Performance Enhancement Category	Title	Description	Key words	Reference	Docket #	
Phenotype, proliferation and exhaustion inhibition	Improvement in efficacy of adoptive transfer of T cells by the genetic addition of a small peptide encoding a protein kinase A regulatory subunit I anchoring disruptor (RIAD)	Enhanced tumoricidal efficiency in adoptive T-cells engineered to co-express RIAD-RISR peptide along with either CAR or engineered TCR.	RIAD-RISR, Solid tumors, Prostate cancer	EP 3286211	15-7306	
Phenotype, proliferation and exhaustion inhibition	Modulation of methylcytosine dioxygenases for improving the therapeutic efficacy of gene-modified antigen-specific T cells	Rapid massive expansion of clonal CAR T cell population and increased functional activity of T-cells via the disruption of methylcytosine dioxygenase genes (e.g., Tet1, Tet2, Tet3).	CAR-T expansion, Tet1, Tet2, Tet3	WO 2017049166	16-7609	
Manufacturing	Single vector systems for simultaneous but independent constitutive and antigen-induced transgene expression	A single lentiviral vector system that integrates constitutive immune receptor expression and autonomous inducible expression based on antigen recognition and microenvironment to improve the targeting and specificity of immunotherapy.	Lentiviral, Constitutive immune receptor expression	Technology Summary	17-8348	
Phenotype, proliferation and exhaustion inhibition	Combination of CART and SMAC mimetics for cancer treatment	A small molecule SMAC-mimetic used in conjunction with CAR T-cell therapy increases efficacy of cancer treatment.	SMAC, SMAC-mimetic	WO 2019165215	18-8446	
Enhanced cytokine activity	CAR T therapy in combination with IL-15R and IL15	Methods for increasing persistance and anti-cancer activity of T-cells by co-transduction of IL15Rα-T2A-IL15 and chimeric antigen receptors.	IL15, IL15R	WO 2019160956	18-8579	
Manufacturing	A method to harness patient's antibodies and transform them to highly potent, T-cell redirecting antibodies for treatment of cancerous tumors.	T cell redirecting antibodies	Bispecific T cell-redirecting autoantibodies	*Inquire*	18-8590	
Phenotype, proliferation and exhaustion	Engineered expression of cell surface and secreted sialidase by CAR T cells for increased efficacy in solid tumors	Methods for human sialidase and neuraminidase-expression to promote synergistic cytotoxicity effects betweek CAR T- and NK cells.	CAR-T and NK synergy, Sialidase, Neuraminidase, Solid tumors	WO 2020236964	19-8906	
Metabolism	Enhancing CAR T therapy with metabolic enzyme expression	Methods to enable CAR immune cells to overcome nutrient-limited tumor environments for competitive advantage over cancer cells.	Metabolic enzyme expression, Nutrient-poor environment	WO 202004166	20-9098	
Phenotype, proliferation and exhaustion	Enhancing CAR T cell efficacy using Neuraminidase as well as Galactose Oxidase	Methods to significantly enhance the killing of solid tumor cells by CAR T-cell therapy through inducible expression of neuraminidase and galactose oxidase.	Neuraminidase, Galactose Oxidase	WO 2023/015300	20-9103	
Enhanced cytokine activity	Treatment of cancer by inhibition of Blimp-1 (PRDM1) in the setting of gene-modified T cell therapy	Methods to develop PRDM1 and NR4A3 deficient CAR T-cells which demonstrate heightened proliferation, sustained central memory T-cell phenotype, elevated effector cytokine secretion, and tumor treatment outcomes.	Blimp-1, PRDM1, Central memory phenotype, Proliferation, Prostate cancer	WO 2023/086882 A1	20-9204	
Phenotype, proliferation and exhaustion	Selective stimulation of T cells in solid tumors using oncolytic viral delivery of orthogonal IL-2	Selective stimulation and expansion of CAR T-cells through the expression of an orthogonal IL2 receptor beta allowing specific activation of tumor-targeting cells without triggering endogenous IL2.	Donor cell expansion, IL2 receptor beta	WO 2022/192346	20-9235	
Phenotype, proliferation and exhaustion	CRISPR mediated knock out of SOX4 and ID3 delays T cell dysregulation induced by chronic antigen exposure	Downregulation of endogenous SOX and/or ID3 to forfend T-cell exhaustion.	Exhaustion, CRISPR-KO, Sox4, ID3	WO 2022/192249	21-9509	
Phenotype, proliferation and exhaustion	Knockout of Regnase-1 and Roquin-1 alone or together to enhance CAR T cell activity	Knockout of Regnase-1 and Roquin-1 to potentiate greater inflammatory CAR T-cell function and persistence against cancer.	Inflamatory function, Regnase-1, Roquin-1	WO2023070080	21-9707	
Enhanced cytokine activity	Chimeric cytokine receptors for enabling adoptive T cell therapy of solid tumors via IL-9 signaling	Development of a CAR that comprises an intracellular signaling domain of IL9 receptor alpha (IL9Ra) combined with IL9, IL13, IL2, or IL18 cytokine expression and Cullin 5 suppression.	IL9, IL13, IL2, IL18, Cul5 inhibition	WO 2023/044456	21-9767	
Enhanced cytokine activity	Orthogonal cytokine enhanced CAR T cells generated through gene editing	Methods to modulate IL-2 and IL-15 responsiveness through expression of orthogonal IL2RB establishing a proof-of-concept for using orthogonal cytokines with ACT.	Orthogonal cytokines, IL2, IL15	*Inquire*	22-10028	
Manufacturing	Methods to PEGylate CAR-T cells to block the interactions with monocytes and macrophages to reduce cytokine release syndrome and neurotoxicity.	In situ PEGylation of CAR T cell therapeutics to alleviate cytokine release syndrome and neurotoxicity.	PEGylation, Cytokine release syndrome	*Inquire*	22-10066	
Manufacturing	Methods for optimizing T cell immunotherapeutic effector and memory function	Methods to allows the distinction of proximal and distal first division daughter CAR cells, with favirable implications for memory phenotype.	Memory phenotype, asymmetric T cell division, LIPSTIC	*Inquire*	22-10074	
Enhanced cytokine activity	Potentiating adoptive cell therapy using synthetic IL-9 receptors	CAR that comprises an intracellular signaling domain of an IL9 receptor alpha (IL9Ra).	IL9, IL9R	WO 2023044453	22-9826	
Manufacturing	Decoy HLA-E SCT for allogeneic donor cells	A method of CAR T-cell modification that genetically removes surface proteins to lower the risk of immune allo-recognition and adds peptides to prevent self-attack in graft vs host disease (GVHD).	Universal donor, Allogenic therapy, NK cytotoxicity, Graft Versus Host Diseas	*Inquire*	22-9914	
Phenotype, proliferation and exhaustion	Compositions and methods for enhancing the anti-tumor activity of CAR T cells by co-expression of Ch25h	Enhancing anti-tumor activity, inhibiting trogocytosis, decreasing T cell exhaustion, and increasing viability of CAR T cells by co-expression with cholesterol 25-hydroxylase (CH25H) in a single construct for treatment of solid tumor and hematological cancers.	Cholesterol 25-hydroxylase (CH25H), Trogocytosis	Technology Summary	22-9930	
Phenotype, proliferation and exhaustion	HVEM and BTLA modulation to enhance CART immunotherapy	Method for enhancing CAR-T immunotherapy via protein mutation to disrupt host immunosuppression and increase CAR effectiveness.	Host immunosuppression, HVEM, BTLA	*Inquire*	22-9982	
Enhanced cytokine activity	Immunocytokines for specific augmentation of CAR T cells	Methods to selectively express immunostimulatory cytokines on CAR T-cells for localized cytokine delivery.	Cytokine delivery	*Inquire*	23-10290	
Metabolism	Inhibition of diacyclglyceral kinase (DGK) to augment adoptive T cell transfer	Methods to improve cytolytic activty of T-cells by inhibiting diacylglyceral kinase.	Cytolytic activity, Diacylglyceral kinase	WO 2014039513	Y6336	
Manufacturing	CD137 enrichment for efficient TIL selection	A platform for the isolation and expansion of CD137-positive tumor-infiltrating lymphocytes to use in adoptive immunotherapy and translational studies.	Tumor-infiltrating lymphocyte, CD137	Technology Summary	Z6725	

For inquiries and further exploration of technologies available from Penn, please reach out to CAR-T@pci.upenn.edu.
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