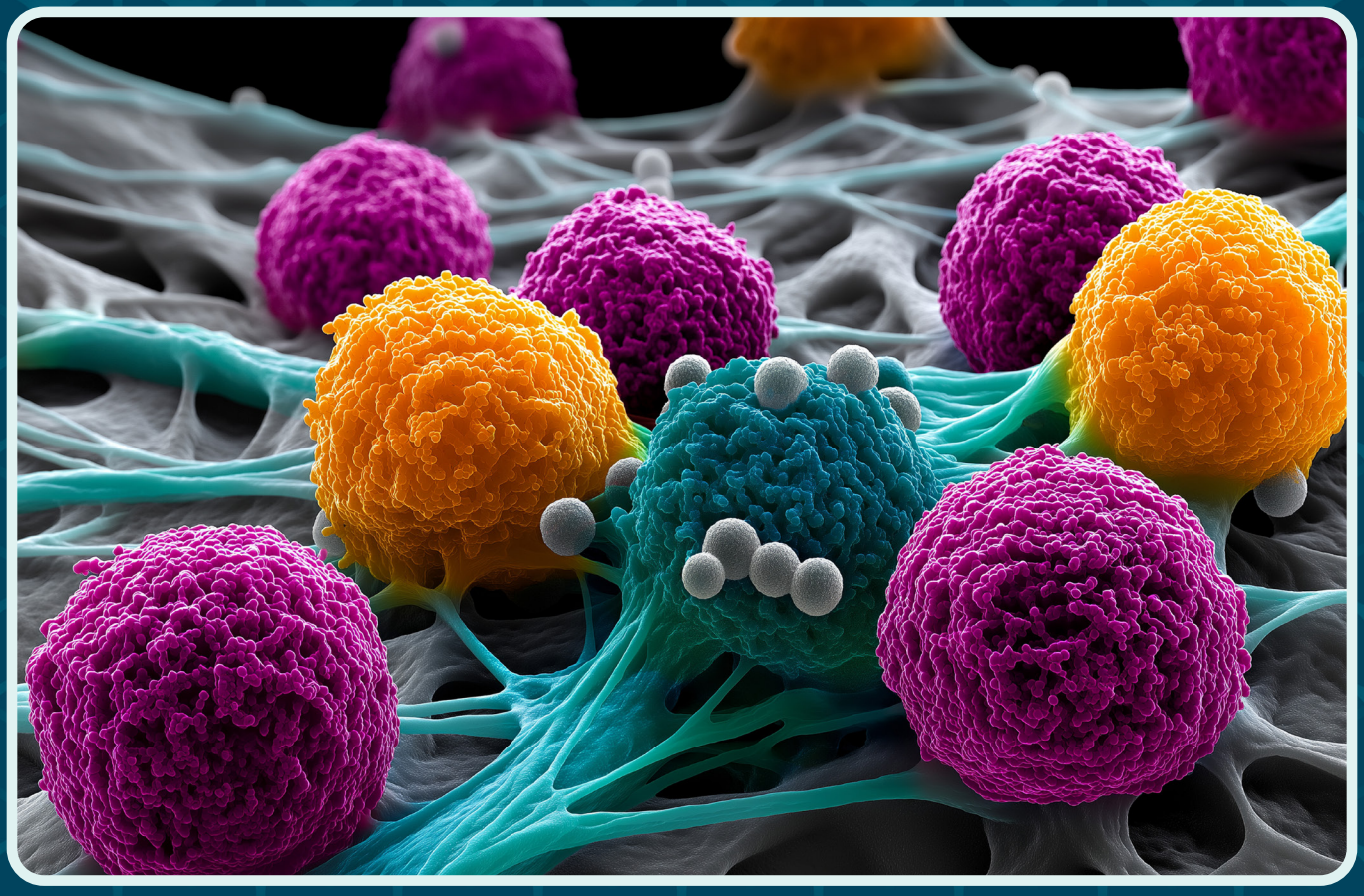
bioXcell

White Paper

Solving the Antibody Access Problem in Translational Research with Custom Services



Scientific breakthroughs in immunology and infectious disease often depend on timely access to the right reagents — especially for in vivo research, where antibodies must meet rigorous standards, including ultra-low endotoxin levels, preservative-free formulations, and murine pathogen screening. A recent study underscored this reality, revealing the essential role of the CXCR6–CXCL16 signaling axis in guiding virus-specific T cells to the kidney during polyomavirus infection. However, the research nearly stalled due to the inaccessibility of a suitable neutralizing antibody. Bio X Cell stepped in — not just as a supplier, but as a partner — navigating international licensing, sourcing hybridoma cells, and producing the antibody in a formulation suitable for in vivo use. The outcome was more than a publication; it was a demonstration of how enabling access to critical reagents can drive scientific progress.

The Research at a Glance

In March 2025, Dr. Aron Lukacher's team from Penn State College of Medicine published a landmark study in PLOS Pathogens that sheds light on a long-standing mystery in transplant immunology: how virus-specific T cells home to and persist in the kidney to control infection. Using a murine model of polyomavirus infection, the researchers identified the CXCR6–CXCL16 chemokine axis as a key regulator of T cell trafficking and retention in kidney tissue.

The study revealed several pivotal findings:

CXCR6 is critical for T cell infiltration of the kidney	Virus-specific CD4+ and CD8+ T cells expressed high levels of CXCR6 when located within the kidney parenchyma, compared with circulating T cells. CXCL16, the sole ligand for CXCR6, was expressed by kidney epithelial cells, creating a tissue-specific homing signal.
Neutralizing CXCL16 impaired immune control	When researchers administered a neutralizing antibody against CXCL16, T cell infiltration into the kidney was reduced, and viral levels increased, demonstrating that this signaling axis is not only active but essential for viral suppression.
IL-12 enhances CXCR6 expression	Treatment with IL-12 increased CXCR6 expression on virus-specific CD8+ T cells and promoted their recruitment to the infected kidney, ultimately lowering viral load. This suggests potential therapeutic strategies to boost antiviral immunity through cytokine modulation.
The findings translate to human disease	T cells from kidney biopsies of transplant patients with BK polyomavirus-associated nephropathy (PVAN) also expressed CXCR6, and transcriptomic data confirmed elevated CXCL16 and CXCR6 gene expression in PVAN patients versus controls. PVAN is the leading infectious cause of kidney allograft loss, and these findings point to new avenues for therapeutic intervention.

Taken together, the study underscores how tissue-specific immune cell trafficking directed by the CXCR6–CXCL16 axis can determine the success or failure of viral control in the kidney. The implications go beyond basic virology: they open the door to adoptive immunotherapy strategies, CXCL16-targeted interventions, and better diagnostics for transplant recipients at risk of PVAN.

This research not only advances our understanding of antiviral T cell dynamics in non-barrier tissues but also provides a translational foundation for clinical innovation. And at the center of this discovery was a critical reagent — an anti-CXCL16 antibody — without which the study would not have been possible.

A Behind-the-Scenes Partnership

The Researcher's Dilemma

Great research often begins with a simple question and sometimes stalls owing to a practical barrier. In this case, the challenge wasn't conceptual; it was logistical. The research team knew that the chemokine ligand CXCL16 was likely central to immune cell behavior in the kidney and sought to validate this with a neutralizing monoclonal antibody (mAb). But that critical reagent was nowhere to be found in a format that met the study's stringent requirements.

Available commercial antibodies to CXCL16 posed multiple challenges. Some were prohibitively expensive, particularly at the scale needed for murine studies. Others were not formulated for *in vivo* use, lacking critical low endotoxin specifications or containing stabilizers unsuitable for injection. Many were simply unavailable in the required volumes, with suppliers offering only microgram quantities designed for *in vitro* assays — far from sufficient for the demands of multi-dose animal studies.

For a study dependent on daily injections over multiple timepoints in mice, none of these options would suffice. Without a viable source for the antibody, the project was at risk of being delayed indefinitely — or shelved entirely.

The Bio X Cell Response

Faced with this obstacle, the research team turned to Bio X Cell, known for its specialized portfolio of *in vivo*–ready antibodies — formulated in preservative-free PBS, certified for low endotoxin, and available at scale. Although the target antibody wasn't listed in the catalog, the team reached out based on prior experience with Bio X Cell's responsiveness and technical expertise.

What followed was a multi-month collaborative effort to resolve the issue. Bio X Cell began by tracing the antibody's origin, ultimately identifying a university lab in Japan believed to have developed the hybridoma. From there, the company initiated technology transfer discussions to gain access to the cell line. Negotiating with the university's tech transfer office proved challenging, particularly given the antibody's limited commercial availability at a high cost from another supplier. Still, Bio X Cell persisted, recognizing the unmet scientific need and potential impact. The team successfully secured a license, enabling in-house production to the company's rigorous *in vivo* standards.

With the hybridoma in hand, Bio X Cell scaled up production, purified the antibody, and delivered it to the research team in the required volume and timeframe — keeping the study on track. Although originally a bespoke project, it soon evolved. Noticing that other researchers had been searching for the same antibody on its website, Bio X Cell chose to convert the product into a catalog offering, ensuring broader access for future studies on T cell trafficking, inflammation, and viral pathogenesis.

Why It Matters: Bio X Cell's Differentiators

Fit-for-Purpose *in vivo* Antibodies

Many commercial antibodies are designed for *in vitro* use, where issues like aggregation, preservative content, or low-level contaminants don't pose serious problems. But *in vivo* applications demand a higher bar:

- **Ultra-low endotoxin levels:** Bio X Cell maintains a rigorous threshold of ≤1 EU/mg — often lower — essential for avoiding adverse immune reactions in live animals. This is made possible not by post hoc purification, but by proactively keeping endotoxin out of the process from the start.
- **Preservative- and stabilizer-free formulation:** All Bio X Cell antibodies for *in vivo* use are formulated in PBS without additives, reducing the risk of immunogenicity or toxicity and ensuring compatibility with sensitive animal models.
- **Pathogen screening:** Many animal facilities require documentation that injected materials are free from murine pathogens. Bio X Cell meets this requirement with routine murine pathogen screening, a service that many competitors simply do not offer.
- **Aggregation testing:** Protein aggregates can provoke unexpected immune responses. Bio X Cell conducts analytical size-exclusion chromatography (SEC) to ensure the structural integrity of select catalog and custom antibodies, minimizing off-target effects *in vivo*.
- **Verified *in vivo* functionality:** Bio X Cell antibodies are selected and validated for functional activity in living systems — including neutralizing, depleting, and activating antibodies — ensuring that researchers can rely on them to produce meaningful biological effects in complex *in vivo* environments.

Dual Capability: Custom and Catalog

In this case, Bio X Cell began with a one-off custom solution and ultimately converted it into a widely available catalog product — a model that bridges the gap between individual researcher needs and community-wide access. This flexibility is central to the company's approach. Researchers can submit custom requests for antibodies not yet listed in the catalog, and Bio X Cell proactively monitors search activity and demand trends to identify high-priority targets for broader production. Thanks to robust in-house manufacturing capabilities, we can scale production seamlessly from milligram quantities to gram-scale batches without compromising quality. This dual custom/catalog model also creates opportunities for co-development, where researchers can contribute antibody targets or supporting data in exchange for discounted pricing and expanded access — transforming the traditional supplier relationship into a true scientific partnership.

In addition to technical precision, Bio X Cell's in-house manufacturing infrastructure offers exceptional scalability, with the ability to produce antibodies in quantities ranging from milligrams to grams. Operating from a 26,000-ft^2 facility with the capacity to scale up to 2,000 liters per month, Bio X Cell reliably supports high-volume production without compromising on quality, purity, or consistency.

Conjugation Capabilities for Advanced *In Vivo* Applications

While this case focused on an unconjugated neutralizing antibody for functional blockade, many modern research applications, from imaging and tracking to targeted delivery, require conjugated antibodies tailored to specific downstream uses. Bio X Cell's in-house conjugation services provide researchers with access to high-quality, ready-for-*in vivo*-use antibodies that are customized for precision applications.

Whether designing antibodies for non-invasive imaging, therapeutic delivery, or multi-color detection assays, Bio X Cell simplifies what is often a complex and time-consuming process. Researchers benefit from a wide selection of catalog antibodies ready for immediate conjugation, along with diverse chemistries to support applications such as oligonucleotide delivery, dye labeling, and protein tagging. Conjugated isotype controls are available to ensure experimental rigor, and every product undergoes rigorous quality control, with optional services like HPLC analysis, fluorescence-to-protein (F/P) ratio measurement, and murine pathogen screening. With rapid turnaround times and large-volume production capacity, Bio X Cell helps researchers meet the demands of preclinical workflows. Available conjugates include biotin, antisense oligonucleotides (ASOs), imaging dyes, and fluorochromes — customized for applications ranging from ELISA and flow cytometry to immunofluorescence, IHC, and TR-FRET.

These services are backed by Bio X Cell's expert technical team, who provide end-to-end support from conjugation strategy to purification, sterile vialing, and delivery. For researchers looking to go beyond basic antibody function and toward integrated therapeutic or diagnostic workflows, Bio X Cell offers a complete, scalable solution.

End-to-End Support and Responsiveness

What truly set this project apart wasn't just what Bio X Cell could make — it was how the process was managed from start to finish. The team took a proactive approach to sourcing the hybridoma, navigated complex IP negotiations to secure licensing, and executed a fast, sterile-scale-up under stringent quality controls. Throughout the project, a dedicated technical project manager ensured clear and continuous communication, providing the researcher with confidence and continuity at every stage. This responsiveness is a key part of what builds trust with researchers, especially academic teams who may lack the resources of biopharma but contribute equally to foundational scientific advances.

Implications for the Broader Research Community

Since delays in reagent access can stifle innovation, Bio X Cell operates as a true partner in scientific discovery, helping to rewrite what researchers can reasonably expect from their suppliers.

Rather than taking a passive, transactional approach to antibody distribution, Bio X Cell actively identifies and resolves bottlenecks that impede research progress. In the case of the CXCL16 project, this meant sourcing and licensing a hard-to-access hybridoma, scaling production under exacting quality standards, and ultimately democratizing access by launching the antibody as a catalog product.

This model of barrier-breaking collaboration carries several important implications. First, it overcomes limitations in reagent availability, particularly for researchers working with novel or underexplored targets. What was once an expensive, impractical reagent became a broadly accessible tool. Second, it helps democratize immunological research by equipping scientists at a range of institutions with access to reagents that meet the high standards of *in vivo* experimentation, regardless of their budget or internal production capabilities. Finally, it encourages new scientific opportunities by enabling the broader research community to build on foundational discoveries. By adding the CXCL16 antibody to the catalog, Bio X Cell effectively opened the door for further investigations into tissue-specific T cell trafficking, transplant immunology, and viral pathogenesis.

The ripple effects of this approach are far-reaching. In the near term, it enables faster, more reproducible preclinical work. In the longer term, it facilitates translational advances — whether in adoptive immunotherapy strategies, cytokine modulation techniques, or new diagnostics for post-transplant care.

Key Takeaways

The development and deployment of the CXCL16 antibody to drive these discoveries underscores how practical challenges in reagent access can shape the trajectory of biomedical research. What began as a request for a hard-to-source reagent evolved into a successful collaboration that enabled a high-impact publication and added a new tool to the research community.

Bio X Cell's role in this process—sourcing a hybridoma, navigating licensing, and producing an *in vivo*–ready antibody to rigorous standards—demonstrates the value of responsiveness, technical expertise, and adaptability. The company's ability to transition from custom solution to catalog offering also highlights how unmet needs in the lab can inform and expand shared scientific resources.

While this case involved a specific target and disease model, it reflects broader themes relevant across the life sciences: the importance of communication between researchers and suppliers, the need for streamlined institutional processes, and the potential for small-scale requests to lead to broader scientific impact.

As new questions emerge and technologies evolve, the research community will continue to rely on both innovation and infrastructure. The CXCL16 project is one example of how those elements can come together to support discovery and a reminder that collaboration, at every stage, remains essential to progress.

Kaitlyn Bushey
Director, Strategic Alliances, Bio X Cell

For more information, please contact us at 1.866.787.3444 | customerservice@bioxcell.com
bioxcell.com

rev 10.25