

Plasmid DNA Manufacturing

with Pratima Cherukuri

Bionova Scientific has established itself in plasmid DNA (pDNA) manufacturing, addressing one of the most significant bottlenecks in the cell and gene therapy (CGT) industry: access to high-quality plasmids delivered at the ideal scale and speed. Founded in 2014 by a biopharmaceutical veteran and acquired by Asahi Kasei in 2022, the company brings a decade of proven expertise in solving complex expression and purification challenges on the biologic side, consistently achieving yields of up to 10 g/L. Pratima Cherukuri (general manager and senior vice president at Bionova Scientific) discussed the company's offerings for pDNA and viral-vector manufacturing in a September 2025 Ask the Expert webinar.

CHERUKURI'S PRESENTATION

The company's value proposition combines scientific depth and proven delivery capabilities. Bionova supports clients at all stages of development in a their comprehensive approach backed by a track record that instills confidence in quality outcomes. Currently operating a 10,000-ft² good manufacturing practice (GMP) facility dedicated to plasmid production, Bionova is adding a new 70,000-ft² greenfield facility. That expansion will increase production capacity from 50 L to 200 L of microbial fermentation, designed to support both late-stage clinical trials and commercial viral-vector manufacturing.

Bionova's service offerings include plasmid design for different applications, such as lentiviral vectors (LVVs), retroviral vectors (RVVs), adenoassociated viruses (AAVs), DNA-based vaccines, and minicircles. The company's comprehensive approach continues through strain development,

cell banking, process and analytical development, and GMP-compliant manufacturing, with full quality-control (QC) and release-testing capabilities onsite. The company offers flexible manufacturing options that shorten technology transfers with reduced risks for client programs.

Two Novel Technologies: Bionova's competitive advantage lies in two technological differentiators: Scarab Genomics and Syenex technologies. The company leverages the Ultra-Yield and Plasmid Plus systems to deliver reproducible, high-yield processes. It also offers off-the-shelf plasmids for LVV production, while a gene of interest (GoI) is developed according to each program's therapeutic requirements.

The Scarab Genomics technology represents an advancement in plasmid manufacturing. Using a specialized bacterial strain that lacks insertional sequences, Bionova is the world's first pDNA manufacturing company to offer IS3 plasmids. Insertional sequences are critical elements in bacterial evolution and antibiotic-resistance development. They can pose risks in CGT manufacturing by disrupting critical plasmid regions. The genetic stability provided by IS3 technology prevents rearrangement and/or loss of essential plasmid sequences, reduces horizontal gene-transfer risks, and eliminates toxic insertions. The approach ensures superior regulatory compliance, enhanced manufacturing efficiency, and consistent batch-to-batch performance.

The Syenex technology platform for LVV applications uses traditional packaging plasmids and an additional Ultra T plasmid system to deliver a 10× boost in T-cell transduction efficiency. The science behind the Syenex

technology involves engineered envelope proteins that transduce T cells more effectively than regular LVV systems do using only vesicular stomatitis virus G (VSV-G) proteins. Usage with the Genetically Encoded Multifunctional Nanovesicles (GEMINI) delivery system (Northwestern University) for enhanced LVV envelope performance demonstrated 7–10× increased transduction efficiency compared with industry standards.

Bionova also is introducing in vivo LVV capabilities: A new packaging plasmid system targets directly injectable LVV applications, showing 10× increased transduction efficiency and enhanced gene presence in humanized mouse models, with demonstrated potency in B-cell killing assays. The company's manufacturing platform consistently produces pDNA with >85% supercoil percentage on average, reaching >90% for packaging plasmids. That comprehensive approach positions Bionova Scientific as a critical partner in the CGT field.

QUESTIONS AND ANSWERS

Why do you use IS3 plasmids over regular plasmids? Regulators historically have accepted traditional plasmids with insertional sequences. However, such sequences can jump into critical plasmid parts, leading to gene inactivation, altered expression, antibiotic resistance, or even production instability. IS3 plasmids are designed to eliminate that concern.

How does the Ultra T system deliver high potency in T cells? The plasmids used are the same ones that will be used during LVV production. The system expresses affinity receptors to T cells with enveloped VSV-G, leading to a 10× increase in potency. 🌐

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