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Duet Co-Culture Platform

A new standard for Phage-Microbe Interaction Research

Executive Summary

Accelerating discovery in microbiome and phage research starts with solving the critical challenge of differentiating phage effects from microbial behavior in co-culture. Traditional tools struggle to distinguish contact-dependent vs. contact-independent (signaling-based) mechanisms, especially in anaerobic or compact environments where real-time monitoring is limited or impossible. These limitations slow progress, reduce clarity, hinder reproducibility, and make it harder to unlock the full potential of phage-microbe interactions.

This bottleneck impacts a wide range of disciplines. In food safety, understanding phage activity is essential for developing biocontrol strategies against pathogens. In environmental science and marine biology, phages regulate microbial succession and nutrient cycling. In biotechnology, they're key to engineering synthetic consortia and precision microbiomes. Without the right tools, vital microbial dynamics are missed or misinterpreted.

Cerillo's Duet Co-Culture Platform is purpose-built to address these gaps. The compact, anaerobic-compatible co-culture system armed with real-time phenotypic monitoring enables the physical separation of microbial species while preserving shared chemical signaling.

The result is clearer mechanistic insights, greater experimental reproducibility, and broader research flexibility. By reducing manual variability, streamlining data collection, and delivering live, high-resolution insight into microbial systems, Cerillo helps scientists do more than just observe microbial life—it accelerates discovery across every industry it touches.

Phage-Microbe Co-Culture: A Cross-Industry Catalyst for Innovation

Phage-microbe co-culture systems are essential tools for exploring how bacteriophages interact with their bacterial hosts in conditions that closely mimic natural environments. These models help uncover critical dynamics such as phage resistance, microbial succession, and biofilm disruption. They are highly valuable across a wide range of industries.

Academic and research institutions (e.g., NIH, CDC, EPA, USDA-ARS, and universities) rely on co-cultures to deepen our understanding of microbial ecology, phage-host co-evolution, and build predictive models for microbiome behavior under stress or therapeutic intervention.

In biotechnology and pharmaceuticals, phage-microbe co-culturing is instrumental in developing alternatives to antibiotics. It supports research into antibiotic resistance by identifying phage therapy strategies effective against multidrug-resistant bacteria. It also enables microbiome engineering, allowing scientists to map how phages shape gut and skin ecosystems. This is critical for developing precision probiotics and treatments for digestive and immune-related diseases.

Food safety and agriculture are rapidly adopting phage-based interventions tested through co-culture systems. These allow scientists to evaluate phage effectiveness in reducing foodborne pathogens like Listeria, Salmonella, and E. coli during processing and storage. In crop systems, phages offer environmentally friendly biocontrol solutions to combat plant pathogens and improve soil health. Co-cultures also inform the development of animal feed strategies that support healthier gut microbiomes in livestock.

In environmental and marine microbiology, co-culture research is unlocking how phages influence nutrient cycling, carbon dynamics, and methanogens in soil, freshwater, and ocean systems (Goff et al., 2024). These insights are vital for optimizing bioreactors, improving waste treatment, and modeling ecological responses to climate change.

By connecting fundamental science to applied challenges, phage-microbe co-culturing has become the cornerstone of innovation for health, food, agriculture and environmental sustainability.

The Research Gap: The Hidden Bottlenecks in Co-Culture Research

While the ultimate goals of phage-microbe co-culture research span a wide spectrum—from developing new antimicrobial therapies and controlling microbial populations to enhancing biotechnological processes and uncovering ecological dynamics—the obstacles confronting researchers, lab managers, and scientists are strikingly universal. Despite advances in microbiology, conventional tools are simply not keeping pace with modern research needs.

Operational, physical, and technical limitations plague traditional plate readers and co-culture setups. Most systems require manual tracking, which causes delays, increases error rates, and introduces bias. The scale of experimentation is typically restricted to a single reader, limiting throughput and replicability. These systems also demand constant physical presence, a barrier in today's push toward automation and remote research.

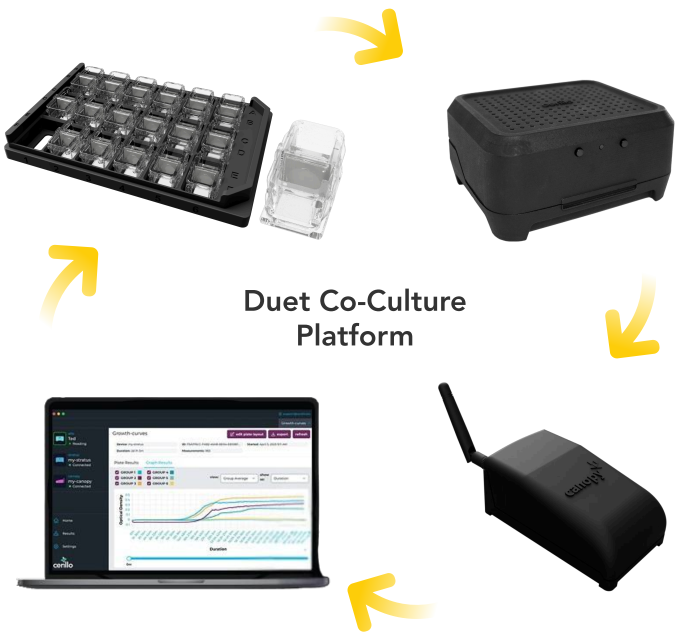
The hardware itself presents challenges. Delicate plate readers fail in harsh environments, struggle with power or computer access limitations, and often cannot fit into compact or anaerobic chambers, constraining where and how experiments can be run. Benchtop space is limited, and the inflexibility of plate formats adds further constraints on experimental design.

Software and data workflows also lag. Complex interfaces slow analysis, and incompatible data tools across devices make real-time collaboration difficult. Data analysis is tedious, while setup validation remains resource-heavy, consuming time and personnel. In addition, the risk of cross-contamination persists in open or poorly compartmentalized systems, and undermines the integrity of co-culture studies.

Beyond logistics, these systems offer poor insight into real-time dynamics, making it difficult to study complex communities or observe phage-

Cerillo's Duet Co-Culture Platform:

It's not just a tool. It's a rethink of how we study life at the microbial level.



Your Complete Solution to:

- Accelerate discovery
- Reduce risk
- Save time
- Drive decisions
- Enhance reliability
- Increase mobility

bacteria interactions as they unfold. Researchers are left with narrow experiment options, limited access to growing cultures, and time-consuming, inflexible hardware builds.

In total, these challenges create a significant research gap—one that holds back innovation, scalability, and discovery across clinical, industrial, and ecological microbiology.

Solving the Complexities of Phage-Microbe Co-Culture with Cerillo's Duet Co-Culture Platform

Researchers, scientists, and lab managers working in microbiology, medicine, environmental science, and biotechnology face persistent challenges co-culturing phages and microbes—especially in anaerobic or complex environments. Whether the objective is to develop novel therapies, control microbial populations, enhance bioprocessing, or explore microbial ecology, conventional lab tools are often limited in scalability, precision, and environmental compatibility. The Duet Co-Culture Platform addresses these challenges head-on through its integrated system: the Duet Co-Culture Plate, Alto Microplate Reader, Labrador Software, and Canopy Wireless Access. Cerillo's Duet Co-Culture Plates' overcome issues of cross-contamination and poor experimental resolution by using a 0.2 µm membrane barrier that allows chemical signaling between microbial populations while keeping them physically separated. For even finer control, researchers can also use a 0.05 µm barrier, which is specifically designed for phage studies due to the smaller size of viruses compared to bacteria. These customizable barrier options make it possible to adjust phage-to-microbe ratios and control interaction modes with precision. This approach was used in a study comparing engineered and parental E. coli to model live biotherapeutic engraftment dynamics (Siguenza et al., 2025).

This platform ensures experimental integrity while enabling the study of direct and indirect interactions—critical for understanding phage-host behavior. Its 18-well multiplexed format supports high-throughput experiments, and the

Two Months of Work in Just Two Weeks

"Using Duet, my postdoc was able to achieve results in two weeks that would have taken two months with traditional methods. The system has allowed us to significantly improve the efficiency of our experiments, providing us with high-quality data in a fraction of the time.

— Alan J. Wolfe, Ph.D., Professor of Microbiology and Immunology, Loyola University Chicago

- Impact -

75% reduction in experimental time

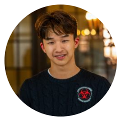
Higher data quality

Accelerated microbiome interaction insights

Cut Crystallization Experiment Time in Half, Solved Sterility Issues

Duet has cut our experiment time in half and eliminated sterilization issues we faced with older systems. Its high-throughput capabilities have also allowed us to explore the role of various bacterial genera in processes like struvite stone formation more comprehensively.

— David Liu, Researcher, Queen's University Medical School



- Impact -

50% reduction in experimental time

Solved long-standing sterilization issues

Enabled broader microbial exploration

accessible wells allow for real-time sampling and continuous validation throughout the growth cycle. With real-time phenotyping, researchers can observe population shifts and phage lysis dynamics, resulting in more accurate, actionable data. This was key in a study monitoring C. difficile growth and bile salt metabolism in real time to explore microbial signaling and biofilm behavior (Martinez Aguirre, Adegbite, & Sorg, 2022).

Complementing this is the Alto Microplate Reader, which is the smallest on the market—so compact it fits in the palm of your hand. Its rugged, portable build and compact footprint allow it to function inside anaerobic chambers, even remote field setups—places traditional readers simply cannot go. Alto supports multiple well formats and co-culture plates, offering unmatched versatility for labs studying microbial dynamics under a range of environmental conditions.

To simplify data analysis and compliance, Labrador Software features intuitive visualization tools, rapid experiment setup, and compatibility with third-party plate reader data. It supports 21 CFR Part 11 compliance, ensuring regulatory readiness, while its IQ/OQ validation module minimizes the burden of setup and qualification.

Meanwhile, Canopy Wireless Access enables real-time streaming, multi-device connectivity, and complete wireless operation. These features eliminate the need for physical presence or manual tracking. Researchers can remotely monitor growth curves, scale their setups, and make mid-experiment decisions faster.

Whether in academic institutions, biotech/pharmaceutical development, agriculture, or environmental microbiology, Cerillo's Duet Co-Culture Platform offers a smart, scalable, and compact solution for the modern lab. It enhances experimental reliability, reduces risk, increases throughput, and provides flexibility—delivering everything today's microbiologists need to push scientific boundaries in microbial co-culture research.

Case Study: Dr. Bryan Hsu, Virginia Tech

Unraveling Gut Secrets: The Role of Bacterial Viruses (Phages)

Researcher: *Bryan Hsu, Ph.D. Assistant Professor of Biological Sciences, Virginia Tech*

Research Focus: Dr. Hsu investigates the role of bacterial viruses (phages) in shaping the gut's chemical environment and bacterial interactions. Using Cerillo's Duet Co-Culture Platform, his study will explore the potential for treatments related to gastrointestinal conditions. His research offers insights into how gut viruses influence bacterial interactions in the gut microbiota.

Using Cerillo's Research Platform: Dr. Hsu's primary objective is to characterize the influence of gut phages on metabolite availability and crossbreeding among bacteria in the gut microbiota. His team expects to discover new principles in how phages influence colonizing communities of bacteria and to develop and leverage therapeutics these interactions. He uses genetic engineering to modulate phage function and expect to apply these strategies.

Key Metrics for Co-Culture: Usually, Dr Hsu uses selective plating to track individual species among co-cultures, but this severely limits the types of bacteria he can examine. He needs an engineered selection marker or selective plating conditions that can inhibit other species.

Key Benefits of Using Cerillo's Duet Co-Culture Platform:

- **Physical Separation with a 0.2 µm Barrier**: The physical separation between wells allows for nutrients to be shared, and bacteria to be separated.
- **Real-Time Phenotyping:** Bacterial separation simplifies how Dr. Hsu would quantify the individual species of interests, making it possible to rapidly quantify bacterial cell numbers by OD and not having to wait for 16S amplicon sequencing, which may not be able to distinguish between taxonomically similar species that may have very different functions.

Desired Outcome: Dr. Hsu hopes to demonstrate the significance of phage predation in communities of gut bacteria on crossbreeding and how they can support the growth of other species through cell lysis. These findings may pave the way for next-generation microbiome therapeutics, guided by ecological principles of phage-bacteria interaction.

Cerillo's Duet Co-Culture Platform empowers researchers like Dr. Hsu to explore complex microbial ecosystems with greater clarity, speed, and confidence—bridging the gap between ecological insight and clinical innovation.

Potential Uses for the Duet Co-Culture Platform

Academic and Research Institutions: Institutions rely on co-culture systems to explore the fundamental biology of phage-microbe interactions. These studies provide foundational knowledge for fields such as microbiology, systems biology, and molecular genetics.

Use cases include:
- Developing and testing bacteriophages as therapeutic agents to combat antibiotic-resistant bacteria.
- Investigating the molecular dynamics between phages and their bacterial hosts.
- Studying the evolution of bacterial resistance to bacteriophages.
- Co-Culturing phages with bacterial pathogens to develop rapid diagnostic tools.
- Understanding the role of phages in natural microbial communities.
- Investigating the effect of bacteriophages on human or animal microbiomes.
- Developing phage-based vaccines or adjuvants for immunization.
- Using bacteriophages to assess bacterial susceptibility to antibiotics.

Biotechnology and Pharmaceuticals: Phage research in the biotech and pharma sectors is focused on applying this knowledge toward product development, including therapeutic, diagnostic, and synthetic biology innovations.

Use cases include:
- Engineering bacteriophages for gene delivery into bacteria.
- Enhancing microbial biosynthesis of valuable compounds using bacteriophages.

Environmental Science: Environmental scientists are increasingly using phage-based approaches to study and manage microbial ecosystems in water, soil, and industrial settings.

Use cases include:
- Using bacteriophages to control microbial populations in industrial bioreactors.
- Co-Culturing phages with bacteria in wastewater treatment processes.
- Using phages to degrade environmental pollutants or harmful microbial contaminants.
- Exploring the potential of phages in industrial processes as biocatalysts.

Agriculture and Animal Health: In agriculture and livestock science, phages are leveraged as natural, targeted solutions for improving plant health, animal nutrition, and food safety.

Use cases include:
- Using phages to control plant pathogens and spoilage microorganisms in agriculture.
- Developing biofertilizers that incorporate bacteriophages to enhance soil microbiome health.
- Using phages to break down microbial biofilms.

Summary: Smarter Tools, Stronger Insights: A New Era in Co-Culture

Cerillo's Duet Co-Culture Platform redefines what's possible in phage-microbe co-culture research. This solution delivers clarity, reproducibility, and real-time insights at a scale that meets the demands of today's microbiology. From anaerobic gut studies to industrial bioreactors, researchers now have a system that offers precise isolation, continuous validation, and seamless integration with standard lab tools.

Whether you're studying resistance in medical pathogens, designing synthetic consortia in biotechnology, or applying phage biocontrol in agriculture, Cerillo empowers faster, smarter experimentation with fewer trade-offs. The platform closes the gap left by bulky, manual, or inflexible systems, and enhances reliability, streamlines data workflows, and supports breakthrough discoveries in microbiome science.

With a palm-sized microplate reader, intuitive software, and a high-throughput co-culture plate design, Cerillo delivers the clarity and control scientists need to push research forward—across the lab, field, or glovebox. It's not just a tool. It's a rethink of how we study life at the microbial level.

Learn more about how we are helping researchers, scientists, and lab managers accelerate discovery. https://cerillo.bio/co-culture-champion-contest-winners/.

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