Job Title: Senior Scientist / Associate Principal Scientist, Cell Line Development & T Cell Mechanistic Biology
Reports to: SVP, Head of Technology Operations
Employment Type: On-site
Location: Philadelphia, PA

About BlueWhale Bio

BlueWhale Bio is a clinical-stage, revenue-generating biotechnology company developing enabling technologies to expand the reach, efficiency, and scalability of cell-based therapies. Our founding scientific team is led by Dr. Carl June and Dr. James Riley at the University of Pennsylvania, and our platform is designed to address critical limitations in current cell therapy manufacturing by enabling more robust, scalable, and cost-effective immune-cell activation and expansion.

About the Role

BlueWhale Bio is seeking a highly motivated, self-driven Senior Scientist / Associate Principal Scientist to lead K562-based cell line development and mechanistic biology for BlueWhale's Synecta platform and new pipeline products.

This scientist will serve as a key technical owner for engineering recombinant K562 producer/model cell lines and using these systems to define how BlueWhale's Synecta T1 product activates T cells compared with other activation technologies, including bead-based, soluble antibody, polymeric, and artificial antigen-presenting-cell approaches.

The ideal candidate combines deep hands-on experience in T-cell biology, molecular biology, stable mammalian cell-line engineering, flow cytometry, and functional immune assays. This person should be comfortable designing experiments from first principles, building new model systems, generating and interpreting complex datasets, and translating mechanistic insights into actionable product-design, process-development, and analytical-control strategies.

This is a highly visible role for a scientist who wants to build a platform, not just run assays.

Key Responsibilities

Cell Line Development & Molecular Engineering

- Lead the design, generation, screening, and characterization of recombinant K562 and related engineered cell-line systems to support Synecta T1 mechanistic studies and new pipeline product development.
- Design and build stable cell lines expressing defined combinations of immune-modulatory signals, including T-cell receptor engagement signals, costimulatory ligands, adhesion molecules, cytokines, antigen-specific constructs, and other surface or secreted factors relevant to immune-cell activation and expansion.
- Apply viral and non-viral engineering approaches, including lentiviral and/or retroviral transduction, transposon-based systems such as Sleeping Beauty or PiggyBac, CRISPR/Cas9, knock-in/knockout strategies, overexpression systems, and molecular cloning.
- Develop cell-line screening workflows to evaluate expression level, expression stability, ligand density, surface presentation, growth characteristics, manufacturability, and functional performance.
- Build modular engineered cell systems that enable rapid hypothesis testing across Synecta T1 and future product concepts.

Synecta T1 Mechanistic Understanding

- Design and execute mechanistic studies to define how Synecta T1 activates, expands, and functionally programs primary human T cells.
- Compare Synecta T1 activity against relevant activation technologies, such as magnetic beads, soluble or polymeric activation reagents, artificial APC systems, and other commercial activation platforms.
- Identify key molecular drivers of product performance, including receptor engagement, costimulation, adhesion, cytokine signaling, ligand density, spatial organization, signal duration, and CDNP-related presentation effects.
- Develop mechanistic models linking engineered producer-cell attributes and Synecta product attributes to T-cell activation, proliferation, phenotype, transduction efficiency, electroporation compatibility, cytokine secretion, exhaustion phenotype, memory phenotype, and functional potency.
- Translate mechanistic insights into product-design principles, critical quality attributes, analytical methods, and next-generation Synecta product concepts.

T Cell Biology & Functional Assay Development

- Design and execute primary human T-cell assays to evaluate activation, expansion, phenotype, function, and durability of response.

- Develop and run multiparameter flow cytometry panels to assess activation markers, memory phenotype, exhaustion markers, costimulatory receptor expression, proliferation, viability, and product-relevant functional markers.
- Use functional readouts such as cytokine secretion, ELISA/MSD/Luminex, cytotoxicity assays, proliferation assays, gene-expression readouts, transduction efficiency, and other fit-for-purpose immune-cell assays.
- Apply perturbation approaches, including genetic, pharmacologic, cytokine, blocking-antibody, and pathway-modulation studies, to dissect mechanism of action.
- Generate high-quality, reproducible datasets that support both scientific understanding and product-development decision-making.

Cross-Functional Leadership

- Collaborate closely with R&D, Analytical Development, Process Development, Manufacturing Sciences, Quality, and Regulatory/CMC teams to translate biological findings into practical product and process strategies.
- Contribute to experimental strategy for new pipeline products, including next-generation T-cell activation reagents and additional immune-cell activation or expansion products.
- Author technical reports, study plans, data summaries, invention disclosures, and presentations for internal leadership, external collaborators, and regulatory-support packages.
- Mentor junior scientists and research associates in cell-line engineering, assay development, experimental design, data interpretation, and scientific rigor.
- Operate with a high degree of independence in a fast-paced, entrepreneurial biotech environment.

Required Qualifications

- PhD in immunology, molecular biology, cell biology, bioengineering, virology, biological engineering, or a related discipline with relevant industry or postdoctoral experience.
- For Senior Scientist level: typically PhD with ~2–5 years of relevant experience, or MS with significant industry experience.
- For Associate Principal Scientist level: typically PhD with ~5–8+ years of relevant biotech/pharma experience and demonstrated scientific/project leadership.
- Strong hands-on experience with T-cell biology, primary human immune-cell culture, and functional immune-cell assays.
- Hands-on experience with stable mammalian cell-line engineering, ideally including K562, Jurkat, HEK293, CHO, or other engineered suspension/adherent mammalian systems.

- Strong molecular biology skills, including vector design, cloning, transduction/transfection, genetic modification, and molecular characterization of engineered cells.
- Experience with viral vector systems and/or transposon-based engineering systems.
- Deep expertise in multiparameter flow cytometry, including panel design, compensation, gating strategy, data interpretation, and immune phenotyping.
- Demonstrated ability to design complex mechanistic experiments and interpret multidimensional biological datasets.
- Strong scientific judgment, problem-solving skills, and ability to prioritize experiments that answer the most important product-development questions.
- Excellent communication skills and ability to present complex scientific concepts clearly to technical and non-technical audiences.

Preferred Qualifications

- Direct experience engineering **K562 cells** or artificial antigen-presenting-cell systems for immune-cell activation.
- Experience with CAR-T, TCR-T, TIL, NK-cell, iPSC-derived immune-cell, or other cell therapy platforms.
- Experience comparing immune-cell activation technologies, such as Dynabeads, TransAct, soluble anti-CD3/anti-CD28, artificial APCs, feeder cells, cytokine cocktails, or engineered nanoparticles.
- Experience with CDNPs, extracellular vesicles, exosomes, lipid nanoparticles, or other cell-derived or particle-based biological systems.
- Experience studying costimulatory biology, including CD28, 4-1BB/41BBL, CD80/CD86, ICAM-1/LFA-1, OX40/OX40L, CD40/CD40L, IL-2, IL-7, IL-15, IL-21, or related immune-modulatory pathways.
- Experience linking biological mechanism to CQAs, potency assays, product characterization, process development, or CMC/regulatory strategy.
- Experience with high-dimensional data analysis, transcriptomics, proteomics, single-cell analysis, or computational immunology.
- Track record of scientific creativity, strong ownership, and independent execution in a startup or fast-moving industry environment.

Key Attributes

We are looking for someone who is:

- Scientifically curious and mechanistically driven.
- Highly motivated, self-directed, and comfortable creating structure in an emerging platform area.
- Hands-on and experimentally rigorous.
- Able to move quickly without sacrificing data quality.
- Comfortable owning projects from concept through execution, analysis, and recommendation.
- Excited to build new technologies that can change how cell therapies are manufactured.
- Collaborative, transparent, and able to work effectively across R&D, process development, analytical development, manufacturing, and leadership teams.

Why Join BlueWhale Bio

This role offers the opportunity to shape a core platform technology at a growing biotechnology company and directly influence the design of next-generation products for cell therapy manufacturing. The successful candidate will help define the mechanistic basis of Synecta T1, build the cell-line engineering engine for future pipeline products, and contribute to technologies with real translational and clinical impact.

BlueWhale Bio is an equal opportunity employer. We are committed to building a collaborative, inclusive, and scientifically rigorous environment where talented professionals can contribute to meaningful advances in cell therapy.

Contact us: careers@bluewhale.bio