Lathrop Celebrates 33 years of Success

Lathrop has been providing top notch design and engineering services since its founding in 1982.

Upcoming Events

- **AACC 2015**

  July 26-30, 2015: Atlanta, GA

  Booth 2056

- **ASHG 2015**

  October 7-9, 2015: Baltimore, MD

  Booth 814

Lathrop exhibits and attends many tradeshows throughout the year across the country. Come visit us at our booth. If you cannot make it to the tradeshow, call us and we can schedule a visit while we are in your area.

LathropNEWS Preview

Topics of Upcoming Newsletters

Optics in the Lab

Gap Analysis

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ISSUE 115 Biology In-House

LathropNEWS

this issue

If you have product development challenges...

We have the solutions.

Product Expertise

Life Science Instrumentation

Medical Device and Diagnostic Instruments

Production Automation

Optics and Imaging

Consumables / Disposables

Lab on a Chip

Fluidics

Lathrop has a seasoned staff of designers and engineers in the fields of:

- Project Management
- Mechanical Engineering
- Systems Engineering
- Electronics Design
- Optics Engineering & Design
- Industrial Design & Human Factors
- Software & Firmware Development

ISO 9001 CERTIFIED

The Importance of In-House Biological Capability

Article By Greg Rogers, Aileen Espinosa, and Randy Marks ~ Lathrop Engineering Team Members

Biology is Dynamic!

Biological systems display variation that is often not found in other physical systems. Living organisms change moment by moment and are impacted by virtually everything in their environment; making rigorous process controls a requirement for successful experimentation. Furthermore, each organism within a sample responds differently to stimuli, which causes aggregate changes that vary not only cell to cell, but sample to sample as well. Consequently, statistical methods are often necessary to understand correlations and causal relationships.

Why is it important to include wet lab capabilities during product development?

The lab environment allows us to have immediate feedback on hardware design and modifications during the R&D process. It provides an in-house facility at Lathrop where we can develop, test, optimize and trouble-shoot associated reagents, biologicals, consumables processes to maximize performance prior to product design and development.

Because many variables (e.g. concentrations and composition, pH, temperature, process steps, material compatibility, scale up, etc.) affect quality, concurrent development of biological and instrumentation processes allows the system design to be tested prior to instrumentation development.

Aileen Espinoza, Lathrop Laboratory Scientist
Photography by Greg Rodgers 2015

Our team now brings experience in the fields of sequencing, PCR, flow cytometry, immunology, microbiology, lab-on-a-chip technology, bio-chemistry, molecular biology and chemistry. With a bio-lab facility, which can be configured to match project needs, Lathrop can now offer support in biological process development as well as hardware and systems engineering.

"We established a state of the art lab for preparing and analyzing biological specimen."

Sample Preparation in Product Development

Sample preparation undergoes a development process, which can scale from manually produced samples to micro, nano, or even pico scale sample prep with delivery by automation. Scaling the sample preparation process and creating reliable automated techniques requires changes in composition, processes, handling and delivery of samples to instrumentation during development.

In general, good aseptic techniques are essential in maintaining sterility, sample integrity and eliminate potential contaminants which can confound the results. Sample handling requirements depend upon the nature of the sample, its intended use, and its environment.

Precision and accuracy are important in measurement of samples and reagents in the laboratory. All laboratory tools should be calibrated against NIST referenced standards by an independent lab annually.

Case Study

Development of *LumiSort*™ for Microbix Biosystems

In Lathrop's view, life sciences applications are taking on a new prominence in emerging technologies as the genomic revolution continues to drive innovation in biology and medicine. In our clients' projects, we have seen molecular biology applications emerge as the forefront of research and product development. In medicine, we see a trend to targeted therapy based on biomarker analysis from pathological specimens. Diagnostics platforms are increasingly built around hybridization arrays, and PCR -based targeted sequencing methods. To complement this, new methods of detection with high sensitivity and specificity are being developed using techniques based on 3D molecular models, leading to the development of novel diagnostics and therapeutics.

Lathrop Engineering has been a leading contributor to the development of both medical and research instruments for bio- and medical-science, in both diagnostics and therapeutics. Our clients include: BD, Agilent Technologies, Life Technologies, Beckman Coulter, Corning, Novartis, ThermoFisher, Abbott and Illumina, among many others at the forefront of molecular medicine and medical device development.

These growing technologies are pushing the boundaries across the biological sciences including in the field of animal breeding. Microbix Biosystems decided to partner with Lathrop Engineering for the development of a sperm sexing technology, which utilizes some of these advancements for reduced cost, higher throughput, and better outcomes than current livestock sperm sorting systems. After an initial assessment spanning the definition of performance specifications, the description of technical risks and mitigation strategies, and work to understand the underlying business model for sexed semen in the livestock industry, we kicked off the first phase of the project in early 2014.

By the end of the year, Microbix was able to announce to its shareholders that Lathrop's handpicked team, working with Microbix' scientists, had successfully delivered on the first phase of the program to create an instrument for sperm sexing. The announcement signaled development of an integrated engineering breadboard demonstrating the operation of the technology in accordance

"Analyzing live sample is integral to our development."

with the claims of Microbix' intellectual property, utilizing numerous insights and innovations provided by Lathrop engineers.

In delivering the first-phase program for LumiSort, we established a state of the art lab for preparing and analyzing biological specimens (biosafety level 1). We also brought on board a dedicated Laboratory Scientist to develop methods, establish process controls, and perform QA for the biological side of the sorting technology. The foray into cellular biology, together with the development of a comprehensive cellular 'wet-lab' capability marks a significant departure for Lathrop, and a substantial new capability that we can offer our clients to significantly speed and streamline product developments in biological technologies.

LumiSort's developments highlight the value of these new capabilities. During the development of the instrument, it has been vital to develop a capability for cell handling and assessment and to create systems for producing statistically valid insights from intrinsically variable samples. Analyzing live sample is integral to our development because it allows us to rapidly assess the effects of our technology on the sperm and implement modifications as necessary.

Our team now brings experience in the fields of sequencing, PCR, flow cytometry, immunology, microbiology, lab-on-a-chip technology, biochemistry, molecular biology and chemistry. With a bio-lab facility, which can be configured to match project needs, Lathrop can now add support in biological process development to our capabilities in hardware and systems engineering.

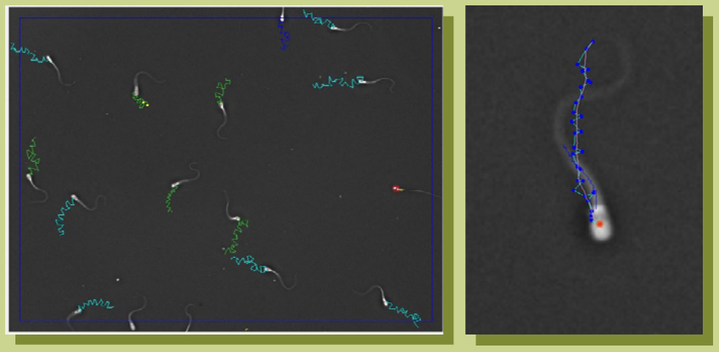

Figure 1. Bovine spermatozoa stained with 5µl/ml of Hoechst 33258 and incubated at ~35°C for 2 minutes and analyzed on the IVOSII CASA microscope system. This staining procedure is part of our Quality Assessment done on all of our samples to determine cell viability and motility. Non -viable cells readily take up the stain as these cells have permeable membranes. The software detects the fluorescence taken up by the dead cells and places a red box over the head of the sperm. Color tracks indicate motility patterns of viable cells: light blue indicates progressive cells, green indicates motile cells, dark blue indicates a cell that entered the field of view late. Figure 2. A close up of a progressive sperm cell. The blue track indicates the motility pattern.

Images above from Lathrop Engineering's Lab provided by Aileen Espinoza

Experience in Laboratory Methods and Fields

- **Sample processing and collection**
- **Nucleic Acids:** PCR, q/RT PCR, DNA extraction, purification, gel electrophoresis, RNA extraction, reverse transcription, primer design.
- **Bacterial cloning:** Litigation, digest with restriction endonuclease, transformation
- **Proteins:** Isolation, expression, purification, western blot
- **Tissue culture:** Cell line maintenance, *in vitro* experimentation.
- **Immunoassays:** ELISA, luciferase
- **Flow Cytometry:** Operation, analysis and sample prep.
- **Microbiological isolation and identification of microorganisms.**
- **Labels:** Use of stains, dyes, and fluorescent markers to identify and quantify species.
- **Spectroscopic analysis:** Fluorescent markers, FRET, quatitative mulit-chroma analysis