robustness
- Delivers more reliable IC_{50} , EC_{50} , and K_d values.

Independent studies have shown markedly higher hit detection and more accurate potency measurements using Echo acoustic transfers compared to traditional methods.

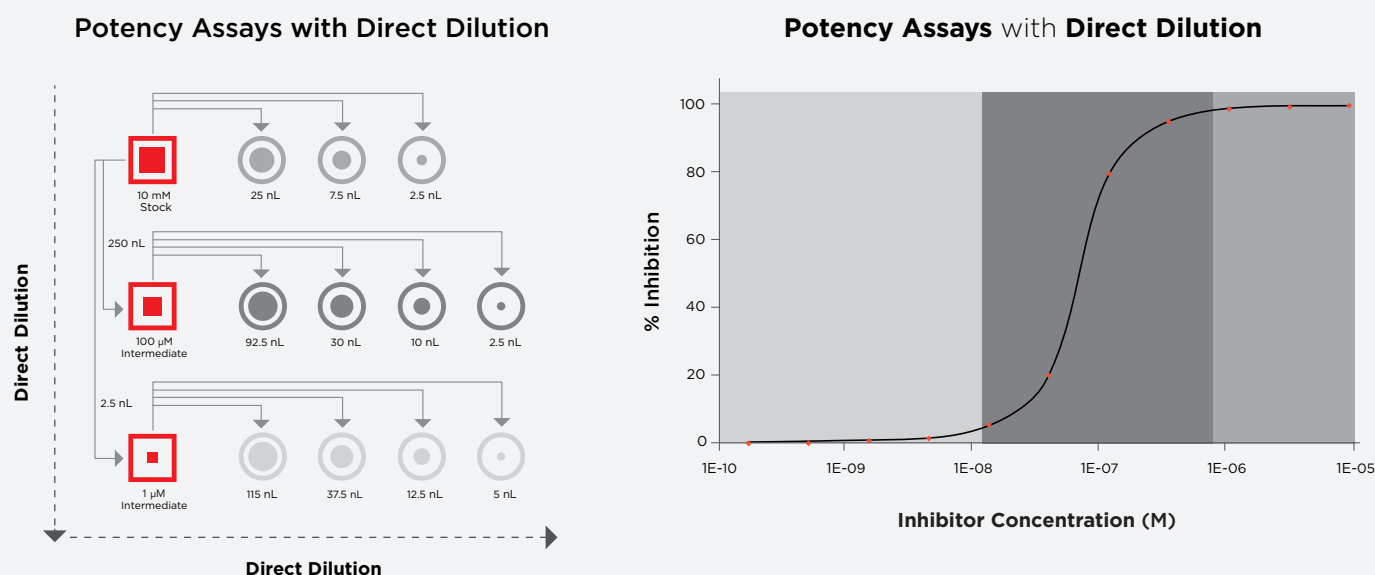


Figure 6: Example of an 11-point curve created using direct dilution. The image on the top shows how the desired concentrations are created by transfers directly from the stock sample and two intermediate dilutions of the stock sample. The resulting IC_{50} curve is shown on the right.

More Experiments. Less Sample. Faster Results.

Rapid Combinatorial and High-Throughput Transfers

By moving the acoustic transducer and destination plate simultaneously, Echo Liquid Handlers execute transfers faster than tip-based systems.

Enables:

- Fast hit picking for secondary screening
- Sample pooling and normalization
- Custom plate layouts and library compression
- Complex combination screening in minutes

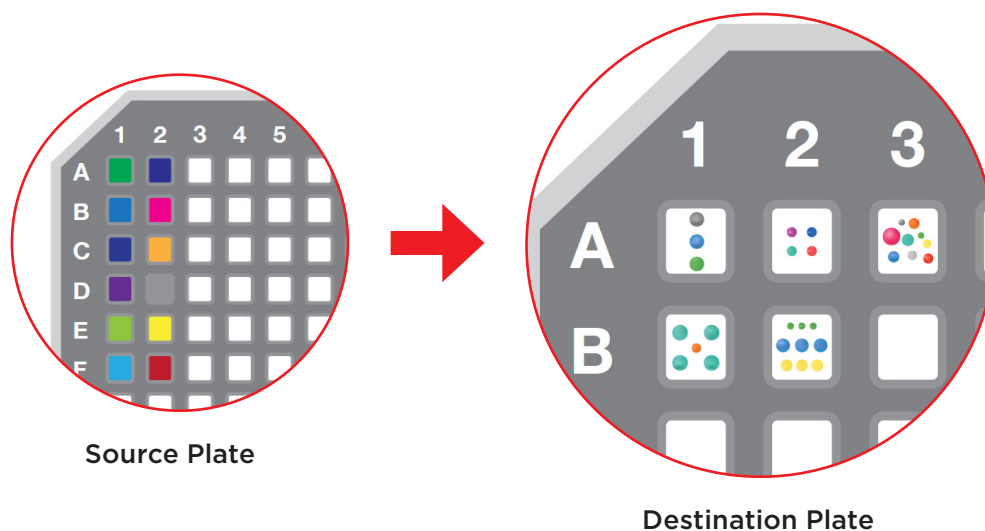


Figure 7: Examples of rapid sample picking, sample pooling, and combination screening from any source well to any destination well, at any volume.

Assay Miniaturization

Assay miniaturization demands highly accurate and reproducible nanoliter-scale transfers. Echo Liquid Handlers enable miniaturization beyond what traditional methods can achieve.

The Echo 650 Plus Liquid Handler further advances this capability with high precision acoustic transfer in nanoliter increments, allowing researchers to conserve valuable samples while maximizing experimental output.

- Enables low-volume sample, reagent and compound addition
- Minimizes final DMSO concentration
- Generates comparable or improved results
- Delivers consistent performance

Echo 525 Liquid Handler

Acoustic Solutions for Genomics and Biologics

The Echo 525 Liquid Handler is optimized for aqueous workflows requiring larger transfer volumes. Using rapid **transfers of 25 nL increments**, it delivers exceptional accuracy and speed for genomics, biochemical, and biologics applications.

Highlights

- Ideal for qPCR, NGS library prep, and enzymatic assays
- Accurate transfer of aqueous and viscous liquids (e.g., enzyme solutions)
- Supports Echo Qualified 384-well microplates and 6-well reservoirs
- Delivers reliable performance without contact or contamination



Figure 8: Echo 525 Acoustic Liquid Handler, integrated onto a Biomek i7 Workstation.

Learn more: www.beckman.com/biomek-echo-one



Confidence in Every Nanoliter

Optimizing Data Handling

Ensuring the integrity of sample transfers is paramount for robust data handling and effective data management, directly contributing to successful data generation. The Echo Liquid Handler plays a critical role in this by enabling highly precise and accurate non-contact transfers, which facilitate the rapid and reliable addition of reagents and nucleic acids.



Amplification Curves

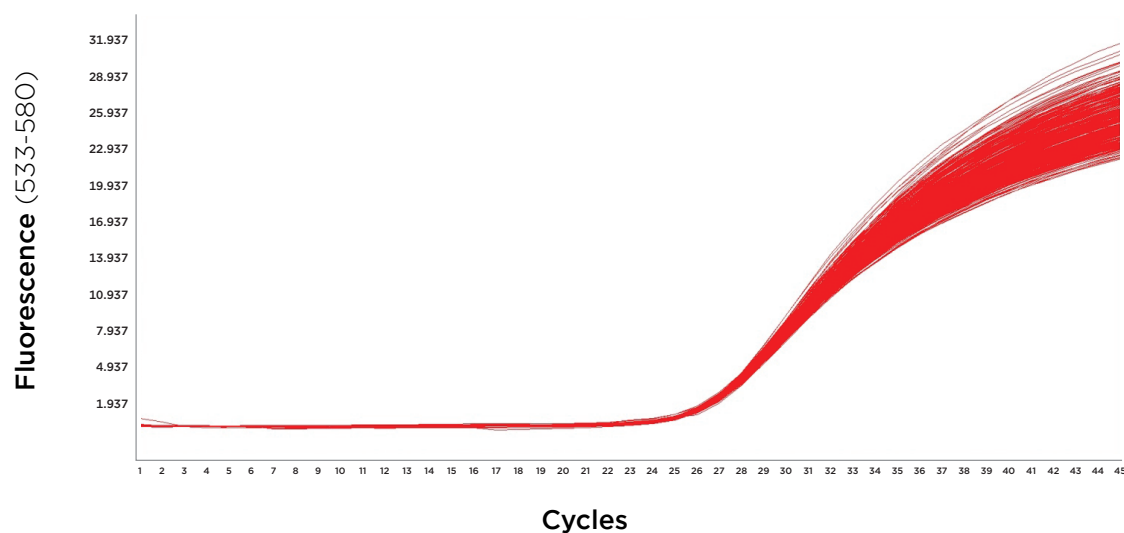


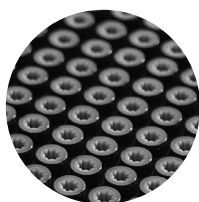
Figure 9: Real-time qPCR data showing transfer uniformity using the Echo Liquid Handler. Source plate Echo Qualified 384-well Polypropylene Plus Microplate to a 384-well assay plate. 1 μ L puc19 in 0.1 %TE per well was transferred. Roche 1536 DNA Green Master reagent was used following the standard protocol and data was read on a Roche LightCycler 480.

Transforming Science, One Application at a Time

The sum of Echo system capabilities, miniaturization, dispensing speed, and combinatorial dispensing allow rapid assay and gene assembly, library pooling and other applications requiring repetitive runs.

Acoustic dispensing from tubes and plates allows researchers to work only with the compounds they need — maximizing inventory usage while reducing waste and cost.

Drug Discovery and High Throughput Sequencing



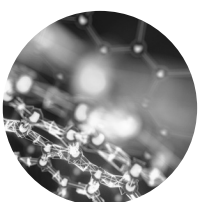
- Miniaturized assays reduce compound consumption and overall screening costs.
- Direct dilution improves confidence in potency measurement and hit selection.
- Rapid cherry picking accelerates secondary screening workflows.
- Acoustic tube dispensing enables collection-on-the-fly and reduces library footprint.

Genomics and Next-Generation Sequencing



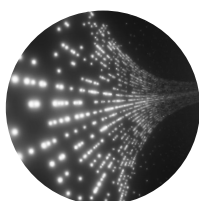
- Miniaturized reagent addition lowers per-sample costs.
- Non-contact transfers reduce contamination risk and improve reproducibility.
- High-density plate formats support large-scale library preparation.
- Consistent performance enables robust and reliable downstream analysis.

Synthetic Biology



- Nanoliter transfers enable dramatic reaction miniaturization.
- Any-well to any-well transfers accelerate design-build-test cycles.
- Precise reagent ratios optimize genetic circuits, cloning, and expression.
- Lower reagent costs expand the explorable design space.³
- Automated cell-free expression (CFPE/CFPS) enables high-throughput, multi-parameter screening of synthetic biology systems.³

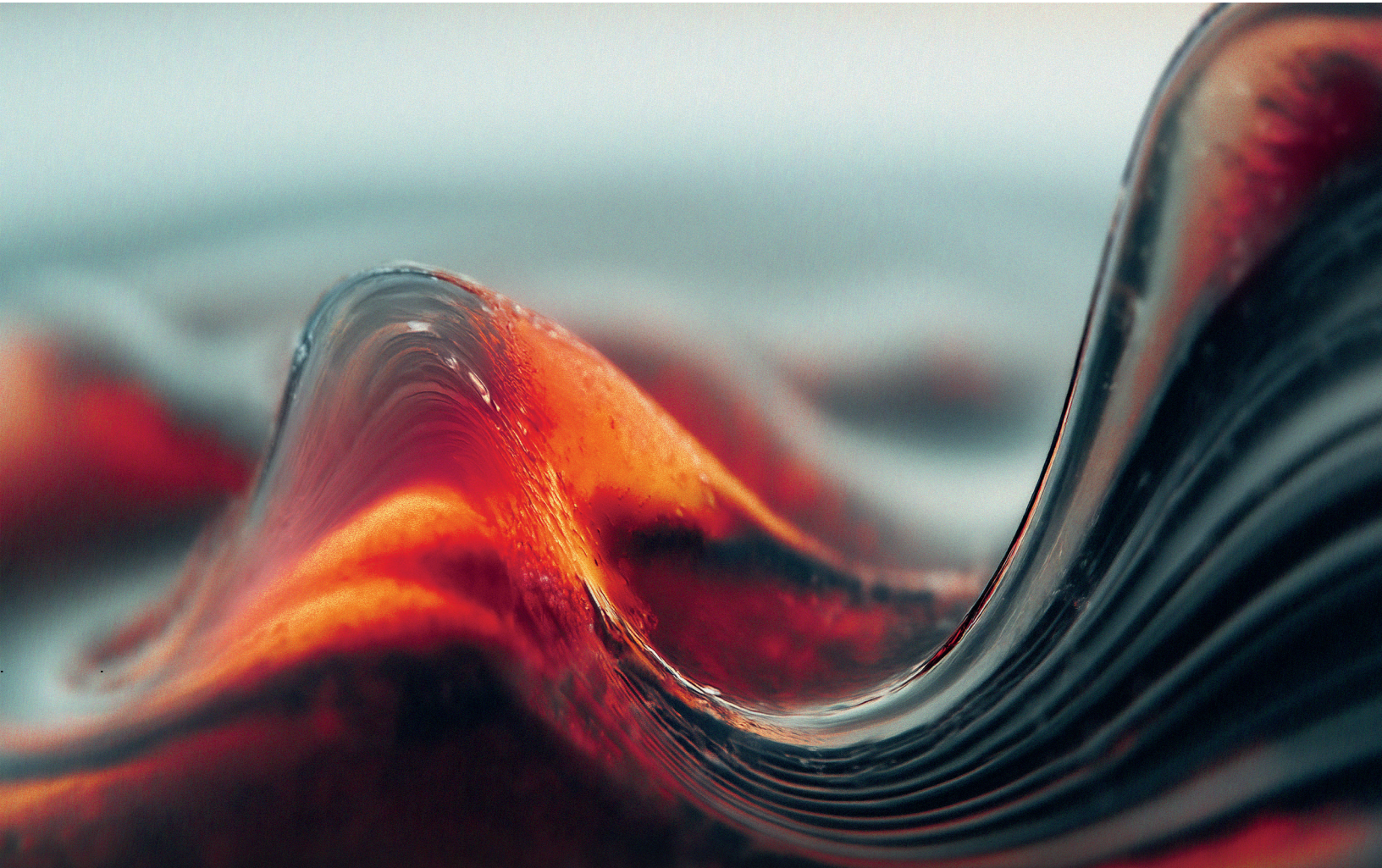
AI-Driven Drug Discovery



- Low-noise, highly reproducible datasets strengthen model training.
- Combinatorial liquid transfers accelerate hypothesis validation.
- Miniaturization increases data density at lower cost.
- Hybrid wet lab deep learning-driven screening for strong out-of-distribution (OOD) hit discovery.⁴

³ Ekas HM et al An Automated Cell-Free Workflow for Transcription Factor Engineering. ACS Synth Biol. 2024 Oct 18;13(10):3389-3399. doi: 10.1021/acssynbio.4c00471. PMID: 39373325; PMCID: PMC11494693.

⁴ Scalia G et al. Deep-learning-based virtual screening of antibacterial compounds. Deep-learning-based virtual screening of antibacterial compounds. Nat Biotechnol. 2025 Oct 24. doi: 10.1038/s41587-025-02814-6. PMID: 41136774.



John E. Gill

Senior Director of R&D, Codex DNA

"At Codex DNA, the Echo 525 Liquid Handler and Access Workstation from Beckman Coulter Life Sciences has become an integral part of our BioXp™ system gene synthesis workflows.

Processes that would take 8 hours with traditional liquid handlers now take less than 30 minutes with the Echo [acoustic and tip-less liquid handler], enabling the construction of DNA variant libraries at an unprecedented scale. Moreover, the high accuracy and precision of non-contact acoustic transfers ensure that we're delivering every oligonucleotide with the utmost confidence."

Integrated Laboratory Automation Solutions

Ready-To-Go Robotic Systems for Echo Liquid Handlers

Beckman Coulter Life Sciences delivers integrated laboratory automation solutions that support workflows from basic applications to advanced, high throughput operations. Each solution is designed to be configurable, allowing you to build an automation system that fits your specific needs — today and as they evolve.

Powered by Tempo Automation Control Software, these solutions use a modular design approach, enabling seamless scalability and easy reconfiguration. Adapt quickly to new assays, changing throughput demands, or expanding workloads — without redesigning your entire system.



Figure 10: ACCESS Automation platforms, ready-to-go robotic systems

Software, Automation, and Compliance

Echo Liquid Handlers are supported by an intuitive software ecosystem that enables rapid protocol development, offline simulation, and full traceability.

- Workflow-specific applications for cherry picking, dose-response, reformatting, and more
- Supported by Access automation platforms for scalable, end-to-end workflows

Echo Array Marker

Echo Array Marker simplifies custom array design to easily transfer samples and reagents from microplates to custom patterns on arrays, chips, and more.

Echo Cherry Pick Software

Echo Cherry Pick Software enables transfers of any volume of liquid from any source well into any destination well.

Echo Combination Screen Software

Echo Combination Screen software for Echo Liquid Handlers simplifies the creation of combinatorial layouts to save time without limiting flexibility.

Echo Dose-Response Software

Echo Dose-Response software provides a simple step-wise process for designing assay plate layout and creating dose-response curves.

Echo Plate Audit Software

Echo Plate Audit software measures sample properties by performing acoustic analysis in order to validate and monitor sample libraries.

Echo Plate Reformat Software

Echo Plate Reformat software offers a variety of liquid transfer functions, including assay plate replication, library compression, and customizable reformatting.

Tempo Automation Control Software

Tempo Automation Control Software offers a dynamic interface for scheduling and managing tasks. Sample management, plate handling, liquid handling, and more.

Consumables, Training, Service and Global Support

Echo Qualified Consumables

Beckman Coulter Life Sciences provides comprehensive support to maximize system performance and long-term value:

- Echo Qualified Consumables meet stringent specifications for exceptional performance.
- Only acoustically compatible plates are approved for Echo systems.
- Superior plate flatness ensures highly reproducible liquid transfers.
- Factory-developed fluid calibrations are tailored to each plate type.
- Accurate transfers are supported across a broad range of fluid types.
- High accuracy and precision are maintained throughout workflows.

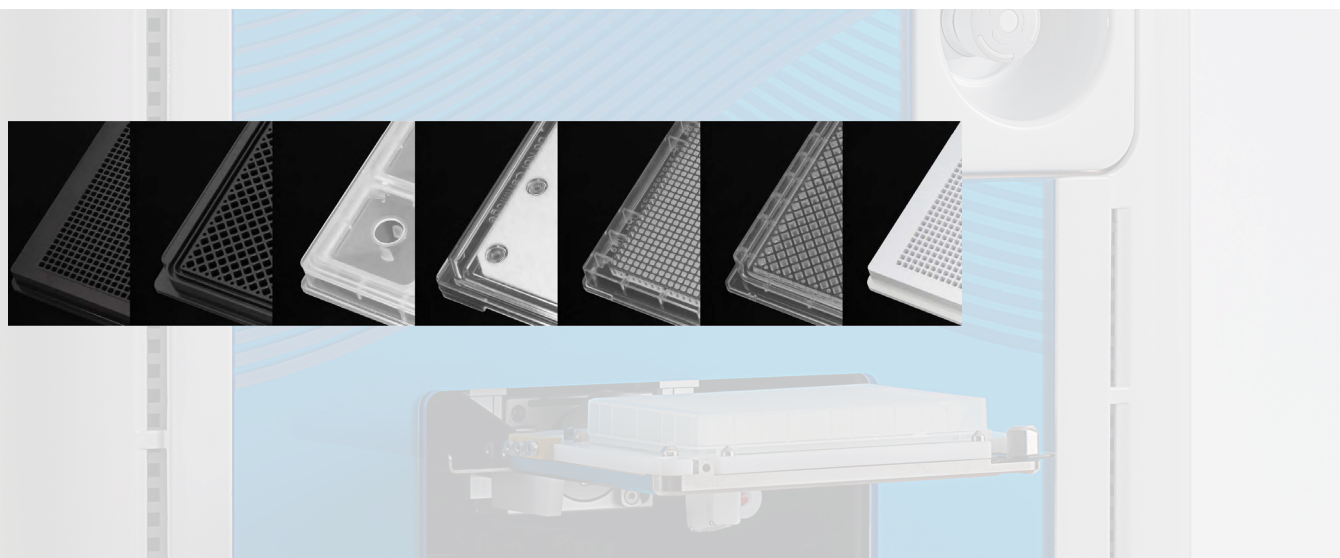


Figure 11: Echo Qualified Consumables

Training, Service, and Global Support

Beckman Coulter Life Sciences provides comprehensive support to maximize system performance and long-term value:

- Global field service and preventive maintenance
- Dedicated applications support experts
- Flexible service plans across the Americas, Europe, and Asia



Hannah Gordon
VP Product Enveda Biosciences

"Machine learning datasets need to be massive and based on real-world results. The Echo Acoustic Liquid Handler is a way to generate those datasets at scale while saving on precious resources."

Echo Technology — Impact That Amplifies

Driving discovery in the world's **top 25** pharma companies.

Echo Technology driving discovery in the world's major pharma and biotech companies.

82% increase in gene assemblies

Increase in gene assemblies: 18 hours in a standard workflow vs 3.2 hours with acoustic dispensing. Validated for gene assembly, pooling and normalization.

Up to **93%** faster

Process that would take 8 hours with traditional liquid handlers now take 30 minutes with the Echo Liquid Handler.

35 million tips saved by IDT

Annual tip reduction achieved through the deployment of Acoustic Liquid Handling Technology⁵.

141,456 available at-will transfer combinations

Available at-will transfer combinations from a 384-well source plate to a 384-well destination plate from the Echo Plate Reformat default screen. 384:384

Cited in over **2,000** scientific publications

Cited in >2,000 international major multidisciplinary and specialized journals (peer-reviewed as well as preprints).

⁵ <https://www.linkedin.com/pulse/reducing-plastic-pollution-one-tip-time-tom-speedy-jpvpe/?trackingId=ZjNb8j3GTnqeDAAs4Gv54w%3D%3D>



These products are not intended or validated for use in the diagnosis of disease or other conditions.

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2026-GBL-EN-109852-v2

