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## LLAMA POLYCLONAL ANTIBODY PRODUCTION SERVICES

Abbotec offers custom polyclonal antibody production services to the scientific community to accelerate a project From Biology to Discovery™. We can routinely accommodate projects in mouse, rat, rabbit, goat and llama, as well as other species on special request. We are proud of offering "Made in USA" quality label for these services by using our USDA-registered animal facility (Certificate No. 93-R-0569) for our llamas.

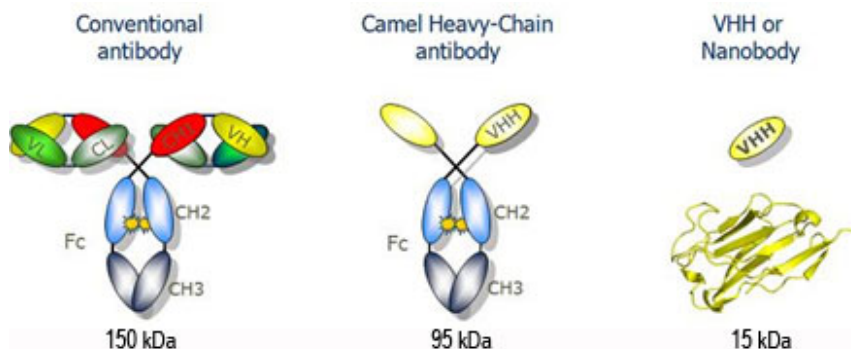
This service is targeted for large scale production of llama antibody. Downstream purification of llama whole IgG yields hundreds of mg. If you want to use llama antibody library, visit the website page specific for single-domain antibody production.

### **Llama VHH Antibodies: smaller is better !**

Abbotec is able to produce recombinant llama antibodies as reagents for the research, diagnostic and pharmaceutical markets. Antibodies are naturally occurring proteins with the ability to seek and bind to an essentially unlimited number of antigens. The specificity and selectivity of antibodies have made them an indispensable component of a wide variety of research, diagnostic and therapeutic activities. In the past decade, the most efficient drugs approved for cancer therapy are monoclonal antibodies engineered to recognize specific receptors on tumor cells and to destroy these cells. Current technologies to produce such antibodies are hindered by the generic antibody scaffold met in most mammals, a heterodimer of a heavy chain bound to light chains.

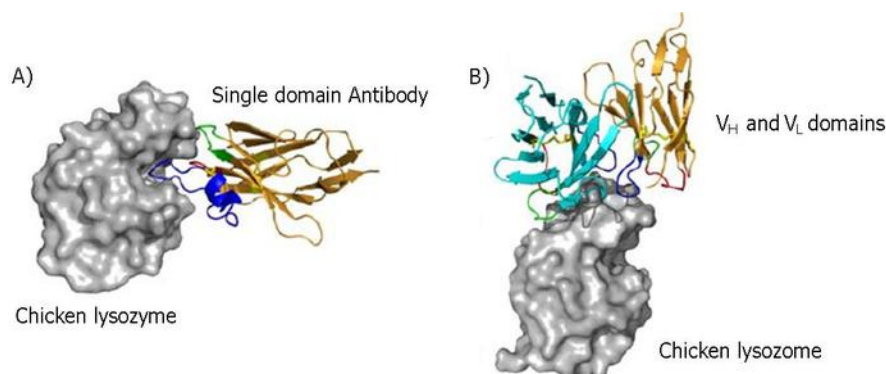
Llamas, as all members of the camelid family, produce antibodies with an original scaffold only made of heavy chains (IgG2 and IgG3), thus promoting binding to structural motifs unreachable before in protein targets, such as viral and enzymatic proteins. Subsequent inhibiting or neutralizing properties of these llama antibodies present them as ideal candidates for diagnostic and therapeutic agents in such fields of infectious diseases (AIDS, hepatitis, malaria), metabolic diseases (diabetes), or oncology (colon and breast cancers). Because engineering, selecting and producing these recombinant llama antibodies as single-domain antibodies (sdAbs), also called nanobodies for their shorter size, require outstanding competence and experience in recombinant antibody molecular and cell biology, few research teams in the world are able to deliver functional sdAbs for immunodiagnostic and immunotherapy.





Llama IgG1 displays the conventional antibody heterodimer backbone (left) whereas llama IgG2 and IgG3 lack light chains (center). VHH is the smallest sdAb with antigen binding properties obtained after gene cloning (right).

Abbotec offers its technical expertise to diagnostic and pharmaceutical companies as services for constructing immunized sdAb libraries using llama, screening of sdAb libraries and producing recombinant sdAbs in large scale. Abbotec's sdAb platform enables the generation of panels of high-affinity sdAbs ready for further development for diagnostic and therapeutic applications in less than 4 months.



Epitopes in the chicken lysozyme 3D structure recognized by llama sdAb (A) or mouse monoclonal antibody (B) raised against chicken lysozyme.

### VHH Properties

VHH single domain of IgG2/3 from dromedaries, camels, llamas, alpacas:

- Single monomeric variable antibody domain: benefits of antibody binding and size of small molecule drugs
- Longer CDR3 loop reaches out enzyme active sites and receptor clefts (mostly conformational epitopes)
- Easy cloning and selection of high-affinity binders
- Enhanced water solubility and temperature stability for production in bacteria
- Improved tissue penetration (BBB crossing) and clearance, low antigenicity (high homology with human)

To obtain good antibody responses, healthy and well-cared-for animals are essential. Injecting and bleeding animals safely and painlessly requires skills, training, and patience. In most countries, these procedures as well as the maintenance of laboratory animals are governed by specific legal requirements. These regulations vary from country to country but are designed to ensure the welfare of animals and to ensure that the operator is skilled and the manipulation justified. Abbotec abides by these requirements and has acquired licenses and permits for its US-based animal facility.

### Llama Polyclonal Antibody Production

Abbotec offers a Llama pAb Combo combining the most common customer requests:

With 3 mg of protein as antigen, 100-200 mg of purified antibody is generated from one llama against multiple epitopes in less than 4 months.

### Get a Quotation

Since prices vary upon project customization, we recommend submitting a quotation using the Quote Form available online for obtaining an accurate price. All requests are processed within 48 hrs.

### Guarantees

Abbotec guarantees competitive pricing and delivery time for all routine options. We are proud of offering "Made in USA" quality label for these services by using our USDA-registered animal facility.

Every antibody project is supplied with a Peptide Design and Project report, when applicable. Abbotec guarantees that the antibody generated using an antigen synthesized by Abbotec will recognize the antigen in an ELISA format.

Although most projects can be completed within 4 months, actual processing time is dependent on the peptide synthesis and animal immunization processes. Please contact the Technical Service Dept for updated timelines. Estimated delivery times are stated on all quotations.

### Llama pAb Production

Protocol	Description	Time	Price
<b>Immunization and Antisera Production</b> Cat. No. 104103	One llama is immunized with protein 98-day immunization protocol Pre-bleed (10 ml) and three bleeds (500-600 ml) per animal Optional: Extended immunization and blood collection (500-600 ml) per animal	14 weeks	\$2,865.00
Additional bleed collection Cat. No. 100125		2 weeks	\$450.00
<b>Serum Titration</b> Cat. No. 100130	Plasma is tested by ELISA before bleeding.	1 day	\$100.00
<b>Antibody Purification using:</b> Protein-G Affinity Cat. No. 100151	Llama IgG are purified from plasma using Protein-G affinity chromatography (50 ml plasma)	1 week	\$300.00
Antigen Affinity Cat. No. 100160	Antigen-specific IgG are purified from plasma using antigen-affinity chromatography with yield up to 10 mg (50 ml plasma)		\$500.00
IgG Fractionation Cat. No. 100152	Llama IgG are purified on Protein-G and A to isolate IgG1, IgG2 and IgG3 fractions (50 ml plasma).		\$800.00
<b>PBMC Isolation</b> Cat. No. 104101	PBMC isolation on Ficoll gradient from whole blood collection (50 ml per animal)	1 day	\$500.00
<b>Llama pAb Combo</b>	Includes Cat. No. 104103, 100130, 100151	<b>15-16 weeks</b>	<b>\$3,265.00</b>

**Immunization Protocol**

<b>Animal</b>	Llama glama (male/female, 3-4 yr old) or equivalent based on availability
<b>Adjuvant</b>	Complete Freund's Adjuvant (CFA) is used for the first injection followed by Incomplete Freund's Adjuvant (IFA) for subsequent injections.
<b>Immunogen</b>	Peptide conjugated to KLH or protein (100-200 µg/injection for proteins, 250-500 µg/injection for peptides), 1-3 mg total
<b>Injection Procedure</b>	Immunogen is diluted in sterile saline solution up to 1-ml and mixed with 1 ml appropriate adjuvant to form an emulsion that is injected subcutaneously in the lower back of the animal with a 20-gauge needle. Secondary site is an intramuscular injection at the lower rump.
<b>Blood Collection</b>	Blood is collected from the jugular vein with a 20-gauge needle. Test bleeds are allowed to clot at room temperature for 8 hours. Clotted blood is then refrigerated overnight before serum is clarified by centrifugation at 2,500 rpm for 20 min at 4C. For production bleeds, whole blood is collected on anti-coagulant (EDTA or citrate), and PBMC separated by Ficoll gradient.
<b>pAb Immunization Standard Protocol 98 Days</b>	Day 1: Collect pre-bleed (10 ml) Immunization No.1 with 500 µg immunogen in CFA Day 14: Immunization No.2 with 500 µg immunogen in IFA Day 28: Immunization No.3 with 500 µg immunogen in IFA Day 42: Production Bleed No.1 (500-600 ml). Plasma is titered by indirect ELISA using the antigen immobilized to the wells. Day 56: Immunization No.4 with 500 µg immunogen in IFA Day 70: Production Bleed No.2 (500-600 ml) Day 84: Immunization No.5 with 500 µg immunogen in IFA Day 98: Production Bleed No.3 (500-600 ml)