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LAMPIRE
BIOLOGICAL LABORATORIES

- ABOUT LAMPIRE
- OUR FACILITY
- OUR TEAM
- QUALITY MATTERS
- BIOLOGICAL PRODUCTS
- CUSTOM ANTIBODY SERVICES

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CONFIDENTIAL

Please be advised that the presentation shows confidential information and is not to be shared or disclosed to any third party. This is an inside look at our operations and may include details on processes, protocols, or equipment that are proprietary to our organization.

We ask that you maintain the confidentiality of this information to protect our competitive advantage. Thank you for your cooperation.

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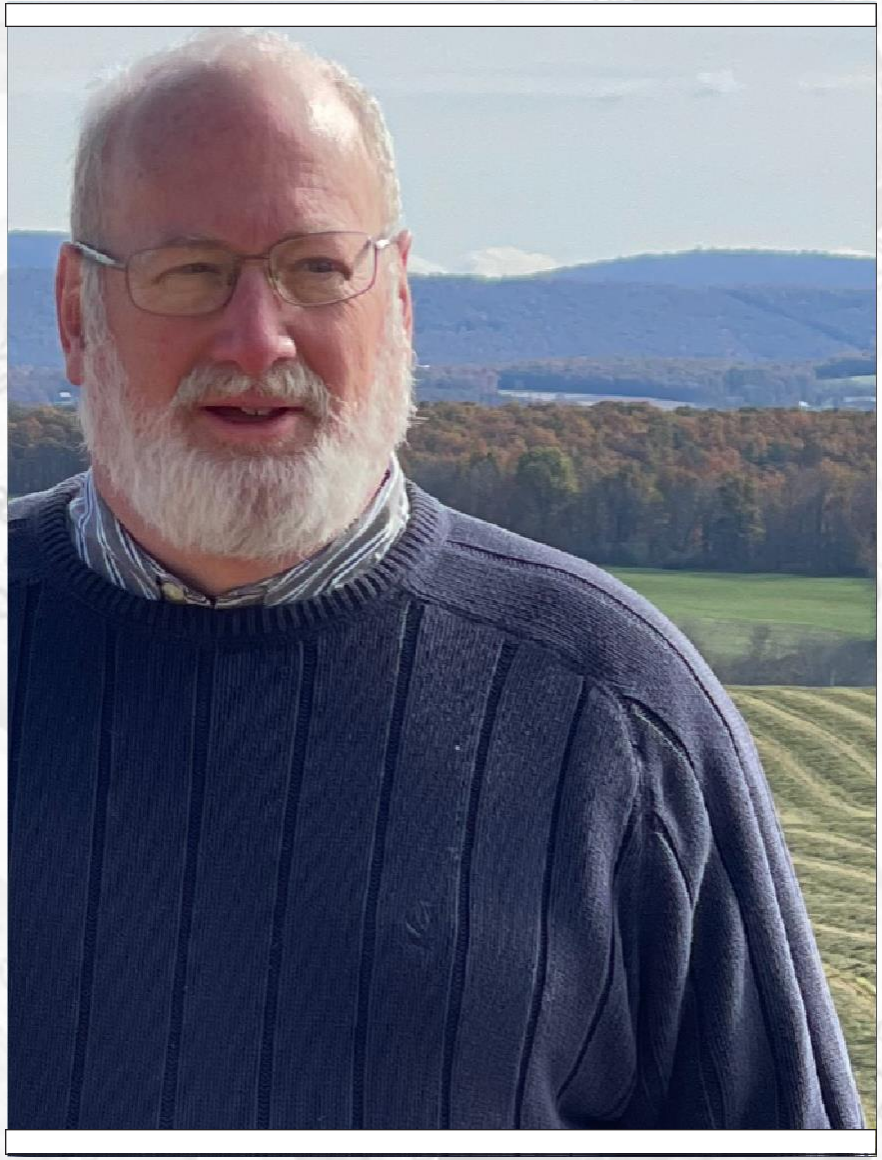

ABOUT LAMPIRE

Founded in 1977, Gregory F. Krug, and his team of employees, have built LAMPIRE into the company it is today. With multiple farming campuses and four strategically located state-of-the-art laboratory facilities throughout Pennsylvania, LAMPIRE continues to expand its reach and capabilities.

Encompassing over 600 acres, LAMPIRE houses over 7,000 animals, representing over 20 unique species. LAMPIRE has over 170 experienced laboratory and animal husbandry technicians manufacturing our products and services under the guidelines of ISO 13485:2016 and AAALAC.

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DIAGNOSTICS

PHARMACEUTICAL

BIOTECHNOLOGY

MEDICAL DEVICES

ABOUT LAMPIRE

LAMPIRE's extensive and diverse product offerings, along with its commitment to quality, have established the company as an invaluable partner to the diagnostic, pharmaceutical, biotechnology, and medical device industries.

With more than 5,000 part numbers assigned, LAMPIRE provides a wide range of tools and materials to support scientific and medical advancement. The company's rigorous QMS ensure that customers receive the highest quality products, earning LAMPIRE a reputation as a trusted and dependable supplier to these industries.

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OUR FACILITY

BIOTECH RESEARCH & RESOURCE CENTER

PIPERSVILLE, PA

LAMPIRE's Pipersville Biotech Research & Resource Center is an advanced laboratory facility that covers 18,000 square feet of space. Established in 1997, it has certified class 2, 5, and 7 rooms/hoods that enable it to perform various biotechnology processes such as cell culture, cell banking, viral transport media preparation, purification, monoclonal antibody production, recombinant B-cell isolation, and hybridoma development. The facility also has a modern small animal vivarium that supports its research activities.

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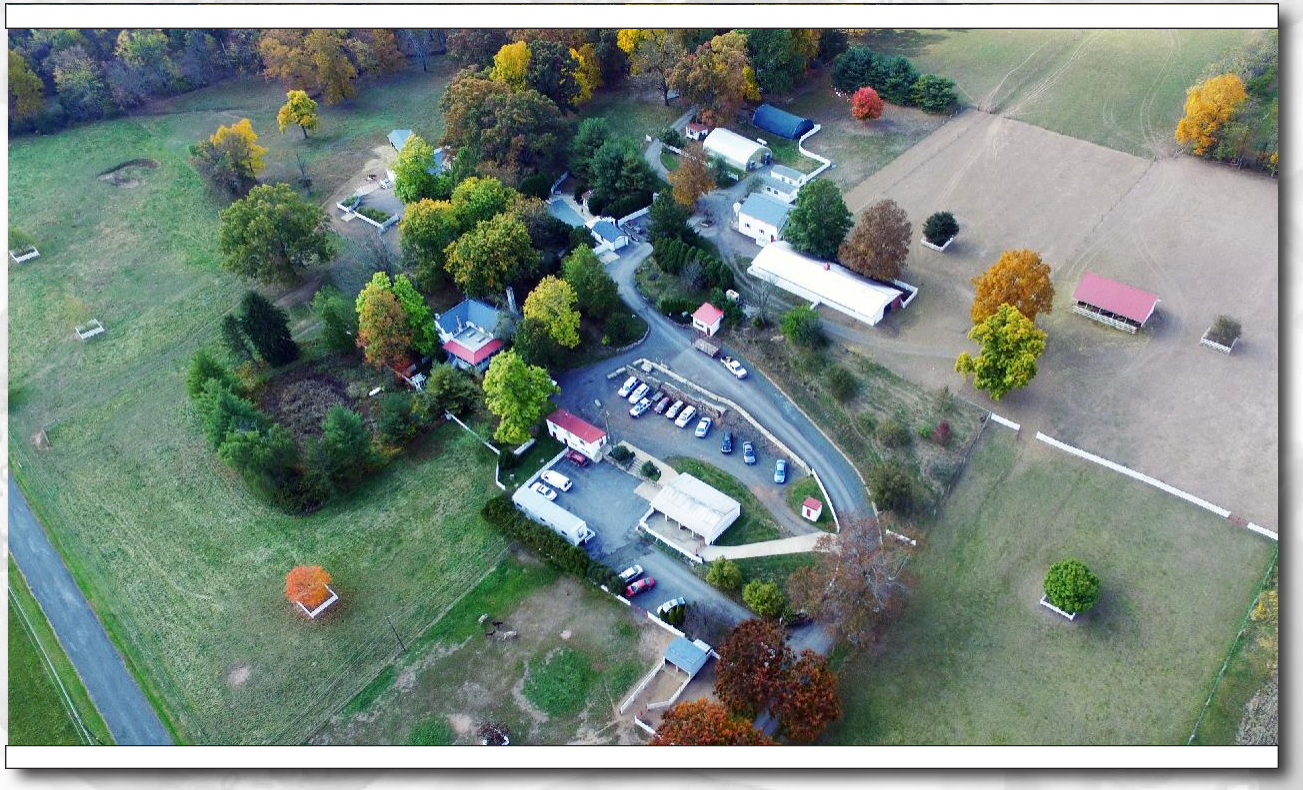

OUR FACILITY

PHARM CAMPUS & COPORATE HEADQUARTERS

OTTSVILLE, PA

LAMPIRE's Ottsville Farm is a 40-acre facility that houses both small and large animals in state-of-the-art vivariums and donor herd enclosures. Established in 1982, it is the company's first and oldest location, and it has undergone several expansions and improvements over the years to enhance its quality and efficiency. The farm also serves as the headquarters for LAMPIRE's office support team members, who work in various departments such as customer service, marketing, IT, accounting and HR.

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OUR FACILITY

PROCESSING LABORATORIES

COOPERSBURG, PA

LAMPIRE's Coopersburg Laboratory is a specialized facility that handles the collection and processing of various biological materials, such as specialty organs and tissues, abattoir-related blood and materials, donor animal blood products, and LAMPIRE's human blood products. The laboratory was acquired by LAMPIRE in 1986 and has been continuously updated ever since to meet the clients' needs. The laboratory spans 5,000 square feet of space and has state-of-the-art infrastructure and workflow that enable it to deliver high-quality products and services.

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OUR FACILITY

BIOTECH INCUBATOR SITE

MILLERSVILLE, PA

LAMPIRE's Millersville Incubator Lab is a shared and secured laboratory space that offers various biotechnology services. The laboratory has a Biosafety Level 2 Viral Lab that performs antiviral testing and other custom-designed assays, such as antibody/antigen ELISA and live cell ELISA. The laboratory also has a range of equipment to support its research activities, such as biological safety cabinet, CO2 incubators, automated cell counter, microscopy, LN Dewars, plate reader and spectrophotometry. The laboratory covers approximately 250 square feet of space and provides LAMPIRE an opportunity to work in conjunction with an esteemed university.

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OUR FACILITY

PHARM CAMPUS

EVERETT, PA

LAMPIRE's Everett Pharm Campus is a state-of-the-art in vivo facility that covers over 600 acres of land and hosts a variety of closed donor herds for custom antisera, donor sera, and red cell production programs. The campus has over 32 animal vivariums that can accommodate multiple species, from small laboratory animals to larger domestic and unique breeds. The campus is AAALAC accredited and has a state-of-the-art small animal vivarium among its featured facilities. The campus offers flexible and reliable solutions for LAMPIRE's operations and clients.

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OUR FACILITY

BIOPROCESSING LABORATORY

EVERETT, PA

The Everett Bioprocessing Laboratory, constructed in 2007, comprises 18,000 square feet of cutting-edge laboratory space. Located in close proximity to the Everett Pharm Campus, this facility specializes in immunochemistry services, tissue processing, blood product processing, and purification. Major equipment and space renovations, aimed at meeting client demand, have led to the creation of specialized contract manufacturing areas and have attracted a talented, diverse workforce to LAMPIRE.

LAMPIRE BIOLOGICAL LABORATORIES

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OUR TEAM

Our team is comprised of over 170 professionals with diverse backgrounds and skill sets

Our experienced and customer service-oriented teams are what sets LAMPIRE apart from others in the industry

We have a comprehensive QMS system in place to ensure the highest level of quality, safety, and compliance

Our team adheres to standard operating procedures for day-to-day processes and committed to having attending veterinarian at each site

We comply with ISO 13485:2016, AAALAC, FDA, USDA, and OLAW regulations

Our team includes AALAS certified technicians.

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OUR TEAM

Our entire animal care program is overseen veterinarian professionals.

Each team works seamlessly to ensure efficient and effective execution of our clients' projects.

We are committed to investing in our personnel's continuous training and development to remain at the forefront of the industry.

We have highly trained staff that includes:

- Animal & Veterinarian Care Teams
- Manufacturing & Production Personnel
- Project Manager & Support Staff
- Customer Service/ Sales Representatives
- Marketing & Public Relation Specialist
- Scientific Technical Development Staff
- Quality Assurance Teams
- Global Logistics Coordinators

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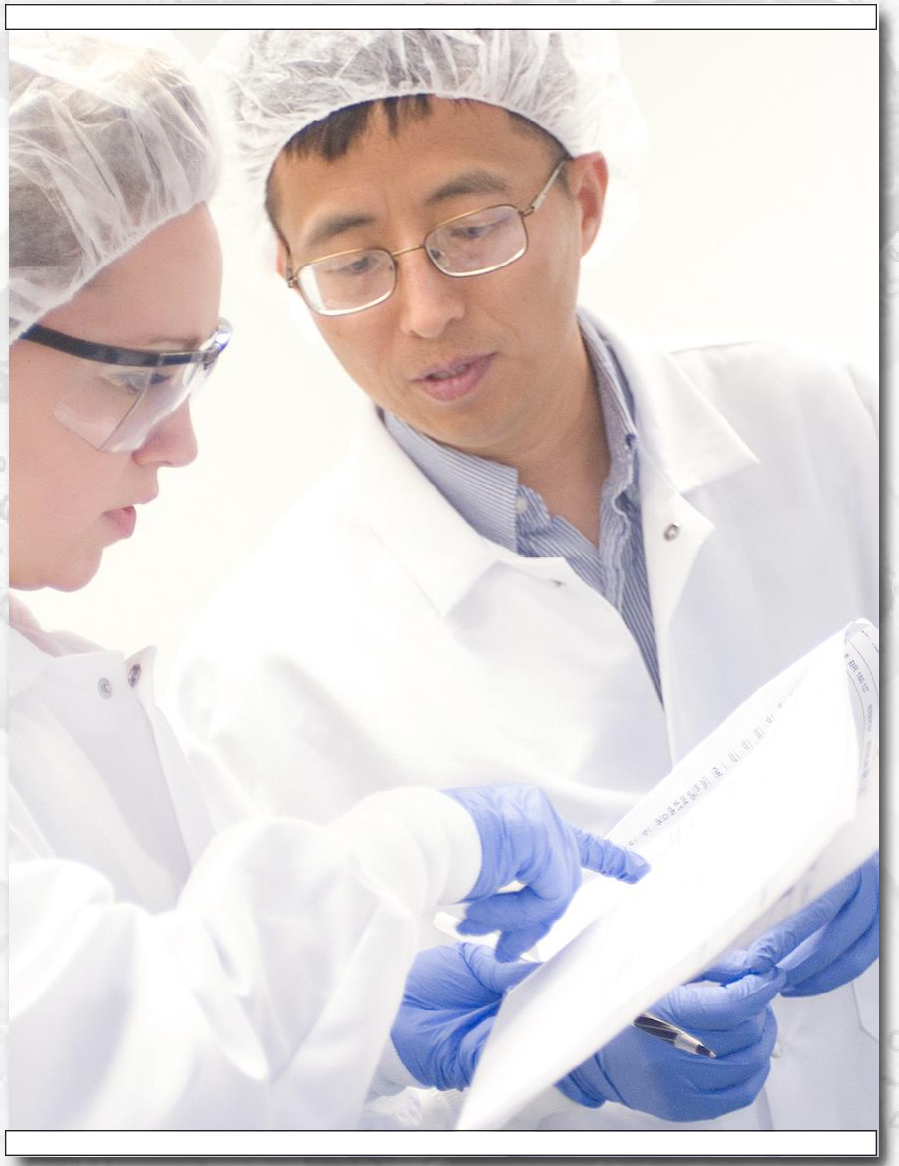

QUALITY POLICY

To provide consistently and competitively, high quality, reliable products and services in conformity with **ISO 13485:2016** and our customers' specifications; while continuing to improve the effectiveness of our quality management system.

In pursuit of this mission, we are dedicated to the following: Treating our customers in a courteous, thoughtful manner; Maintaining our commitment to the health and wellbeing of our animals, according to AAALAC guidelines; Fostering innovation and creativity in research; Producing high quality products at fair prices;

Striving to GET IT RIGHT THE FIRST TIME...EVERY TIME!

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ACCREDITATION

ISO 13485:2016

aaalac INTERNATIONAL

FDA

USDA

Office of Laboratory Animal Welfare OLAW

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OUR ANIMAL CARE PROGRAM

LAMPIRE's Animal Husbandry Program is a core value of the company and reflects its commitment to animal welfare and ethical standards. The program ensures that the animals are provided with optimal care and conditions by the staff, who are trained and certified in animal care.

The program includes:

- *A well-regulated diet that meets the nutritional needs of the animals*
- *Daily observation and monitoring of the animals' health and behavior*
- *Housing that maximizes efficiency and productivity, ensures cleanliness, safety, appropriate light/dark cycles, and good visibility*
- *Knowledgeable onsite staff who handle animal care and respond to any issues promptly*
- *On-staff veterinarians who oversee the health of all animals and provide medical treatment as needed*
- *Regular inspections by the internal IACUC committee and external agencies such as USDA and AAALAC to ensure compliance with all regulations and guidelines*

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OUR ANIMAL CARE PROGRAM

LAMPIRE's Animal Enrichment Program is a vital part of the company's animal welfare policy and reflects its respect and appreciation for the animals. The program aims to provide the animals with stimulating and engaging activities that allow them to express their natural behaviors and enhance their well-being.

The program includes:

- *Nutritional supplements that offer variety and taste to the animals' diet*
- *Foraging and/or nesting opportunities that challenge the animals' cognitive and physical skills*
- *Chewing/gnawing aides that satisfy the animals' oral needs and prevent boredom*
- *Social interaction and companionship that foster the animals' emotional and social development*

The program has been implemented for every species onsite for over 47 years, and it is constantly updated and improved by the staff, who are passionate and creative about animal care. The program not only benefits the animals, but also the company, as it helps to create quality products and services for the clients.

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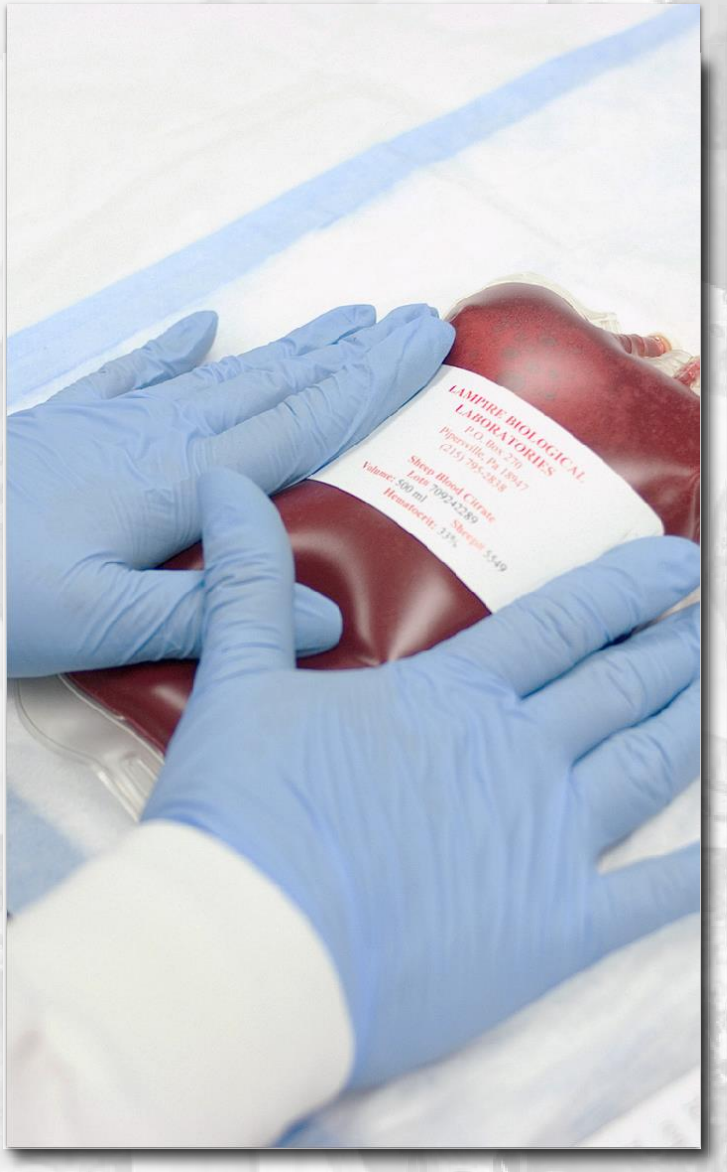

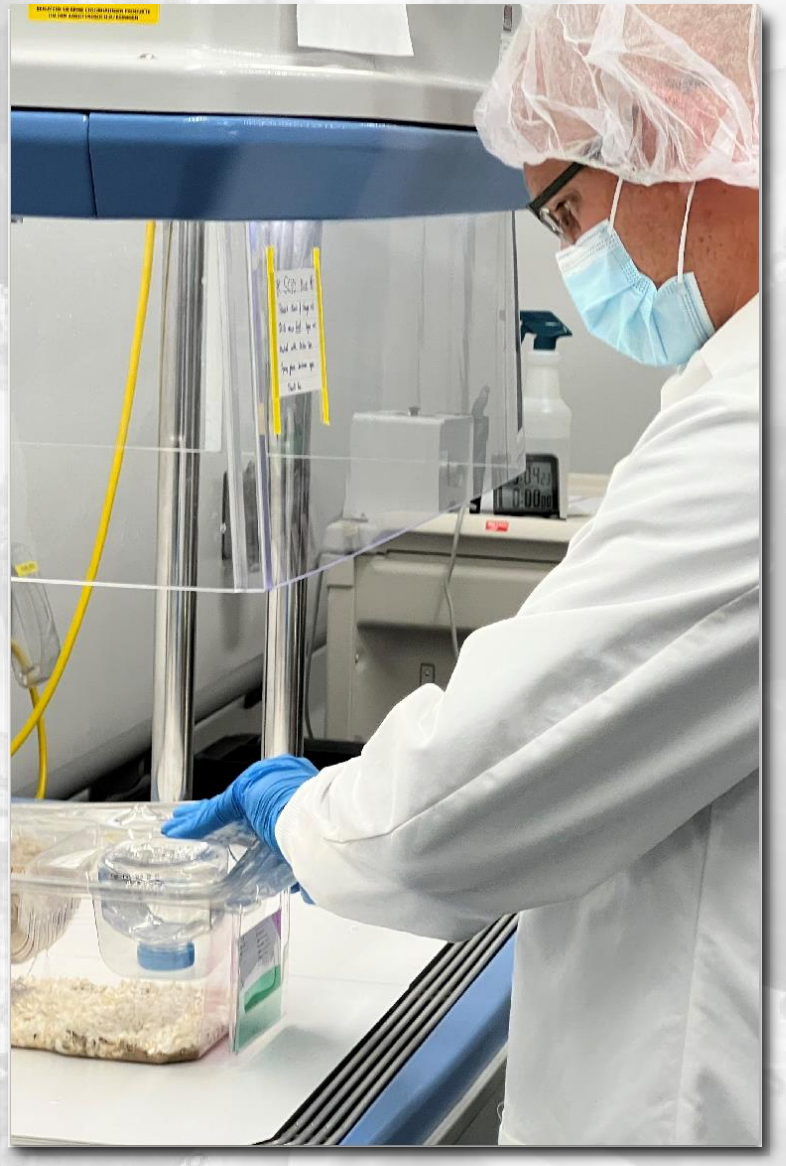

PRODUCTS & SERVICES

60%

PRODUCTS

BIOLOGICAL PRODUCTS
PURIFIED PROTEINS & REAGENTS
SPECIALTY PRODUCTS

40%

CRO SERVICE

INCLUDING CUSTOM POLYCLONAL & MONOCLONAL ANTIBODY PRODUCTION

75%

OF ALL ORDERS

ARE CUSTOM

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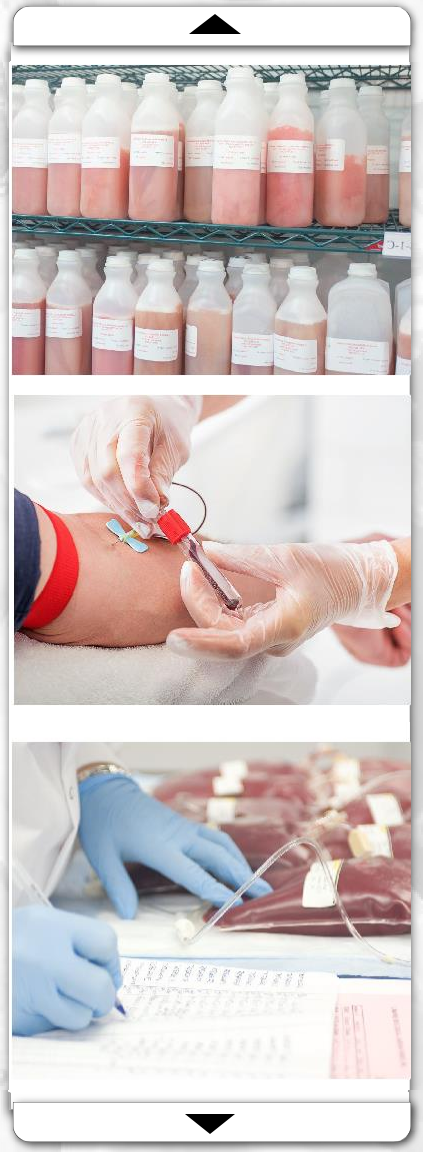

BIOLOGICAL PRODUCTS

- Donor Animal Blood Products
  - Whole Blood
  - Defibrinated, Lysed, Laked Blood
  - Washed Red Blood Cells
  - Domestic Serum & Plasma
  - Non-Domestic Serum & Plasma
- Human Blood Products
  - Whole Blood
  - Normal Plasma
  - Defibrinated Plasma
  - Sera from Anticoagulant-Free Whole Blood
  - Blood Components
  - Specialty Products
- Abattoir Blood Products, Organs, and Tissues

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PURIFIED PROTEINS & RELATED REAGENTS

- BSA; Domestic and New Zealand Sourced
- Bulk Normal Immunoglobulins
- Secondary Antibodies
- Antibodies to Drugs of Abuse
- Custom Purified Immunoglobulins and Conjugates

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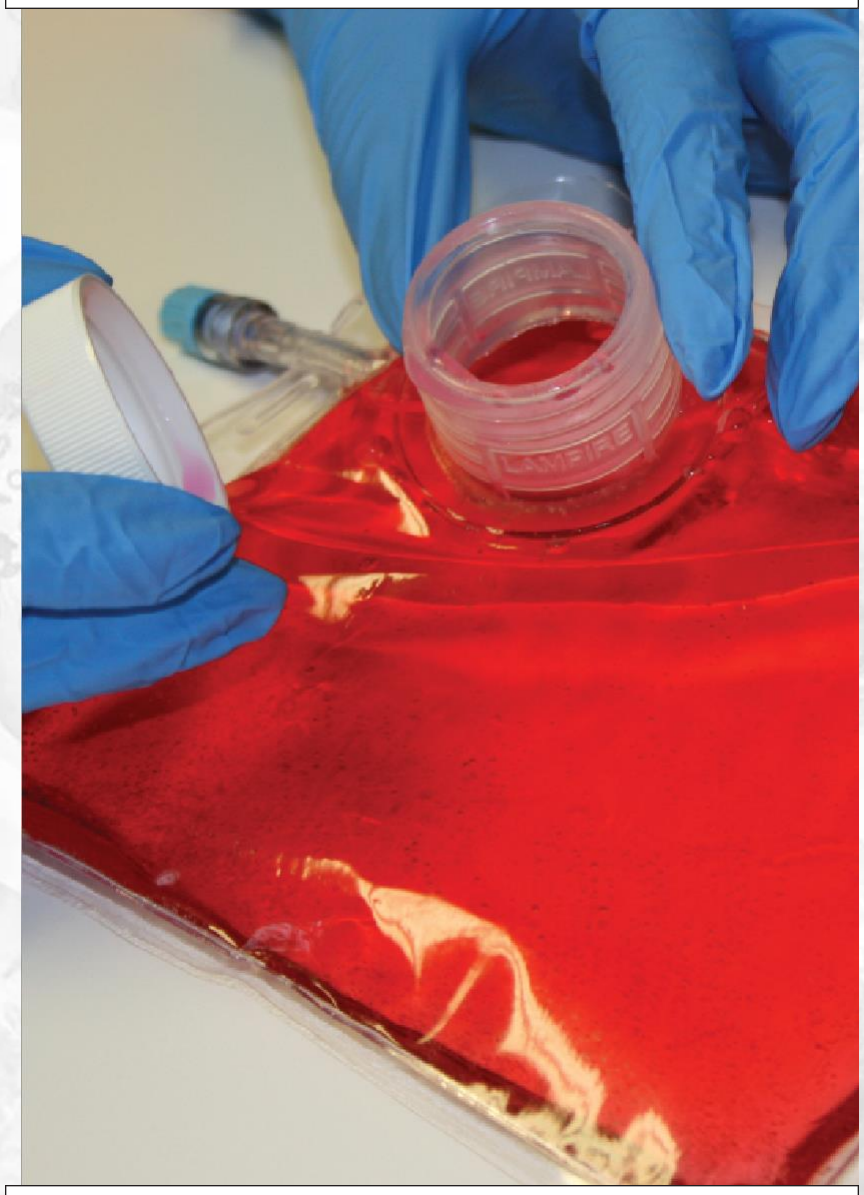

SPECIALIZED PRODUCTS & SERVICES

- Lobster Hemocynin
- OMNI C3® Cell Culture Bags
- Assay Development
- Contract Manufacturing
- Collaborative Research
- Pharmacokinetic Studies

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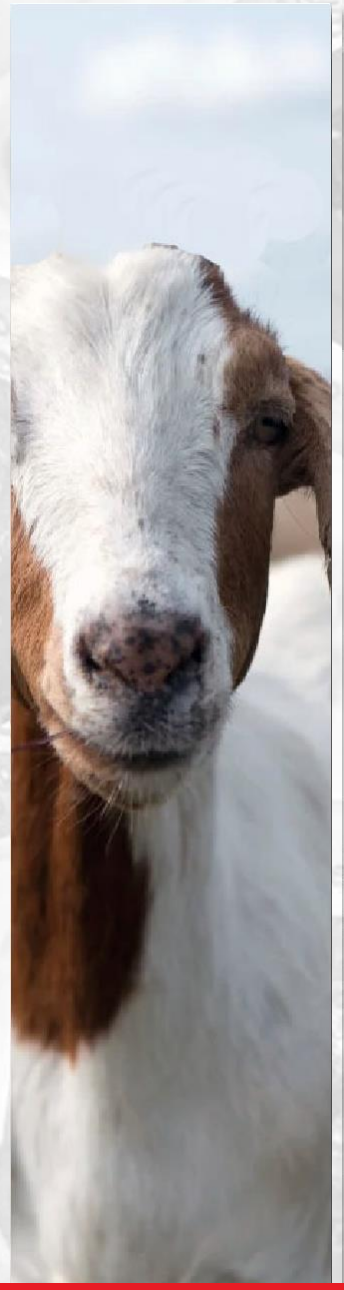

CUSTOM POLYCLONAL ANTIBODY SERVICES

At LAMPIRE, we offer high-quality polyclonal antibody production services using a variety of animal species, such as rabbits, goats, sheep, chickens, and more. Our polyclonal projects are designed to meet your specific needs and goals, from antigen selection and immunization protocol to purification and characterization methods.

We adhere to the highest standards of animal welfare and ethical practices, as evidenced by our IACUC review and AAALAC accreditation. We also provide you with regular and timely communication throughout the project, including antigen inventories, project milestones, monthly boarding reports, and other relevant testing data. This allows you to monitor the progress of your project and make informed decisions about antigen modification, protocol adjustments, downstream processes, or production scale-up.

We also offer additional testing services to our project clients, such as ELISA, Western blot, immunohistochemistry, affinity measurements, and more. These services can provide you with critical information about the specificity, sensitivity, and functionality of your polyclonal antibodies. Whether you need polyclonal antibodies for research, diagnostic, or therapeutic applications, LAMPIRE is your trusted partner for delivering reliable and customized solutions.

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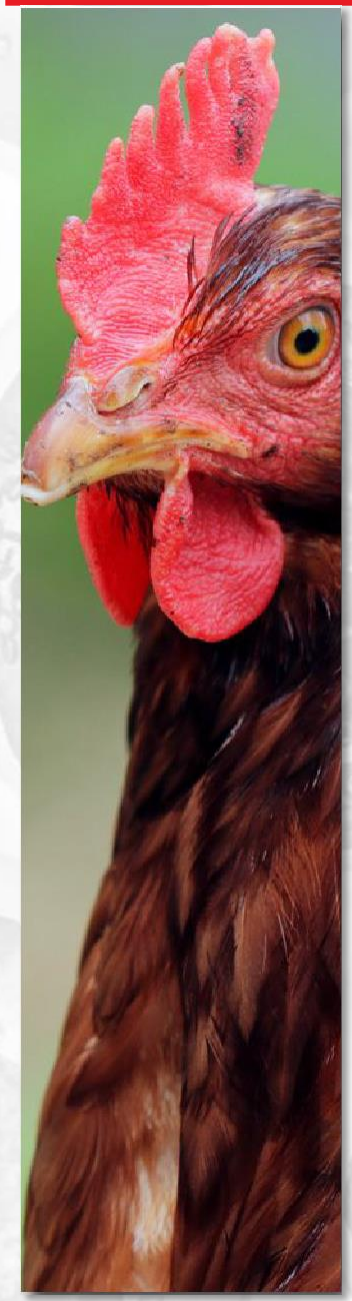
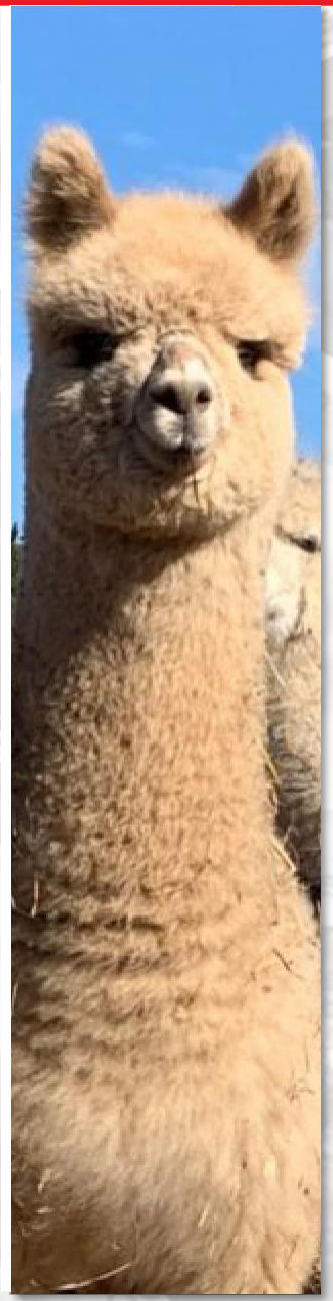

ADDITIONAL SERVICES

- Antigen Preparation
- Assays Against Host Antigen
- Assays Against Target Antigens
- ELISA Testing
- Pre-Immune Screening
- Antigen Conjugation
- Titer Testing
- Antibody Purification
- Antibody Conjugation
- Buffy Coats (PBMCs)
- RNA Isolation
- Affinity Purification
- Splenectomies & Bone Marrow Collection
- For Use In Downstream Antibody Production (B-Cell Sorting, Phage Display)

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CUSTOM MONOCLONAL

LAMPIRE offers a comprehensive line of monoclonal antibody services from research to bulk scale production, single B-cell recombinant approach, hybridoma development, cell line optimization, serum free antibody production, supernatant concentration, antibody purification and characterization, cell bank production, testing and storage.

- Mouse
- Hamster
- Guinea Pig
- Rat

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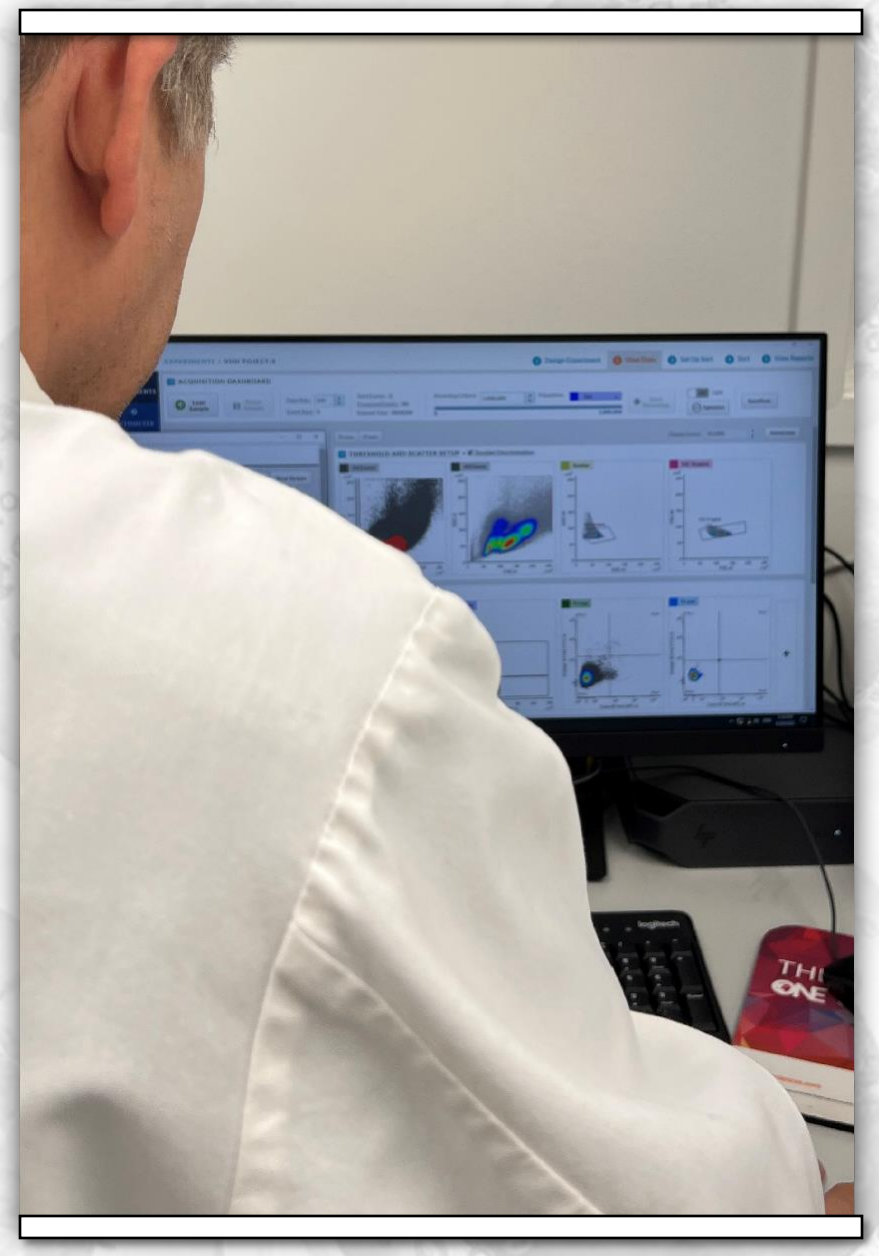

MONOCLONAL ANTIBODY GENERATION, SINGLE B CELL APPROACH

- FACs sorting B-cells bound to labeled antigen
- Robust sampling of natural antibody repertoire
- Fastest timeline to sequence and screening recombinant monoclonal antibody on "FC of choice“
- Large quantities of PBMCs can be collected and analyzed from Llamas, Bovine and Rabbits across multiple timepoints during an immunization.
- Conventional hetero-dimeric vH+vK antibodies are commonly recovered from Rabbits while vHH nanobodies and ultralong-CDR3 picobodies can be selectively recovered from Llamas and Bovine respectively.

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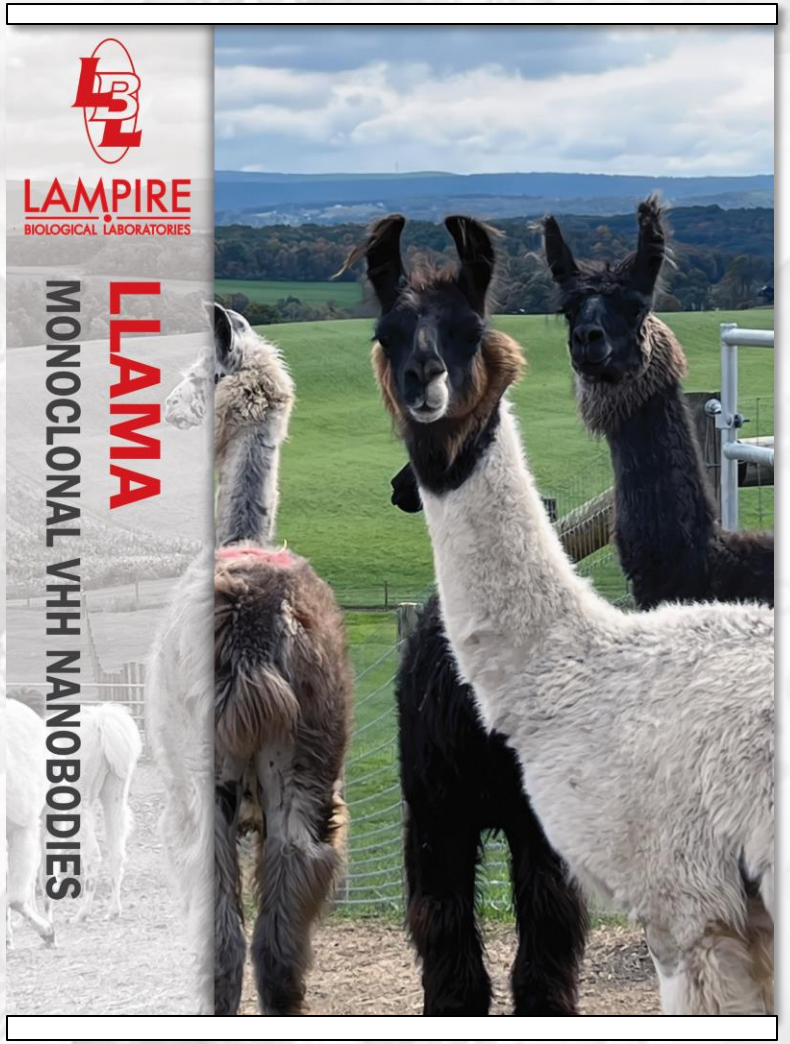

LAMPIRE BIOLOGICAL LABORATORIES

Your In Vivo
CRO LEADERS

LAMPIRE'S CUTTING-EDGE LLAMA vHH ANTIBODY APPROACH

Are you ready to revolutionize your monoclonal antibody discovery process? Look no further than LAMPIRE's innovative Llama B Cell approach. Leveraging our extensive expertise in Llama and Alpaca immunizations, we've developed a proprietary process for Single Cell Sorting of Target-Positive Llama and Alpaca B cells, paving the way for rapid and cost-effective monoclonal antibody discovery.

Time Advantage: With our Llama B Cell approach, you'll experience the quickest timeline to a validated vHH binder. vHH sequences are recovered within 3 weeks of PBMC isolation, ensuring swift progress towards your research goals.

Cost Efficiency: Save on expenses without compromising quality, by eliminating the costs associated with phage or yeast library creation and panning. With our process, duplicate clones are eliminated during the initial recovery phase prior to screening, maximizing resource utilization.

Full Diversity from Immunized Animals: Our approach enables you to capture the entire antibody repertoire, empowering you to explore the relationship between sequence clonotype and affinity/epitope.

CMC and Developability for Therapeutics: Through in silico assessment of predicted developability risks, human-ness, and immunogenicity potential, you can streamline the selection process. And for those seeking additional refinement, we offer optional services such as sequence liability removal and humanization.

Contact us today (215) 795-2838 / sales@lampire.com to learn more about how you can accelerate your antibody discovery with LAMPIRE's Llama B Cell technology.

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APPEARANCE
MEDICA®
Düsseldorf, Germany
Location: Hall 1, Booth #B44

LLAMA MONOCLONAL VHH NANOBODIES

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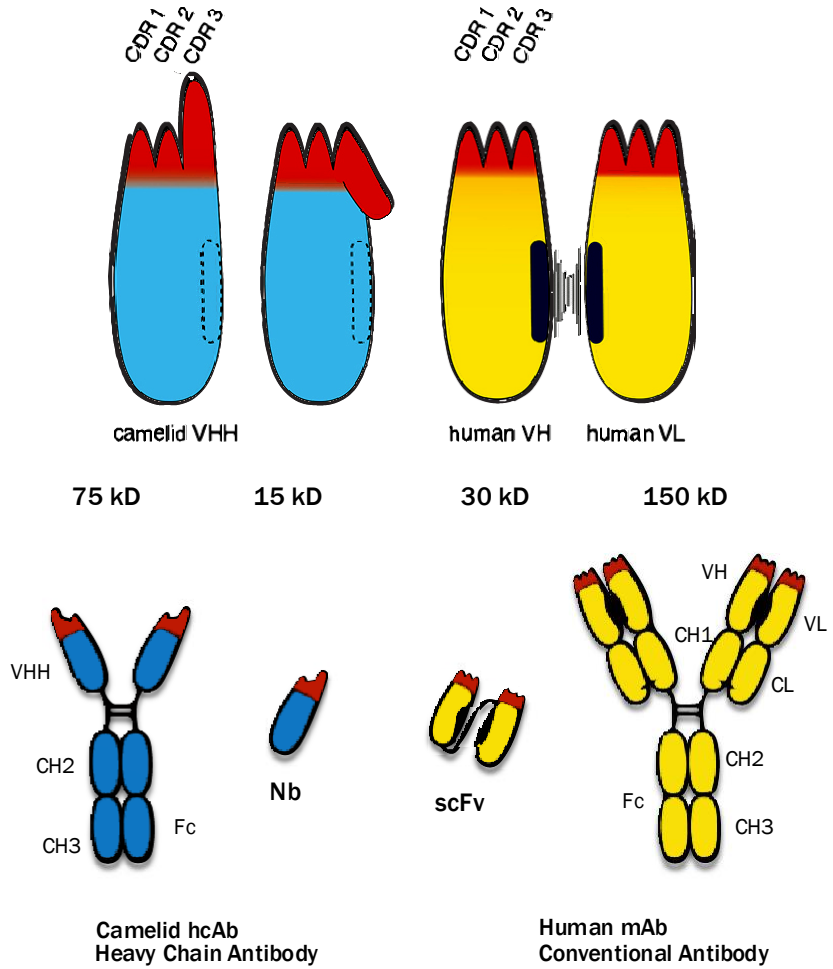
ADVANTAGES OF LLAMA MONOCLONAL VHH NANOBODIES



Structural Advantages:

- The CDR3 loop of a camelid VHH typically can be much longer allowing it to reach epitopes on target antigens inaccessible to conventional antibodies.
- VHH is its entirely hydrophilic framework, whereas a VH domain contains a hydrophobic side facing the VL domain (indicated in black). This may aid inclusion of vHHs into bi-specific antibodies and alternative formats.

Therapeutic Advantages:

- Their nanoscale dimensions enable deep penetration of tumors (15kDa, Diameter: 2.5nm)
- Certain nanobodies able to cross the blood brain barrier (BBB)
- High affinity and specificity for their target antigens
- Modularity, can be used as soluble fragment or fused to FC or HSA or CAR-T receptors in bi- or multi-specific formats

Developability Advantages:

- High melting temperatures (60–80◦C, several weeks at 37◦C)
- Non-physiological pHs (3.0–9.0)
- Strong chemical denaturants (2–3 M guanidinium chloride, 6–8 M urea)

Manufacturing Advantages:

- Nanobodies are inexpensive to produce and can leverage existing manufacturing processes.
- Leverage standard Protein-A purification.
- Can be synthesized through microbial or mammalian expression systems

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LLAMA MONOCLONAL VHH NANOBODIES

Llama/Alpaca Immunization

PBMCs

- Minimum 50ml bleed, ≥20e6 PBMCs

Building upon our expertise in Llama and Alpaca immunizations, Lampire has invested in a proprietary process for Single Cell Sorting of Target-Positive Llama and Alpaca Bcells to aid monoclonal antibody discovery. When combined with recombinant expression and screening, monoclonal vHHs can be generated quickly and within budget. Requiring only 50mls of blood derived PBMCs, a Llama Bcell approach can run in parallel to established immune-bacteriophage library creation and panning. Our "Llama Bcell" can result in high affinity, epitope diverse vHH antibodies which favorable biophysical properties.

Note: Advanced Target Binding on Cells (OE or primary), Kinetic and Epitope screening is Optional and part of our "Secondary Screening" workflow.

ANTIGEN LABELLING

- Protein antigens
- Peptides
- Cells
- Nanodiscs/VLPs
- Exosomes

FACS*

*proprietary panel to isolate antigen-positive Bcells

VHH RECOVERY & SEQUENCE ANALYSIS

- NGS and/or colony sequencing
- All sequences provided to client
- All IP is clients
- in silico analysis
- **Optional:** Inclusion of vH4 germlines

RECOMBINANT Mab EXPRESSION

- vHH-mFC or vHH-His
- **Optional:** purified rMab provided to client

PRIMARY ELISA

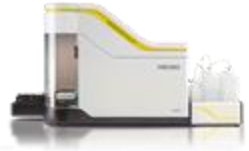
- 3pt titration
- Controls
- **Optional:** Primary screening on cells
- **Optional:** Off-target Selectivity
- **Optional:** Species cross-reactivity

SECONDARY SCREEENING

EPITOPE BINNING

KINETIC ANALYSIS (EG AFFINITY)

TARGET BINDING ON CELLS



A “SEQUENCE FORWARD" APPROACH FOR LLAMA MONOCLONAL VHH NANOBODIES

Time Advantage: With our Llama B Cell approach, you'll experience the quickest timeline to a validated vHH binder. vHH sequences are recovered within 3 weeks of PBMC isolation, ensuring swift progress towards your research goals.

Cost Efficiency: Save on expenses without compromising quality, by eliminating the costs associated with phage or yeast library creation and panning. With our process, duplicate clones are eliminated during the initial recovery phase prior to screening, maximizing resource utilization.

Full Diversity from Immunized Animals: Our approach enables you to capture the entire antibody repertoire, empowering you to explore the relationship between sequence clonotype and affinity/epitope.

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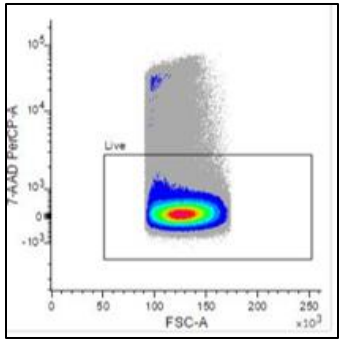
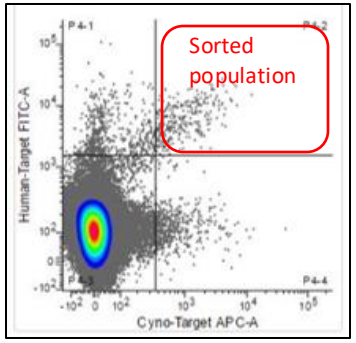
EXAMPLE VHH FACS REPORT: <CLIENT> <PROJECT CODE> <SORT#> <DATE>

Animal: <llama number>
Date of harvest: <date, TEST BLEED>
FACS Antigen1: <name of antigen_conjugation (Biot) and concentration>
FACS Antigen2: <name of antigen_conjugation (AF647) and concentration>
Staining strategy: proprietary (viability/Fc-counter/X/Y/Ag1/Ag2)*
%Viable (7AAD):
Number of sorted cells: <number>

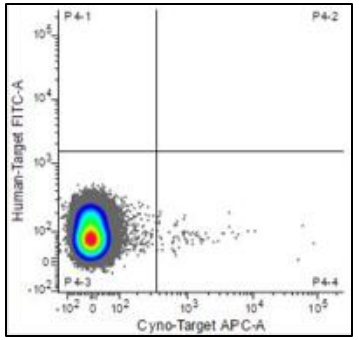
7AAD Viability



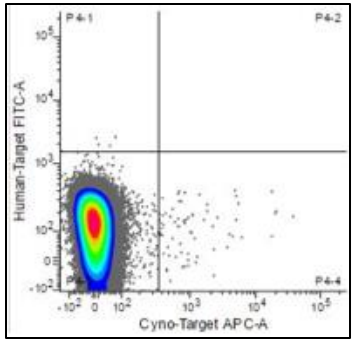
Final Gate



FMO1: Ag2

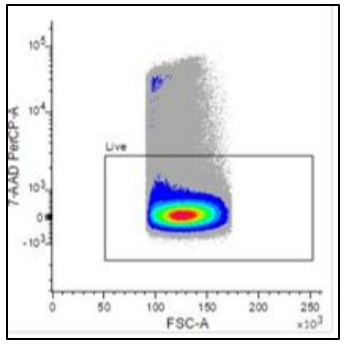


FMO2: SA-PE

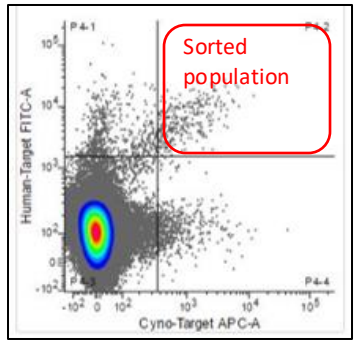


Animal: <llama number>
Date of harvest: <date, FINAL BLEED>
FACS Antigen1: <name of antigen_conjugation (Biot) and concentration>
FACS Antigen2: <name of antigen_conjugation (AF647) and concentration>
Staining strategy: proprietary (viability/Fc-counter/X/Y/Ag1/Ag2)*
%Viable (7AAD):
Number of sorted cells: <number>

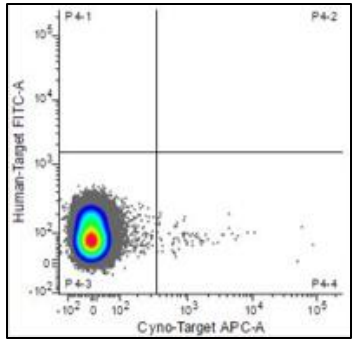
7AAD Viability



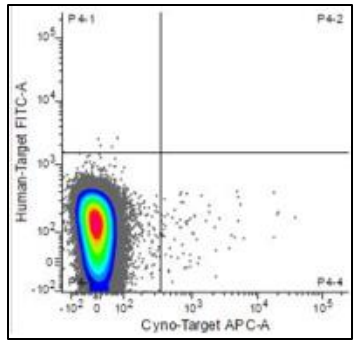
Final Gate



FMO1: Ag2



FMO2: SA-PE

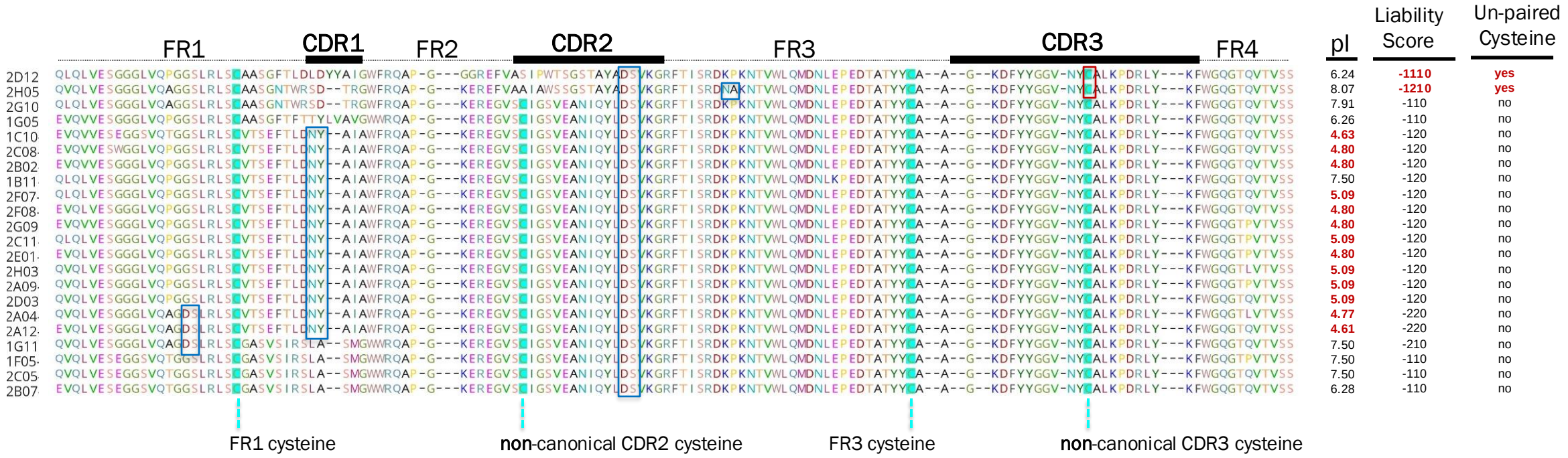


EXAMPLE VHH SEQUENCE CLONOTYPE ANALYSIS: <CLIENT> <PROJECT CODE><SORT#><DATE>

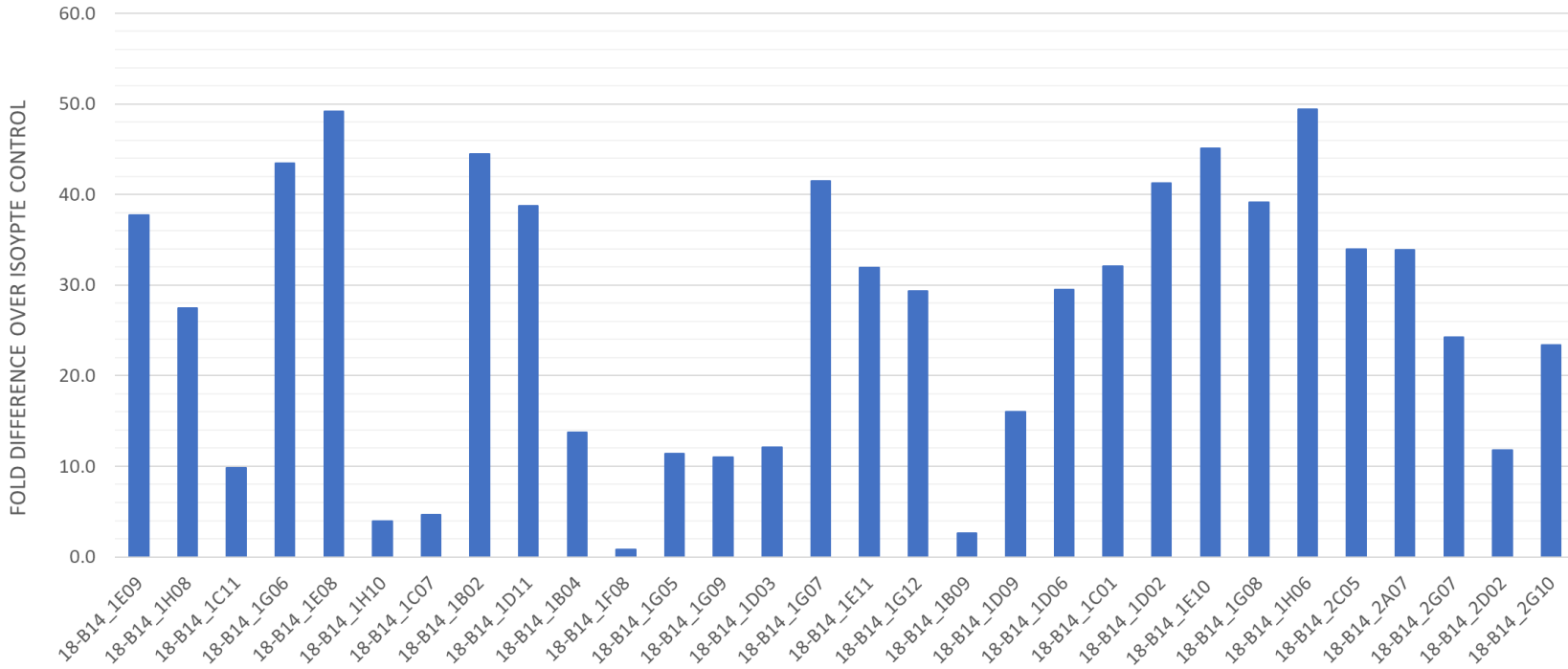
Shown is an example CDR3 clonotype assembled during initial sequence triage of PBMCs isolated by FACS.

Sequence clonotype analysis may represent clonal enrichment and affinity maturation events (since these vHHs are derived in vivo rather than isolated from a naïve or synthetic library). Once a clonotype is validated by containing true-positive binders, it can be beneficial to “revisit” and test additional clones within a clonotype family.

Additional triage at this stage can include removal of clones with “un-paired” cysteines, un-desirable isoelectric point ands potential for post translational modification (PTM) liabilities such as deamidation, isomerization or oxidation. Such sequence-based properties may impact Developability and CMC of therapeutics.



PRIMARY ELISA SCREENING OF VHHS DERIVED FROM LLAMA BCELL



Shown is an example of primary ELISA screening of recombinant “vHH-mFC” monoclonal antibodies captured by Llama Bcell Sorting. In this example 30 sequence-unique vHHs were screened for binding against a Target antigen. Our standard ELISA screening includes a 3-point titration and is performed with available positive-control mAbs and relevant negative-control antigen(s) for specificity or selectivity assessment

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UNLOCK THE POTENTIAL OF RABBIT BCELL WITH LAMPIRE

Rabbit monoclonal antibodies combine high specificity, reduced off-target effects, and broader antigen detection capabilities, making them valuable tools for research, diagnostics, and therapeutics. Look no further than LAMPIRE Biological Laboratories, where innovation meets expertise.

Why Choose Us?
- Rabbit Immunization: Whether you're starting from scratch or converting from polyclonal, our dedicated campaigns are tailored to your needs.
- Animal Selection: Each campaign focuses on one animal, ensuring optimal results with sera titer-based selection and PBMCs/splenocytes extraction.

Isolation of Antigen-positive Bcells by FACS:
- Precision FACS Analysis: Our multiparameter approach identifies antigen-positive B cells with unparalleled accuracy.
- Versatile Antigen Types: From protein antigens, peptides and soluble membrane protein preparations including nanodiscs and VLPs, we offer a spectrum of methods to identify Bcells expressing monoclonal antibodies.

Antibody Sequence Recovery:
- Cutting-Edge NGS: Next-generation sequencing ensures comprehensive recovery of vH and vK sequences.
- Client-Centric Approach: All sequences are provided to the client, with complete IP ownership.

Recombinant mAb Expression:
- Matrix Expression: Our transient CHO system yields high quality antibodies at scales from 100 ug to 1 Gram.
- Customization: Expressing rmAbs in different backbones is possible, offering flexibility to meet your specific requirements.

Primary Binding Analysis:
- Robust ELISA Assays: Our 3-point ELISA includes positive and negative controls, ensuring selectivity and cross-reactivity assessment.

Elevate your research with our Rabbit B Cell expertise. Partner with LAMPIRE Biological Laboratories today and unlock a world of possibilities in antibody development! Contact us today (215) 795-2838 / sales@lampire.com for more information, or a free technical consulation.

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RABBIT MONOCLONALS

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RABBIT MONOCLONALS

Rabbit immunization

- Dedicated monoclonal OR conversion from polyclonal campaign

Selection of animal(s) based on sera titer

- 1 Animal per campaign
- Not necessary to sacrifice animal when only PBMCs are collected

Antigen Labelling*

- Antigen1: Biot
- Antigen2: AF647

*Alternate FACS baits

- Cells
- VLPs
- Nanodiscs
- Peptides
- Exosomes

FACS

- Multiparameter
- Antigen Positive Bcells

vH + vK Sequence Recovery

- NGS based sequence recovery
- IGKC1 light chain
- All sequences provided to client.
- All sequence IP is clients

Recombiant mAb Expression

- Matrix expression
- Transient CHO
- 30+ rMabs
- Rabbit FC backbone is standard**

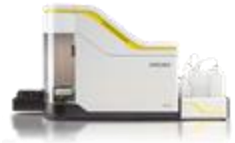
**Expressing rmAbs as Human or Mouse mAbs is possible. However, this requires removal of the “extra” V-region cysteine in rabbit light chains.

Primary Binding

- 3pt ELISA
- Pos & Neg Controls
- (selectivity)
- (cross-reactivity)

Secondary Screening

Target Binding on Cells



Kinetic Analysis (eg Affinity)

Epitope Binning

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RABBIT MONOCLONALS

Rabbit immunization

- Dedicated monoclonal OR conversion from polyclonal campaign

57- and 98-Day immunization protocols

Selection of animal(s) based on sera titer

- 1 Animal per campaign

Blood collected ~7days after Final Boost

Day1

Day21 (Stage1 complete)

Day56 (Stage2 complete)

Day63 (Stage3 complete)

Additional Time required for Secondary Screening

Antigen Conjugation
- Antigen1: Biot
- Antigen2: AF647

FACS
- Multiparameter
- Antigen Positive Bcells

vH + vK Sequence Recovery
- All sequences provided to client

Recombiant mAb Expression
- Remaining rMab can be provided to client

Primary Binding

Target Binding on Cells

Kinetic Analysis (eg Affinity)

Epitope Binning

~63 Days post-immunization to receive sequences from all confirmed binding rabbit antibodies

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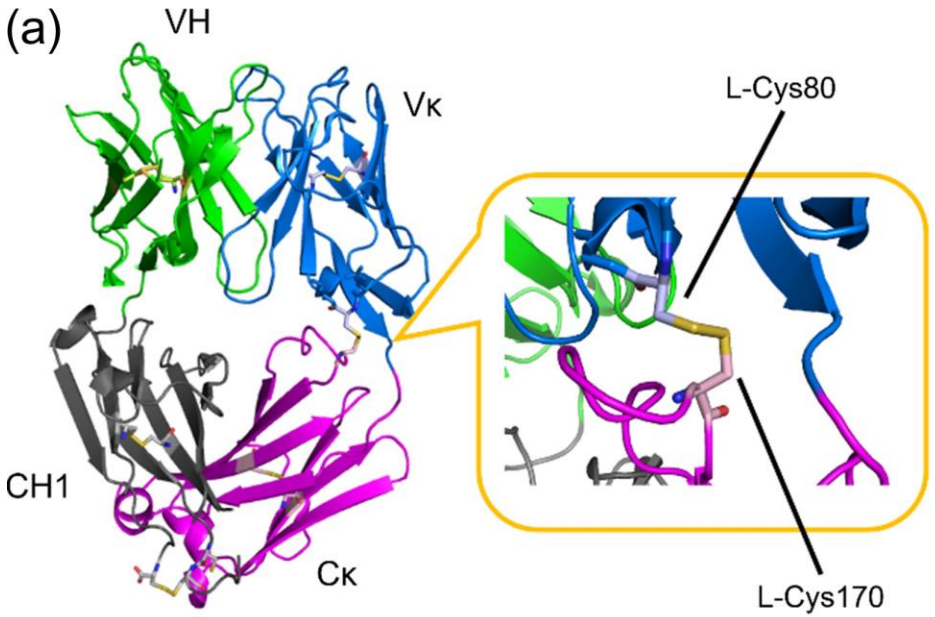
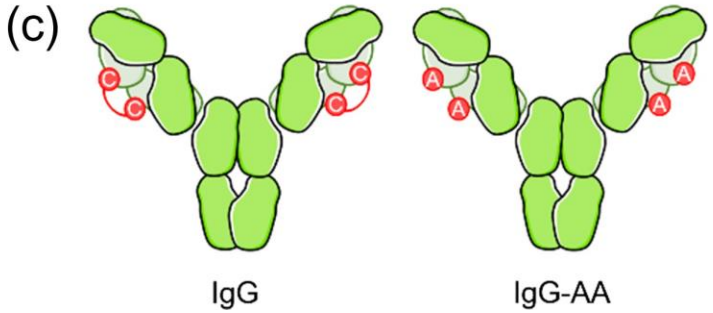
THE MAJORITY OF RABBIT ANTIBODIES FROM NZWS USE A IGKC1 LIGHT CHAIN & CONTAIN A "NON-CANONICAL" DISULFIDE BETWEEN THE V-GENE AND IGKC1 CONSTANT



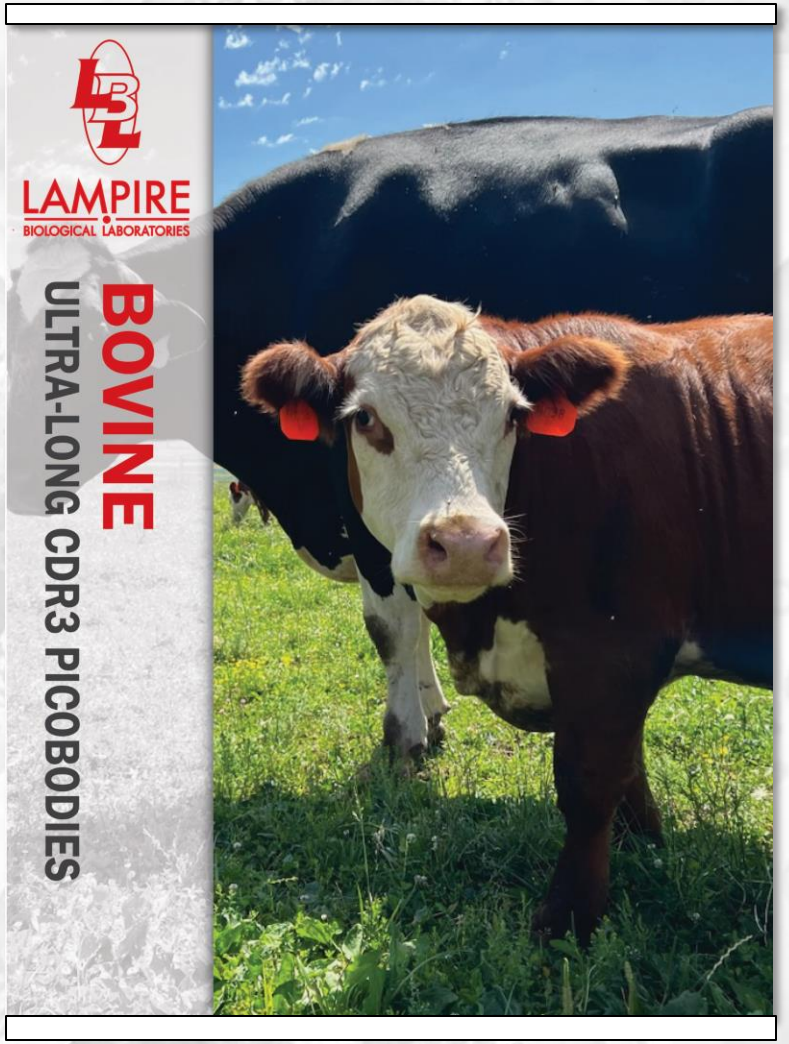
(b)

			L-Cys80	L-Cys170
A3	LC	:	ISGVE**C**DDAAT.....	PQNSDD**C**TYNLT
A4	LC	:	ISGVQ**C**DDAAT.....	PQNPED**C**TYNLT
G11	LC	:	ISDLE**C**ADAAT.....	PQNSAD**C**TYNLT



Protein Eng Des Sel, Volume 31, Issue 7-8, July-August 2018, Pages 243–247, https://doi.org/10.1093/protein/gzy008

The existence of this extra disulfide in Rabbit LCs impacts directly how Rabbit antibodies are expressed recombinantly. If Rabbit V-regions are expressed as recombinant Rabbit Mabs then the appropriate rabbit_IGKC1 FC region must be utilized. If Rabbit V-regions are expressed as recombinant Human Mabs then the "extra" cysteine in the Rabbit Light Chain V-region must be removed (C>S, C>A or C>P, 'A' and 'P' are germline in some Rabbit IGKVs)



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BOVINE ULTRA-LONG CDR3 PICOBODIES

Explore the forefront of antibody research with monoclonal Bovine Ultra-long CDR3 Picobodies. Aligned with our commitment to scientific advancement, we introduce an opportunity to investigate Bovine Picobodies, incorporating "Single Bcell Sorting" and Directed Sequencing of ultralong-CDR3s.

What sets Bovine Picobodies apart?

These binding domains, sourced exclusively from Bovines, exhibit compactness and stability. With a small size ranging from 3 to 5 kiloDaltons (kDa), they mark an advancement in antibody technology. Derived from a specialized subset of Bovine ultralong-CDR3-containing antibodies, Picobodies offer potential for targeted therapy development.

Numerous possibilities

While in the nascent stages of preclinical development, picobody-derived recombinant antibodies, can be formatted into "knobbodies" and bispecific antibodies, and exhibit novel efficacy in binding viral and cancer target epitopes. This heralds a new era of precision medicine, where previously inaccessible targets become attainable.

Join us at the forefront of antibody innovation with LAMPIRE's Bovine Bcell technology. Explore the potential of Picobodies. Contact us today (215) 795-2838 / sales@lampire.com for more information, or a free technical consultation.

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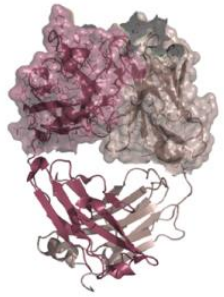
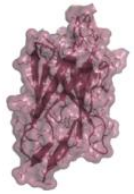
Conventional Antibody (Fv region)

25kDa



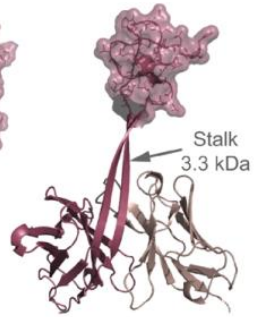
VHH Nanobody

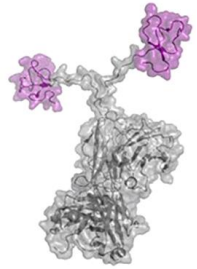
15kDa



Knob/ulCDR3 Picobody

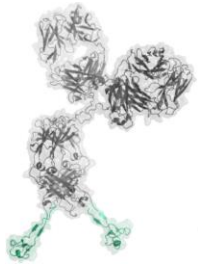
3-5kDa





Knobbody

(Bovine Knob+human FC)



BiSpecific

(Human Antibdoy + Bovine Knob)

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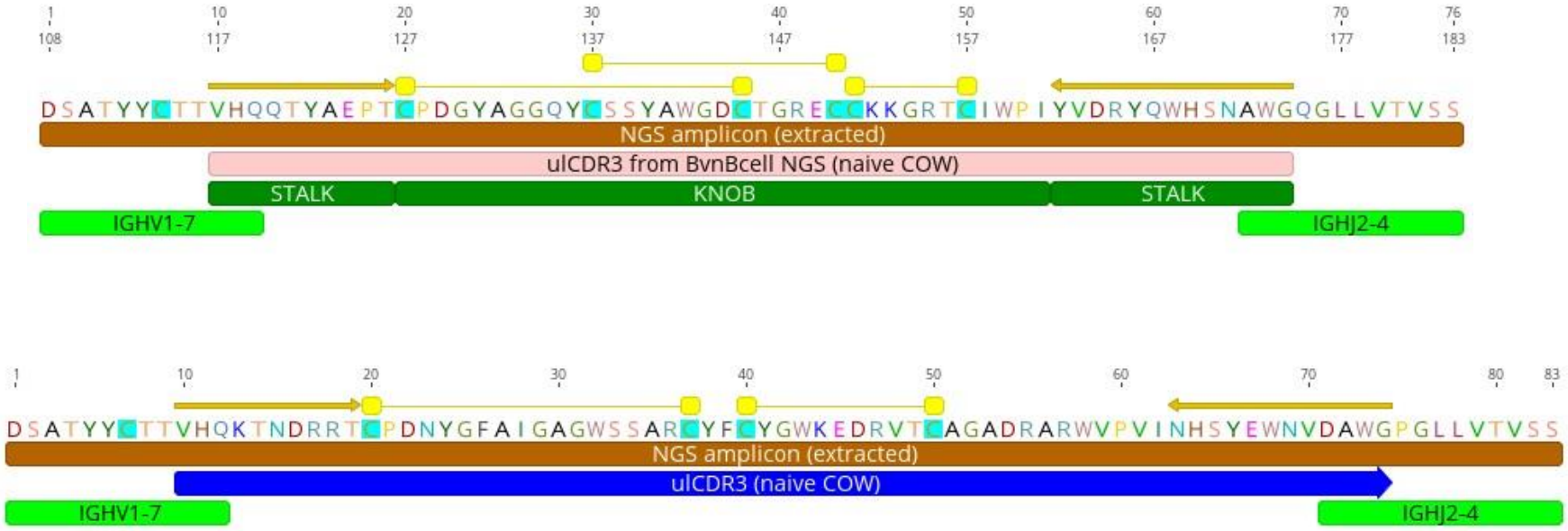
BOVINE ULTRA-LONG CDR3 PICOBODIES



Shown are two ultralong CDR3 Picobody sequences captured and sequenced from LAMPIRE's Hereford herd. Note the significant number of cysteine residues. These cysteine residues help stabilize target binding loops through disulfide bond formation. The knob domain is flanked by ascending and descending flexible stalk domains thought to allow flexibility in the binding of target epitope.

ADVANCED SECONDARY SCREENING OPTIONS

Target Binding on Cells

- Single concentration or EC50 determination against target overexpressing relative to control cells
- On-cell binding competition, internalization and bespoke functional assays
- Sartorius iQue flow cytometer.

Kinetic Analysis

- Off-rate ranking (single concentration) or full KD kinetics
- Biacore SPR T200 system or Octet BLI

Epitope Binning

- “bi-directional “ matrix competition
- Identification of novel, non-competing epitopes
- **Optional**: inclusion of patented or published mAbs into matrix to show overlap or establish novelty

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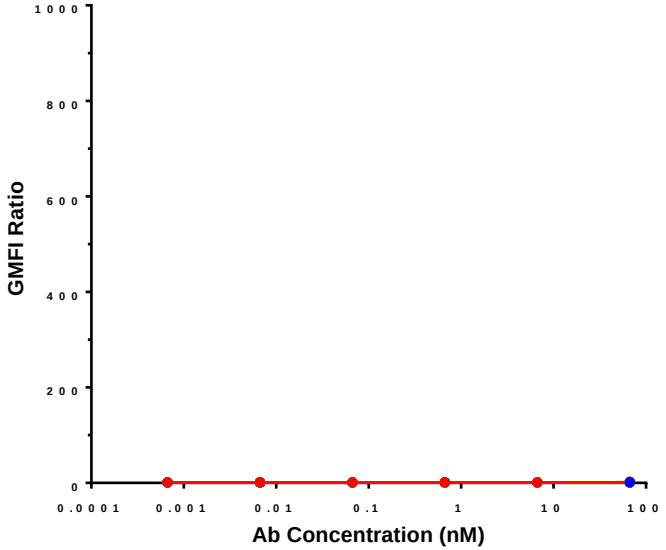
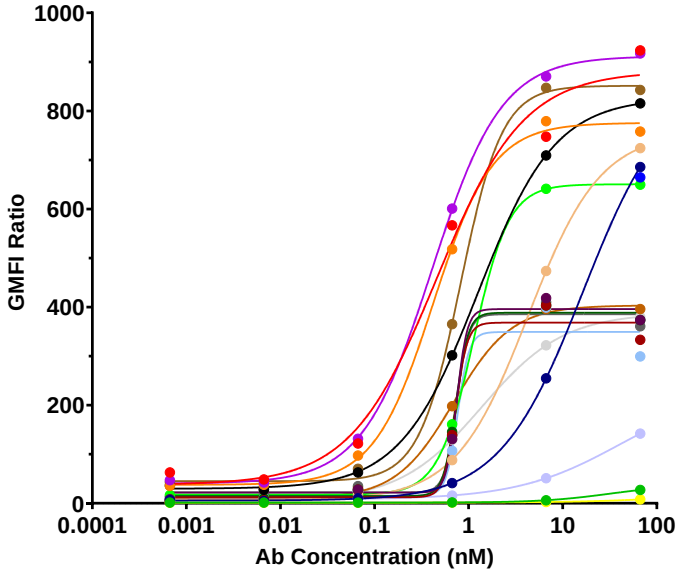
CELL SURFACE TARGET BINDING OF RECOMBINANT mABS BY FLOW CYTOMETRY

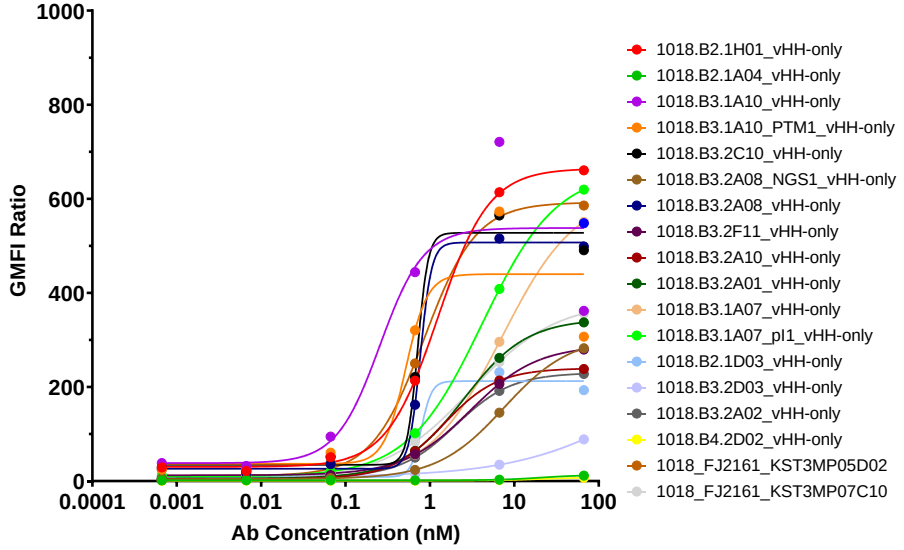
CHO (parent cell)

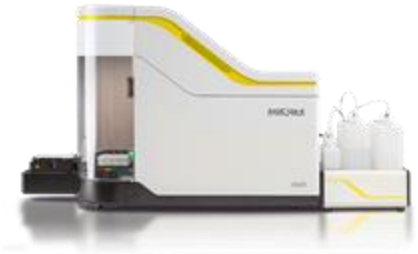


CHO_hu-Target



CHO_cyno-Target

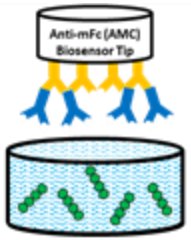




iQue3 flow cytometer

Cell surface screening of recombinant vHHs derived from a Llama Bcell process showing selective binding to Human and Cyno Target expressed on the cell surface of CHO cells. vHHs can be screened against primary or recombinant target over-expressing cells at single concentrations or through dose titrations to establish “on-cell” EC50 and Bmax values.

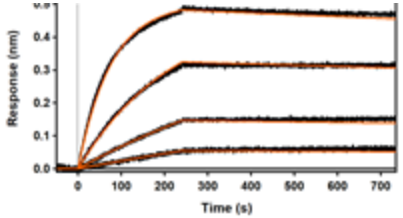
SPR AFFINITY OF RECOMBINANT mABs



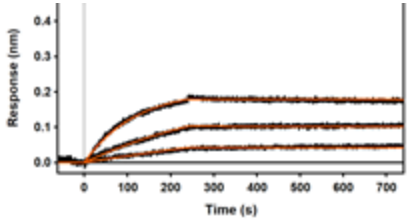
Biacore T200

	Human_TARGET1.His (Acro)				NHP_TARGET1.His (Acro)				
Description	ka (1/Ms)	kd (1/s)	KD (M)	t½ (min)	ka (1/Ms)	kd (1/s)	KD (M)	t½ (min)	NHP / Human KD
1018.B3.2D03	3.50E+05	1.15E-04	3.30E-10	100.1	3.30E+05	1.12E-04	3.39E-10	103.3	1.0
1018.B3.1A07	8.68E+03	≤1.00E-05	1.15E-09	≥240	1.22E+04	3.65E-04	3.00E-08	31.7	26.0
1018.B3.2A10	8.57E+03	≤1.00E-05	1.17E-09	≥240	9.44E+03	≤1.00E-05	1.06E-09	≥1155.2	0.9
1018.B3.2F11	7.86E+03	≤1.00E-05	1.27E-09	≥1155.2	8.20E+03	≤1.00E-05	1.22E-09	≥1155.2	1.0
1018.B3.2A02	7.62E+03	≤1.00E-05	1.31E-09	≥1155.2	9.59E+03	≤1.00E-05	1.04E-09	≥1155.2	0.8
1018.B3.2A01	7.51E+03	≤1.00E-05	1.33E-09	≥1155.2	7.38E+03	≤1.00E-05	1.35E-09	≥1155.2	1.0
1018.B2.1D03	6.81E+03	≤1.00E-05	1.47E-09	≥1155.2	7.28E+03	≤1.00E-05	1.37E-09	≥1155.2	0.9
1018.B3.1A07_pI1	7.85E+03	2.52E-04	3.21E-08	45.9	1.10E+04	2.35E-03	2.14E-07	4.9	6.7
1018.B3.1A10	1.17E+04	4.59E-04	3.92E-08	25.2	1.16E+04	4.74E-04	4.08E-08	24.4	1.0
1018.B2.1H01	1.15E+05	6.04E-03	5.24E-08	1.9	4.37E+04	6.46E-03	1.48E-07	1.8	2.8
1018.B3.1A10_V1	6.42E+03	6.34E-04	9.87E-08	18.2	9.33E+03	1.05E-03	1.13E-07	11.0	1.1

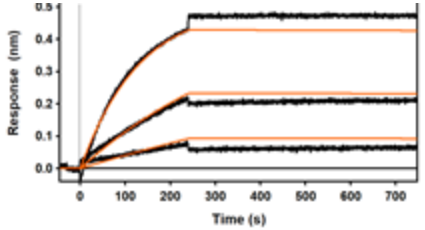
18.B3.2D03



18.B3.1A07



18.B3.2A10



SPR-based analysis of sub- and single-digit nanomolar vHHs with cross-reactivity against Human and NHP target antigen.

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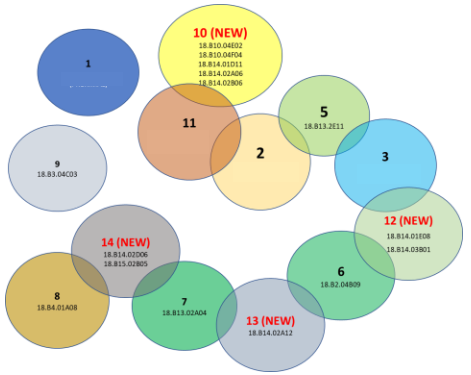
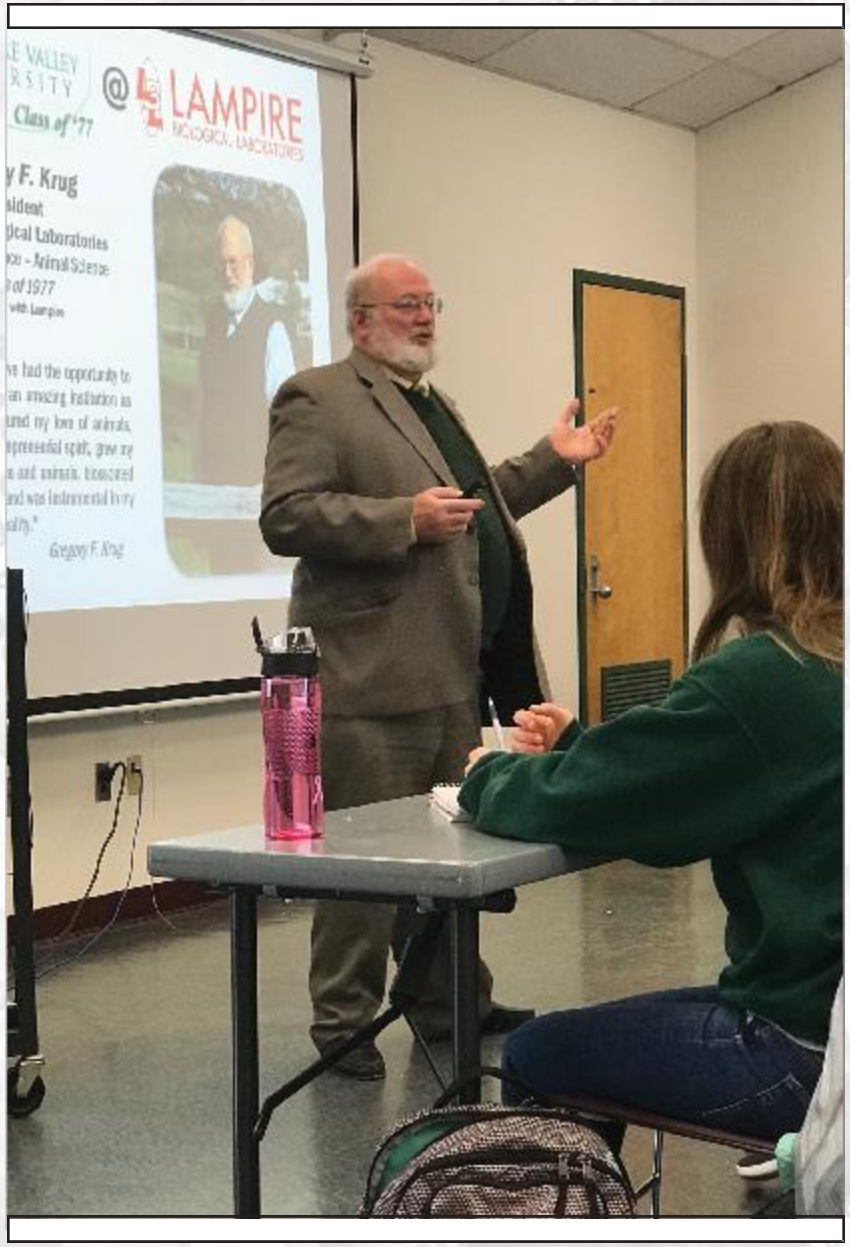
IDENTIFICATION OF VHH WITH NOVAL EPITOPES AGAINST A CLINICAL PHASE TARGET

						Bin Features			Responseof mAb-2 when mAb-1 is Saturated with 25ug/mL of hTARGET.His (nm)																		
Source	Description	Format	15ug/mL hTarget.His Load (nm)	25ug/mL mAb-1 Bound (nm)	Unique Bin	Overlap-ping Bins	Non-Competing Bins	AB#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Patent	mAb1	IgG mAb	0.72 ± 0.02	0.22 ± 0.01	1	None	2-14	1	-0.01	0.26	0.38	0.38	0.38	0.37	0.37	0.27	0.58	0.45	0.41	0.40	0.41	0.42	0.42	0.41	0.41	0.28	0.42	-0.03	-0.01
Internal Bcell	18.B3.04C03	VHH-Fc	0.72 ± 0.01	0.15 ± 0	9	None	1-8, 10-14	2	0.18	-0.01	0.28	0.26	0.27	0.21	0.24	0.26	0.56	0.45	0.23	0.21	0.28	0.25	0.36	0.34	0.35	0.19	0.31	-0.06	-0.05
Internal Bcell	18.B10.04E02	VHH-Fc	0.61 ± 0.06	0.33 ± 0.03				3	0.32	0.29	0.01	0.01	0.01	0.01	0.01	0.02	0.44	0.27	0.40	0.40	0.41	0.36	0.45	0.44	0.38	0.32	0.42	0.01	0.02
Internal Bcell	18.B10.04F04	VHH-Fc	0.7 ± 0.01	0.3 ± 0.01				4	0.30	0.28	0.01	0.01	0.01	0.01	0.01	0.01	0.47	0.39	0.31	0.26	0.34	0.32	0.46	0.42	0.45	0.33	0.38	0.00	0.02
Internal Bcell	18.B14.01D11	VHH-Fc	0.69 ± 0.01	0.3 ± 0.01	10 (NEW)	11	1-9,12-14	5	0.30	0.28	0.02	0.02	0.01	0.01	0.01	0.02	0.43	0.37	0.31	0.26	0.34	0.31	0.45	0.41	0.45	0.33	0.38	0.01	0.03
Internal Bcell	18.B14.02A06	VHH-Fc	0.55 ± 0.01	0.18 ± 0.01				6	0.24	0.22	0.01	0.01	0.01	0.01	0.01	0.01	0.38	0.29	0.25	0.20	0.27	0.25	0.37	0.35	0.37	0.27	0.29	0.00	0.02
Internal Bcell	18.B14.02B06	VHH-Fc	0.55 ± 0.01	0.22 ± 0.01				7	0.25	0.23	0.01	0.01	0.01	0.01	0.01	0.02	0.37	0.29	0.26	0.20	0.28	0.25	0.37	0.35	0.38	0.27	0.30	0.01	0.02
Patent	mAb2 (Distal)	IgG mAb	0.73 ± 0.01	0.4 ± 0.01	11	2,10	1,3-9,12-14	8	0.32	0.28	0.10	0.09	0.10	0.07	0.09	0.06	0.18	0.27	0.35	0.28	0.35	0.33	0.44	0.42	0.42	0.30	0.38	-0.01	0.01
Patent	mAb3 (Distal)	IgG mAb	0.71 ± 0.02	0.77 ± 0.04	2	5,11	1,3,4,6-10,12-14	9	0.32	0.31	0.44	0.45	0.44	0.43	0.43	0.02	0.05	0.18	0.28	0.46	0.45	0.48	0.46	0.44	0.38	0.30	0.43	0.00	0.01
Internal Bcell	18.B13.02E11?	VHH-Fc	0.61 ± 0.06	0.49 ± 0.05	5	2,3	1,4,6-14	10	0.29	0.27	0.34	0.33	0.35	0.32	0.36	0.07	0.19	0.02	-0.07	0.38	0.40	0.34	0.40	0.39	0.32	0.28	0.37	-0.02	0.00
Patent	mAb4 (Distal)	IgG mAb	0.7 ± 0.02	0.39 ± 0.01	3	5,12	1,2,4,6-11,13,14	11	0.27	0.27	0.39	0.39	0.39	0.38	0.37	0.23	0.28	0.01	0.01	0.02	0.01	0.02	0.42	0.39	0.38	0.29	0.39	-0.02	0.00
Internal Bcell	18.B14.01E08	VHH-Fc	0.6 ± 0.06	0.33 ± 0.03	12 (NEW)	3,6	1,2,4,5,7-11,13,14	12	0.28	0.30	0.32	0.30	0.31	0.30	0.31	0.30	0.56	0.38	0.02	0.00	0.00	0.01	0.36	0.35	0.30	0.28	0.37	0.00	0.01
Internal Bcell	18.B14.03B01	VHH-Fc	0.58 ± 0.06	0.33 ± 0.03				13	0.24	0.26	0.29	0.28	0.28	0.27	0.28	0.27	0.50	0.35	0.02	0.00	0.00	0.01	0.30	0.29	0.26	0.22	0.35	-0.02	-0.01
Internal Bcell	18.B2.04B09?	IgG mAb	0.69 ± 0.02	0.38 ± 0.01	6	12,13	1-5,7-11,14	14	0.24	0.23	0.35	0.35	0.35	0.34	0.33	0.24	0.47	0.40	0.04	0.04	0.03	0.04	0.25	0.25	0.29	0.19	0.35	-0.04	-0.03
Internal Bcell	18.B14.02A12	IgG mAb	0.59 ± 0.06	0.39 ± 0.04	13 (NEW)	6,7	1-5,8-12,14	15	0.24	0.25	0.29	0.27	0.28	0.28	0.27	0.29	0.52	0.32	0.31	0.34	0.33	0.19	0.02	0.03	0.02	-0.01	0.34	-0.03	-0.03
Internal Bcell	18.B14.02D06	VHH-Fc	0.58 ± 0.06	0.37 ± 0.04	7	13,14	1-6,8-12	16	0.27	0.27	0.32	0.30	0.30	0.29	0.30	0.31	0.54	0.34	0.34	0.34	0.34	0.23	0.02	0.01	0.01	0.00	0.35	-0.01	0.00
Internal Bcell	18.B13.02A04?	IgG mAb	0.67 ± 0.02	0.5 ± 0.01	14 (NEW)	7,8	1-6,9-13	17	0.28	0.28	0.40	0.40	0.39	0.38	0.37	0.26	0.47	0.42	0.38	0.38	0.38	0.37	0.10	0.09	0.04	0.08	0.12	0.00	0.00
Internal Bcell	18.B15.02B05	VHH-Fc	0.54 ± 0.01	0.25 ± 0.01				18	0.19	0.19	0.23	0.22	0.22	0.17	0.19	0.23	0.45	0.36	0.19	0.19	0.24	0.20	0.08	0.08	0.09	0.02	0.21	-0.03	-0.02
Internal Bcell	18.B4.01A08?	VHH-Fc	0.71 ± 0.01	0.35 ± 0.01	8	14	1-7,9-13	19	0.21	0.19	0.25	0.24	0.24	0.18	0.21	0.25	0.51	0.44	0.25	0.17	0.27	0.27	0.33	0.29	0.05	0.11	0.02	-0.09	-0.08
BioXCell	mIgG Isotype Ctrl (-)	IgG mAb	0.73 ± 0.02	-0.06 ± 0	NB	NB	NB	20	0.25	0.25	0.34	0.34	0.35	0.32	0.33	0.31	0.67	0.48	0.38	0.36	0.38	0.39	0.41	0.40	0.42	0.27	0.40	-0.02	-0.01
Internal Bcell	18.B8.02H07	scFv-Fc	0.72 ± 0.01	-0.05 ± 0	4	NB	NB	21	0.23	0.23	0.29	0.27	0.28	0.22	0.24	0.31	0.65	0.51	0.25	0.21	0.29	0.27	0.38	0.36	0.40	0.26	0.33	-0.03	-0.01

Through bi-directional Matrix Binning, Epitope diversity can be explored. Novel “non-competing” epitopes can also be found that may aid intellectual property and clinical requirements.



Key	
	Bidirectional Blocking
	Unidirectional Blocking
	No Binding
	Isotype Control
	Self-Self Competition
	Inconclusive



BEYOND THE LABORATORY

LAMPIRE's impact on the community, particularly in the areas of preschool through high school and college education, as well as with teachers, is significant and multifaceted.

- *Educating on the Importance of Life Science: LAMPIRE educates students and the community about the significance of life sciences, inspiring an appreciation for the field.*
- *Inspiring the Next Generation: LAMPIRE inspires students to consider careers in life sciences, offering events, science fairs, and workshops.*
- *Working with Education Boards: Collaborating with education boards to shape curriculum and programs that align with the latest developments in life sciences.*
- *Supporting Program Availability: LAMPIRE supports programs by offering scholarships and grants for life science students.*
- *Tech Program Collaboration: Promoting interdisciplinary education at the intersection of life sciences and technology, preparing students for evolving careers.*
- *Volunteering to Teach: LAMPIRE experts volunteer to teach students directly, providing real-world insights into the industry.*
- *Supporting Teachers: Providing resources and training for educators to enhance life science teaching, creating more engaging classroom experiences.*

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BEYOND THE LABORATORY

Animal Care Program LAMPIRE offers a hands-on animal care training program for veterinarians, further contributing to the community by providing specialized training and expertise in veterinary care.

What's So Cool.... We make science engaging, with educational programs, including participation in the "What's So Cool About Manufacturing" initiative, inspiring the next generation and igniting a passion for learning.

Economic Collaboration We partner with local economic boards, striving for job creation, strategic investments, and a thriving local economy.

Community Support For over four decades, Team LAMPIRE actively enhances lives through initiatives like sponsoring local events, supporting charities, and volunteering.

LAMPIRE
BIOLOGICAL LABORATORIES

The LAMPIRE Advantage

Customer Focused: Technical Knowledge and Experience

More than 47 years of collaborating with the research, diagnostic and scientific industries worldwide. We work together with you from concept-to-completion. Our Project Management, Sales Associates, Customer Service Representatives and Technical Support personnel become part of your team.

World Class Specialized Facilities

State-of-the-art facilities designed with efficiencies and redundancies already in place to provide our expert techs every opportunity to make your project a success.

Quality Management System

Complete QMS Documentation System with certification to ISO 13485:2016. In addition to AAALAC, OLAW, and continuous process improvement systems consistent with our Quality Policy.

Expansive Product and Service Offerings with Customization Available

One stop for all your research needs. Our quality products and services can be customized to meet your specifications.

Beyond the Laboratory

LAMPIRE employees are passionate. Passionate about education, family, and community.