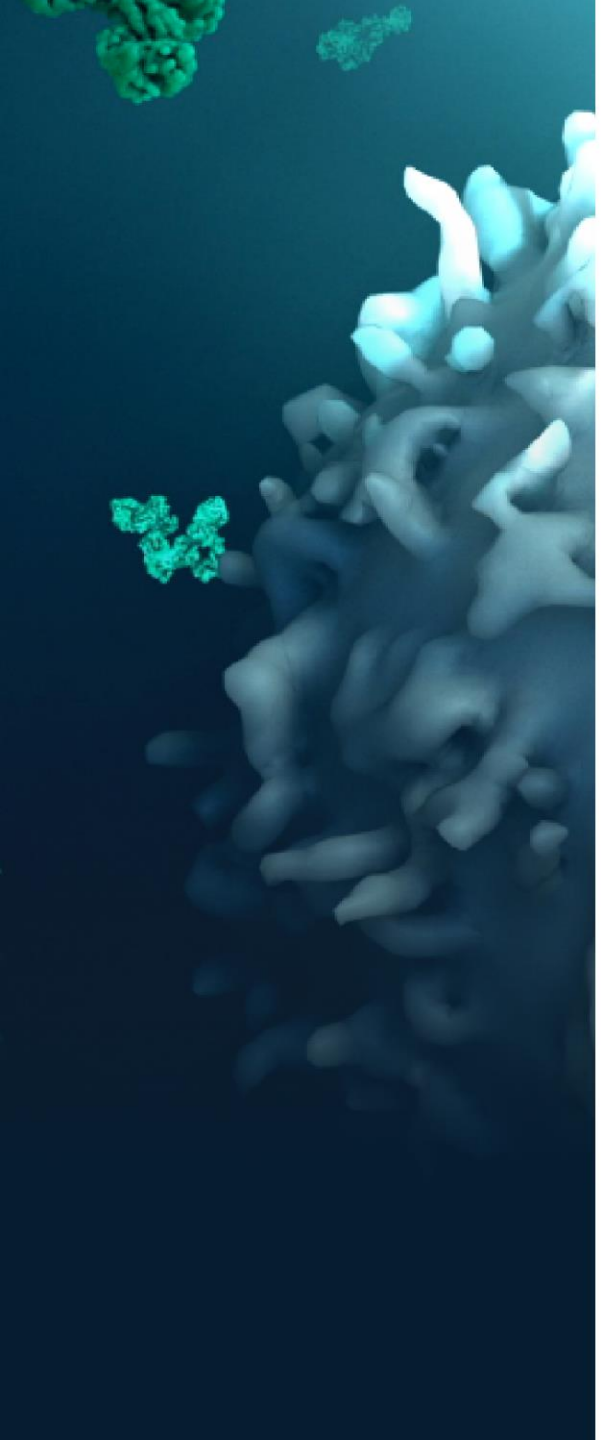
2021 Oncology R&D Day

JUNE 16, 2021

PDS Biotechnology

A new generation of multi-functional cancer immunotherapies and infectious disease vaccines



Forward-Looking Statements

This presentation contains forward-looking statements about PDS Biotechnology Corporation (“PDSB”), and its businesses, business prospects, strategies and plans, including but not limited to statements regarding anticipated pre-clinical and clinical drug development activities and timelines and market opportunities. All statements other than statements of historical facts included in this presentation are forward-looking statements. The words “anticipates,” “may,” “can,” “plans,” “believes,” “estimates,” “expects,” “projects,” “intends,” “likely,” “will,” “should,” “to be,” and any similar expressions or other words of similar meaning are intended to identify those assertions as forward-looking statements. These forward-looking statements involve substantial risks and uncertainties that could cause actual results to differ materially from those anticipated.

Factors that may cause actual results to differ materially from such forward-looking statements include those identified under the caption “Risk Factors” in the documents filed with the Securities and Exchange Commission from time to time, including its Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q and Current Reports on Form 8-K. You are cautioned not to place undue reliance on these forward-looking statements, which speak only as of the date of this presentation. Except to the extent required by applicable law or regulation, PDSB undertakes no obligation to update the forward-looking statements included in this presentation to reflect subsequent events or circumstances.

Welcome and Agenda

Today's Agenda

Welcome and Introductions	Deanne Randolph
Versamune®: A New Generation of Cancer Immunotherapies	Dr. Frank Bedu-Addo
Development of PDS0101 for HPV16-associated cancers	Dr. Lauren V. Wood Dr. Jeff Schlom Dr. Caroline Jochems Dr. Julius Strauss
Development of PDS0102 for TARP-related cancers	Dr. Lauren V. Wood
Development of PDS0103 for MUC1-related cancers	Dr. Lauren V. Wood Dr. Caroline Jochems
Conclusion	Dr. Frank Bedu-Addo

Versamune®: A New Generation of Cancer Immunotherapies

A significant barrier to effective immunotherapy has been the **inability to promote adequate CD8+ killer T-cell responses** *in vivo* resulting in **diminished efficacy; 70-90%** of cancer patients **fail check point inhibitor therapy**

PDS Biotech's Versamune®-based immunotherapies are designed to promote a powerful *in vivo* tumor-specific **CD8+ killer T-cell response**

Versamune®-based therapies also show promising potential to:

Generate the right type and quantity of effective CD8+ killer T-cells

Generate memory T-cells, to enhance durability of response

Generate potency without systemic side effects

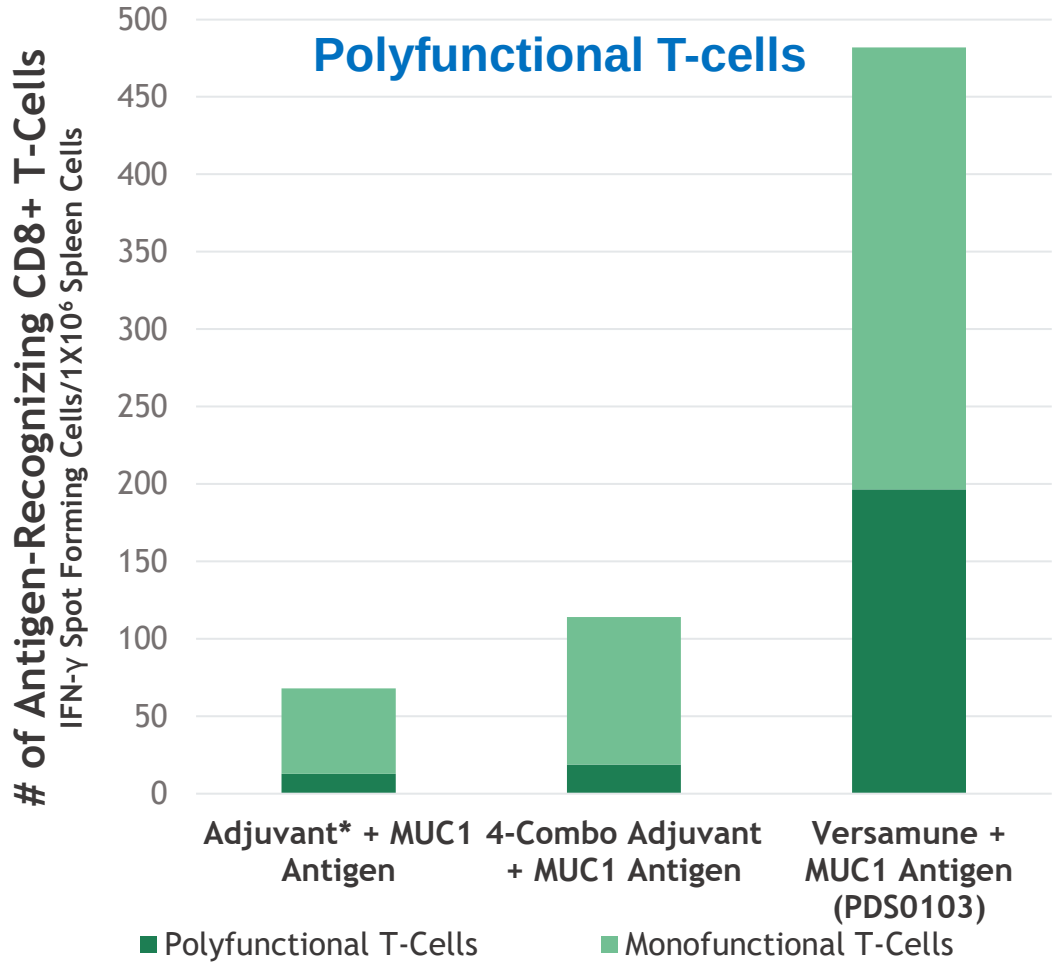
Current state of cancer immunotherapy

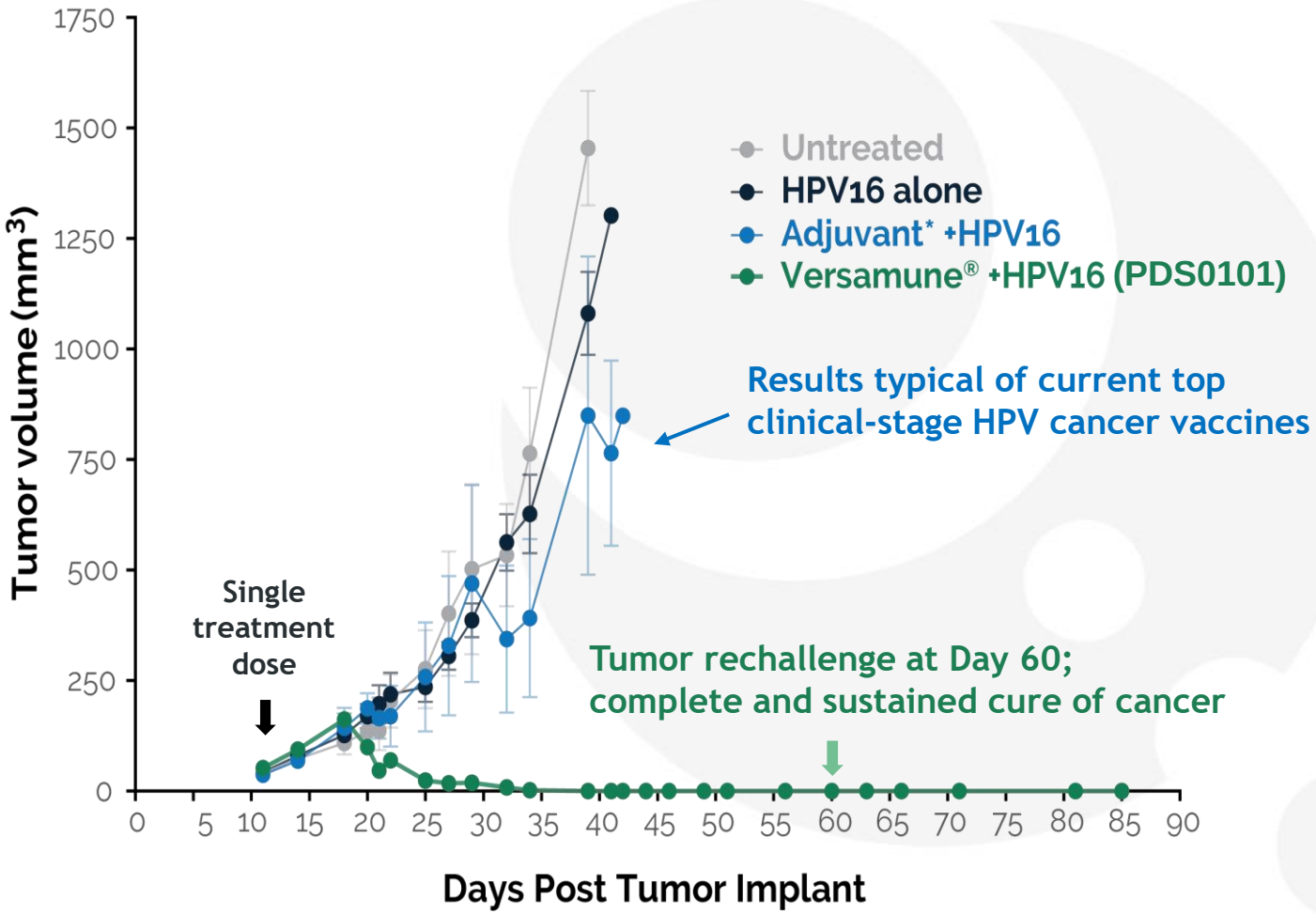
- **Cancers evade immunosurveillance and suppress T-cell attack by several immune suppressive and evasive mechanisms - *several immunotherapies target such mechanisms***
  - Checkpoint inhibitors
  - Inhibitors of LAG-3
  - TGF-β TRAP

- **Technologies that can overcome immune suppressive mechanisms to promote T-cell induction are lacking - *CD8+ (killer) T-cells in particular are critical***
  - Cancer vaccines must induce large quantities of effective killer T-cells in order to kill thousands and billions of cancer cells
  - The immune systems of cancer patients are usually severely debilitated due to aging, side effects of cancer drugs and immune cell exhaustion thus T-cell activators must be highly efficient

Greater quantity and quality of Versamune®-induced killer T-cells may result in unique ability to eradicate HPV-positive tumors after a single dose

Induced a >10-fold number of highly potent T-cells and eradication of HPV-positive tumors after a single dose in preclinical studies



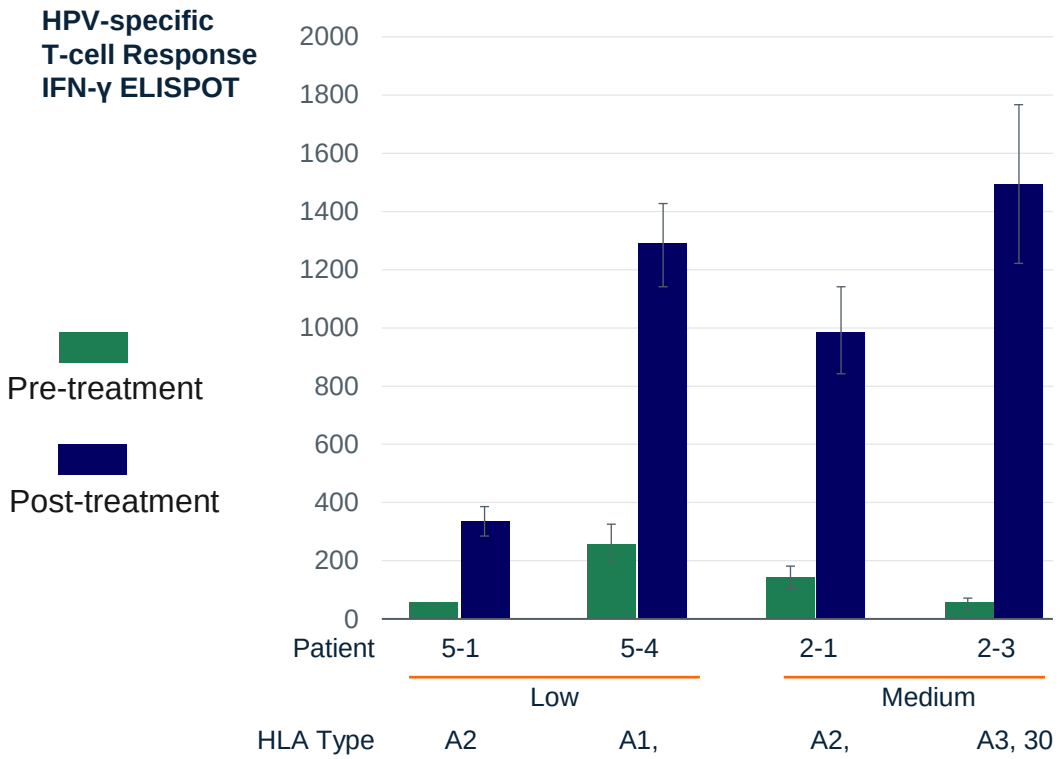


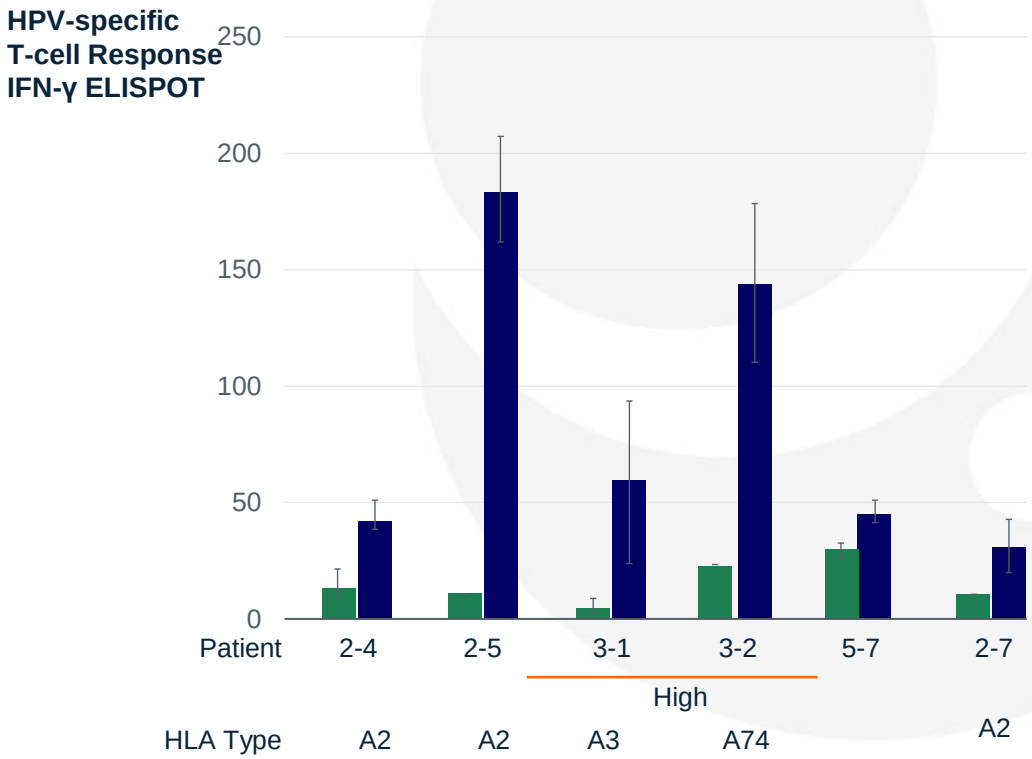
*Adjuvant = cytokine GMCSF

References: J. Immunology, 2019 (202), 1215; Studies in TC-1 tumor model with other immunotherapies reported in: Vaccine 2009, January 14, 27 (3): 431; Science Translational Medicine 2016, 13 April, Vol 8 Issue 334; Vaccine 2009, September 25, 27 (42): 5906.

PDS0101 Phase 1 clinical study demonstrated strong *in vivo* induction of circulating HPV16 T-cell responses

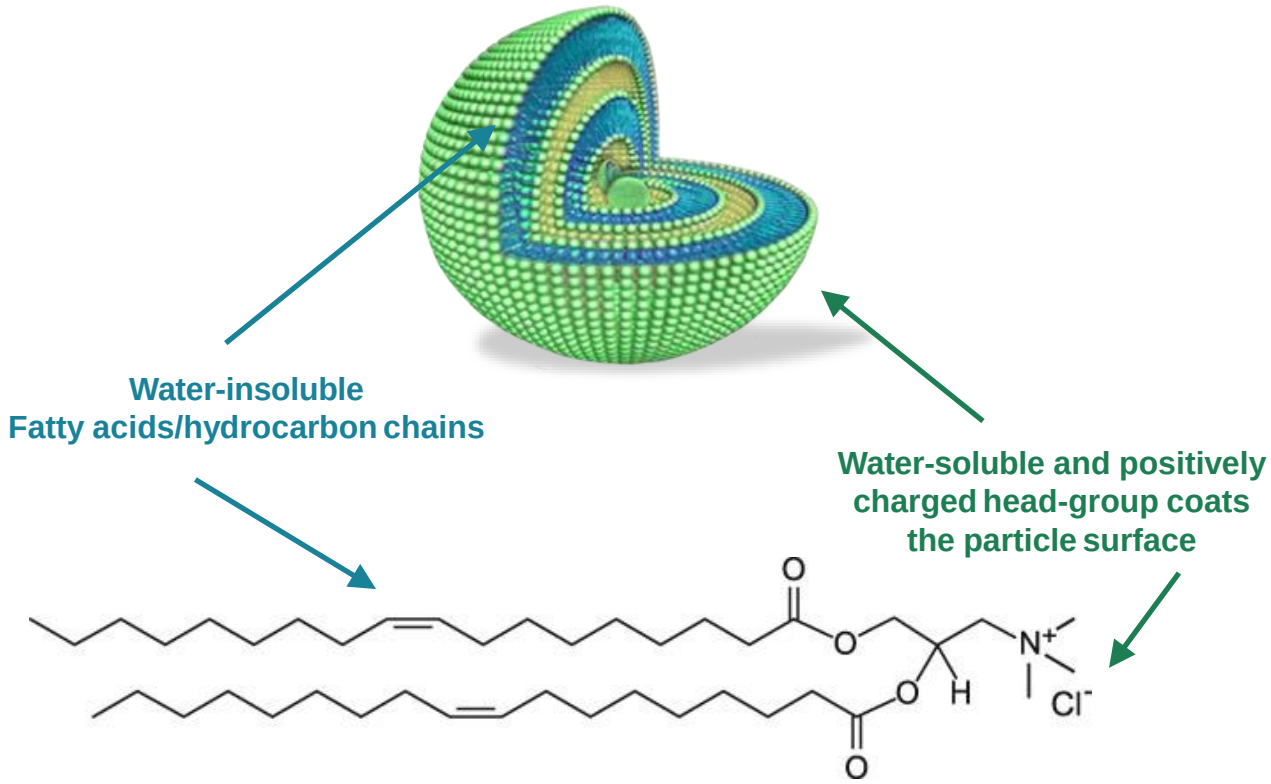
Responses were evaluated on Days 14-19 after SC injection
Predominant CD8+ T-cell responses confirmed by Granzyme-b ELISPOT





Introduction to the Versamune® Platform

Versamune® is a proprietary T-cell activating platform engineered to induce a robust, targeted anti-tumor response *in vivo*



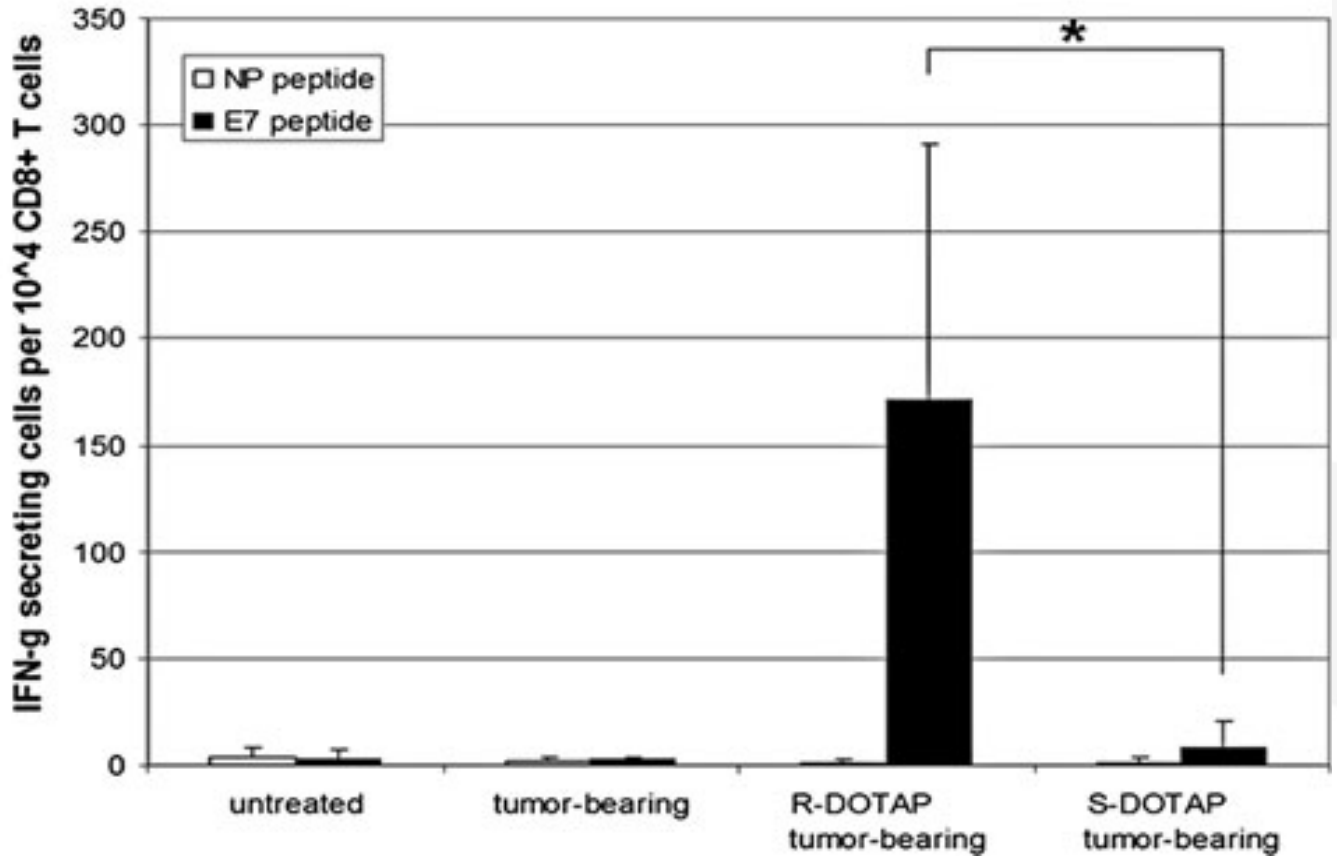
R-enantiomer of 1,2-dioleoyl-trimethyl-ammonium-propane (R-DOTAP)

- Versamune® is based on proprietary, positively charged and immune activating lipids that form spherical nanoparticles in aqueous media
- The nanoparticles are sized to mimic viruses, which promotes excellent uptake by dendritic cells of the immune system
- Activates the important Type I interferon immunological signaling pathway
- Versamune® promotes the activation and maturation of dendritic cells, which then migrate to the lymph nodes

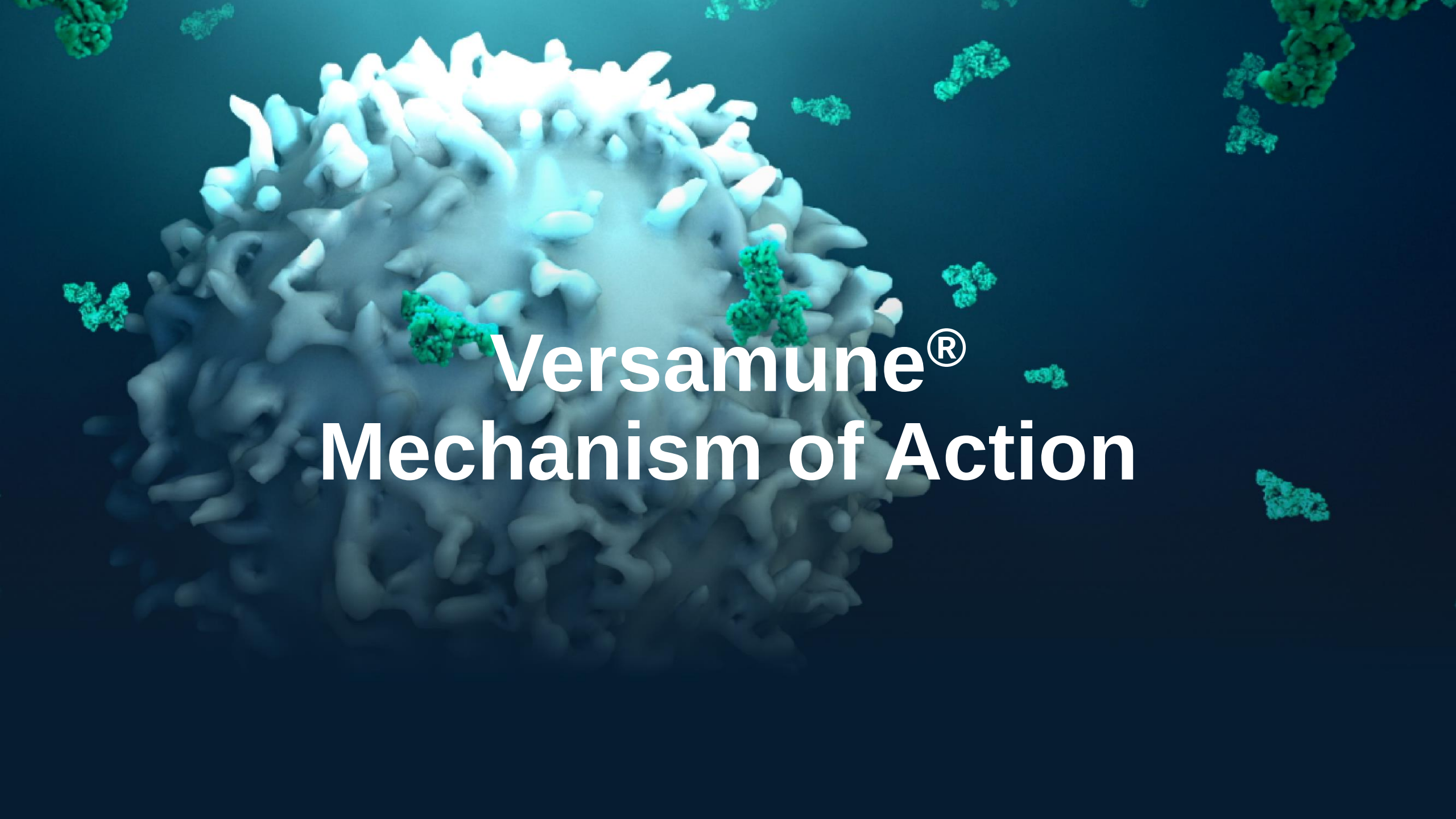
Versamune® provides the first demonstration of enantiomeric specificity pertaining to immunological activation

R-DOTAP provides superior CD8+ and CD4+ T-cell induction vs. S-DOTAP
Immune responses to S-DOTAP are further weakened in the presence of a tumor

Enantiomeric specificity

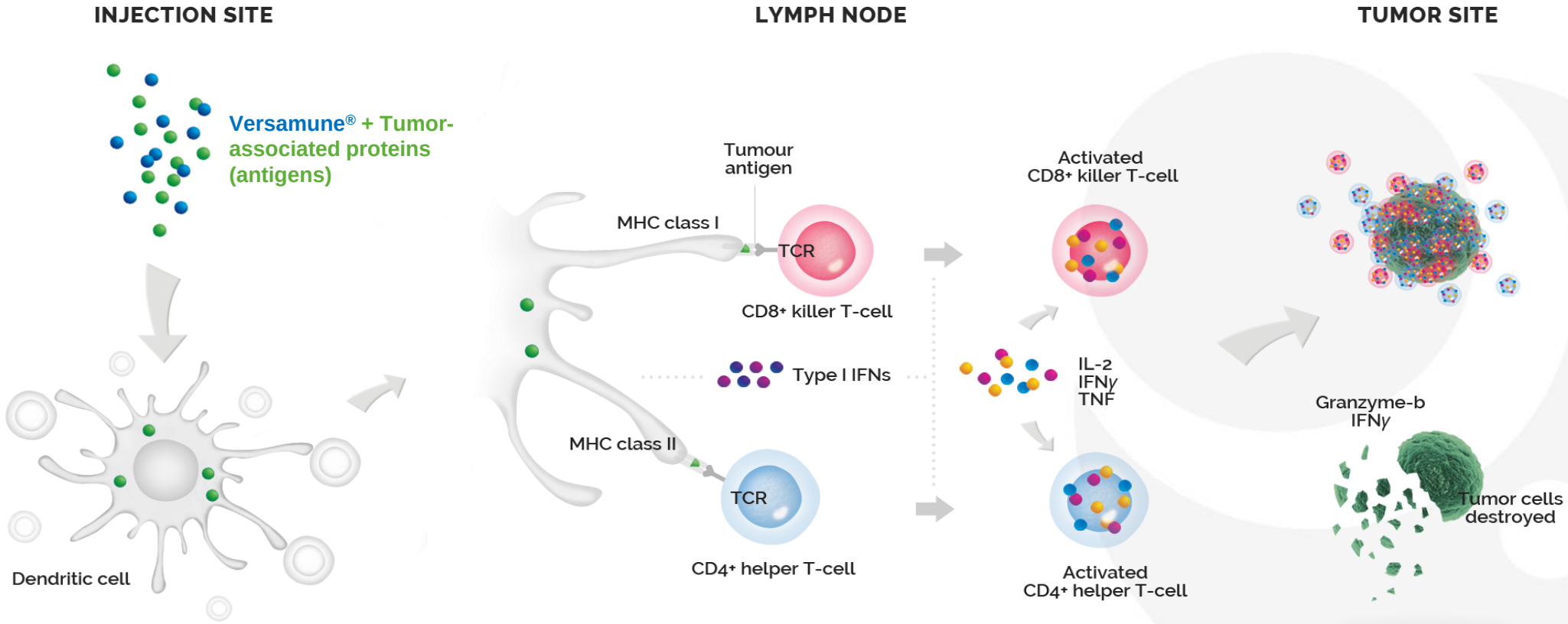


Reference: Vasievich EA et al. 2011 Cancer Immunol Immunother 60(5) 629-638



Versamune®
Mechanism of Action

Versamune® is designed to induce a robust and targeted anti-tumor response *in vivo* when administered with a tumor-associated antigen



Promotes uptake of vaccine or immunotherapy and entry into lymph nodes

Promotes antigen processing and presentation to T-cells via MHC I and II pathways

Activates Type I Interferon pathway, enabling a powerful anti-tumor killer CD8+ T-cell response

Reference: Gandhapudi SK, et al. 2019. Antigen priming with enantiospecific cationic lipid nanoparticles induces potent antitumor CTL responses through novel induction of a Type I IFN response. J Immunol. 202 (12): 3524-3536.Smalley Rumfield C et al.. 2020. Immunomodulation to enhance the efficacy of an HPV therapeutic vaccine. J. for ImmunoTherapy of Cancer 8:e000612.

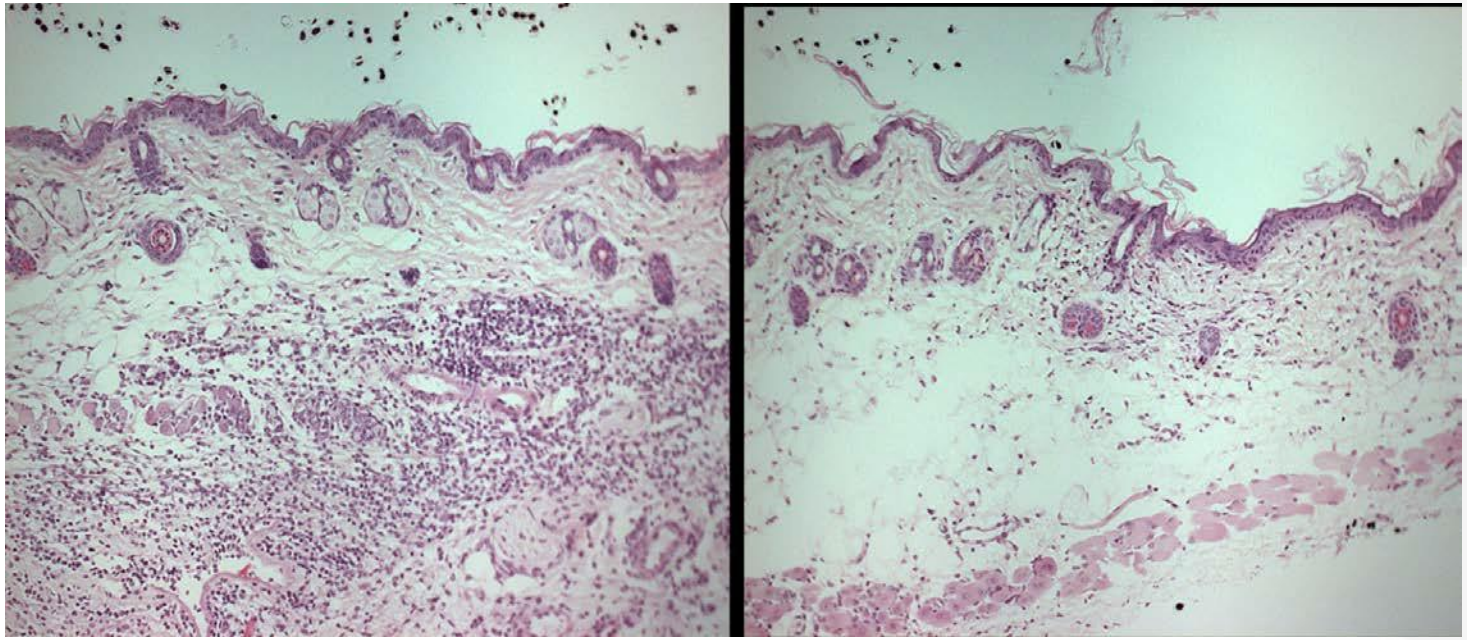

Uptake of the Versamune®-
Based Immunotherapy

Versamune® sub-cutaneous injection initiates a powerful and targeted cascade of critical immunological events

First demonstration of lipid enantiomeric specificity on immune activation

Versamune® (R-DOTAP) nanoparticles

S-DOTAP nanoparticles



SC injection of the active enantiomer (R-DOTAP) results in activation of type I interferons and induces monocyte infiltration to injection site

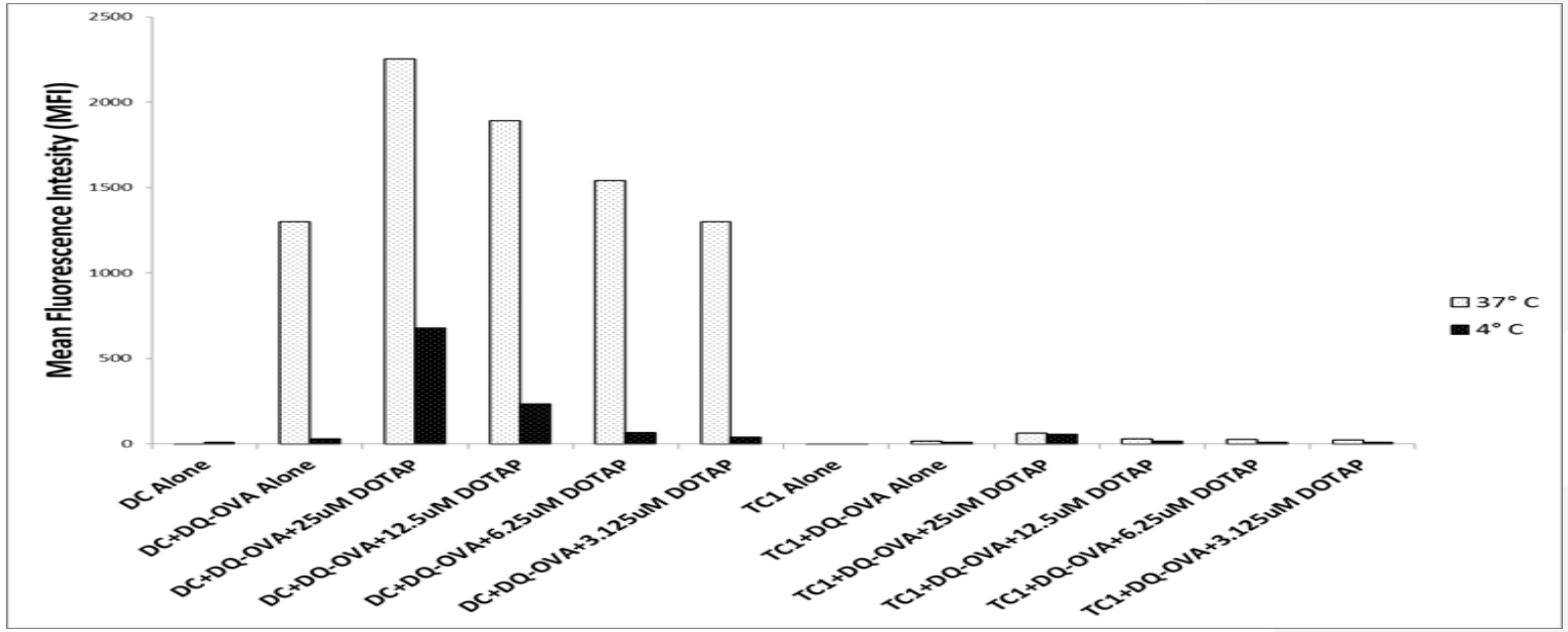
SC injection of the weakly biologically active enantiomer (S-DOTAP) results in low infiltration of monocytes to the injection site

Reference: Data on file.

Early clinical studies with Versamune® demonstrate efficient and exclusive uptake by dendritic cells

Positively-charged particles are designed to be spherical and sized similarly to viruses for optimal uptake

VLP nanoparticle sizing

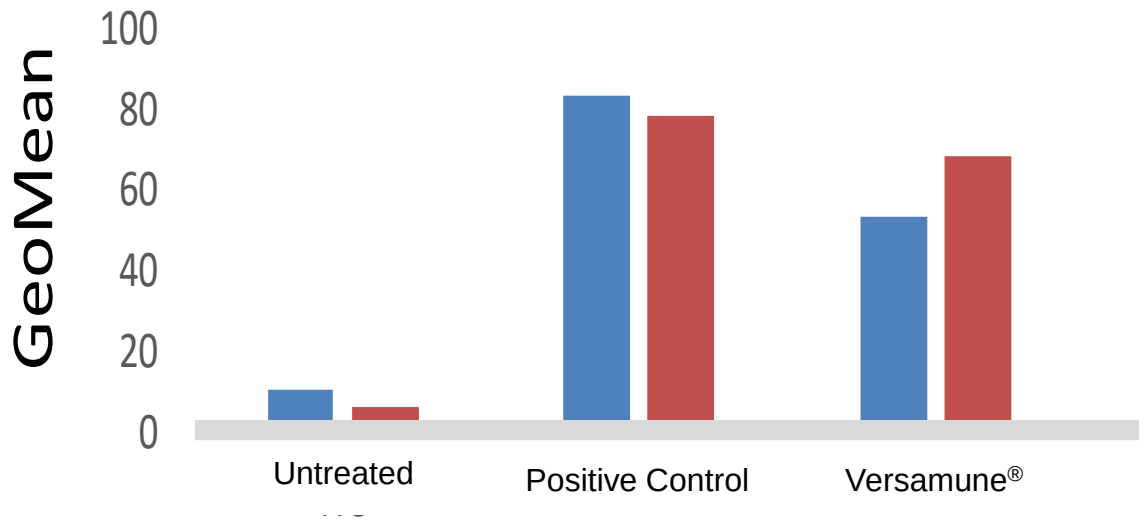


Dendritic cells or epithelial cell line incubated with DQ-OVA alone or with varying doses of Versamune®

Reference: Data on file.

Versamune® induces activation/maturation of dendritic cells

Dendritic cell Versamune® uptake & T-cell activation



Mature dendritic cells:

- **migrate into lymph nodes**
- **express costimulatory molecules**
- **facilitate the interaction with T-cells**
- **take up Versamune® within 4 hours of exposure**

Versamune® and a positive control known to induce maturation of dendritic cells were incubated with human dendritic cells from donors and compared with the untreated cells. Versamune® is seen to induce activation and maturation of dendritic cells resulting in expression of both CD83 and CD86.

Reference: Data on file.


Versamune® Promotes Antigen Cross-Presentation

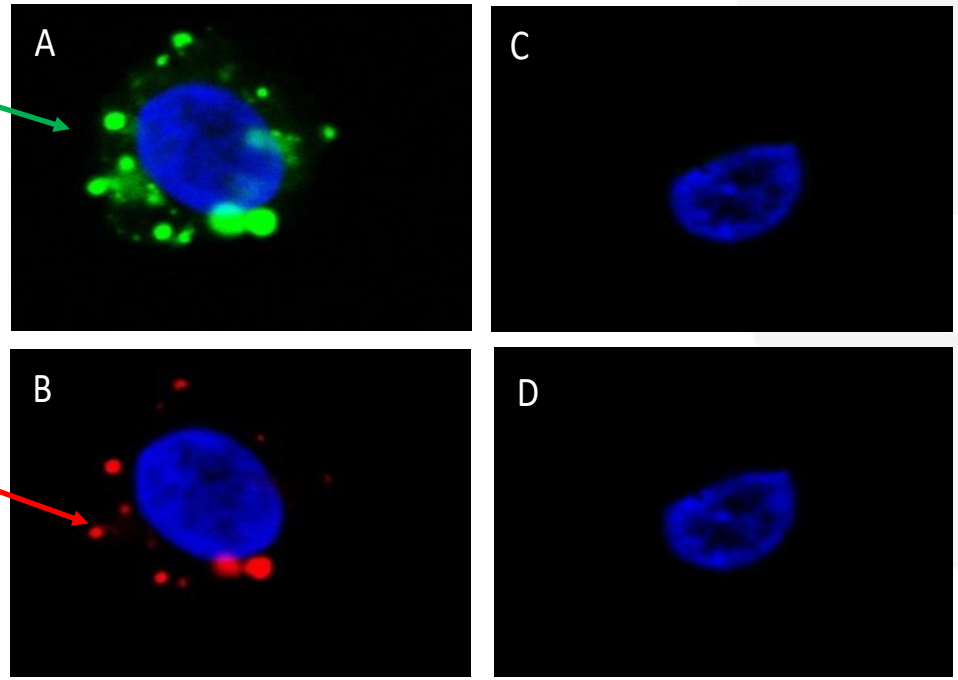
Versamune® may promote superior antigen processing and endosomal accumulation (*in vitro*) – Facilitates access to MHC Class I Pathway

The positive charge of the liposome destabilizes the endosomes allowing the antigen to enter the cytoplasm of the dendritic cells and facilitates cross-presentation to CD8+ killer T-cells

Antigen uptake, processing and presentation

Versamune® induced protein uptake and processing (green fluorescence)

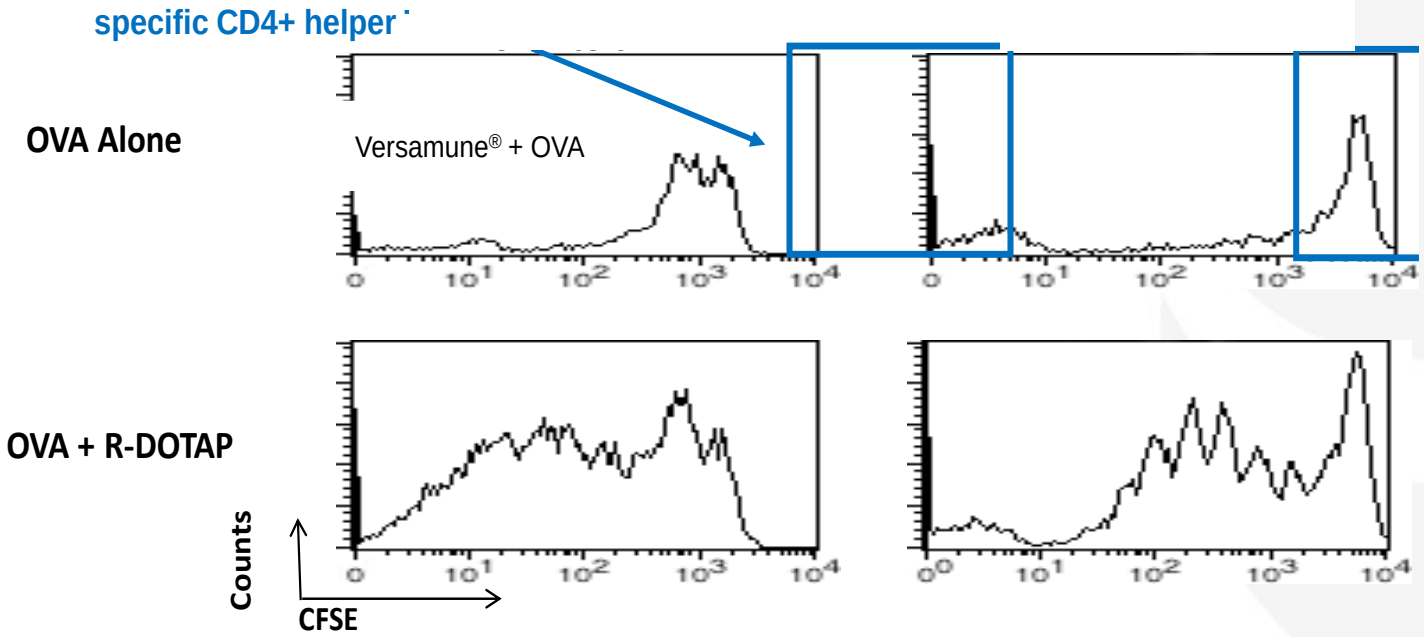
Versamune® induced peptide accumulation in endosome (red fluorescence)



*DQ-OVA is the protein ovalbumin conjugated to a fluorescent molecule and used as a model antigen to facilitate the study of antigen uptake and antigen processing and trafficking within the dendritic cell

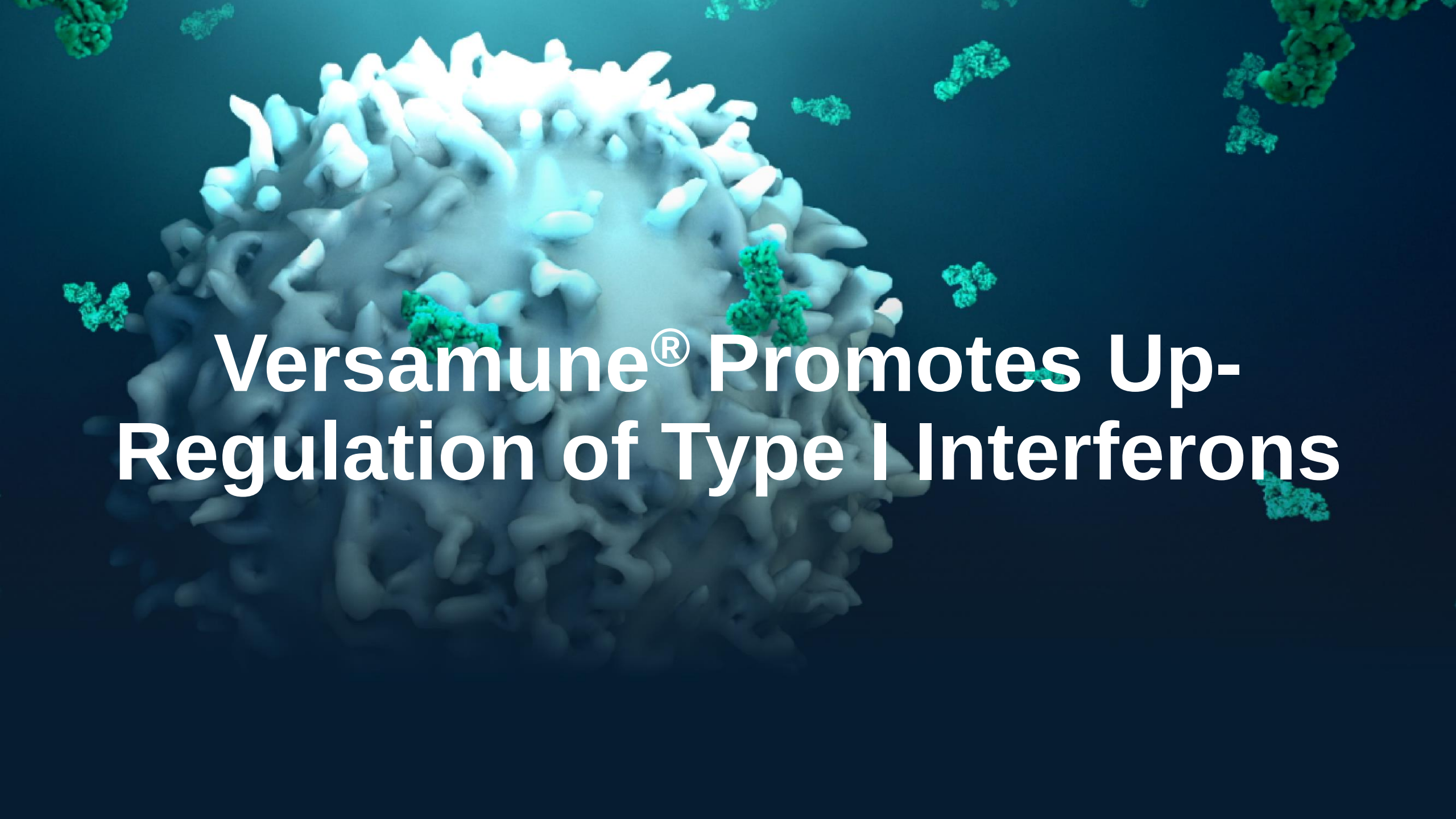
Preclinical studies show that Versamune® demonstrates effective antigen presentation to both CD8+ killer and CD4+ helper T-cells

Effective presentation of peptides via both the major histocompatibility complex (MHC) Class I pathway to CD8+ killer T-cells and via the MHC Class II pathway to CD4+ helper T-cells



Adoptive transfer mice were produced using CFSE labeled DO11.10 T cells (TCR transgenic, class II restricted, OVA specific) or OT1 T cells (TCR transgenic, class I restricted, OVA specific). Mice were immunized 24h later subcutaneously with 0.25 µg (OT1) or 1µg (DO11.10) whole OVA alone or mixed with 4mM R-DOTAP immediately prior to injection. Draining LN cells were analyzed 3 days later by flow cytometry measuring CFSE fluorescence on gated TCR transgenic T cells. Histograms are representative of three to four mice per group. **CFSE bright cells (far right peak) represent undivided cells. Each cell division (proliferation) results in a 50% reduction of CFSE intensity and a left-ward shift of the peaks**

Reference: Data on file.

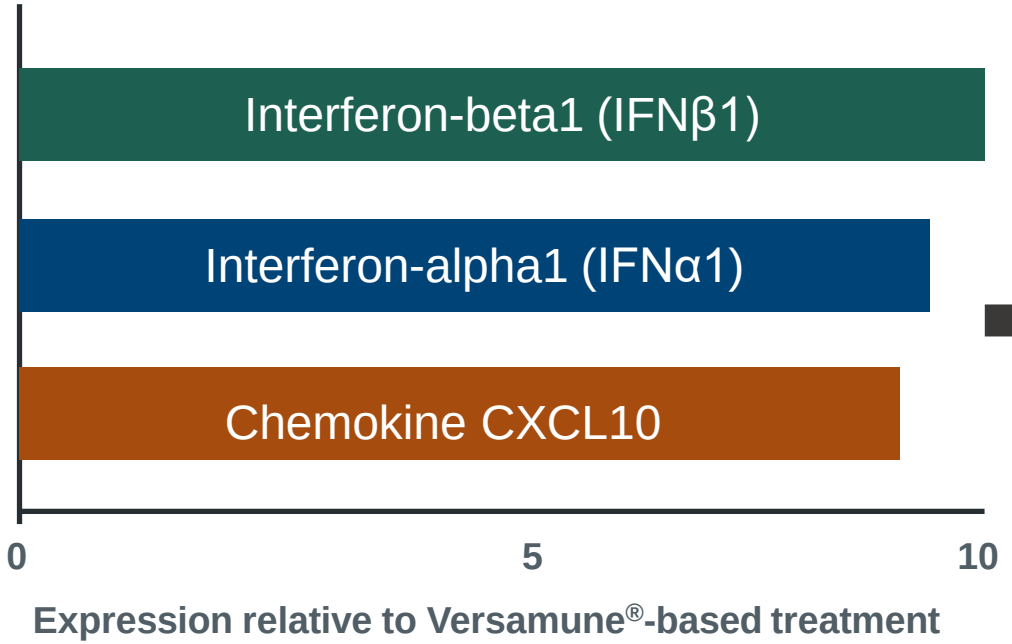


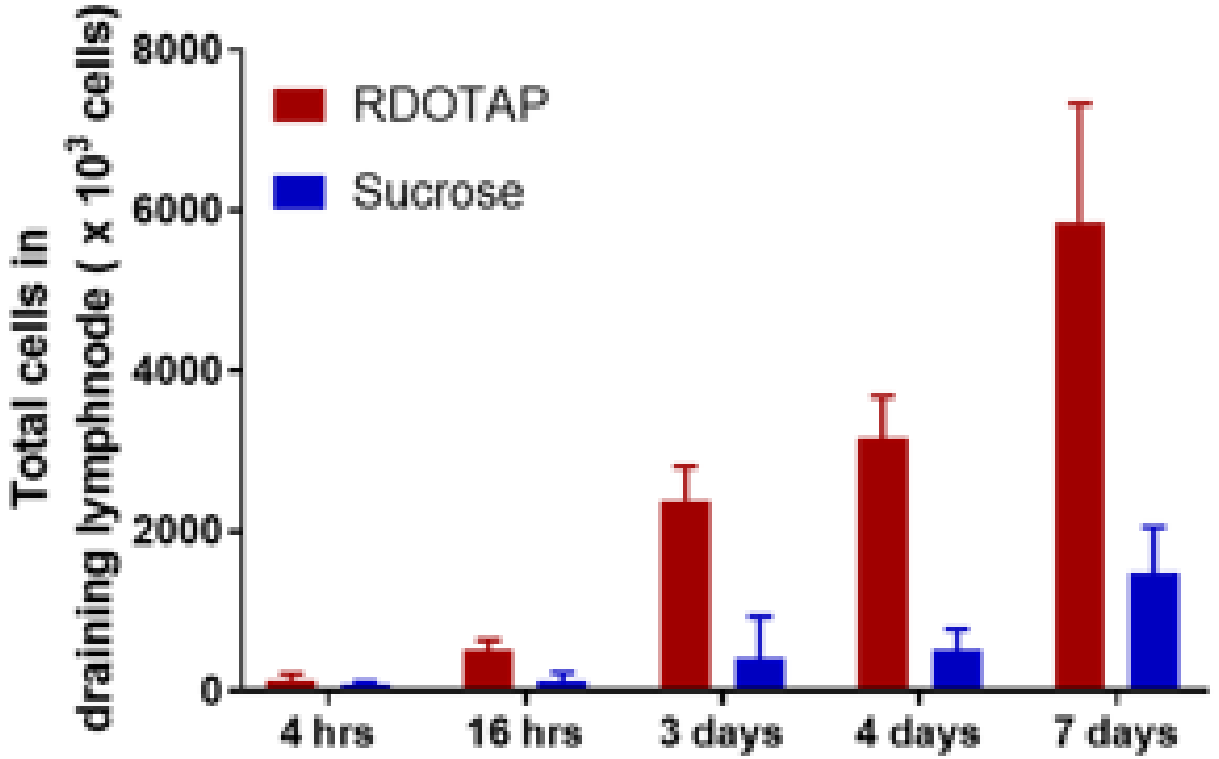
Versamune® Promotes Up-Regulation of Type I Interferons

Induction of Type I interferons and associated chemokines in the lymph nodes leads to powerful and sustained recruitment of T-cells

Elevated T-cell levels persist in lymph nodes for over 7 days after 1 Versamune® dose Localization of cytokines & chemokines promotes a strong safety profile

Localized T-cell induction and persistence



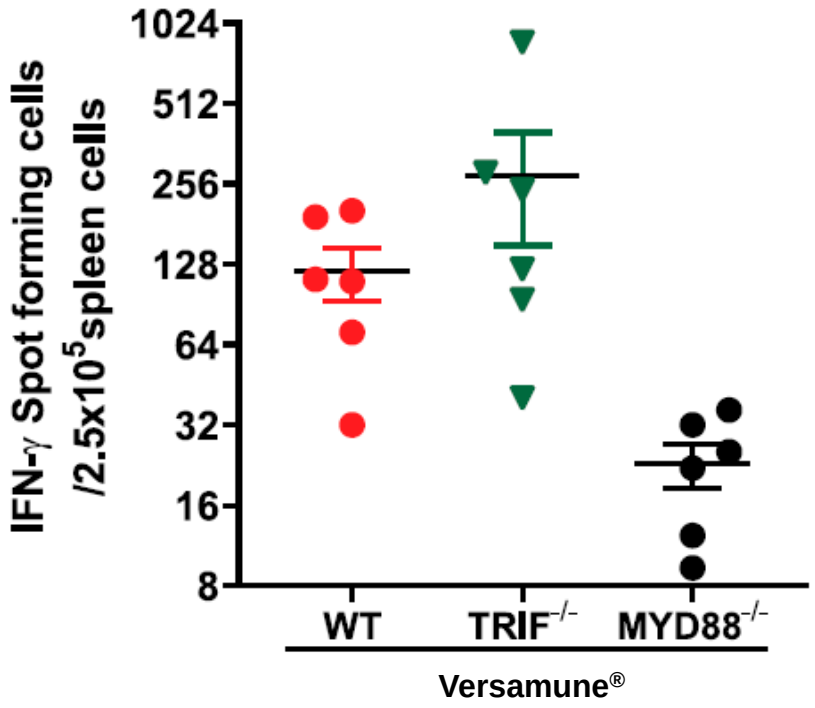


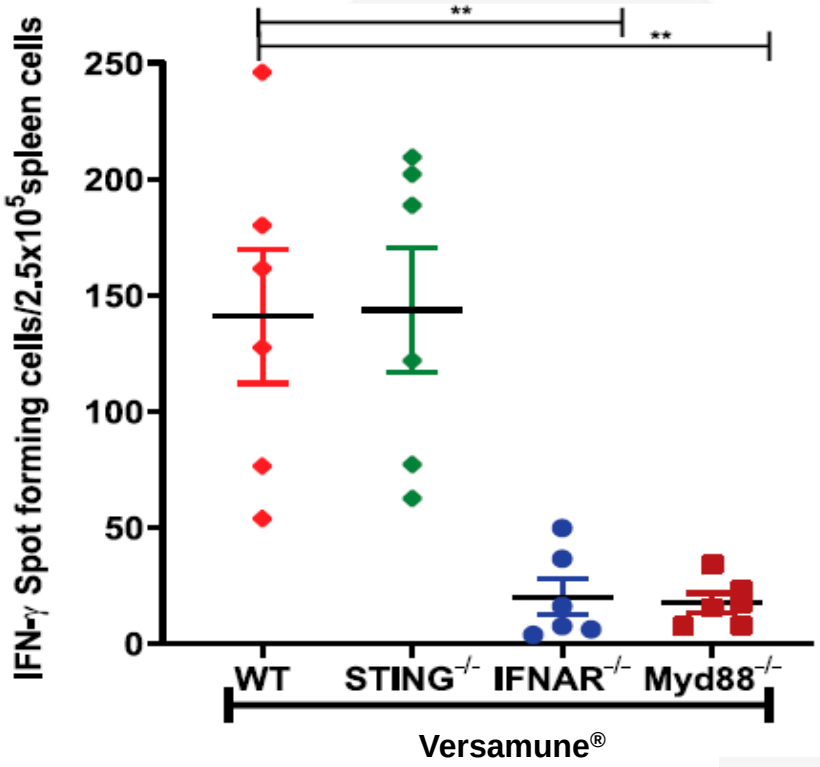
Reference: Gandhapudi SK, et al. 2019. Antigen priming with enantiospecific cationic lipid nanoparticles induces potent antitumor CTL responses through novel induction of a Type I IFN response. J Immunol. 202 (12): 3524-3536

Specificity of the Versamune® effect: Type I interferons are upregulated via activation of the Myd88 pathway

Versamune® mediates its CTL-inducing effects by activating type I interferons in a Myd88-dependent manner

Type I IFN / Myd88 specificity

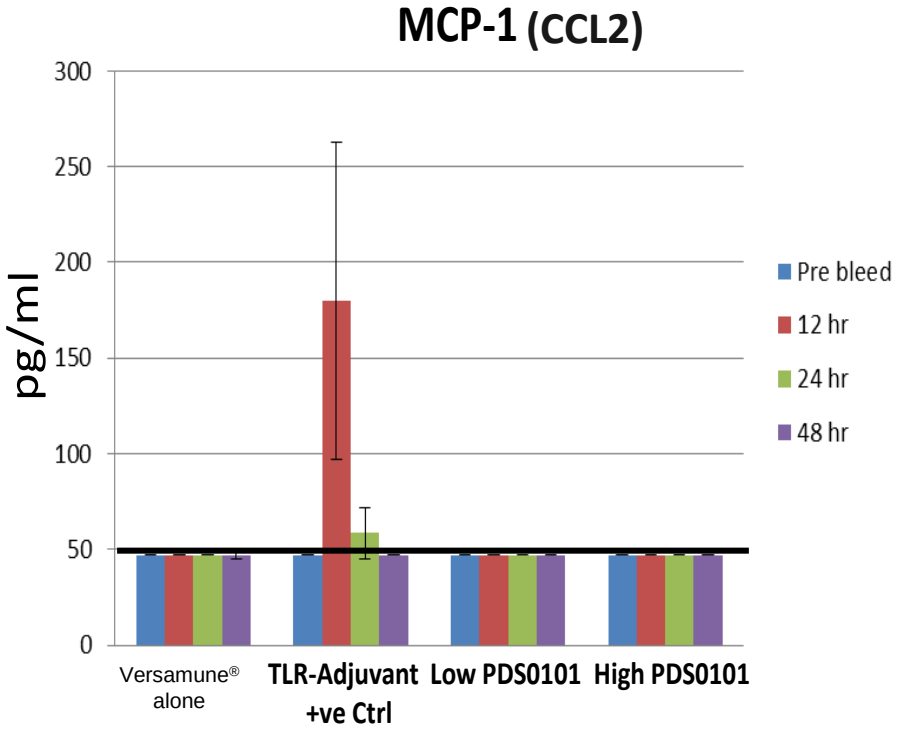


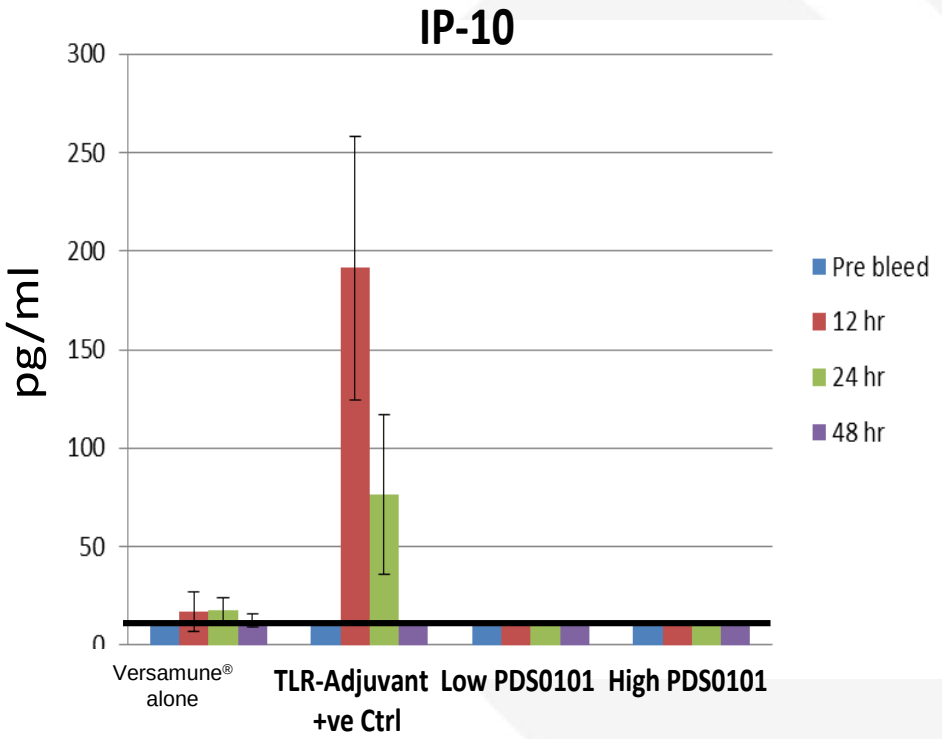


The T-cell responses were eliminated only in Myd88 or IFNAR (Type 1 IFN) knockout mice, but not in wild type mice (WT), STING or TRIF knockout mice

The localized and sustained cytokine induction in the lymph nodes of Versamune® has the potential to minimize the risk of systemic toxicity

Negligible systemic inflammation





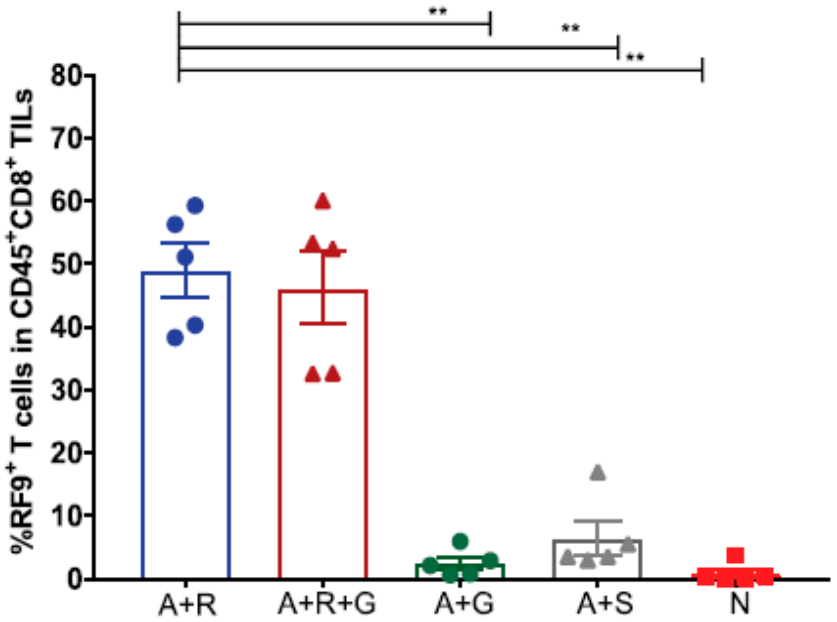
Negligible increases above baseline in systemic cytokine levels with Versamune® alone or PDS0101

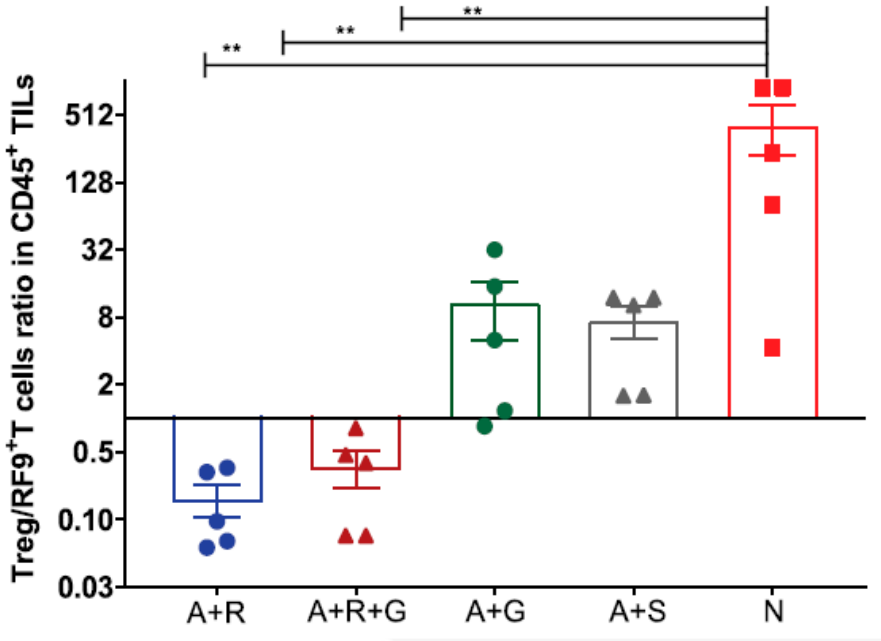
Reference: Data on file.

PDS0101: Versamune® induces high quantity and quality of CD8+ killer T-cells and alters the tumor micro-environment to increase efficacy

Minimizes the presence of immune suppressive regulatory T-cells (Treg) within the tumor microenvironment

Antigen-specific T-cells infiltrate tumor





A-antigen, R-Versamune® (R-DOTAP); G-GM-CSF; S-Sucrose; N-Naive

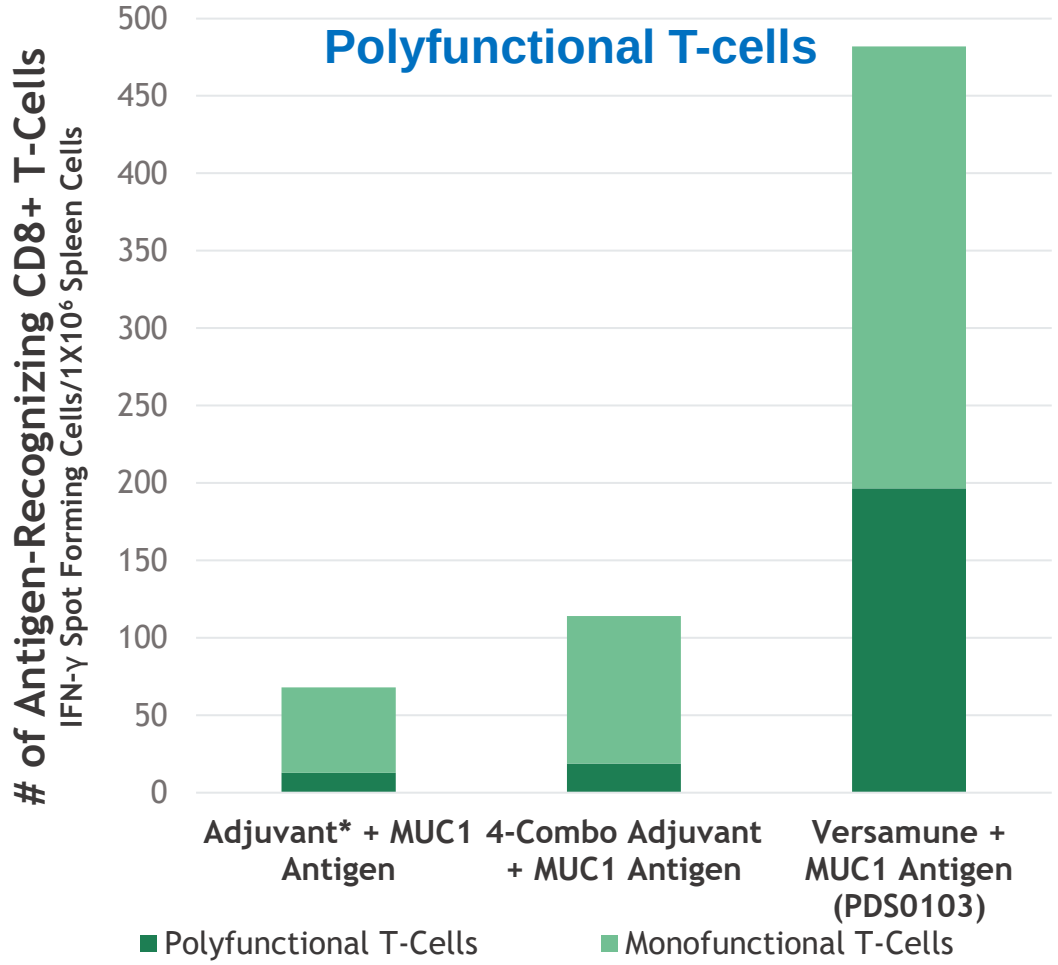
In Versamune® formulations almost 50% of CD8+ T-cells are antigen specific vs <5% with the cytokine GM-CSF

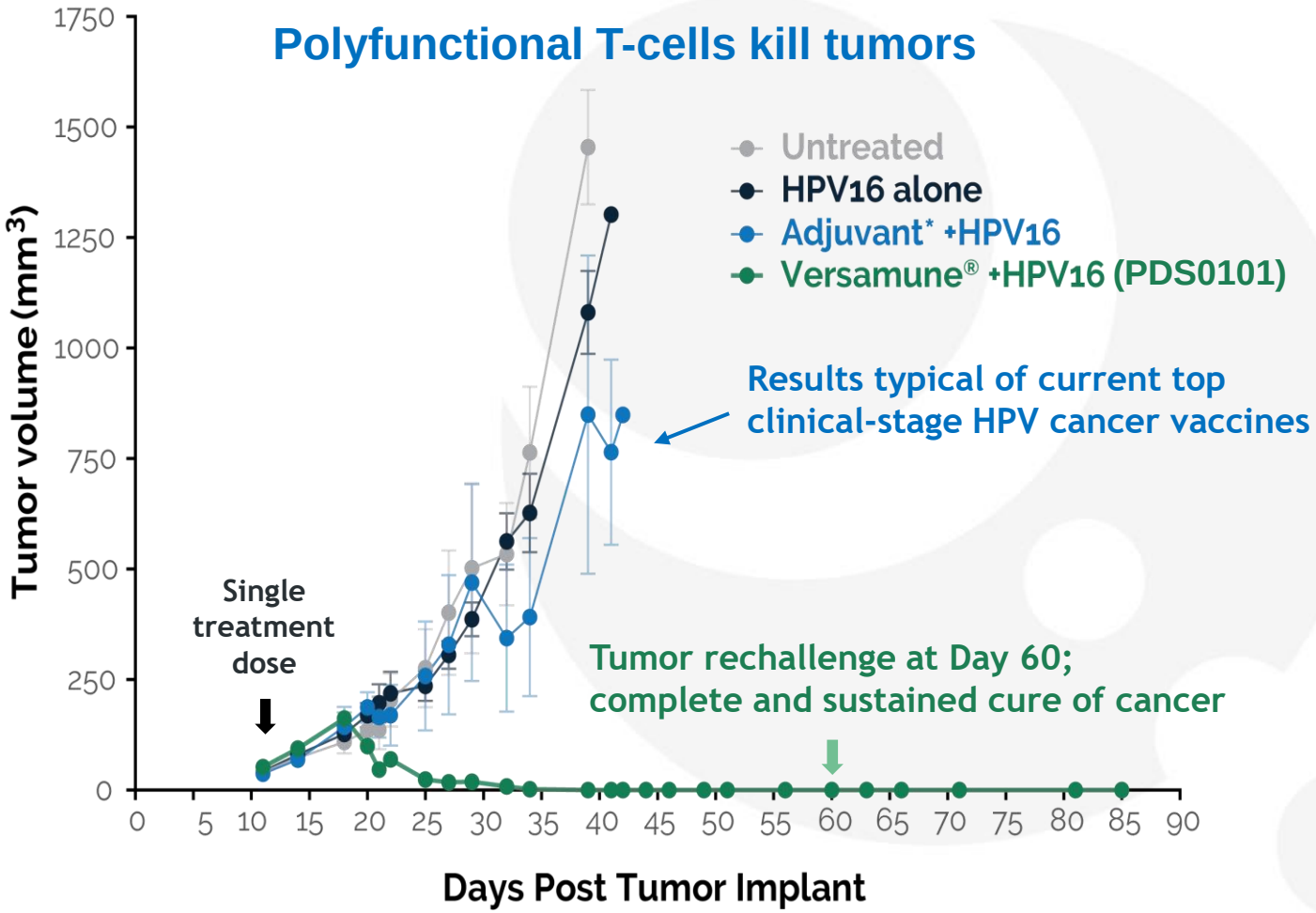
In Versamune® formulations, the ratio of Treg to to antigen-specific CD8+ killer T-cells is < 1

Reference: Gandhapudi SK, Ward M, Bush JPC, Bedu-Addo F, Conn G, Woodward JG. 2019. Antigen priming with enantiospecific cationic lipid nanoparticles induces potent antitumor CTL responses through novel induction of a Type I IFN response. J Immunol. 202 (12): 3524-3536.

Greater quantity and quality of Versamune®-induced killer T-cells may result in unique ability to eradicate HPV-positive tumors after a single dose

Induced a >10-fold number of highly potent T-cells and eradication of HPV-positive tumors after a single dose in preclinical studies





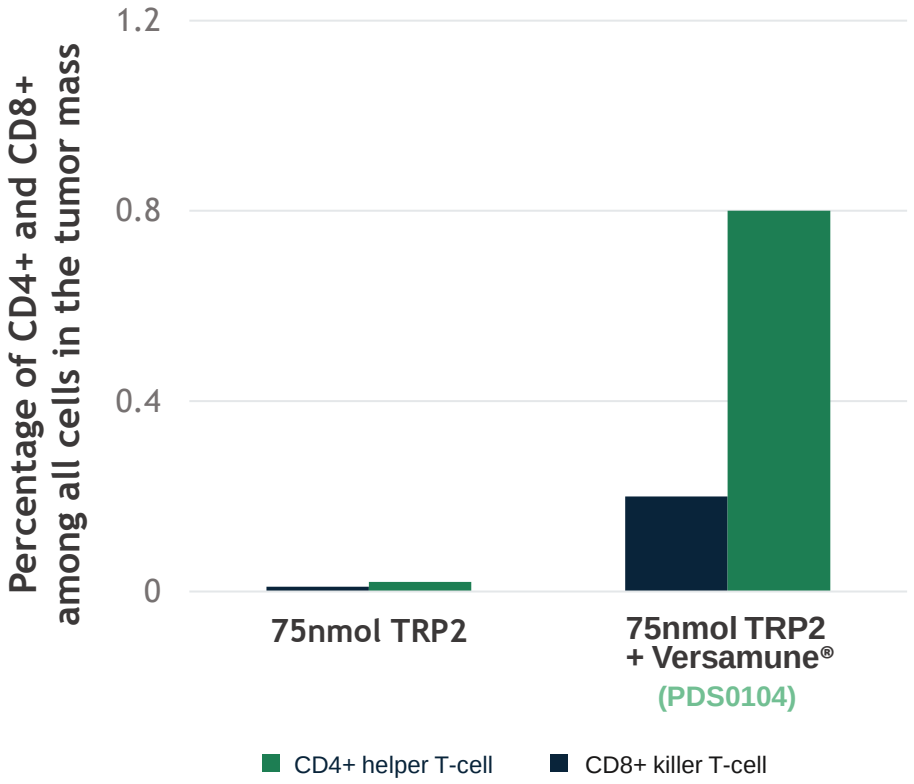
*Adjuvant = cytokine GMCSF

References: J. Immunology, 2019 (202), 1215; Studies in TC-1 tumor model with other immunotherapies reported in: Vaccine 2009, January 14, 27 (3): 431; Science Translational Medicine 2016, 13 April, Vol 8 Issue 334; Vaccine 2009, September 25, 27 (42): 5906.

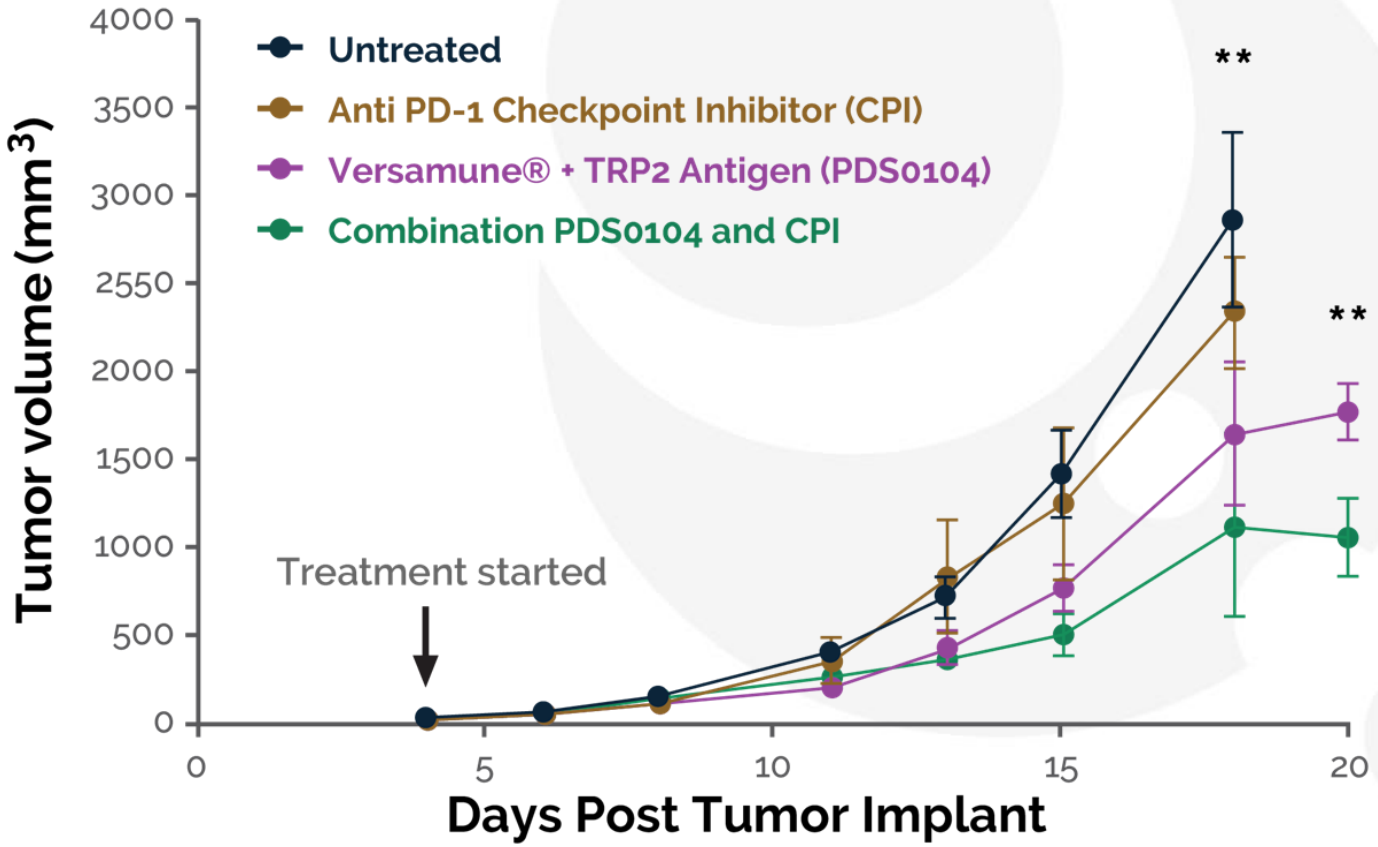
Versamune® Is Effective Against Non-Viral Tumors

Versamune®-induced T-cells may enhance efficacy of checkpoint inhibitors – Study in immune suppressive B16 melanoma

Versamune works with multiple tumor antigens



Enhanced anti-tumor activity in combination



Reference: Gandhapudi SK, et al. 2019J Immunol. 202 (12): 3524-3536
Vasievich, et al. 2012 Mol. Pharm. 6(9) 2, 261-268

Versatility of Versamune®: Potent TRP2-specific CD8+ killer T-cells break immune tolerance in difficult-to-treat B16 melanoma

Potent activity with different tumor antigens

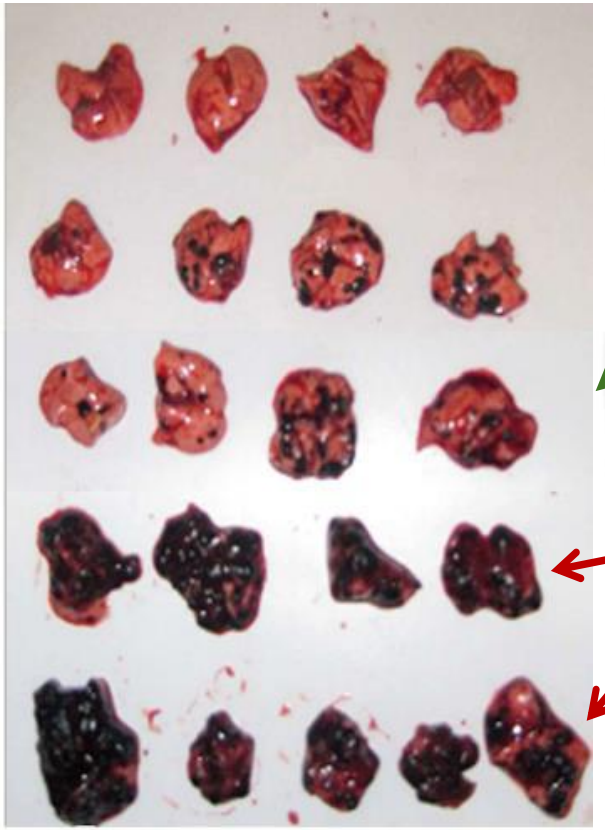
Healthy animals

Versamune® Formulation 1

Versamune® Formulation 2

Negative Control

Untreated



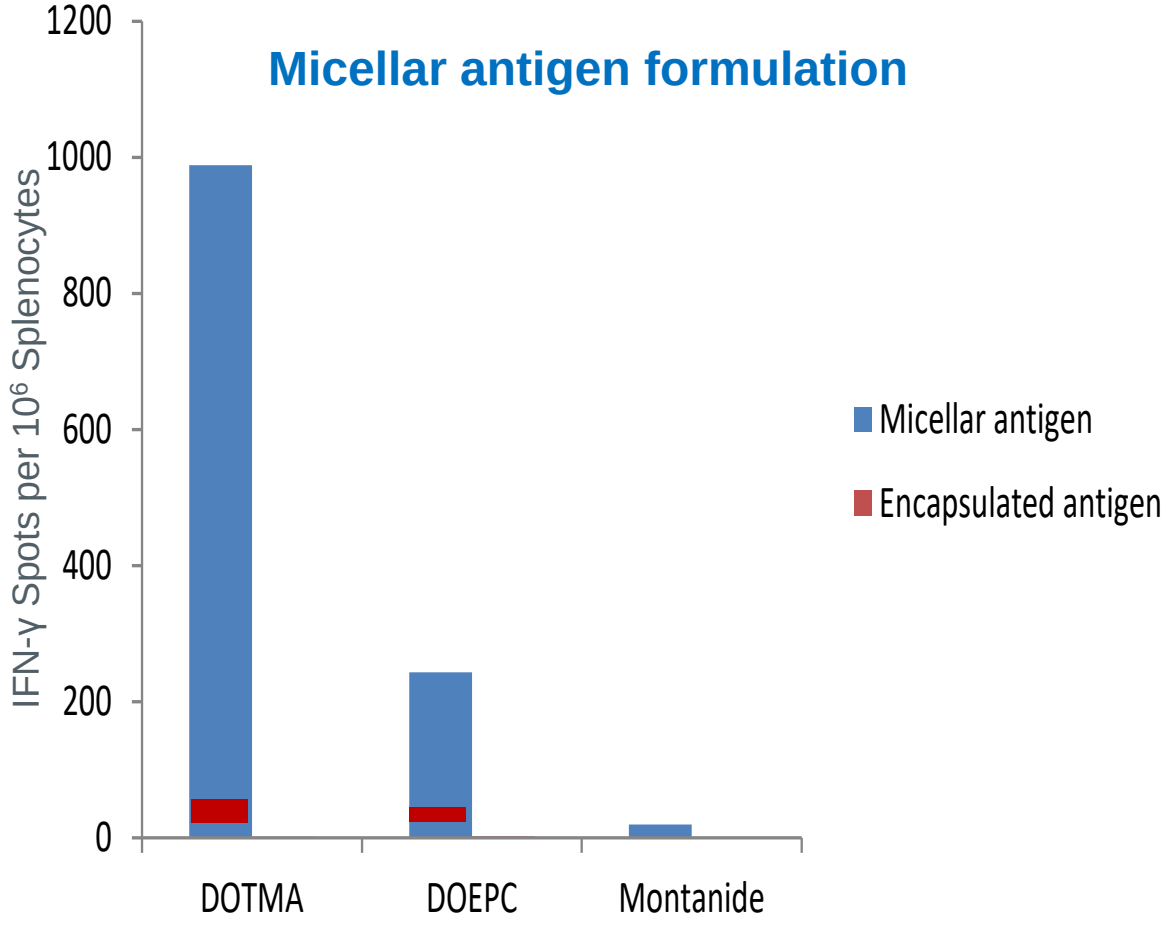
LUNG TISSUE

14 days after single injection treatment

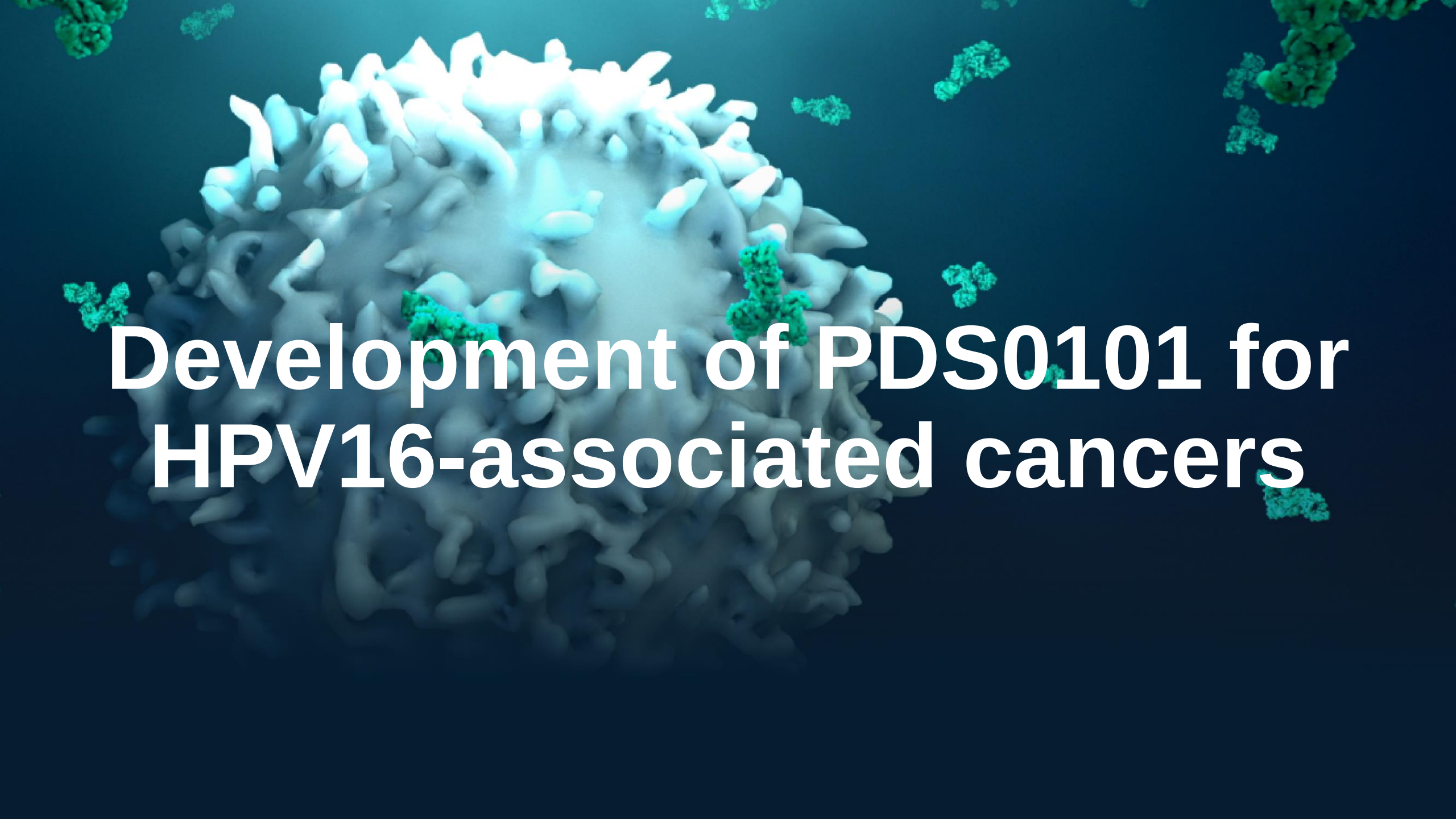
Black stains due to tumors

PDS0101 Proprietary formulation: Mixture of peptide micelles with Versamune® promotes superior CD8+ killer T-cell response

Comparison of Micellar vs. Traditional Encapsulation Methods - IFNγ ELISPOT Shows Superior Potency of the PDS Biotech Micellar Approach – EU Patent Received



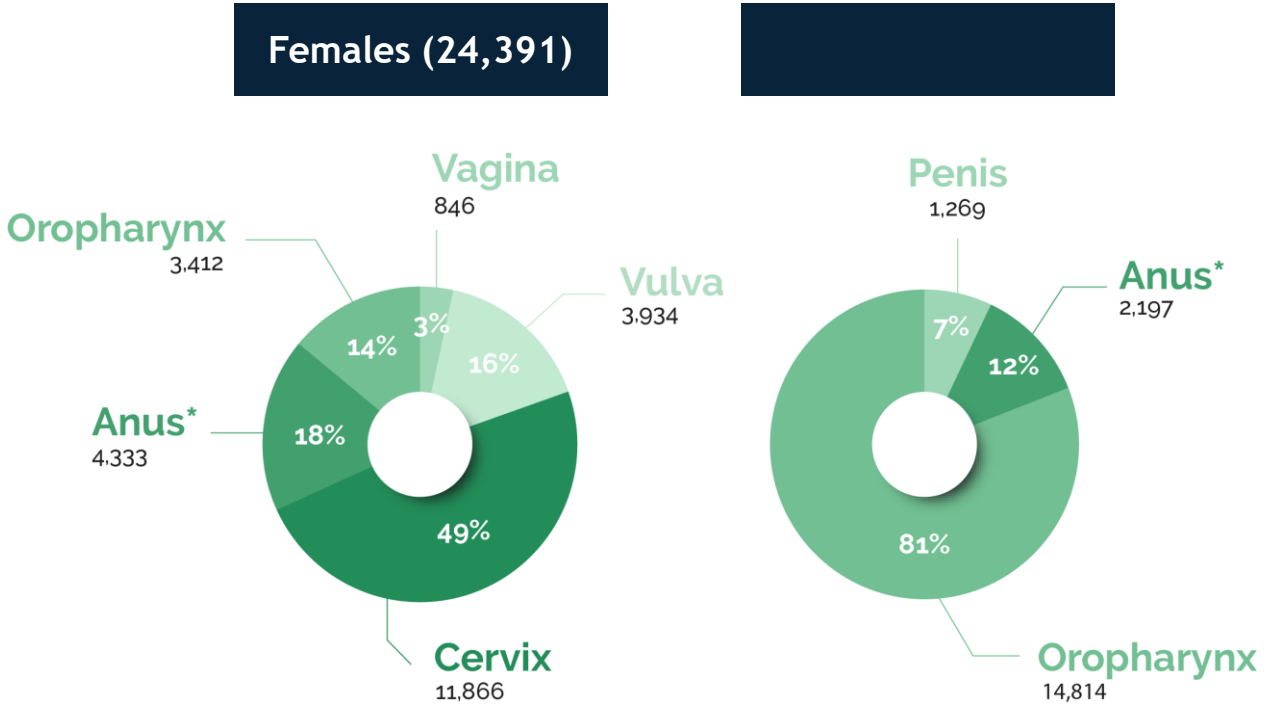
- DOPC and DOTMA (Lipids covered under
- Versamune®-class) formulated using a weakly immunogenic HPV antigen:
- CD8+ killer T-cell response of DOTMA and DOEPC superior to the clinical-stage adjuvant Montanide (ISA Pharma – HPV competitor)
- The micellar peptides without Versamune® generate a very weak CD8+ killer T-cell response even less than seen with Montanide



Development of PDS0101 for HPV16-associated cancers

PDS0101 is designed to treat cancers caused by human papillomavirus (HPV)-16, which represents 70-80% of the HPV-associated cancers

US annual HPV-associated cancer incidence[1]



- Approximately **43,000 patients** are diagnosed with HPV-associated cancers annually in the US[1]
- **Incidence rate of anal and head and neck cancer is growing** despite increased use of HPV preventative vaccines
- **Significant unmet medical need** across the spectrum of HPV-associated cancer

[1]Markowitz et al. 2016. Centers for Disease Control and Prevention. 2018.
[2]Hernandez et al. 2018. American Journal of Managed Care Volume 24, Issue 2; Company Research

Clinical strategy: Develop PDS0101 in combination with established therapies for rapid proof-of-concept and risk mitigation

Combinations of PDS0101 with FDA-approved standard of care

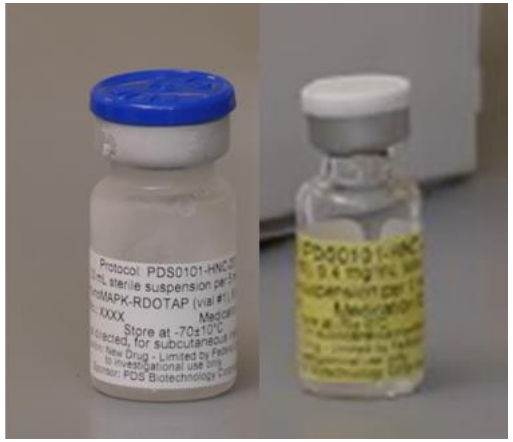
- ***Combination with KEYTRUDA®***
  - First line treatment of recurrent/metastatic HPV-positive head and neck cancer in patients who are checkpoint inhibitor naïve
  - First line treatment of recurrent/metastatic HPV-positive head and neck cancer in patients who are checkpoint inhibitor refractory
- ***Combination with chemoradiotherapy***
  - Treatment of advanced localized cervical cancer

Novel combinations of PDS0101 with promising, investigational immunotherapeutic agents

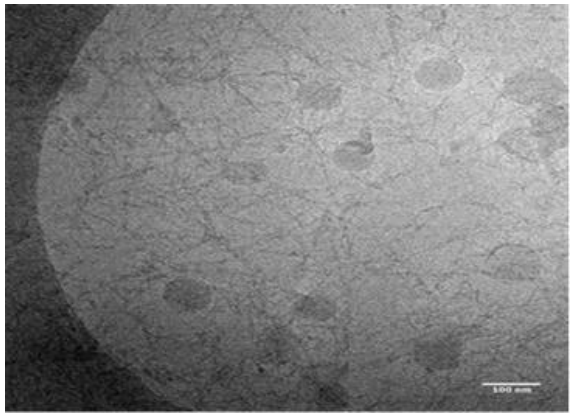
- ***Triple combination with bintrafusp-alpha and M9241***
  - Treatment of advanced HPV-associated cancers (anal, cervical, vaginal, head and neck etc.) in patients who are checkpoint inhibitor naïve
  - Treatment of advanced HPV-associated cancers (anal, cervical, vaginal, head and neck etc.) in patients who are checkpoint inhibitor refractory

PDS0101: Versamune® plus a proprietary mix of HPV16 antigens is engineered for simplicity and ease of administration

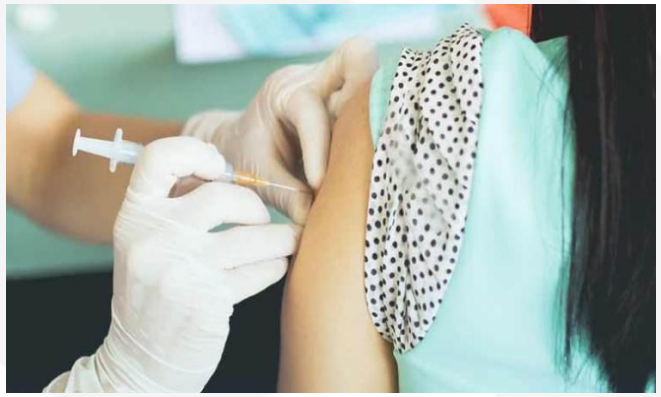
Delivered SC – no need for intratumoral or intranodal delivery



Vial #1 of Versamune® (L) and Vial #2 of HPV16 mix (R)



PDS0101 formulation is mixed before injection*



Delivered via subcutaneous injection

*Electron microscopy picture

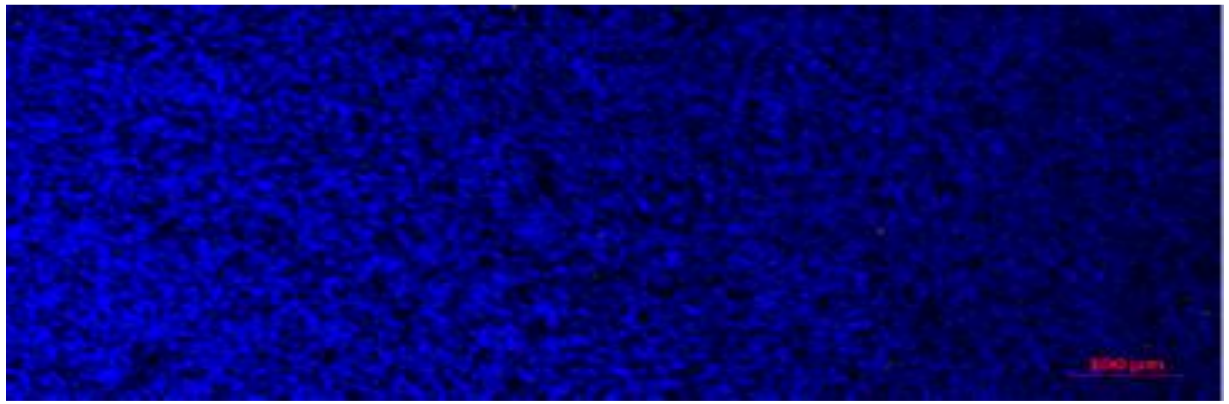
Phase 2 NCI-led clinical trial evaluating the triple combination of PDS0101, Bintrafusp alfa and M9241 in advanced HPV-associated cancer

Indication	Patients with advanced HPV-associated cancer who have failed prior treatment
Clinical Agents	**Bintrafusp alfa:** Bifunctional “trap” fusion protein **M9241:** Antibody-conjugated immuno-cytokine **PDS0101:** Versamune®-based immunotherapy generating HPV-specific CD8+ T-cells
Study goals	Group 1: Objective response rate (ORR) in checkpoint inhibitor (CPI) naïve patients Group 2: ORR in patients who have failed checkpoint inhibitor therapy (CPI refractory)
Timing	**Full enrollment of 56 patients** **Complete enrollment expected by Q4 2021/Q1 2022**
Trial Sponsor	NIH NATIONAL CANCER INSTITUTE

The objective of this trial is to confirm that PDS0101 enhances the therapeutic benefit of Bintrafusp alfa and M9241 and may lead to expanded evaluation in several pipeline products

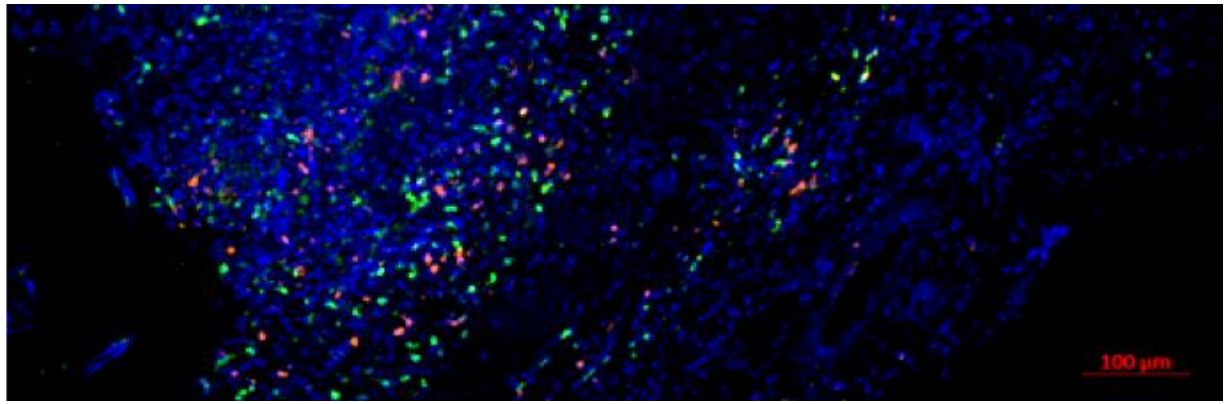
Preclinical study: Triple combination of PDS0101, Bintrafusp alfa (M7824) and M9241 (NHS-IL12) demonstrated higher targeted T-cell response

Combination of PDS0101 with Bintrafusp alfa or M9241 generated superior targeted T-cell response; triple combination demonstrated superior efficacy



Bintrafusp alfa (bi-functional checkpoint inhibitor)

Tumor Regression: **0/16 (0%)**
T-cell Clones: **22**



PDS0101 + Bintrafusp alfa + M9241

Tumor Regression: **13/17 (76%)**
T-cell Clones: **3**

T-cell clones per 25% of TCR repertoire (Average)

Red – CD8+ (killer) T-cells
Green – CD4 + (helper) T-cells

Reference: Smalley Rumfield C, Pellom ST, Morillon II YM, et al; Journal for ImmunoTherapy of Cancer 2020; 8:e000612. doi: 10.1136/jitc-2020-000612

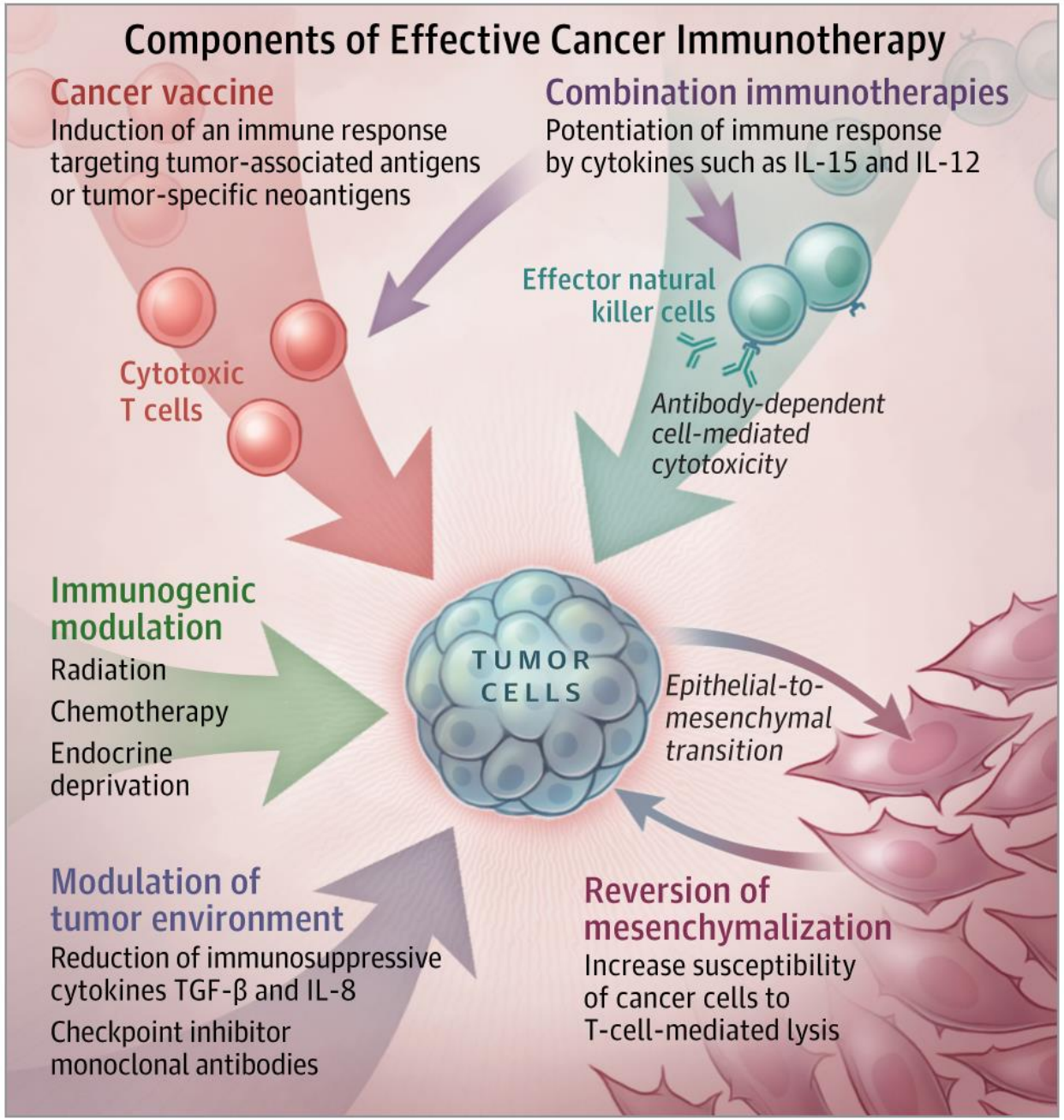
NATIONAL CANCER INSTITUTE
Center for Cancer Research

"A Multifaceted Approach to Cancer Immunotherapy"

Jeffrey Schlom, PhD
Chief, Laboratory of Tumor Immunology and Biology
Center for Cancer Research
National Cancer Institute, NIH

PD(L)-1 Inhibitors and HPV-associated Cancers

- Cervical, SCCHN, rectal, vaginal, vulvar
  - > 30,000 new cases in the U.S. annually
  - > 630,000 annually worldwide
- Nivolumab and Pembrolizumab approved for SCCHN
- Pembrolizumab approved for PD-L1^{+} cervical cancer
- ORR ranged from 13–24%



Schlom and Gulley. JAMA 2018

A Multifaceted Approach to Cancer Immunotherapy

- Activation of a T-cell immune response to a tumor-associated/specific antigen

- Potentiation of the immune response
  - systemic
  - in the tumor microenvironment (TME)

- Reduction of immunosuppressive cells

- Alteration of the tumor phenotype to render tumor cells more susceptible to immune-mediated lysis

A Multifaceted Approach to Cancer Immunotherapy

- Activation of a T-cell immune response to a tumor-associated/specific antigen
  - HPV therapeutic vaccine (PDS0101)

- Potentiation of the immune response
  - systemic
  - in the tumor microenvironment (TME)
    - NHS-IL12 immunocytokine

- Reduction of immunosuppressive cells
  - Bintrafusp alfa (anti-PDL1/TGFβRII)
    - anti-PDL1 checkpoint
    - TGFβRII “traps” TGFβ at TME

- Alteration of the tumor phenotype to render tumor cells more susceptible to immune-mediated lysis
  - Bintrafusp alfa (anti-PDL1/TGFβRII)
    - TGFβ reduction: mesenchymal to epithelial transition

Triple therapy of HPV-associated malignancies with PDS0101, bintrafusp alfa, and NHS-IL12

Caroline Jochems, M.D., Ph.D.

PDS Oncology R&D Day, June 16, 2021

Journal for ImmunoTherapy of Cancer

Immunomodulation to enhance the efficacy of an HPV therapeutic vaccine

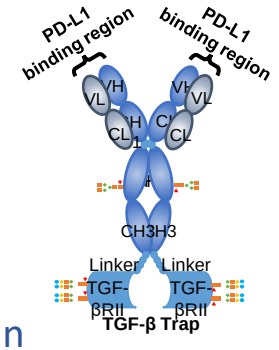
Claire Smalley Rumfield, Samuel T Pellom, Y Maurice Morillon II, Jeffrey Schlom, Caroline Jochems

HPV-associated malignancies

Human Papilloma Virus: dsDNA virus, > 200 strains
13 “high risk” strains, HPV16 and HPV18
Prevalence of high-risk HPV: Men: 25%
Women 20%
> 630,000 new cases worldwide annually
> 30,000 cases in the US
Cervical, Oropharyngeal and Anogenital cancers
Squamous cell carcinomas

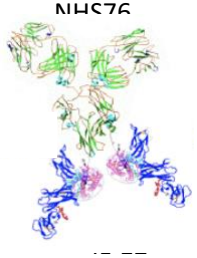
★ **Poor prognosis for advanced disease**

Bintrafusp alfa / M7824



EMD Serono
Bifunctional fusion protein, human IgG1 anti-PDL1 and extracellular domain of TGFbRII (TGFb “trap”)
Well tolerated in Phase I study
Toxicity similar to anti-PD1/PDL1
HPV-associated cancer: 30.5% response rate
⬆ HPV-specific T-cells

NHS-IL12



EMD Serono
Immunocytokine; two IL12 heterodimers fused to the NHS76 antibody, which targets tumor necrosis
Phase I: Safe, increased IFNγ, influx of lymphocytes into the tumor

Publications: Bintrafusp alfa / M7824

Analysis of the tumor microenvironment and anti-tumor efficacy of subcutaneous vs systemic delivery of the bifunctional agent **bintrafusp alfa**.
Ozawa Y, Schlom J, Gameiro SR. Oncoimmunology. 2021 May 3;10(1):1915561.

Improving the Odds in Advanced Breast Cancer With Combination Immunotherapy: Stepwise Addition of Vaccine, Immune Checkpoint Inhibitor, Chemotherapy, and HDAC Inhibitor in Advanced Stage Breast Cancer.
Gatti-Mays ME, Schlom J, Gulley JL. Front Oncol. 2021 Mar 5;10:581801. d

Bintrafusp alfa, a bifunctional fusion protein targeting TGF-beta and PD-L1, in patients with human papillomavirus-associated malignancies.
Strauss J, Schlom J, Gulley JL. J Immunother Cancer. 2020 Dec;8(2):e001395.

Immunomodulation to enhance the efficacy of an HPV therapeutic vaccine.
Smalley Rumfield C, Schlom J, Jochems C. J Immunother Cancer. 2020 Jun;8(1):e000612.

The Use of a Humanized NSG-beta2m(-/-) Model for Investigation of Immune and Anti-tumor Effects Mediated by the Bifunctional Immunotherapeutic **Bintrafusp Alfa**.
Morillon YMI, Schlom J.Front Oncol. 2020 Apr 21;10:549.

Dual targeting of TGF-β and PD-L1 via a bifunctional anti-PD-L1/TGF-βRII agent: status of preclinical and clinical advances.
Lind H, Schlom J. J Immunother Cancer. 2020 Feb;8(1):e000433.

M7824, a novel bifunctional anti-PD-L1/TGFbeta Trap fusion protein, promotes anti-tumor efficacy as monotherapy and in combination with vaccine.
Knudson KM, Schlom J, Gameiro SR. Oncoimmunology. 2018 Feb 14;7(5):e1426519.

Phase I Trial of **M7824** (MSB0011359C), a Bifunctional Fusion Protein Targeting PD-L1 and TGFbeta, in Advanced Solid Tumors.
Strauss J, Schlom J, Gulley JL. Clin Cancer Res. 2018 Mar 15;24(6):1287-1295.

Anti-PD-L1/TGFbetaR2 (**M7824**) fusion protein induces immunogenic modulation of human urothelial carcinoma cell lines, rendering them more susceptible to immune-mediated recognition and lysis.
Grenga I, Schlom J. Urol Oncol. 2018 Mar;36(3):93.e1-93.e11.

Analyses of functions of an anti-PD-L1/TGFbetaR2 bispecific fusion protein (**M7824**).
Jochems C, Schlom J. Oncotarget. 2017 Sep 8;8(43):75217-75231.

A novel bifunctional anti-PD-L1/TGF-beta Trap fusion protein (**M7824**) efficiently reverts mesenchymalization of human lung cancer cells.
David JM, Schlom J, Palena C. Oncoimmunology. 2017 Jul 13;6(10):e1349589.

Publications: NHS-IL12 / M9241

Immunomodulation to enhance the efficacy of an HPV therapeutic vaccine.
Smalley Rumfield C, Pellom ST, Morillon Ii YM, Schlom J, Jochems C.J Immunother Cancer. 2020 Jun;8(1):e000612.

Efficient Tumor Clearance and Diversified Immunity through Neoepitope Vaccines and Combinatorial Immunotherapy.
Lee KL, Schlom J, Hamilton DH. Cancer Immunol Res. 2019 Aug;7(8):1359-1370.

Temporal changes within the (bladder) tumor microenvironment that accompany the therapeutic effects of the immunocytokine **NHS-IL12**.
Morillon YM 2nd, Su Z, Schlom J, Greiner JW.J Immunother Cancer. 2019 Jun 11;7(1):150.

First-in-Human Phase I Trial of a Tumor-Targeted Cytokine (**NHS-IL12**) in Subjects with Metastatic Solid Tumors.
Strauss J, Heery CR, Kim JW, Jochems C, Donahue RN, Montgomery AS, McMahon S, Lamping E, Marté JL, Madan RA, Bilusic M, Silver MR, Bertotti E, Schlom J, Gulley JL.Clin Cancer Res. 2019 Jan 1;25(1):99-109.

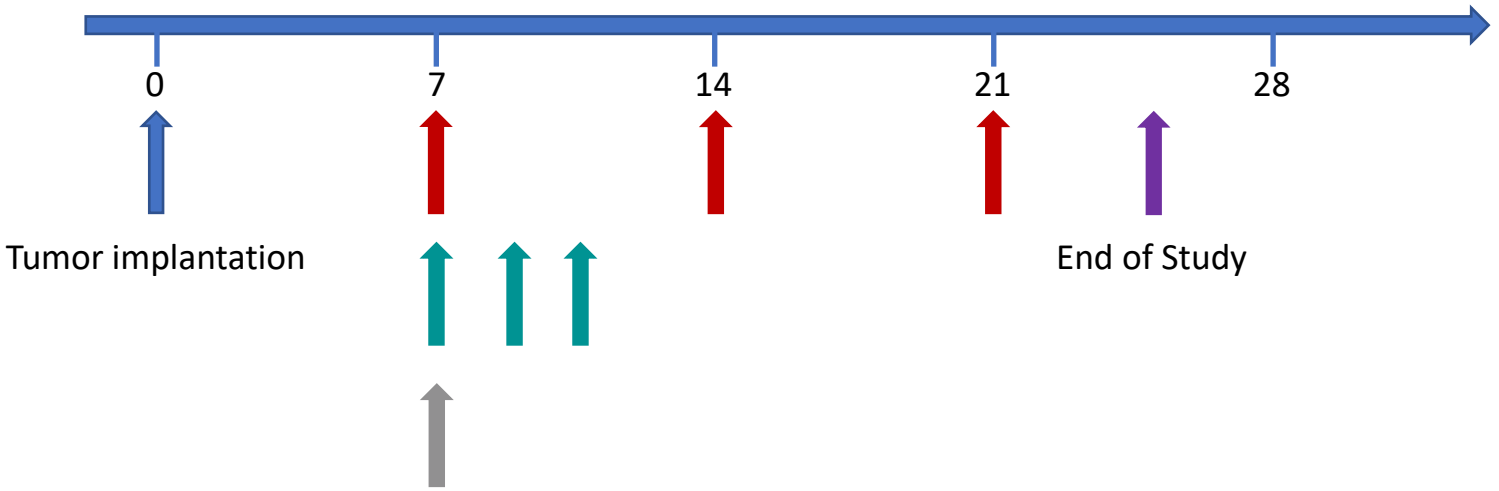
The immunocytokine **NHS-IL12** as a potential cancer therapeutic.
Fallon J, Tighe R, Kradjian G, Guzman W, Bernhardt A, Neuteboom B, Lan Y, Sabzevari H, Schlom J, Greiner JW.Oncotarget. 2014 Apr 15;5(7):1869-84.

Tumor model TC-1

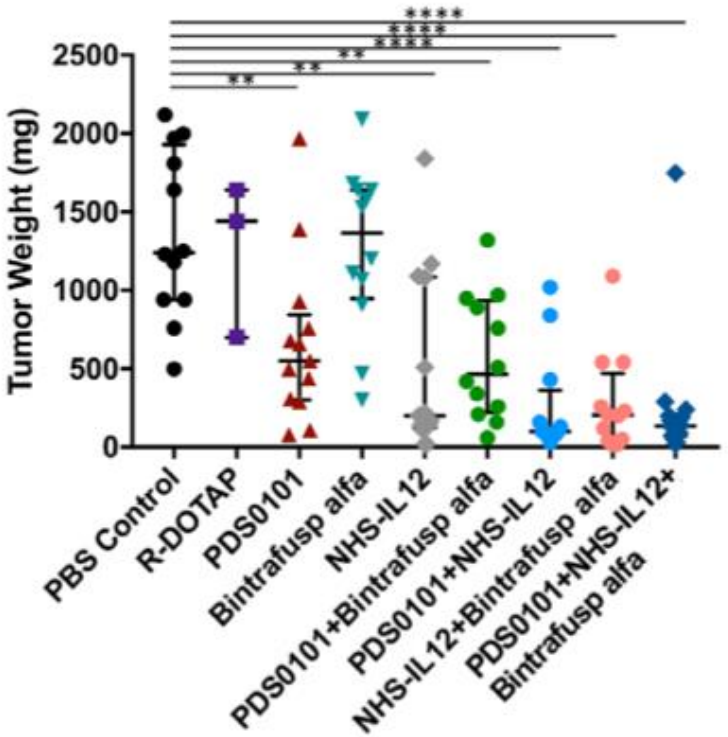
TC-1: syngeneic lung carcinoma cell line transformed with HPV16 E6/E7
TC Wu, Baltimore

Mice treated with:

- **PDS0101** s.c, weekly, days 7, 14, and 21
- **M7824** 250 µg i.p, days 7, 9, and 11
- **NHS-IL12** 50 µg s.c, day 7

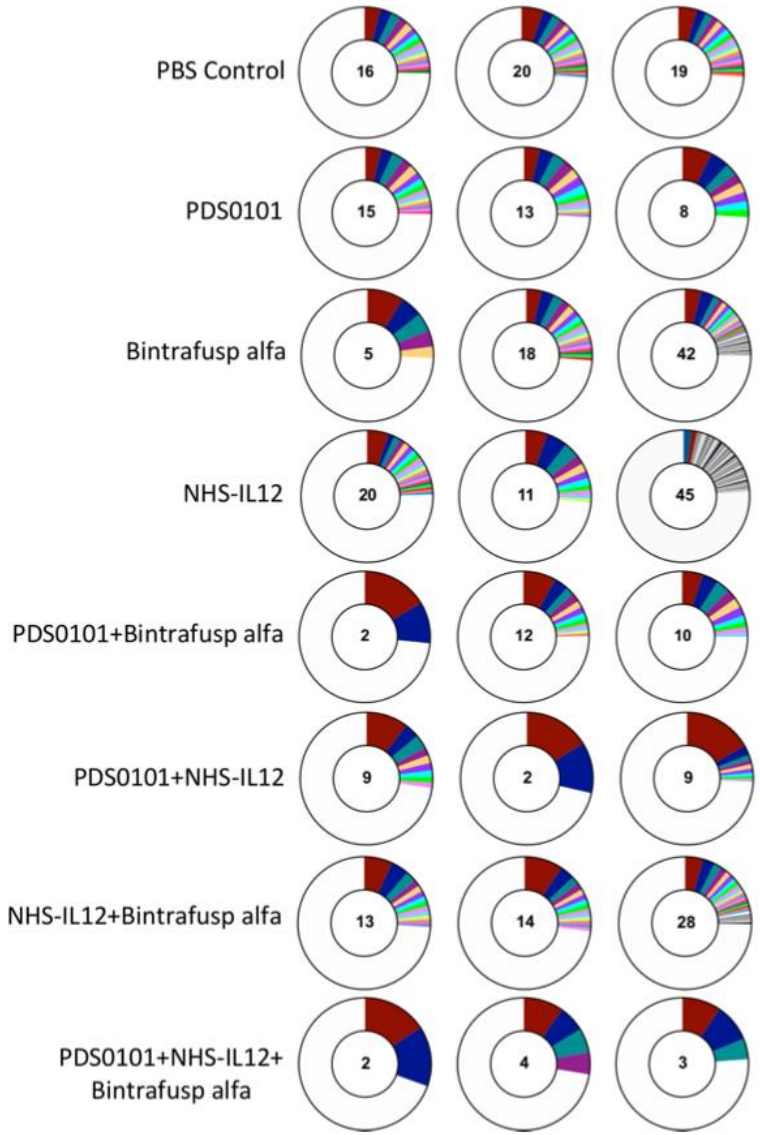


The combination of PDS0101, bintrafusp alfa, and NHS-IL12 reduced tumor volume in TC-1 bearing mice



Treatment	# Mice with Tumor Volume <300mm^3
PBS Control	0/16
R-DOTAP	0/8
PDS0101	3/16
Bintrafusp alfa	0/16
NHS-IL12	6/16
PDS0101+Bintrafusp alfa	5/16
PDS0101+NHS-IL12	10/16
NHS-IL12+Bintrafusp alfa	8/16
PDS0101+NHS-IL12+Bintrafusp alfa	13/17

The combination of PDS0101, bintrafusp alfa, and NHS-IL12 increased TCR clonality



Treatment	T-cell Clones per 25% of TCR Repertoire (Avg)
PBS Control	18
PDS0101	12
Bintrafusp alfa	22
NHS-IL12	25
PDS0101+Bintrafusp alfa	8
PDS0101+NHS-IL12	6
NHS-IL12+Bintrafusp alfa	18
PDS0101+NHS-IL12+ Bintrafusp alfa	3

Tumor infiltrating lymphocytes (TILs) were purified from whole tumor.
DNA isolated from TILs was analyzed by Adaptive Biotechnology for TCR repertoire.

Conclusions

These studies provide a preclinical rationale for the on-going Phase I/II study run by Dr. Julius Strauss

2021 ASCO ANNUAL MEETING

PHASE II EVALUATION OF THE TRIPLE COMBINATION OF PDS0101, M9241, AND BINTRAFUSP ALFA IN PATIENTS WITH HPV 16 POSITIVE MALIGNANCIES

Julius Strauss[1], Charalampos S. Floudas[2], Houssein Abdul Sater[2], Michell Manu[3], Elizabeth Lamping[2], Deneise C Francis[2], Lisa M Cordes[2], Jenn Marte[2], Renee N Donahue[1], Caroline Jochems[1], Jason Redman[2], Ravi A Madan[2], Marijo Bilusic[2], Fatima Karzai[2], Scott Norberg[2], Christian S. Hinrichs[2], Lauren V Wood[4], Frank K Bedu-Addo[4], Jeffrey Schlom[1], James L Gulley[2]

[1]Laboratory of Tumor Immunology and Biology, NCI; [2]Genitourinary Malignancies Branch, NCI; [3]Leidos Biomedical Research, Inc.; [4]PDS Biotechnology, Princeton, NJ

Abstract No. 2501. Presented at the 2021 ASCO Annual Meeting, June 4–8, 2021; Virtual. Presentation No.

Study Design

- Patients with advanced HPV-related cancers received the combination of bintrafusp alfa at 1200 mg flat dose i.v. q 2wks, M9241 at 16.8 mcg/kg s.c. q 4 wks and PDS0101 given as two separate 0.5 ml s.c. injections q 4 wks [NCT04287868]
- Dose reductions of M9241 to 8 mcg/kg were allowed as well as skipped doses of agent(s) for toxicities
- HPV genotyping was done with PCR based assays (BD Onclarity or Molecular MD) if testing not already done

Population

- Cervical
- Anal
- P16+ oropharyngeal
- Other HPV-associated

Endpoints

Primary: ORR
Secondary: safety

Treatment until confirmed progression, unacceptable toxicity, or any criteria for withdrawal; treatment past progression was allowed

Results

	All patients N=25
Age, median (range), years	50 (37-80)
Female, n (%)	17 (68)
Tumor type, n (%)	
Cervical	10 (40)
Anal	6 (24)
Head & Neck SCC	6 (24)
Vulvar/ Vaginal	3 (12)
Number of prior anticancer therapies, n (%)	
1	5 (20)
2	11 (44)
≥3	9 (36)
Prior chemotherapy, n (%)	25 (100)
Prior radiotherapy, n (%)	24 (96)
Prior PD-(L)1 inhibitor therapy, n (%)	14 (56)
HPV status, n (%)	
HPV 16	18 (72)
HPV type other than 16	6 (24)
Negative	1 (4)

Key baseline patient and disease characteristics

- As of 01 MAR 2021, 25 patients had received the triple combination of PDS0101, M9241 & bintrafusp alfa
  - The median follow-up is 8 months

Results

	All patients N=25
	Grade ≥2
Treatment-related adverse events (TRAEs)	23 (92)
TRAEs leading to discontinuation of ≥ 1 drug(s)	5 (20)
Treatment-related serious AEs	7 (28)
TRAEs in ≥5% of patients	
Anemia	12 (48)
Lymphocyte decrease	7 (28)
Flu like symptoms	6 (24)
Injection site reactions	5 (20)
Hematuria	4 (16)
AST/ ALT/ Alk phos elevation	4 (16)
Keratoacanthomas	4 (16)
Leukocyte decrease	3 (12)
Maculopapular rash	3 (12)
Pruritis	3 (12)
Nausea/ vomiting	3 (12)
Mucositis	3 (12)
Hypothyroidism	3 (12)
Peripheral motor neuropathy	2 (8)
Fatigue	2 (8)

1. **Hemophagocytic lymphohistiocytosis**

Safety summary

- Grade 3 TRAEs occurred in 10 (40%) patients
  - anemia due to hematuria (n=4), AST/ALT elevation (n=2); flu like symptoms (n=1), nausea/ vomiting (n=1), leukopenia (n=1), lymphopenia (n=2), HLH[1] (n=1)
- All four patients with grade 3 hematuria had cervical ca with prior pelvic RT + brachytherapy
- One patient with transient grade 3 leukopenia and lymphopenia also had transient grade 4 neutropenia
- 4 patients who originally had grade 3 toxicities with the triple combo including M9241 at 16.8 mcg/kg tolerated the triple combo with M9241 at 8 mcg/kg w/o any further grade ≥3 toxicities
- No treatment-related deaths occurred

Results

	All patients N=25	HPV 16+ N=18	HPV 16+ CPI Naïve N=6	HPV 16+ CPI Refractory N=12
BOR, n (%) Complete response (CR) Partial response (PR)	 2 (8) 8 (32)	 2 (11.1) 8 (44.4)	 1 (16.7) 4 (66.7)	 1 (8.3) 4 (33.3)
ORR (CR+PR), n (%)	10 (40)	10 (55.6)	5 (83.3)	5 (41.7)
Disease Reduction, n (%)	13 (52)	12 (66.7)	5 (83.3)	7 (58.3)
Ongoing response, n/n (%)	8/10 (80)	8/10 (80%)	4/5 (80%)	4/5 (80%)
Overall Survival, n/n (%)*	20/25 (80)	16/18 (88.9)	6/6 (100)	10/12 (83.3)

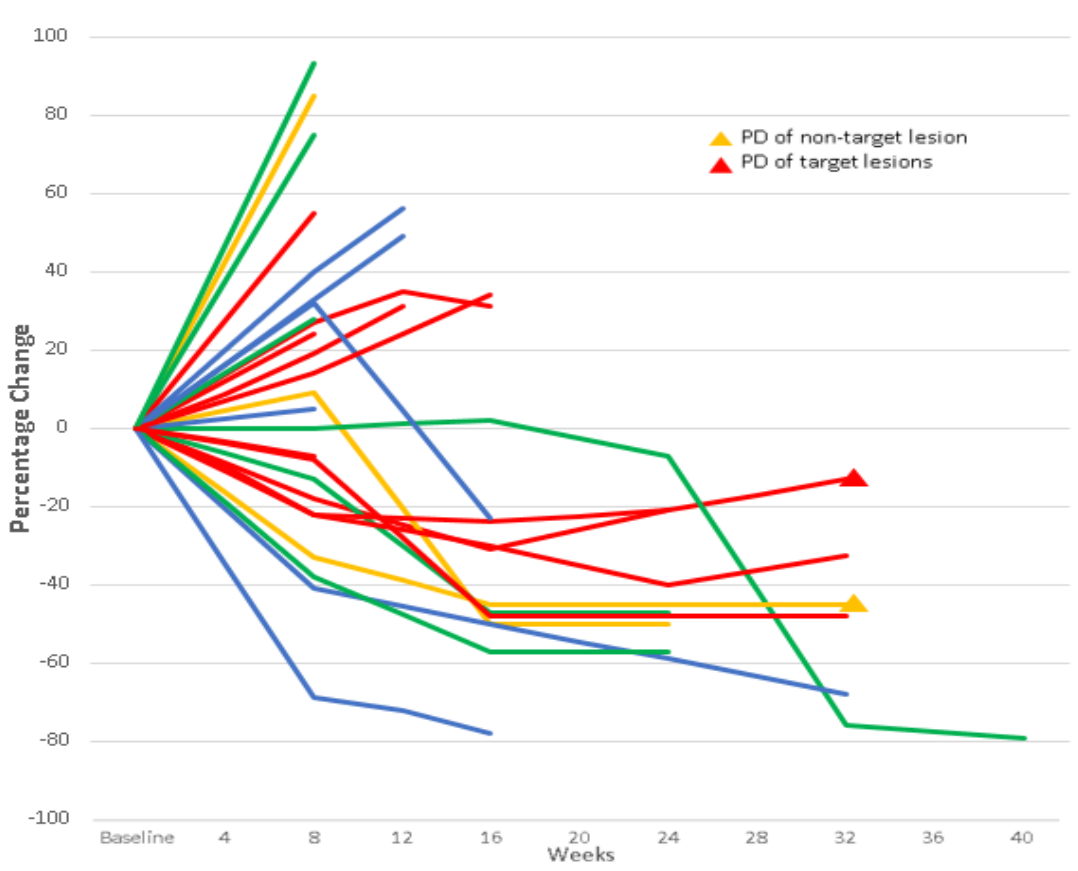
* Median 8 months of follow up

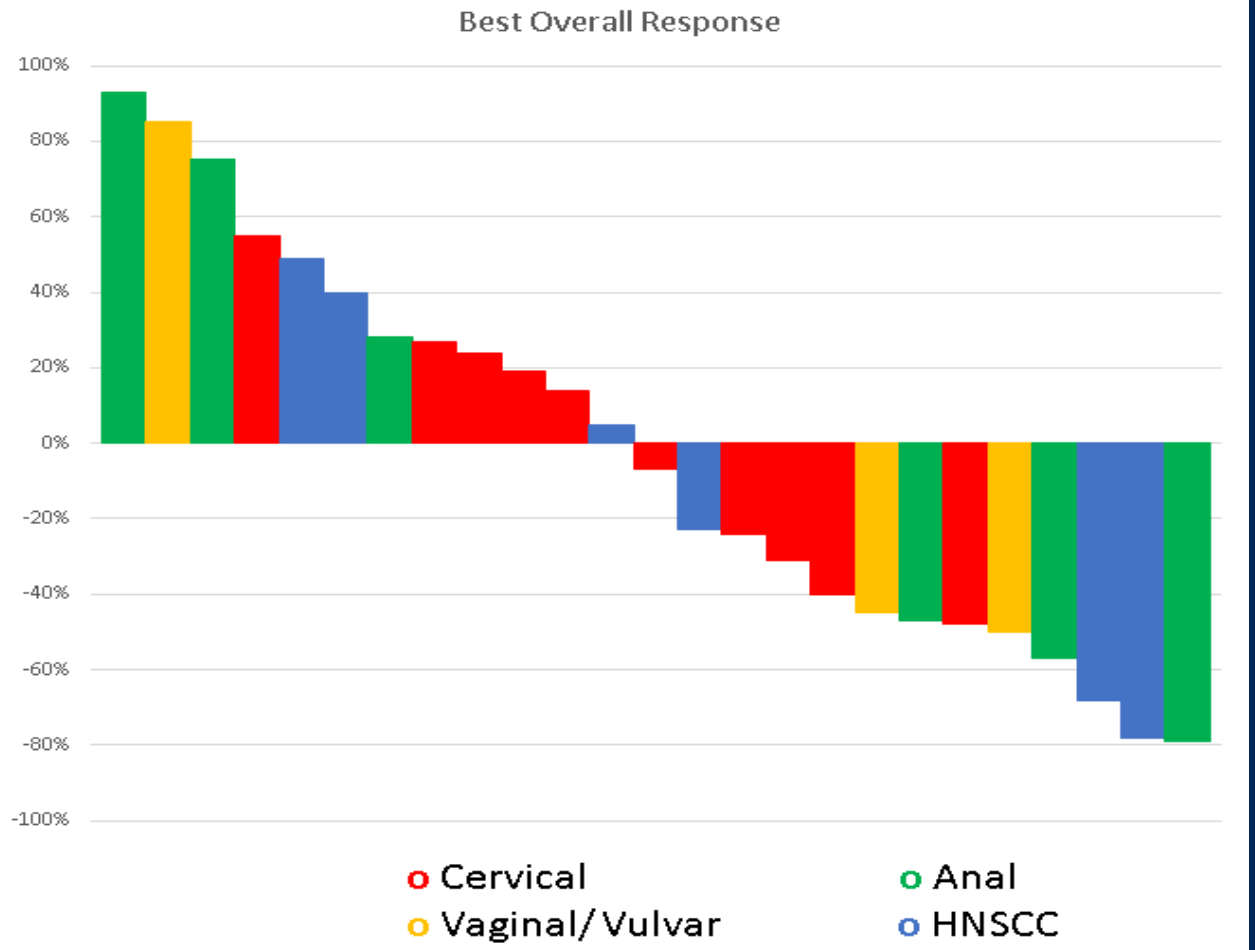
Patient Outcomes

- ORR 55.6% (tumor reduction 66.7%) in HPV 16+ disease
- ORR 83.3% in CPI *naïve* HPV 16+ disease
- ORR 41.7% (tumor reduction 58.3%) in CPI *refractory* HPV 16+ disease
- After a median 8 months of follow up:
  - 80% of responses are ongoing
  - 6/6 (100%) pts with HPV 16+ CPI naïve disease remain alive (historical median OS is 7-11 mo)[1-6]
  - 10/12 (83.3%) pts with HPV 16+ CPI refractory disease remain alive (historical median OS is 3-4 mo)[7]

1. Bauml J, et al. *J Clin Oncol* 2017;35:1542–49; 2. Ott PA, et al. *Ann Oncol.* 2017;28:1036–41; 3. Mehra R, et al. *Br J Cancer.* 2018;119:153–59; 4. Ferris RL, et al. *N Engl J Med*. 2016;375:1856–67; 5. Morris VK, et al. *Lancet Oncol*. 2017;18:446–53; 6. Chung HC, et al. *J Clin Oncol* 2019;37: 1470-8; 7. Strauss J, et al. J Immunother Cancer. 2020 Dec;8(2):e001395

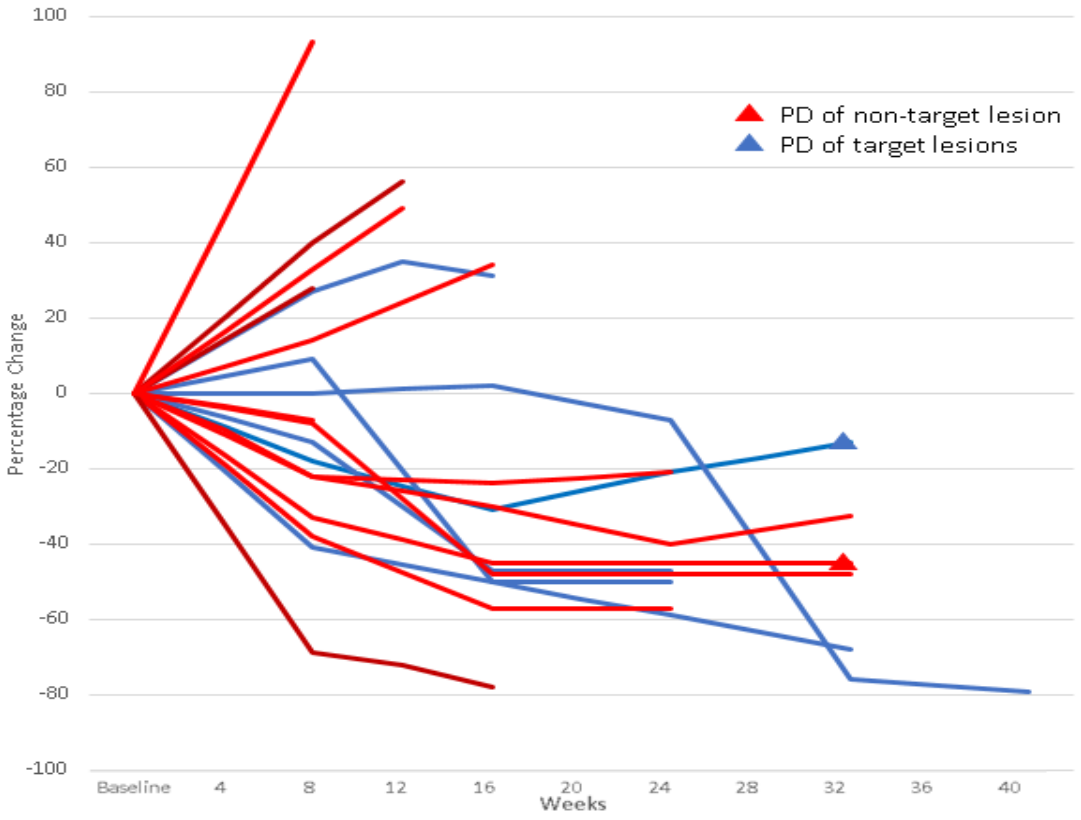
Results

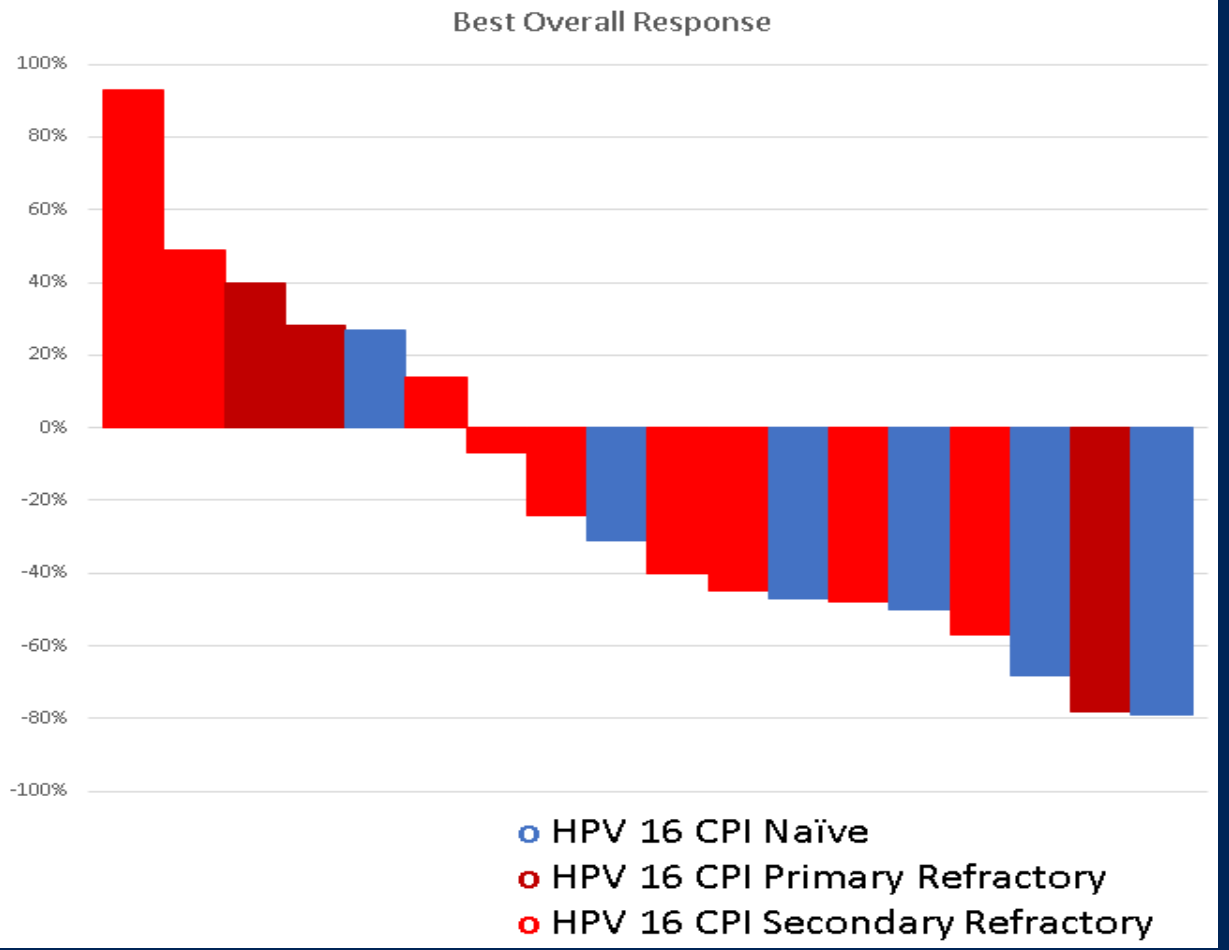




- Responses in HPV 16+ disease occurred irrespective of tumor type

Results





Primary Refractory: Prior PD or SD < 6 months
Secondary Refractory: Prior PR or SD > 6 months

- Overwhelming majority of HPV 16+ CPI naive pts had a response
- Majority of HPV 16+ CPI refractory pts had tumor shrinkage

Conclusions

- Triple combination of PDS0101, M9241 and bintrafusp alfa appears to have a manageable safety profile along with early evidence of notable clinical activity for pts with advanced HPV 16+ malignancies

- Clinical activity noted irrespective of tumor type or CPI status
- ORR was 55.6% (tumor reduction 66.7%) in all pts with advanced HPV 16+ disease
- ORR was 83.3% in patients with CPI *naive* HPV 16+ disease
- ORR was 41.7% (tumor reduction 58.3%) in patients with CPI *refractory* HPV 16+ disease

- After a median 8 months of follow up:
  - 80% of responses are ongoing
  - 6/6 (100%) pts with HPV 16+ CPI naïve disease remain alive
  - 10/12 (83.3%) pts with HPV 16+ CPI refractory disease remain alive

- Accrual is ongoing to the triple combination [NCT04287868]

Clinical strategy: Develop PDS0101 in combination with established therapies for rapid proof-of-concept and risk mitigation

Combinations of PDS0101 with FDA-approved standard of care

- ***Combination with KEYTRUDA®***
  - First line treatment of recurrent/metastatic HPV-positive head and neck cancer in patients who are checkpoint inhibitor naïve
  - First line treatment of recurrent/metastatic HPV-positive head and neck cancer in patients who are checkpoint inhibitor refractory
- ***Combination with chemoradiotherapy***
  - Treatment of advanced localized cervical cancer

Novel combinations of PDS0101 with promising, investigational immunotherapeutic agents

- ✓ ***Triple combination with bintrafusp-alpha and M9241***
  - Treatment of advanced HPV-associated cancers (anal, cervical, vaginal, head and neck etc.) in patients who are checkpoint inhibitor naïve
  - Treatment of advanced HPV-associated cancers (anal, cervical, vaginal, head and neck etc.) in patients who are checkpoint inhibitor refractory

PDS Biotech-sponsored phase 2 trial evaluating the combination of PDS0101 and KEYTRUDA for first-line treatment of HPV-associated metastatic/recurrent head and neck cancer (VERSATILE-002)

Indication	First line treatment of patients with HPV-associated head and neck cancer whose cancer has spread or returned
Clinical Agents	**KEYTRUDA® (Standard of Care):** Anti-PD1 checkpoint inhibitor (ORR ~20%) **PDS0101:** Versamune®-based immunotherapy generating HPV-specific CD8+ and CD4+ T-cells
Study goals	Group 1: Objective response rate (ORR) in checkpoint inhibitor (CPI) naïve patients Group 2: ORR in patients who have failed checkpoint inhibitor therapy (CPI refractory)
Timing	Preliminary data anticipated Q4 2021/Q1 2022: ORR minimum of 4 of 17 in CPI naïve and 2 of 21 in CPI refractory required for subsequent stage 2 enrollment (n=95 patients)
Trial Partner	MERCK

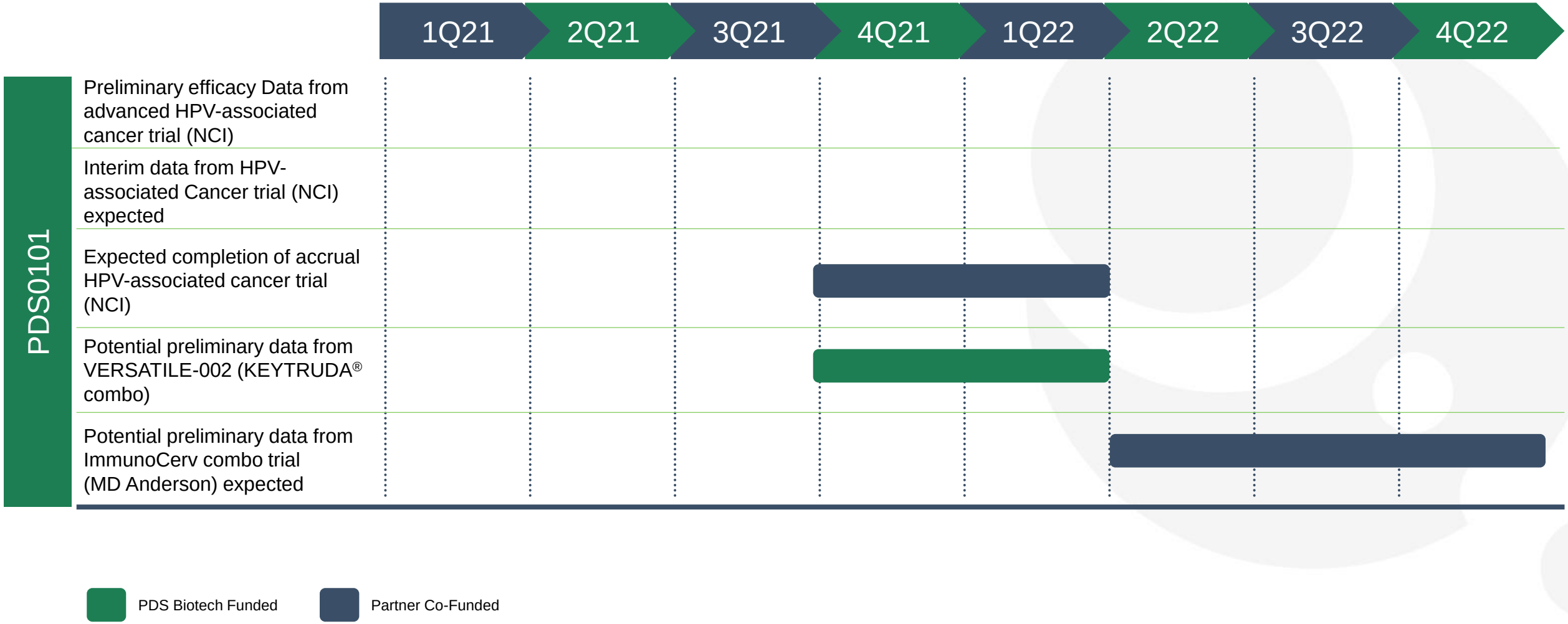
If achieved, confirmation that PDS0101 enhances the therapeutic benefit of checkpoint inhibitors could expand evaluation of Versamune®-based therapies in multiple cancer indications

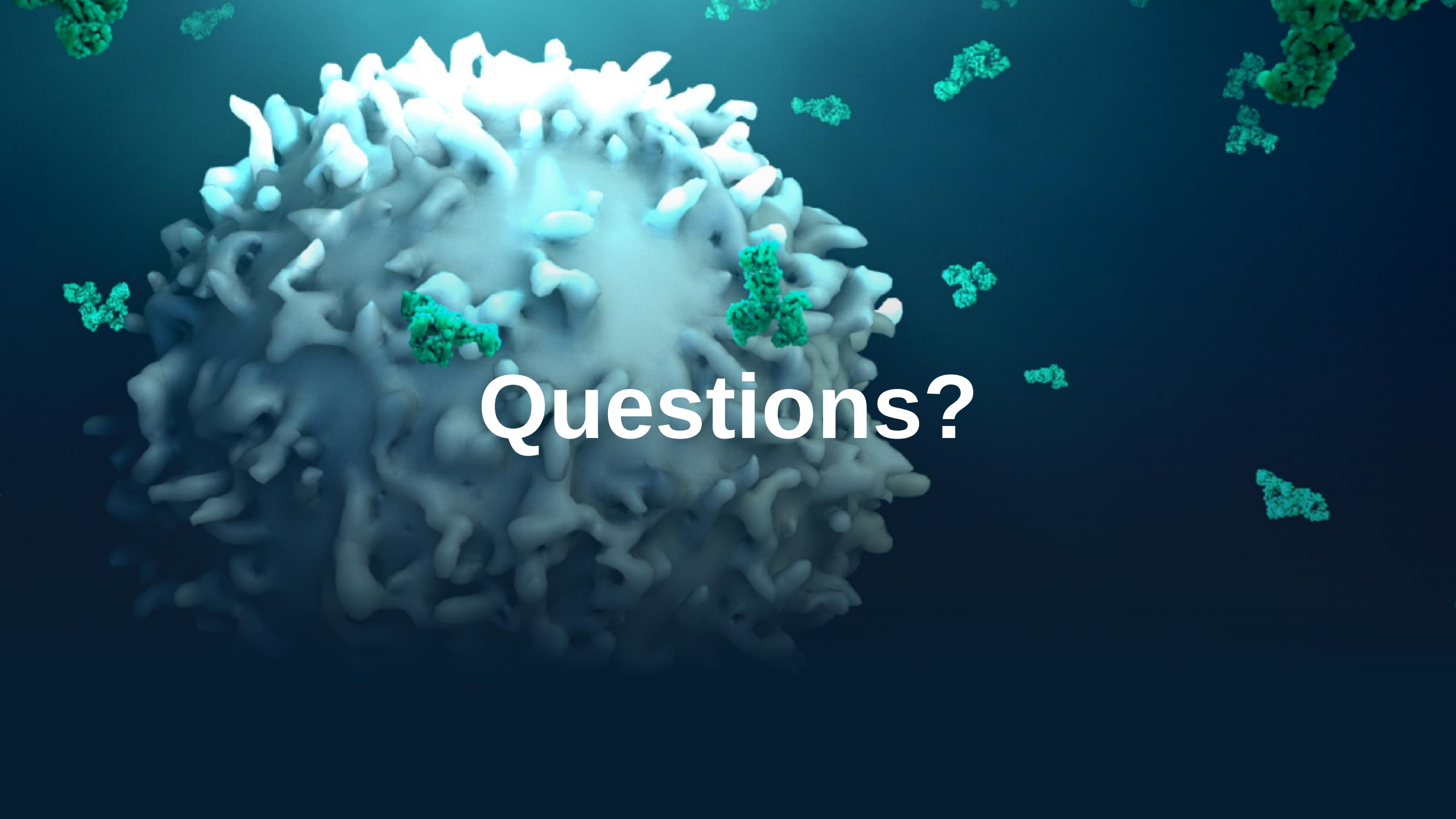
A Phase 2, investigator-initiated clinical trial evaluating PDS0101 in combination with chemoradiation therapy in patients with locally advanced cervical cancer (IMMUNOCERV)

Indication	Treatment of patients with locally advanced cervical cancer – Stages IB3-IVA
Clinical Agents	**Chemoradiotherapy (CRT – Standard of Care):** Cisplatin & radiation therapy **PDS0101:** Versamune®-based immunotherapy generating HPV-specific CD8+ and CD4+ T-cells
Study goals	Safety, rate of regression and local control in patients with primary tumor ≥5cm (n=35 patients)
Timing	Preliminary data anticipated Q4 2021/1H 2022 – Rate of complete response by PET-CT at 6 months and rate of tumor volume reduction by MRI at 30-40 days from start of treatment
Trial Sponsor	THE UNIVERSITY OF TEXAS MD Anderson Cancer Center

If successful, this study could support further investigation of Versamune®-based immunotherapies in combination with chemotherapy or CRT to treat multiple cancers

Projected PDS0101 milestones through 2022*

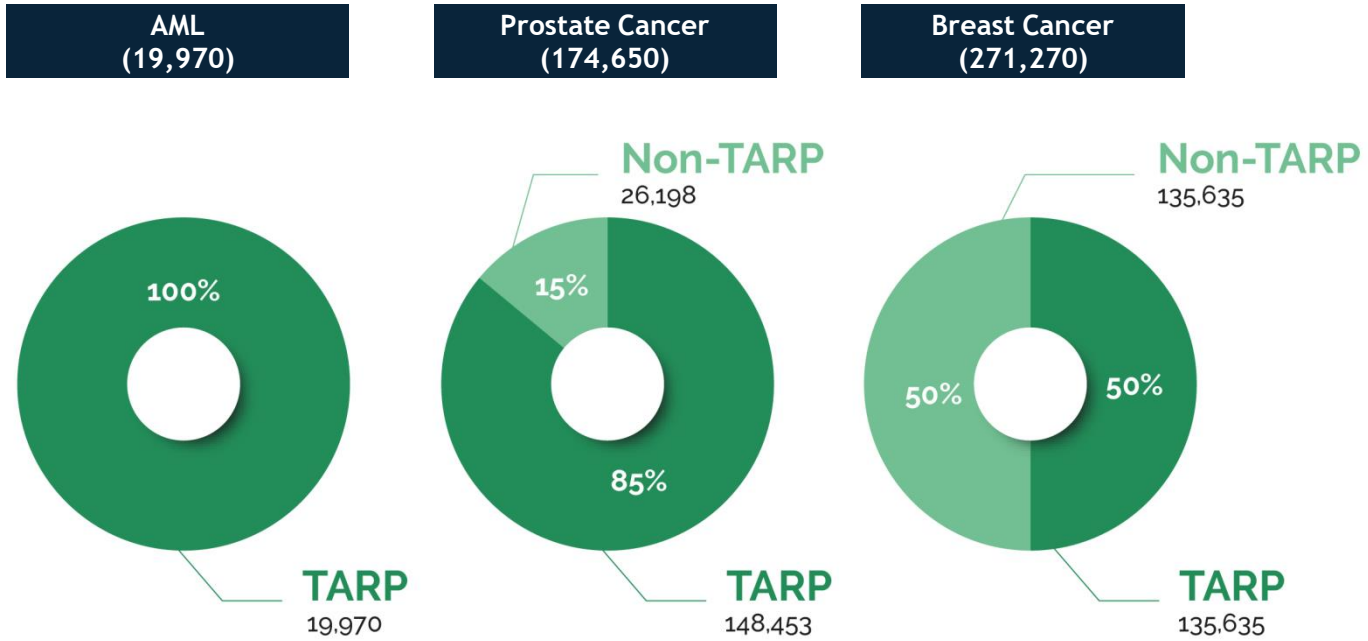



Questions?

Development of PDS0102 for TARP-related cancers

PDS0102 is designed to treat cancers caused by T-cell receptor gamma alternate reading frame protein (TARP), including AML, prostate and breast cancers

Approximately 470,000 patients are diagnosed annually with AML, prostate or breast cancer, most of which are associated with target T-cell receptor gamma alternate reading frame protein (TARP)

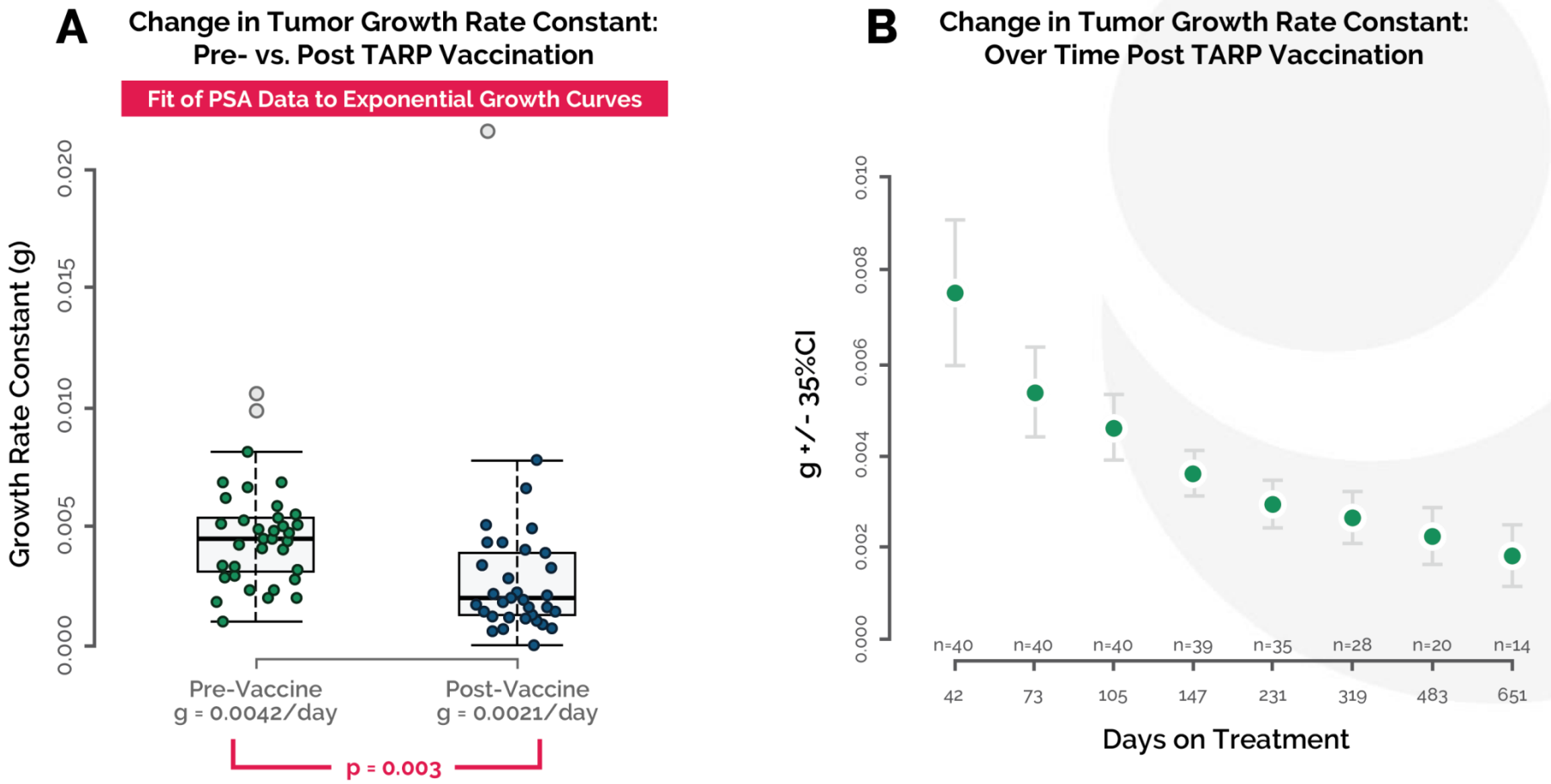


- **Acute Myeloid Leukemia (AML)**
  - Almost 20,000 cases in the US annually
  - TARP expressed in 100% of AML
- **Prostate cancer**
  - Almost 175,000 US cases annually
  - The immunogenic TARP protein is expressed in about 85% of prostate cancers at all stages of the disease^
- **Breast cancer**
  - More than 270,000 US cases annually
  - TARP expressed in about 50% of breast cancers at all stages of the disease

References: Fritzche FR et al. Histol Histopathol 2010 Jun; 25 (6): 733-9 doi: 10.14670/HH-25.733, Cancer Facts & Figures, American Cancer Society, 2019

The TARP antigen used in PDS0102 has been validated for use in cancer immunotherapy

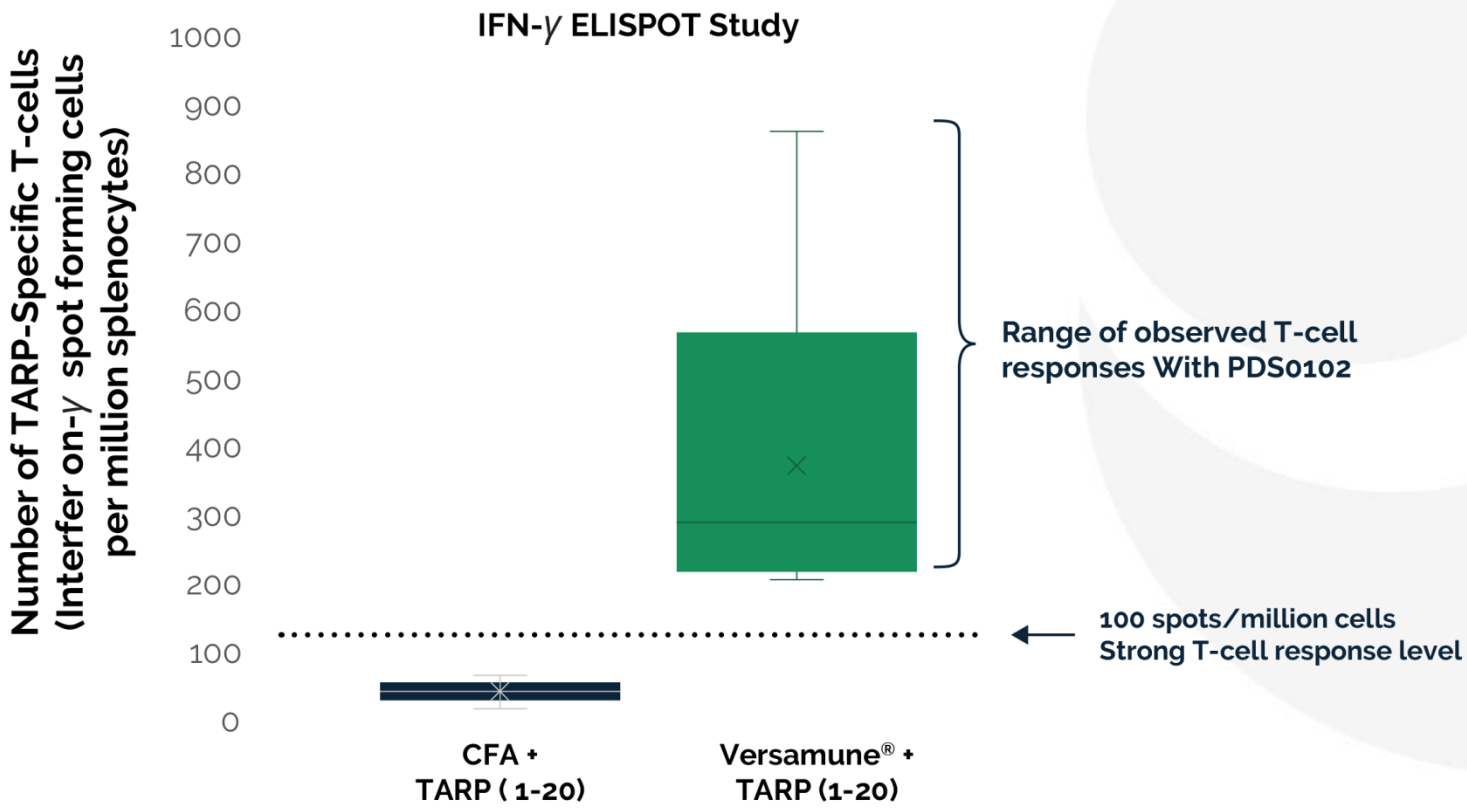
Patients with Stage D0 prostate cancer vaccinated with TARP showed a significant decrease in tumor growth rate based on PSA levels*



Reference: Wood LV et al, Oncoimmunology, 2016, Vol. 5 (8)

PDS0102 may provide superior induction of TARP-specific tumor attacking CD8+ killer T-cells

PRE-CLINICAL OPTIMIZATION STUDIES:
TARP-Specific T-cell Induction after 2 injections of PDS0102



Reference: Wood LV et al, Oncoimmunology, 2016, Vol. 5 (8)
CFA – Complete Freund's Adjuvant a highly potent immune activator not used in humans due to potentially lethal toxicity

Clinical strategy: Develop PDS0102 both as monotherapy and in combination with established therapies in prostate cancer, then expand

Early Disease

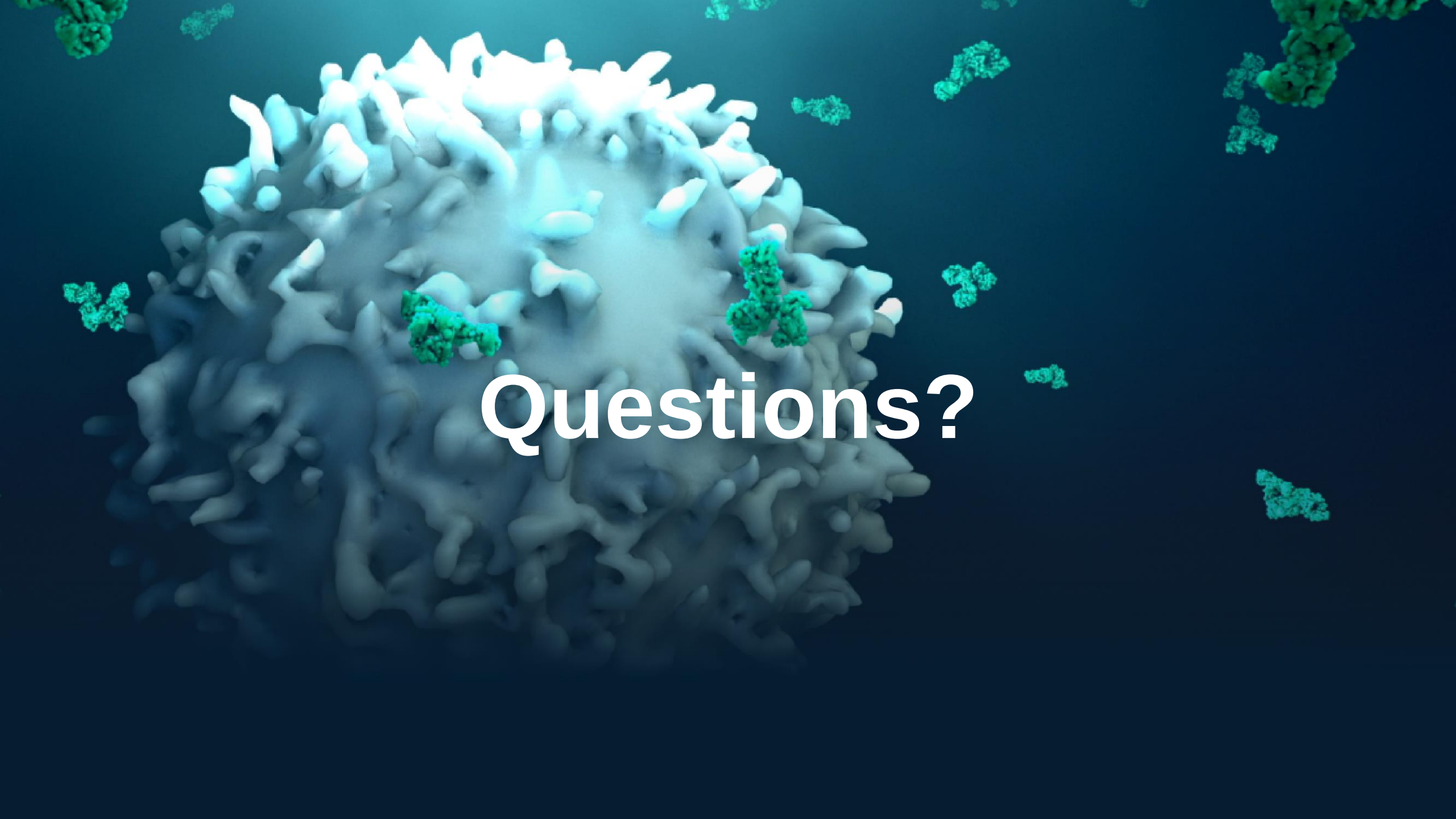
Confirm PDS0102 immunogenicity and tumor infiltration as monotherapy and in combination:

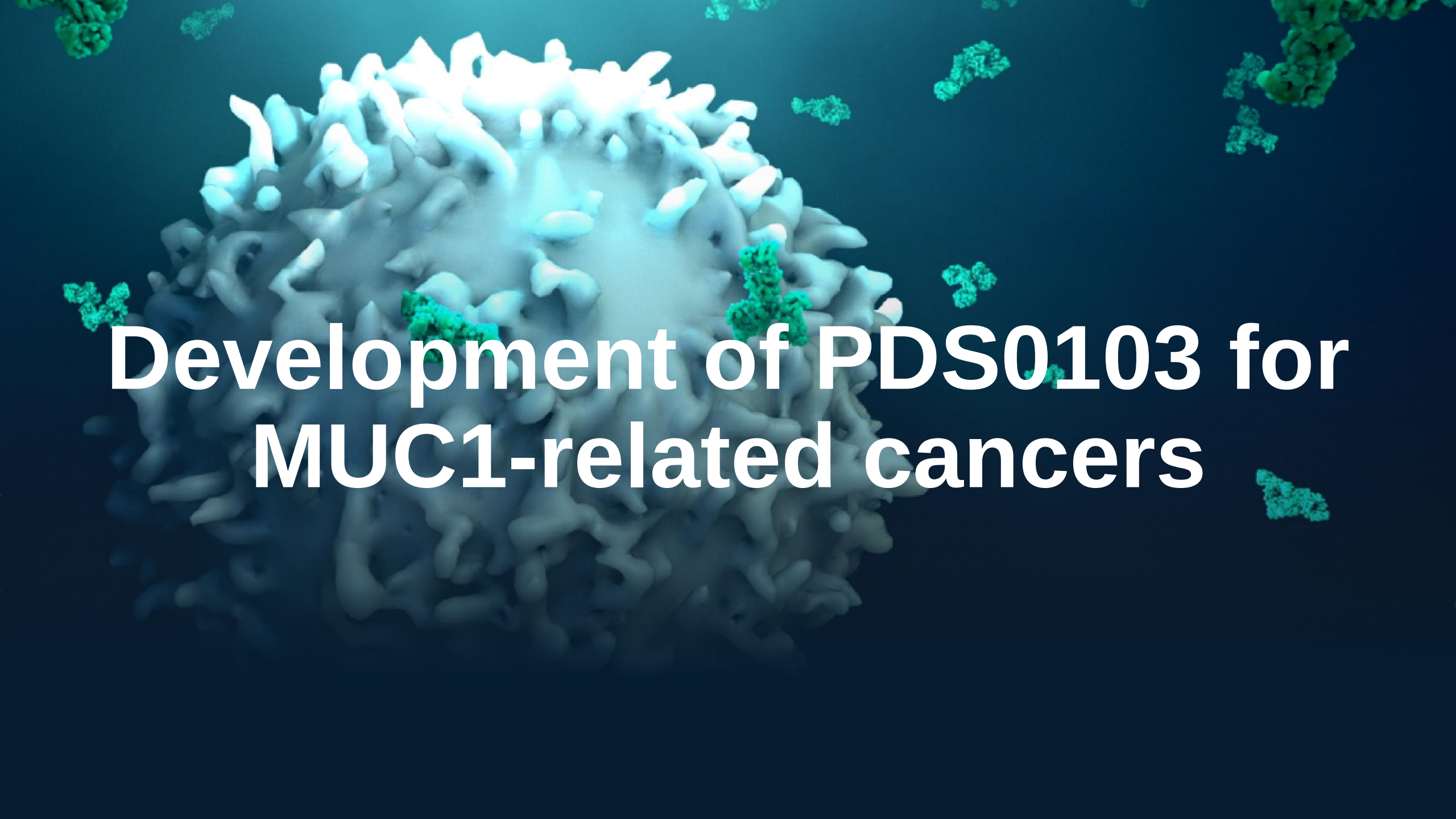
- ***Prostate cancer – active surveillance***
  - Evaluate safety, immunogenicity and pathologic response of neoadjuvant PDS0102 as a monotherapy and in combination with checkpoint inhibitors
- ***TARP-positive breast cancer – DCIS***
  - Evaluate safety, immunogenicity and pathologic response of neoadjuvant PDS0102 as a monotherapy and in combination with checkpoint inhibitors
  - Evaluate options for companion diagnostic to identify appropriate patients

Advanced Disease

Explore PDS0102 safety and immunogenicity in combination with SOC agents / regiments

- ***Treatment of mCSPC and mCRPC***
  - Establish safety, immunogenicity and preliminary efficacy
- ***Treatment of recurrent/metastatic BC***
  - Establish safety, immunogenicity, preliminary efficacy
  - Validation of companion diagnostis
- ***Treatment of AML***
  - Establish PDS0102 safety and immunogenicity in hematologic malignancies

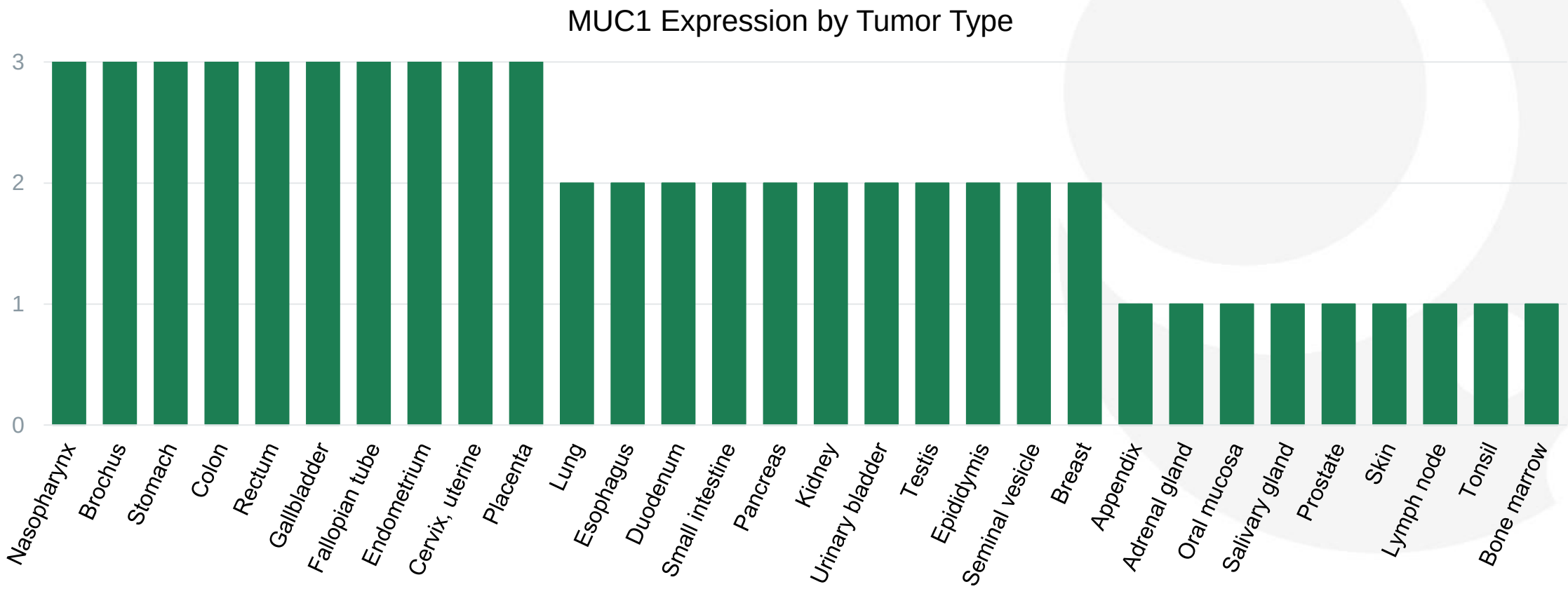

Questions?



Development of PDS0103 for MUC1-related cancers

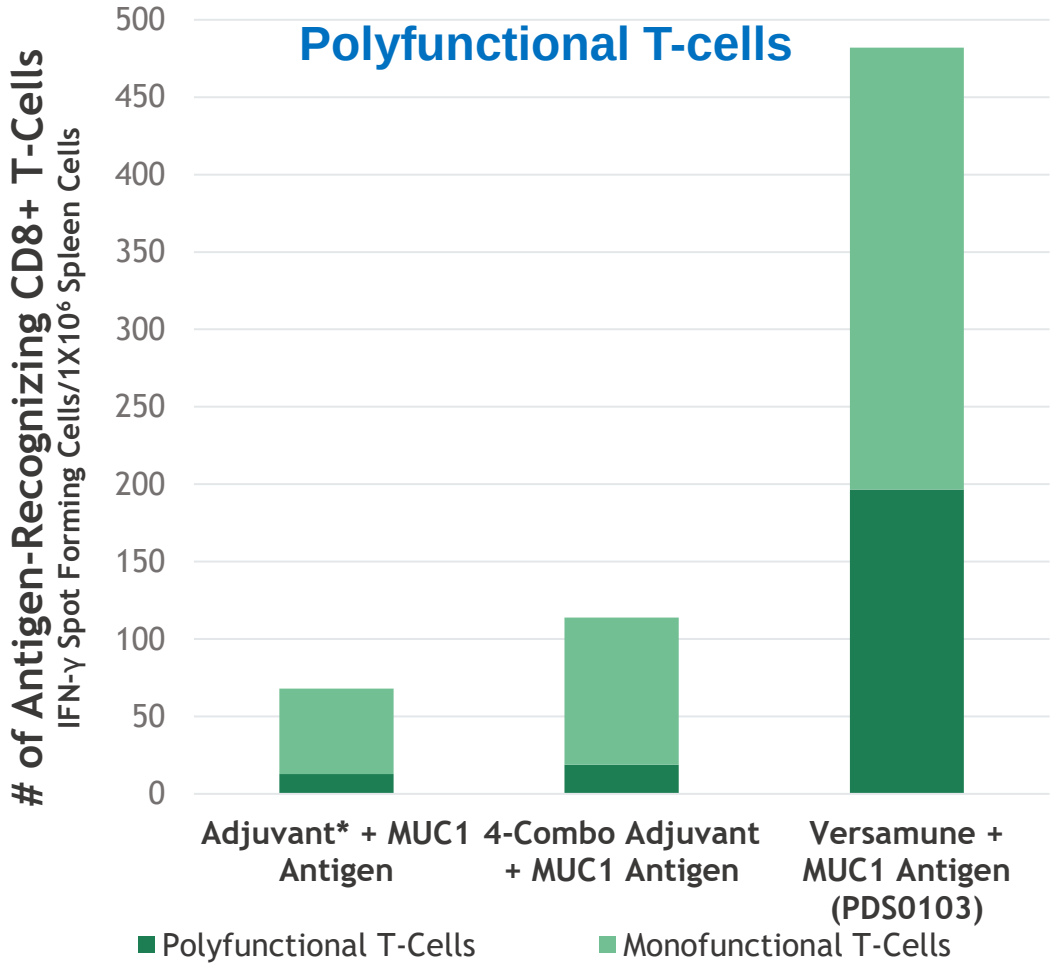
PDS0103 is designed to treat cancers caused by mucin-1 (MUC1), which is highly expressed in solid tumors and is associated with poor prognosis

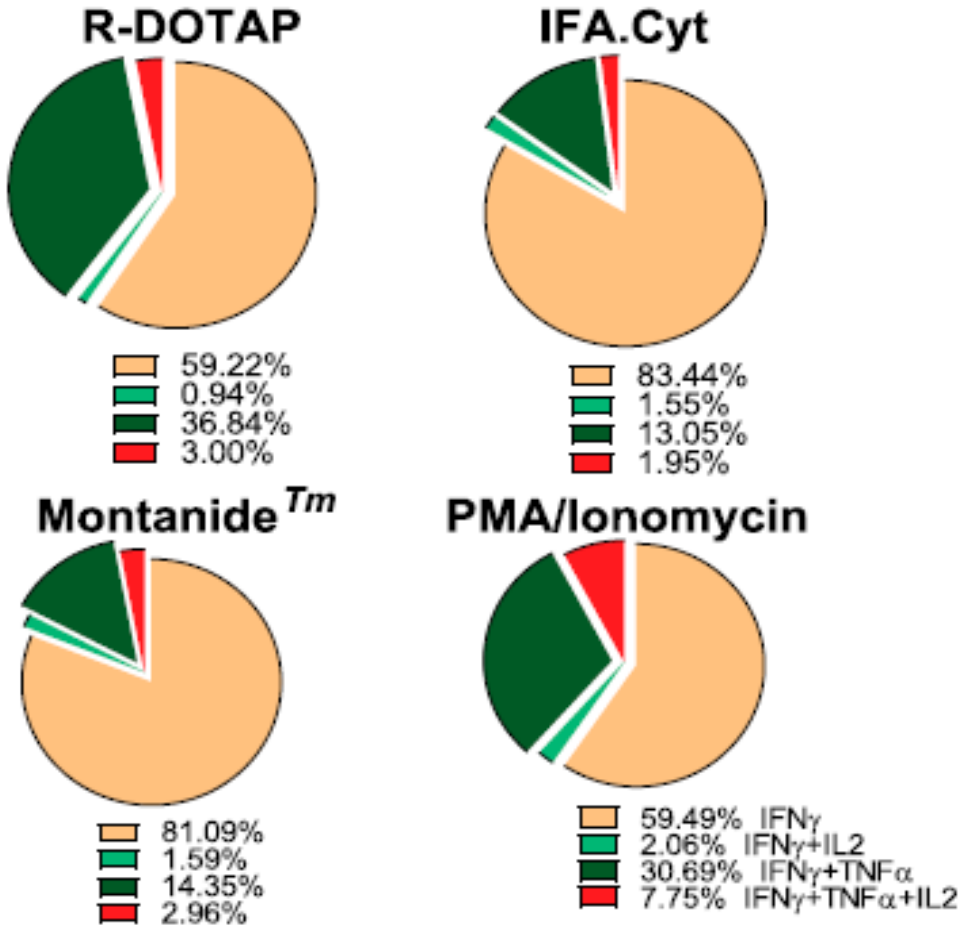
Clinical trial design will seek to evaluate PDS0103 in tumor types with the highest expression of MUC1 and the greatest differences in MUC1 expression between malignant and healthy tissue



Greater quantity and quality of Versamune®-induced CD8+ killer T-cells may result in unique ability to eradicate MUC1-positive tumors

Induced a >10-fold number of polyfunctional MUC1 specific CD8+ T-cells





*Adjuvant = cytokine GMCSF

References: J. Immunology, 2019 (202), 1215; Studies in TC-1 tumor model with other immunotherapies reported in: Vaccine 2009, January 14, 27 (3): 431; Science Translational Medicine 2016, 13 April, Vol 8 Issue 334; Vaccine 2009, September 25, 27 (42): 5906.

MUC1 agonist epitopes for therapeutic cancer vaccine development

Caroline Jochems, M.D., Ph.D.

PDS Oncology R&D Day, June 16, 2021

MUC1

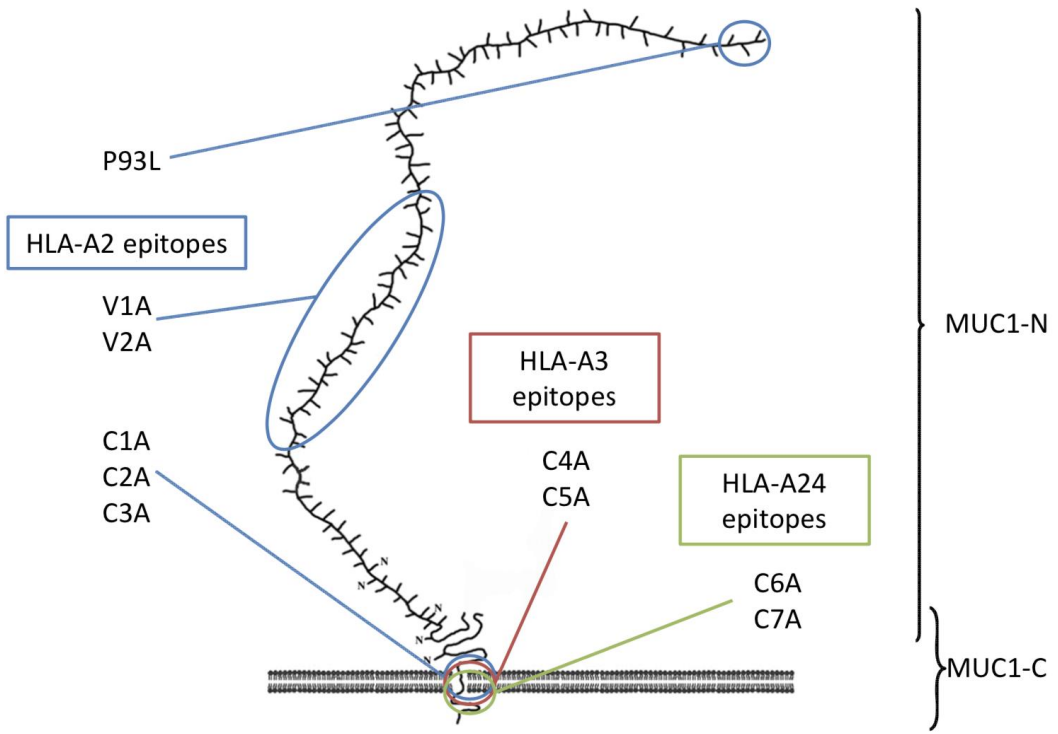
- Expressed in >90% of all carcinomas
- Aberrantly expressed in cancer
- N-terminus of MUC1: extracellular, shed

- C-terminus of MUC1:
  - Transmembrane and intracellular parts
  - Oncogene
  - Drives lineage plasticity by inducing EMT (Epithelial to Mesenchymal Transition)
  - Associated with more malignant phenotype
  - Associated with immune evasion

- MUC1-C is a druggable target: CAR T-cells, antibody-drug conjugates, and a functional inhibitor are under clinical development

- Donald W. Kufe, M.D., Dana-Farber Cancer Institute

MUC1 epitope designations and locations



Cancer Immunol Immunother (2014) 63:161–174
DOI 10.1007/s00262-013-1494-7

ORIGINAL ARTICLE

Identification and characterization of agonist epitopes of the MUC1-C oncoprotein

Caroline Jochems · Jo A. Tucker · Matteo Vergati · Benjamin Boyerinas · James L. Gulley · Jeffrey Schlom · Kwong-Yok Tsang

Agonist epitopes

Change individual amino acids

Better MHC binding

Better presentation

Better T-cell stimulation

Table 1 MUC1 HLA-A2-, HLA-A3-, and HLA-A24-binding peptides and potential agonists, with predicted binding and T2-cell binding assay

Peptide	Location	Position	Sequence	Class I allele	Predicted binding*	Actual binding#
C1	C domain	1172–1181	ALAIVYLIAL	A2	49	249
C1A			**Y**LAIVYLIAL		226	245
C2	C domain	1177–1186	YLIALAVCQC	A2	52	211
C2A			YLIALAVCQ**V**		736	299
C3	C domain	1240–1248	SLSYTNPAV	A2	70	326
C3A			**Y**LSYTNPAV		320	342
V1	VNTR region	150–158	STAPPAHGV	A2	1	166
V1A			**YL**APPAHGV		320	486
V2	VNTR region	141–149	APDTRPAPG	A2	0	210
V2A			**YL**DTRPAP**V**		128	647
C4	C domain	432–441	ALAIVYLIAL	A3	5	NA
C4A			AL**F**IVYLIA**K**		900	NA
C5	C domain	483–491	STDRSPYEK	A3	3	NA
C5A			S**LF**RSPYEK		300	NA
C6	C domain	462–471	TYHPMSEYPT	A24	6	NA
C6A			**K**YHPMSEY**AL**		480	NA
C7	C domain	502–510	SYTNPAVAA	A24	5	NA
C7A			**K**YTNPAVA**L**		400	NA

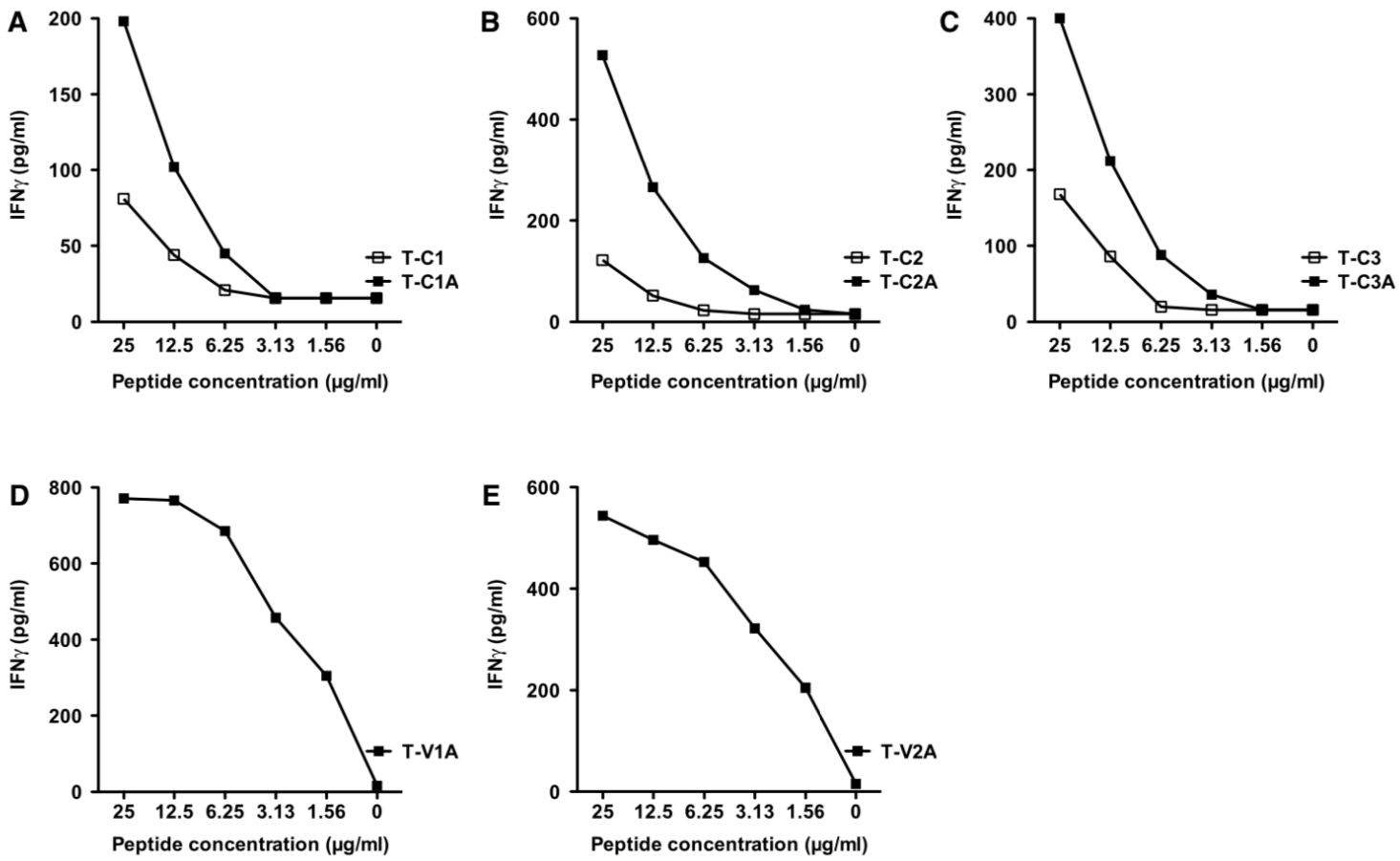
Amino acids that were changed to generate an agonist epitope are in bold

Table 2 Inability of the predicted HLA-A2 binding to predict the biologic activity of MUC1 peptides

Peptide	Position	Sequence	Predicted binding to HLA-A2	T2-A2 binding	Level of killing by peptide-specific CTL	Level of IFN-γ produced by peptide-specific CTL
C1A	1172	YLAIVYLIAL	5	5	2	3
C2A	1177	YLIALAVCQV	3	3	1	1
C3A	1240	YLSYTNPAV	4	1	3	2
C8A	1135	YLSDVSVSDV	1	2	Negative	4
C9A	1162	YLLVLVCVLV	2	4	Negative	Negative

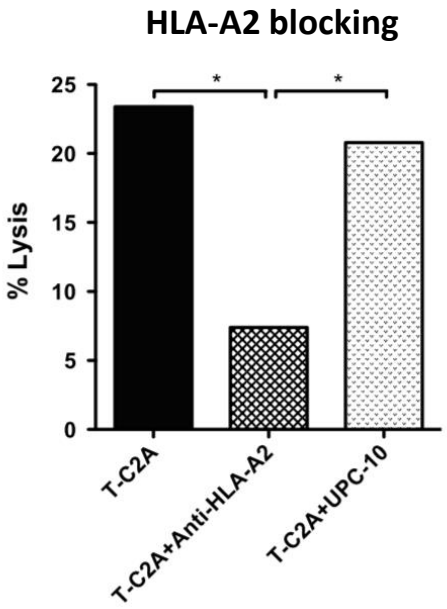
Comparison and ranking of predicted and actual binding, as well as peptide-specific killing and IFN-γ production for potential agonist epitope peptides for MUC1-C. We found that the predicted binding of an epitope did not always correspond to the actual binding to T2-A2 cells and also that the epitope with the best binding affinity did not always generate T cells with the most efficient tumor cell killing or IFN-γ production. 1 = highest level, 5 = lowest level. The agonist epitopes C8A and C9A were not among those evaluated in the other figures and tables

Production of IFNγ by native and agonist specific T cell lines stimulated with the native and agonist HLA-A2 epitopes



MUC1 native and agonist epitope-specific T cell lines lyse tumor cell lines expressing MUC1 and HLA-A2

T cell line	E:T ratio	MCF-7 $MUC1^+$ $HLA\text{-}A2^+$	SK-Mel $MUC1^-$ $HLA\text{-}A2^+$
T-1-C1	50:1	26.4	8.0
	25:1	3.9	-
T-1-C1A	50:1	40.7	0
	25:1	25.5	-
T-1-C2	50:1	53.6	4.6
	25:1	38.5	-
T-1-C2A	50:1	54.4	0
	25:1	46.2	-
T-2-C3	50:1	9.2	-
	25:1	8.4	0.8
T-2-C3A	50:1	25.9	-
	25:1	20.8	1.3
T-1-V1	25:1	N/A	N/A
	12.5:1	N/A	N/A
T-1-V1A	25:1	42.2	5.0
	12.5:1	24.6	0
T-1-V2	25:1	N/A	N/A
	12.5:1	N/A	N/A
T-1-V2A	25:1	53.4	0
	12.5:1	45.1	1.5



MCF-7 (breast carcinoma cell line); SK-Mel (melanoma cell line)
Results are expressed as % specific lysis. N/A = not applicable.

Functional assays with MUC1 agonist peptides compared to native peptides

MUC1 Region	HLA allele	Designation	Agonist vs. Native Tumor Lysis	Agonist vs. Native IFNγ	Agonist Lysis of Tumor	Agonist IFNγ Production
N-non-VNTR	A2	P93L	+	+	+	+
VNTR	A2	V1	NA*	NA*	+	+
VNTR	A2	V2	NA*	NA*	+	+
C domain	A2	C1	+	+	+	+
C domain	A2	C2	+	+	+	+
C domain	A2	C3	+	+	+	+
C domain	A3	C4	+	+	+	+
C domain	A3	C5	+	+	+	+
C domain	A24	C6	NA*	NA*	+	+
C domain	A24	C7		+	+	+

* T-cell line could not be established from the native epitope.

Conclusions

1. 10 agonist epitopes have been identified for MUC1
   - **7** are in the oncogenic C-terminus

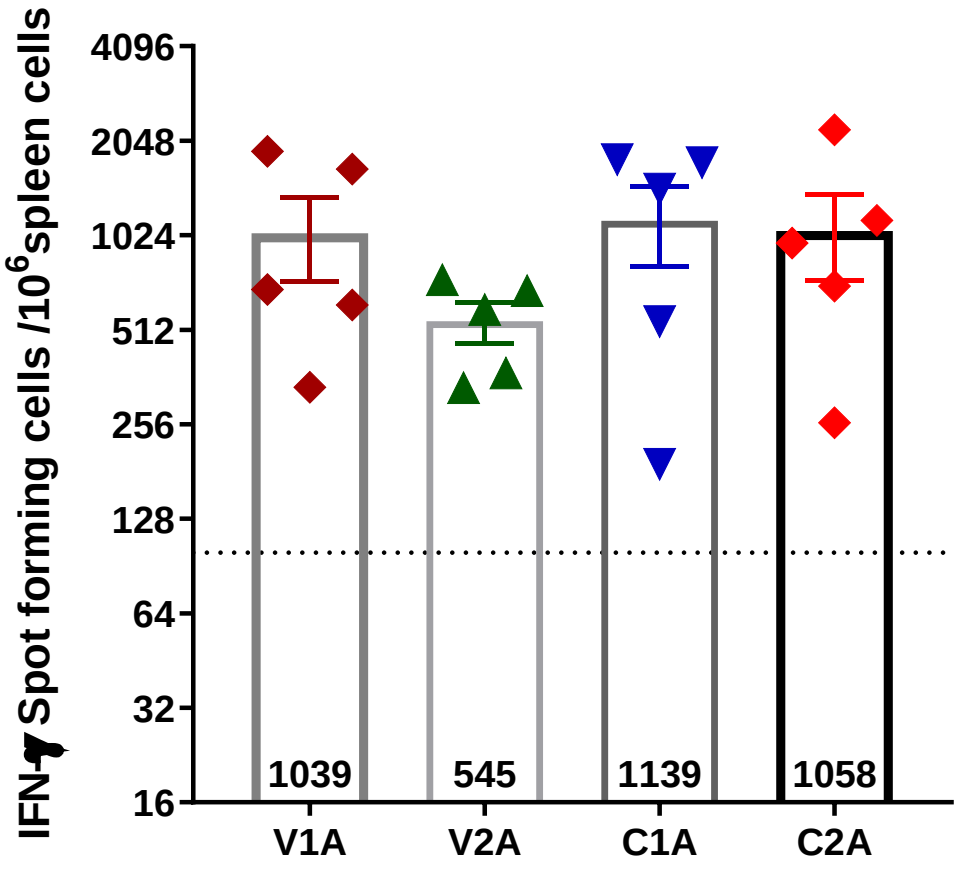
2. Compared to T-cells generated with the native epitopes, T-cells generated with the agonists show greater lysis of tumor cells expressing native MUC1

3. All 10 agonist epitopes are included in PDS0103

4. The LTIB will evaluate activation of human T-cells

5. The LTIB will test anti-tumor activity of the HLA-A2, A3 and A24 peptides in a TKO NSG mouse model humanized by reconstitution with healthy donor PBMC, and bearing human HLA-A2, A3 or A24 tumors expressing the native MUC1

PDS0103 (MUC1) demonstrates potent induction of MUC1-specifc T cells across multiple epitopes



- PDS0103 formulation EN10 was tested in HLA-A2 transgenic mice.
- Vaccine immunogenicity was assessed using HLA-A2 specific epitopes V1A, V2A,C1A, and C2A.
- Similar results were obtained with other PDS0103 formulations and found to be equally potent in inducing vaccine-specific immune responses (data not shown).

Clinical strategy: Develop PDS0103 in a basket trial of MUC1-associated cancers in combination with established and investigational therapies

Combinations of PDS0103 with FDA-approved standard of care

- ***Treatment of advanced MUC1-associated cancers*** *(breast, colorectal, NSCLC and ovarian)*
  - Combination with checkpoint inhibitor therapy
  - Combination with chemoradiotherapy

Novel combinations of PDS0103 with promising, investigational immunotherapeutic agents

- ***Treatment of advanced MUC1-associated cancers*** *((breast, colorectal, NSCLC and ovarian)*
  - Triple combination with bintrafusp-alpha (bi-functional checkpoint inhibitor - M7824) and M9241 (antibody conjugated immuno-cytokine NHS-IL12)

Clinical disease indications that could potentially be targeted by dual Versamune®-based platforms

PDS0101 (HPV16mix)

Anal
Cervical
HNC
Penile
Vaginal / Vulvar

PDS0102 (TARP)

AML
Prostate
Breast

PDS0103 (MUC1)

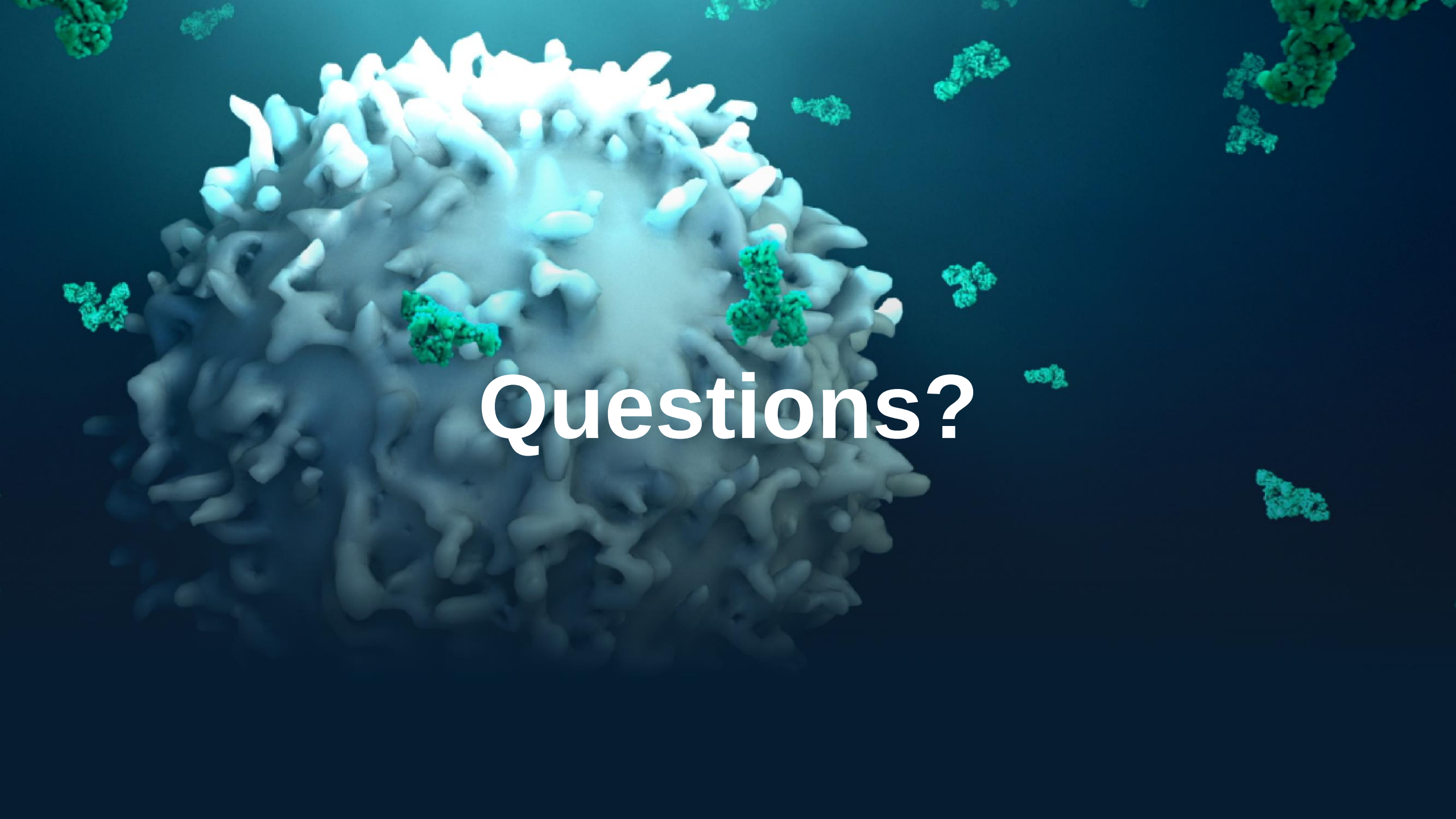
Breast
Colorectal
Lung
Ovarian
Cervix
HNC

PDS0101 / PDS0103

Cervical
NPC HNC

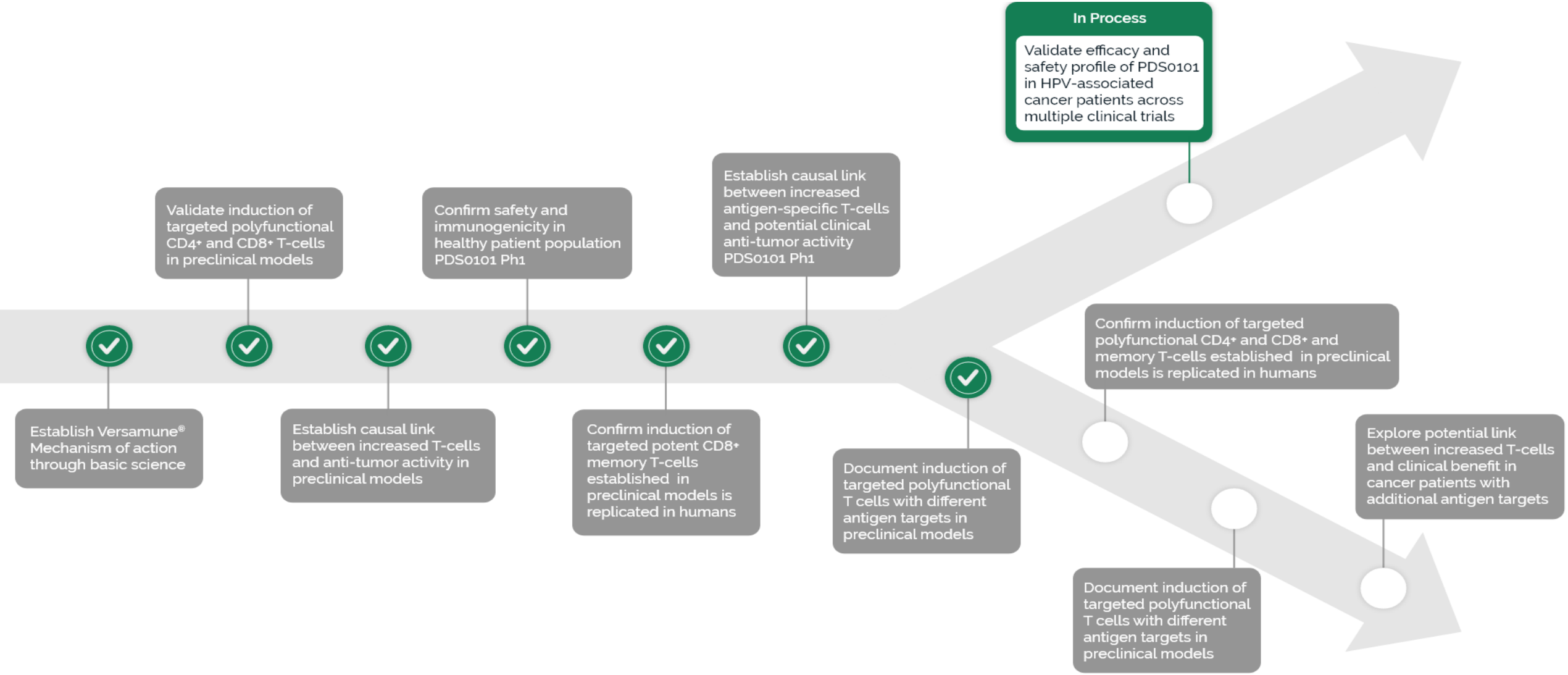
PDS0102 / PDS0103

Breast
Prostate


Questions?

Next Steps and Opportunities

PDS Biotech seeks to validate the efficacy and safety of the Versamune® platform across multiple tumor-targeting antigens



Versamune® has demonstrated the potential for immunological compatibility with a wide array of tumor antigens

- Versamune®'s unique flexibility means it may work well with a wide range of targets
  - **4 tumor antigens** are currently being utilized with the Versamune® platform

PRODUCT	INDICATION	COMBINATION	PC	P1	P2	P3	R	PARTNER(S)
Oncology								
PDS0101 (HPV16)	First line treatment of recurrent / metastatic head and neck cancer	KEYTRUDA®						MERCK
PDS0101 (HPV16)	Advanced HPV-associated malignancies	Bintrafusp alfa M9241						NIH NATIONAL CANCER INSTITUTE
PDS0101 (HPV16)	Stage IIb-IVa cervical cancer	Chemo-radiation						THE UNIVERSITY OF TEXAS MD Anderson Cancer Center
PDS0102 (TARP)	Acute myeloid leukemia (AML), prostate and breast cancer	TBD						NIH NATIONAL CANCER INSTITUTE
PDS0103 (MUC1)	Non-small cell lung cancer (NSCLC), breast, colorectal and ovarian cancer	TBD						NIH NATIONAL CANCER INSTITUTE
PDS0104 (TRP2)	Melanoma	TBD						

  - The company is seeking commercial partnerships and research collaborations to explore Versamune®'s utility with other tumor antigens that have been identified as promising therapeutic targets

Reference: Clin Cancer Res. 2009 Sep 1;15(17):5323-37. doi: 10.1158/1078-0432.CCR-09-0737

Over the next 18 months PDS Biotech will be exploring research collaborations and partnerships to progress the pipeline

PDS Biotech Asset	Research Objectives
PDS0101	• Document tumor infiltration of PDS0101-induced HPV16-targeted T-cells
PDS0102	• Establish safety, immunogenicity and pathologic response in prostate cancer • Establish safety, immunogenicity and pathologic response in breast cancer • Establish safety and immunogenicity in acute myeloid leukemia (AML)
PDS0103	• Establish safety, immunogenicity and preliminary efficacy in advanced MUC1-associated cancers (basket trial)
Pipeline	• Explore combination of Versamune® with other tumor antigens in validated animal models

PDS Biotechnology

A new generation of multi-functional cancer immunotherapies