Investor Presentation

Building a powerful new future in cellular IO

February 2023

Bellicum

Forward Looking Statement

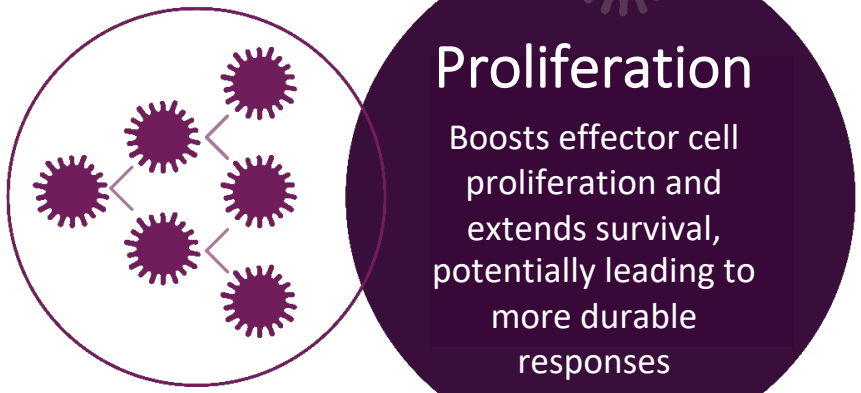
This presentation contains estimates, projections and other forward-looking statements, concerning, among other things: our research and development activities relating to our GoCAR™ platform, our CaspaCIDe safety switch, and related technologies; our product candidates including BPX-601, BPX-603, and rimiducid; the timing and success of our current and planned clinical trials, including the timing of receipt of data from such clinical trials and the timing of our reports of such data; the possible range of applications of our cell therapy programs and potential curative effects and safety in the treatment of diseases, including as compared to other treatment options and competitive therapies; our expected cash runway; and the potential to expand the use of our switch technology through additional license opportunities. Our estimates, projections and other forward-looking statements are based on management's current assumptions and expectations of future events and trends, which affect or may affect our business, strategy, operations or financial performance. Although we believe that these estimates, projections and other forward-looking statements are based upon reasonable assumptions, they are subject to numerous known and unknown risks and uncertainties and are made in light of information currently available to us. Many important factors, in addition to the factors described in this presentation, may adversely and materially affect our results as indicated in forward-looking statements. All statements other than statements of historical fact are forward-looking statements.

Estimates, projections and other forward-looking statements speak only as of the date they were made, and, except to the extent required by law, we undertake no obligation to update any forward-looking statement. These statements are also subject to a number of material risks and uncertainties that are described more fully in Bellicum’s filings with the Securities and Exchange Commission, including without limitation our annual report on Form 10-K for the year ended December 31, 2021 and our quarterly report on Form 10-Q for the period ended September 30, 2022.

Technology Overview

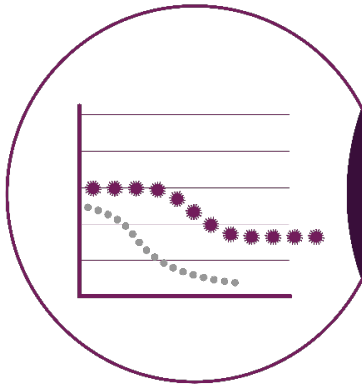
Building a Powerful New Future in Cellular IO

Our GoCAR platform is engineered to break through the limitations of current cell therapies



Proliferation

Boosts effector cell proliferation and extends survival, potentially leading to more durable responses

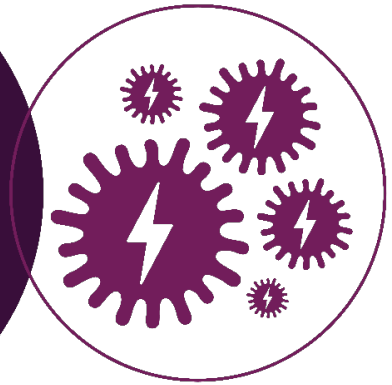


Persistence

Enhances effector cell functional persistence by resisting exhaustion and inhibitory signals from the tumor environment

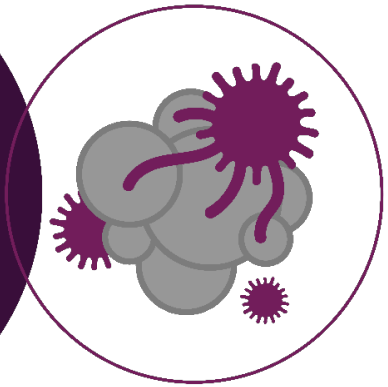
Power

Re-ignites the host immune response, unleashing the power to combat tumor tolerance and intensify tumor killing



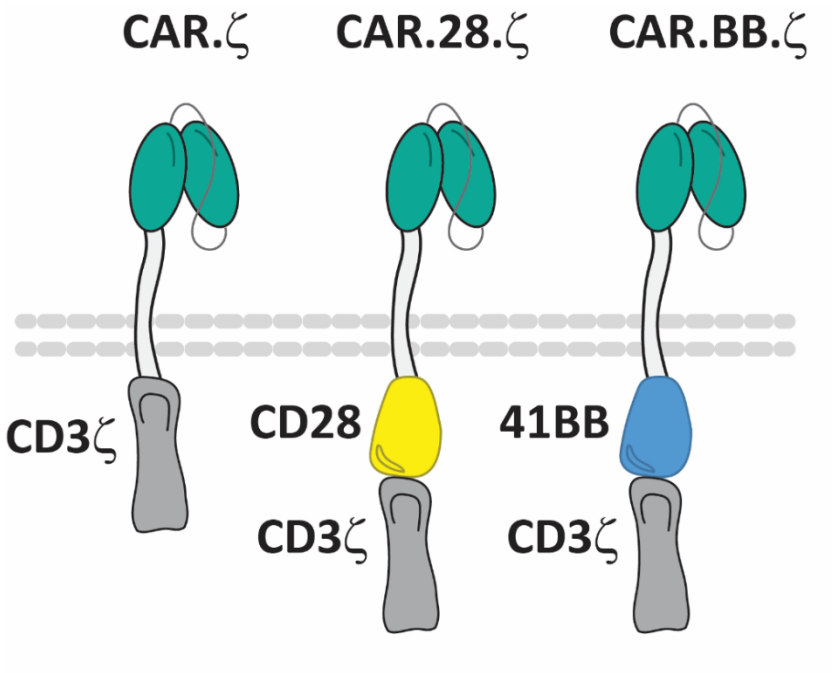
Performance

Molecular switch technology enables superior control over GoCAR cells

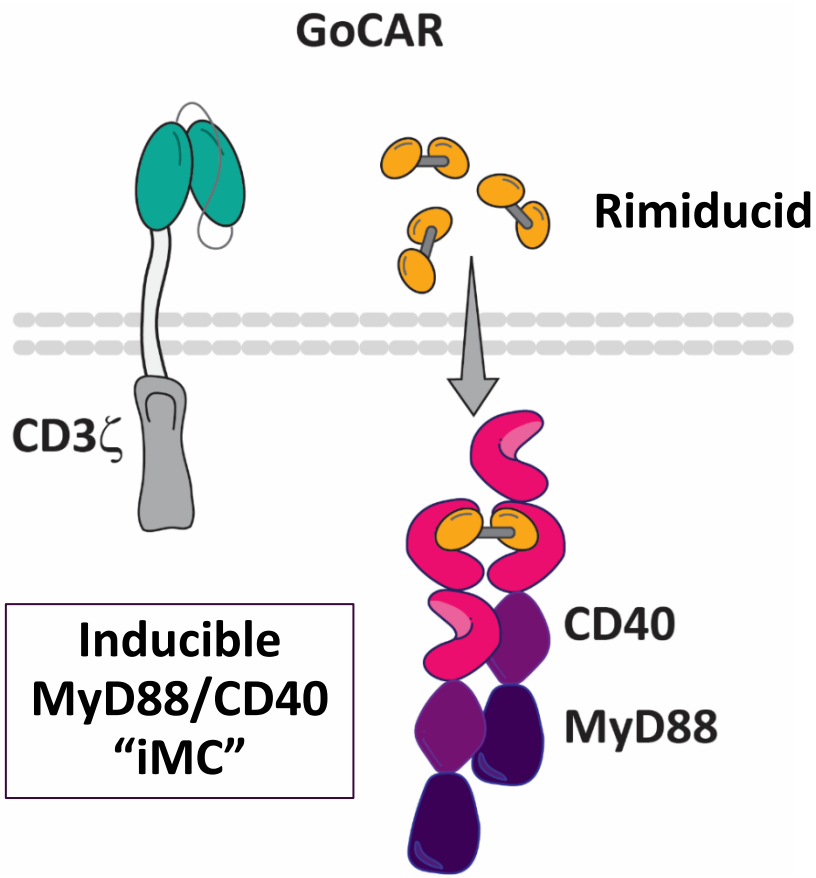


GoCAR: Differentiated Technology Platform

Current Generation CAR Technology



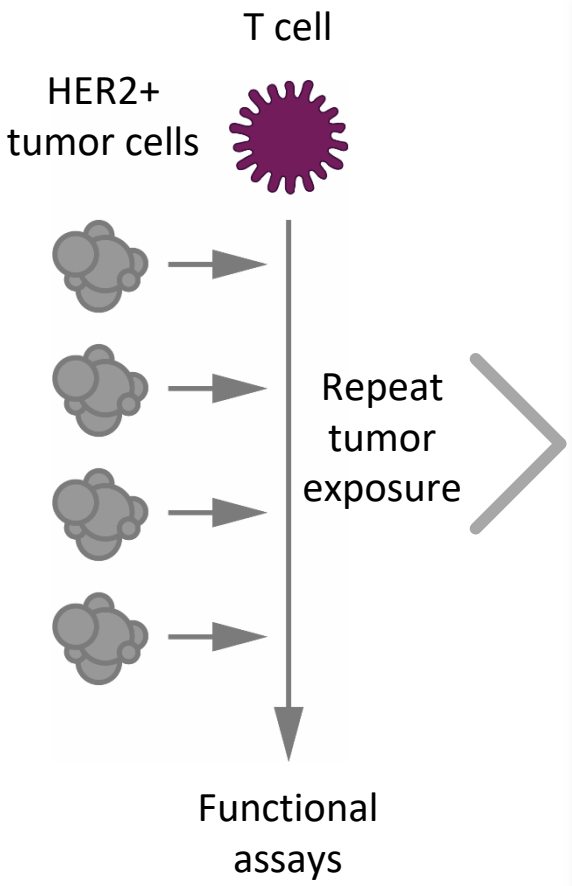
Next Generation GoCAR Technology

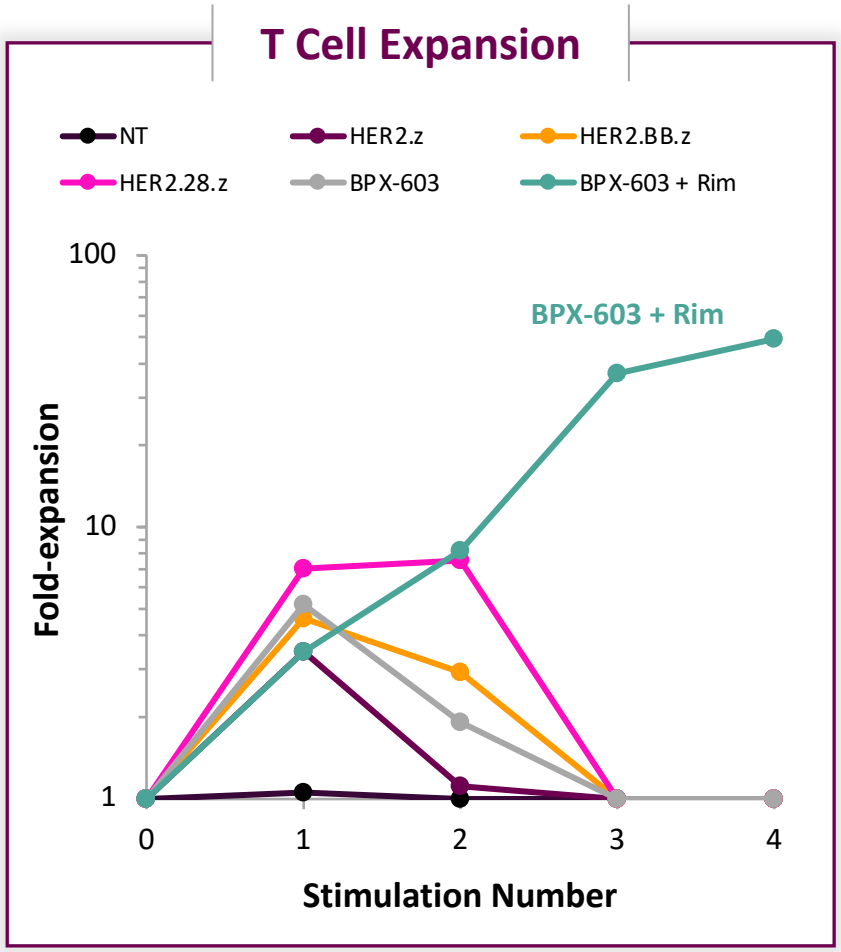


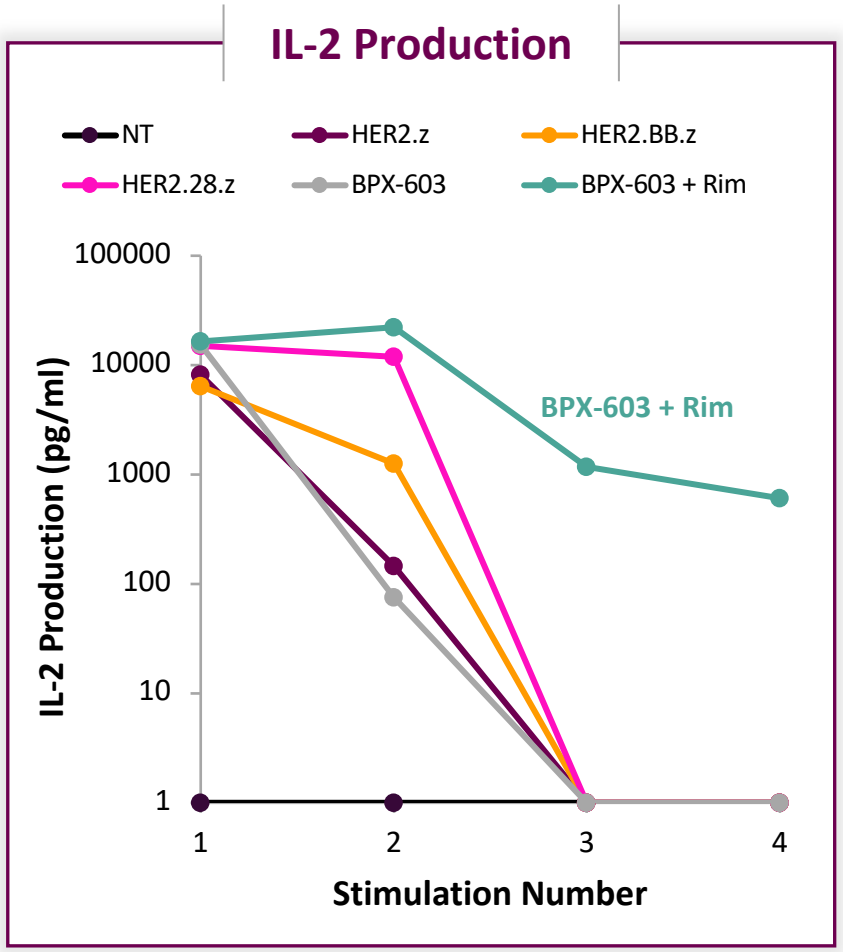
Lead Program: BPX-601 (PSCA)

GoCAR Proliferation: Superior Expansion and Resistance to T Cell Exhaustion

iMC activation limits T cell dysfunction in repeat tumor stimulation exhaustion assay

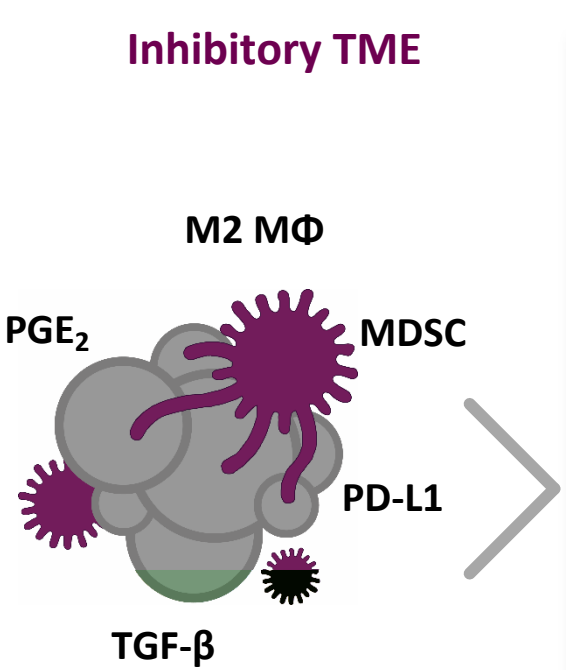


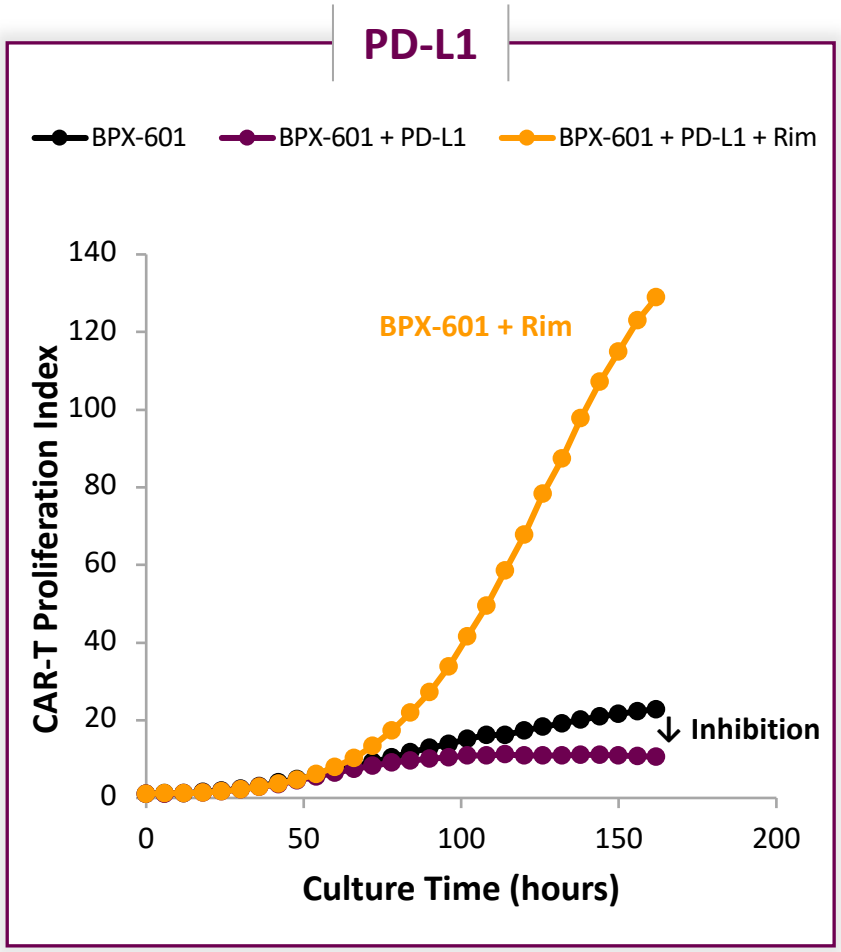


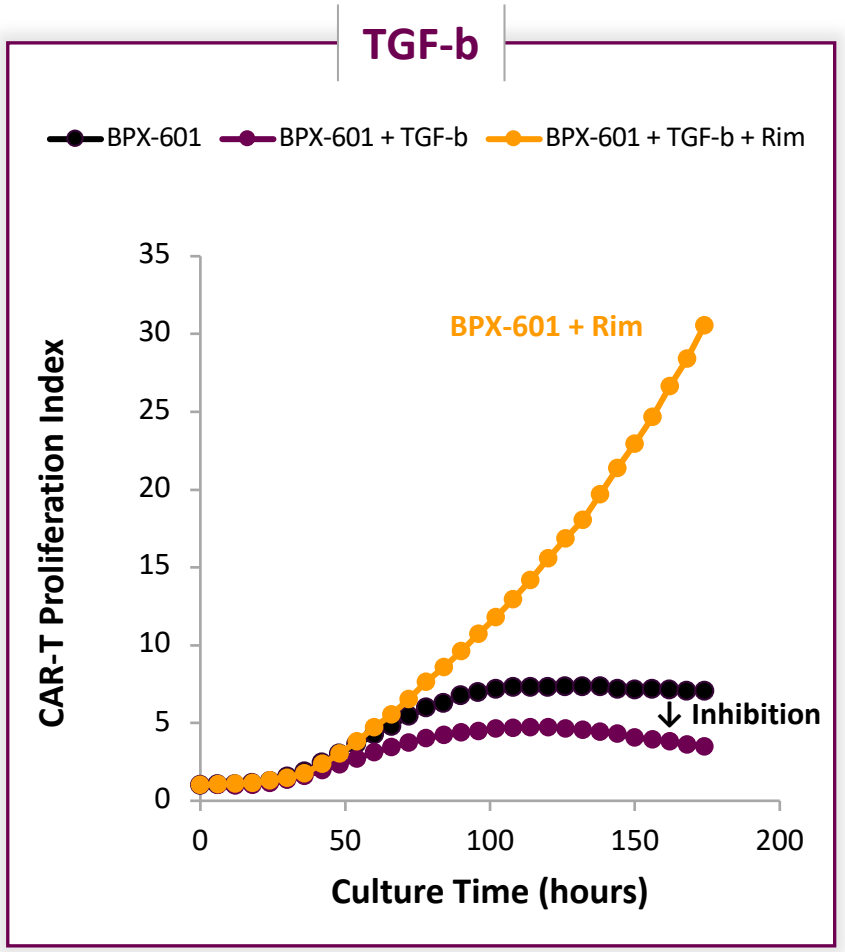


GoCAR Persistence: Resistance to Immune Suppressive TME

iMC overrides common inhibitory molecules in the tumor microenvironment





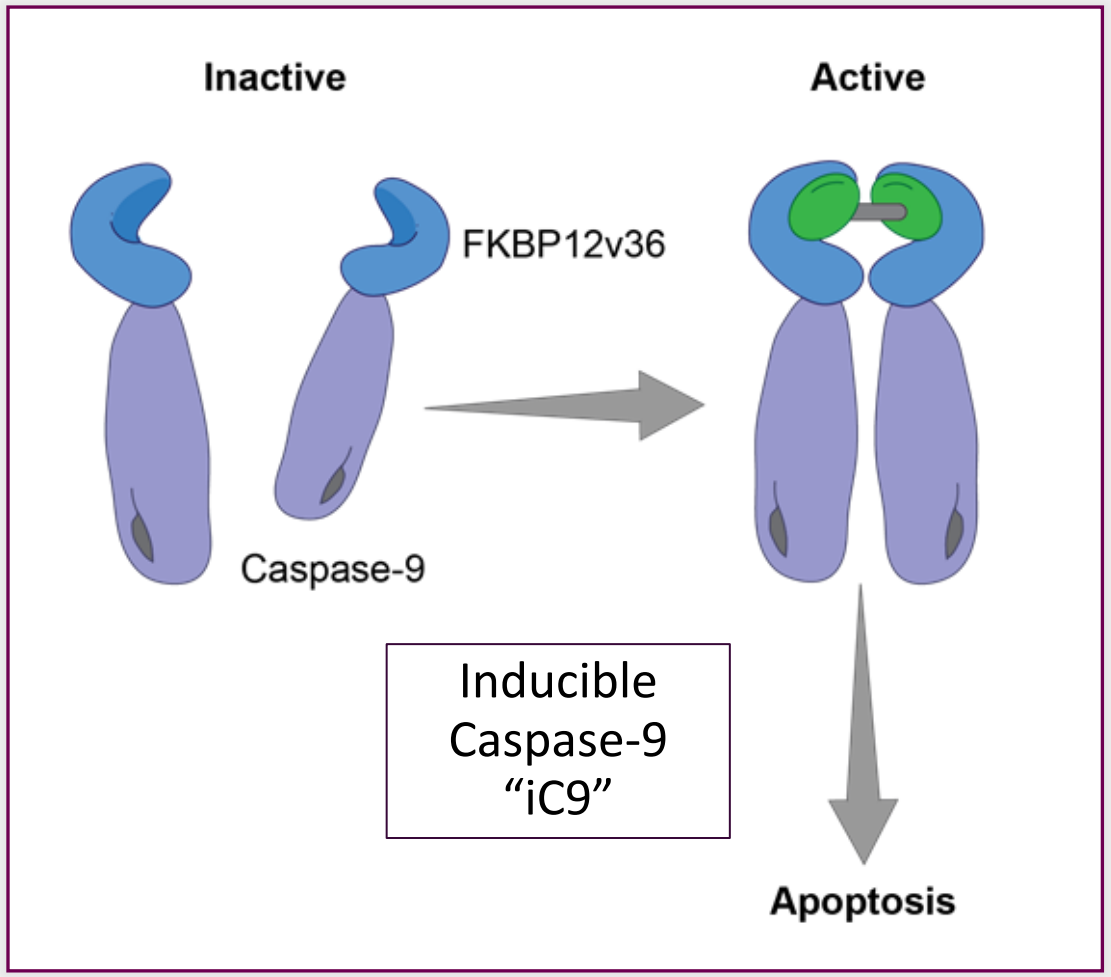


Bellicum

TME – tumor microenvironment.

CaspaCIDe Safety Switch

Inducible apoptosis to mitigate cell therapy-mediated adverse events

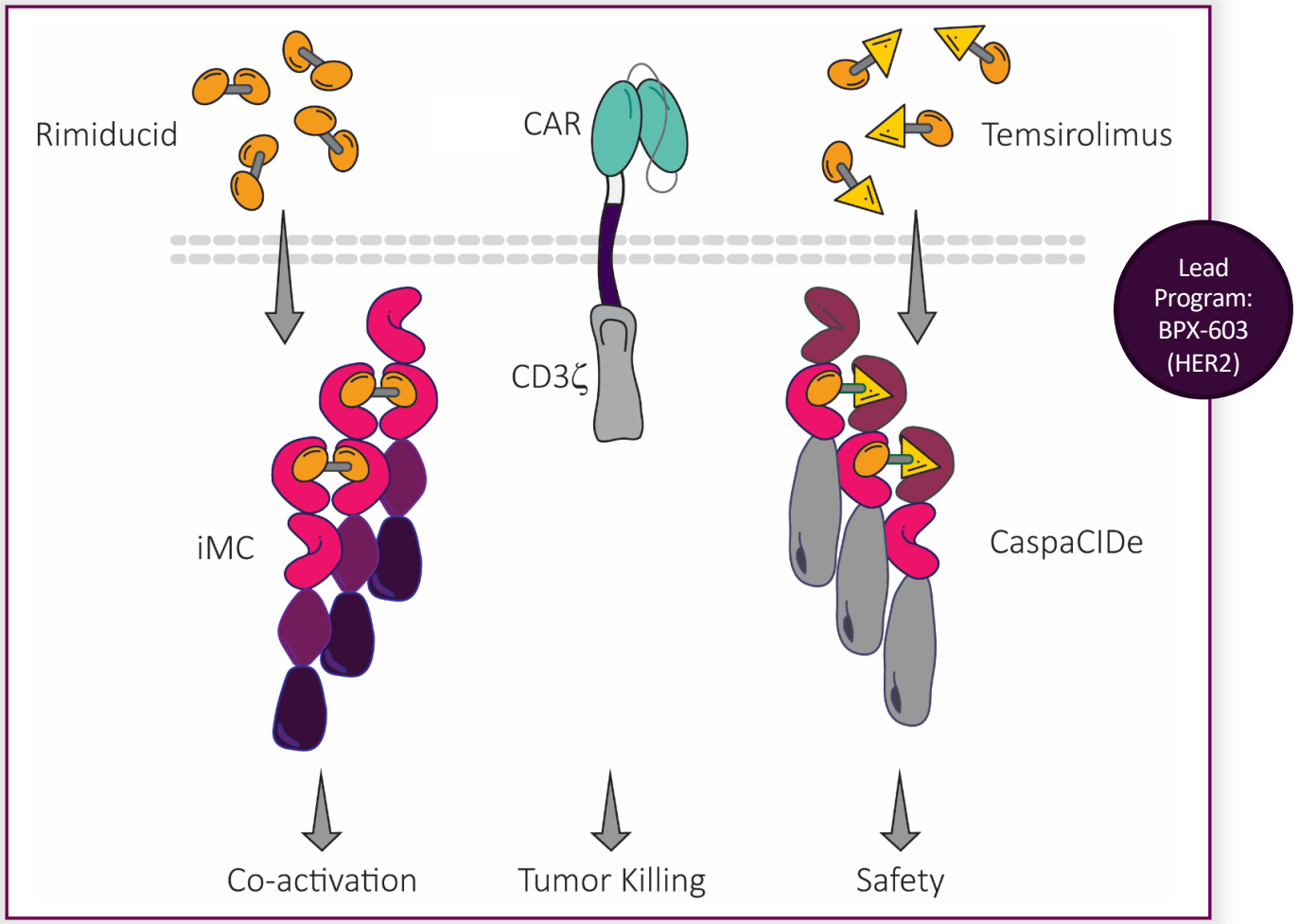


Potential Applications

- Controlling toxicity associated with cell therapies
  - Cytokine Release Syndrome
  - ICANS
- Targeting antigens with known or potential high-risk side effects
- Developing next-generation, higher-potency cell therapy constructs
- Protecting against the risk of tumorigenesis
- Managing GvHD associated with adoptive T cell therapy with allogeneic T cells

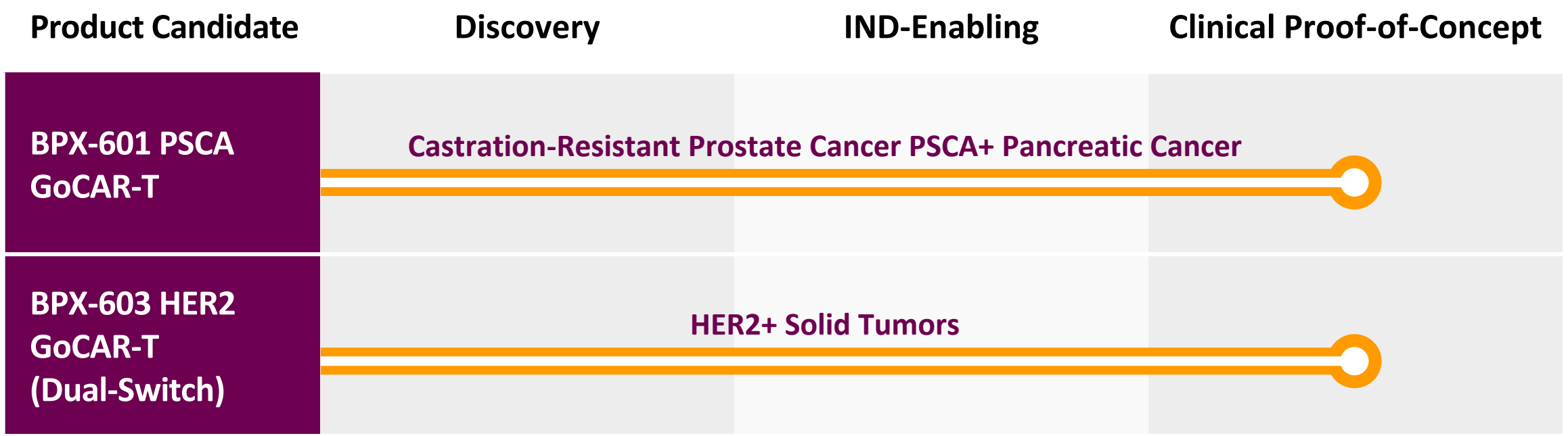
Dual-Switch GoCAR-T

A controllable system to manage CAR-T proliferation, persistence, and safety



Product Pipeline

Establishing the clinical value of GoCAR-T in solid tumors to propel cellular IO forward



BPX-601
PSCA GoCAR-T

BPX-601 GoCAR-T Targeting PSCA in mCRPC

Product Summary

- Attractive first-in-class solid tumor CAR-T opportunity; first-in-human experience with iMC
- Initial cell dose escalation, lymphodepletion optimization, and safety assessment of rimiducid dosing in pancreatic cancer complete
- Data presented at ASCO GU 2023 demonstrate:
  - Encouraging biochemical and radiographic responses in heavily pre-treated mCRPC patients
  - >PSA50 in 50% of patients (4/8) treated
  - Consistent BPX-601 expansion with persistence >200 days

Program Update

- Rimiducid dose escalation ongoing
- Data update planned for 1Q'2024

Unmet Need

Unmet need in mCRPC remains, particularly in patients who have progressed after androgen deprivation therapy, chemotherapy, and radiotherapy

	Annual Incidence (U.S.)*	Annual Deaths (U.S.)	% Expressing PSCA
Prostate	249k	34k	75-90%

* Incidence includes all newly diagnosed prostate cancer

Bellicum

Incidence and annual deaths: American Cancer Society projections for 2021 based on earlier reported SEER data. Source: seer.cancer.gov, August 2021
PSCA expression: Argani et al, Cancer Res 2001; Reiter et al., PNAS 1998; Abate-Daga et al, HGT 2014; Data on file

BPX-601 Phase 1/2 Trial Design in mCRPC

Eligible subjects with mCRPC with PD:

- Rising PSA or radiographic imaging
- At least 2 prior regimens
- Measurable disease at baseline

Escalating BPX-601 & Rimiducid Dose

DL 6	10E6 cells + Rim 1.6mg/kg D7*
DL 5	7.5E6 cells + Rim 1.6mg/kg D7*
DL 4	5E6 cells + Rim 1.6mg/kg D7*
DL 3	5E6 cells + Rim 0.8mg/kg D7*
DL 2	5E6 cells/kg + Rim 0.4mg/kg D7*
DL 1	5E6 cells/kg + Rim 0.4mg/kg D7

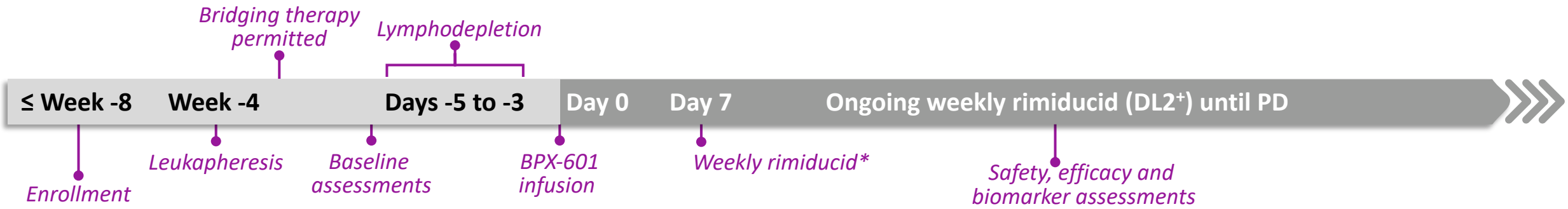
Dosed, n=5

Completed, n=3

Interim Results Presented at ASCO GU (Feb 2023)

Dose Expansion

Up to N=40



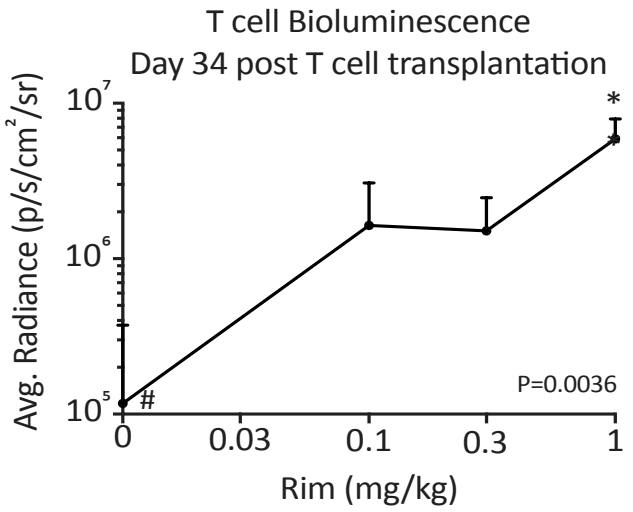
Bellicum

DL = Dose Level; mCRPC = metastatic castrate resistant prostate cancer; PD = progressive disease.
*Weekly rim dosing to progression or DLT.

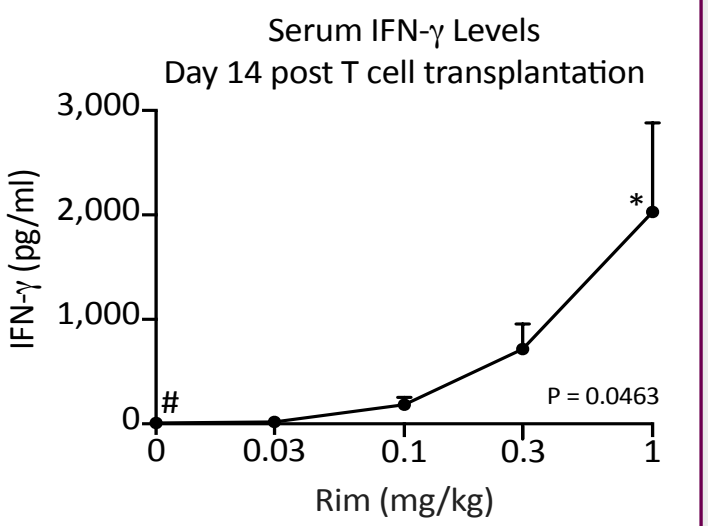
Rationale for Rimiducid Dose Escalation

In non-clinical models, increasing exposure to rimiducid leads to…

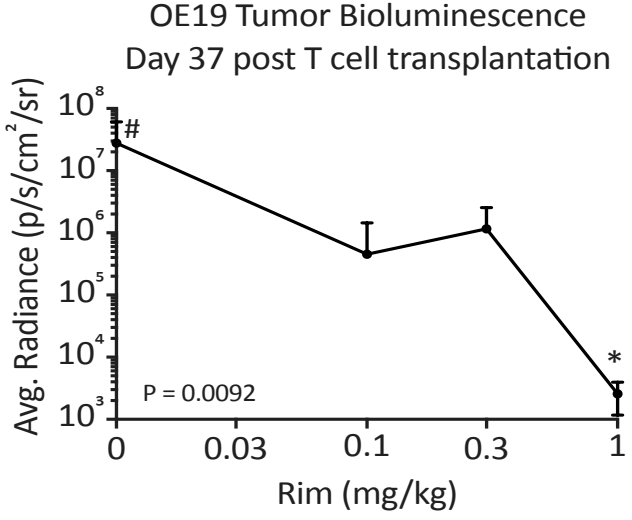
Increased GoCAR-T Cell Persistence



Enhanced Cytokine Production



Improved Anti-Tumor Efficacy



Source: Data on file.
N = 5 mice per group. # - Reference group. * - Comparator. P values calculated by one-way ANOVA.

Patient Demographics and Characteristics

Baseline Characteristic	All Patients (N=8)
Age, median (range) – yr	66.5 (56 - 75)
ECOG performance score, no. (%)	
0	4 (50%)
1	4 (50%)
Site of Disease – no. (%) ¥	
Liver	2 (25%)
Lung	2 (25%)
LNs	5 (62.5%)
Bone	4 (50%)
Bone only	2 (25%)
PSA level (ng/mL), median (range)	186 (29-331)
Prior lines of treatment, median (range)	6 (5-9)

- Patients received BPX-601 dose of 5 x 10^6 cells/kg and rimiducid 0.4 mg/kg (range: 1-40 doses)
- Tumor of all patients tested (n=5) expressed PSCA mRNA*
- All patients received prior ADT and chemotherapy
  - 87.5% received docetaxel
  - 75% received immune-based therapies

Bellicum

¥Patients can be counted in more than one category of site of disease. *As measured by RNAScope; No tumor tissue available for 3 subjects.
ADT = androgen deprivation therapy and could include a standard 17α lyase inhibitor or second-generation anti-androgen therapy.

Adverse Event Summary

	All Patients (N=8)	
	All Grades n (%)	Grade 3+ n (%)
TEAE	8 (100%)	7 (87.5%)
Serious TEAE	5 (62.5%)	5 (62.5%)
Cytokine Release Syndrome	8 (100%)	2 (25%)
Neurotoxicity/ICANS¥	2 (25%)	1 (12.5%)
Dose Limiting Toxicity	1 (12.5%)*	1 (12.5%)*
TEAE Leading to Death	1 (12.5%)*	1 (12.5%)*

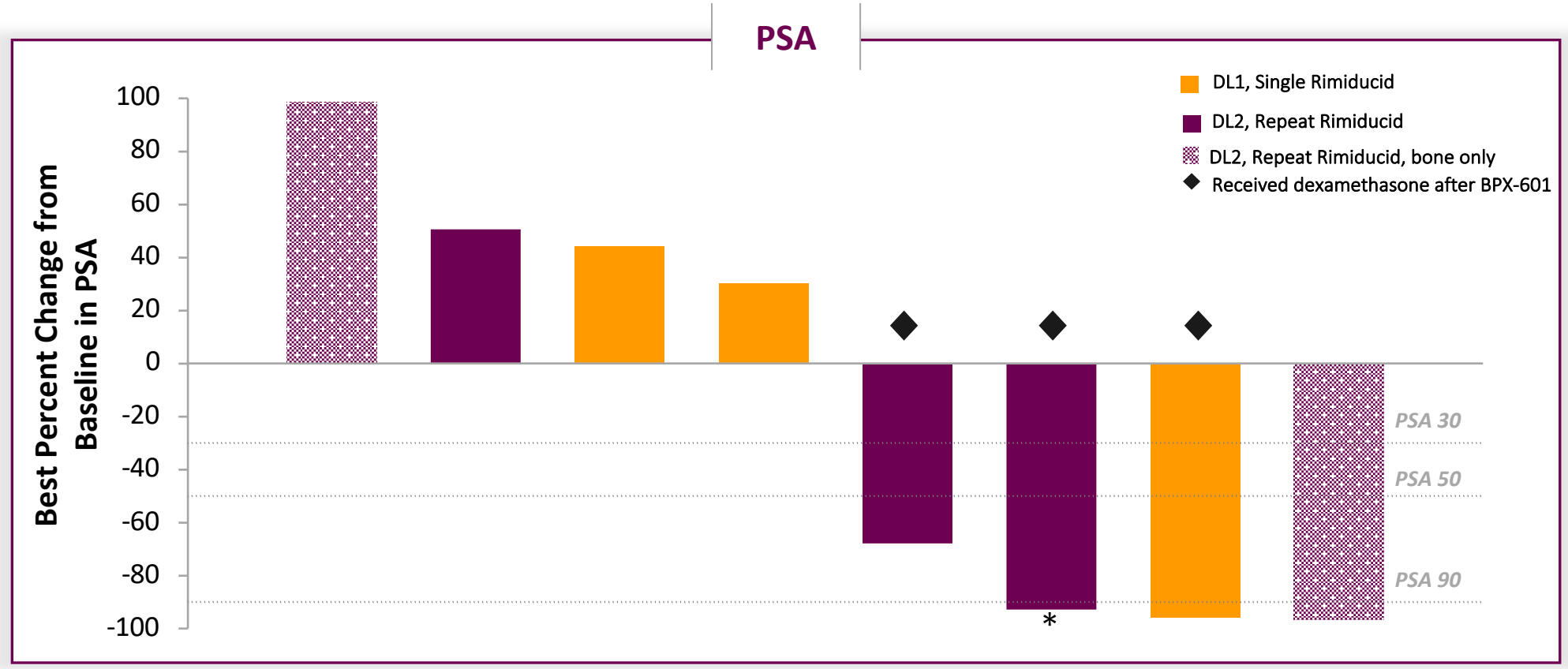
- 2 patients experienced grade 3 CRS managed with tocilizumab and dexamethasone
- 1 patient experienced grade 4 ICANS on study day 13 with concurrent HLH; ICANS event resolved to grade 1
  - Management included standard of care and withholding rimiducid
  - Patient died on study day 20 due to sepsis; confounded by baseline renal impairment, increased fludarabine exposure and CMV reactivation during lymphodepletion

- Grade 3+ adverse events occurred in 87.5% of patients, predominately myelosuppression due to lymphodepleting chemotherapy: anemia (75%), neutropenia (62.5%) and leukopenia (37.5%)
- Other grade 3+ events occurring in 2 or more patients (25% each) included AST increase, alkaline phosphatase increase, hypocalcemia, hypokalemia and dyspnea

*Death due to sepsis (Stenotrophomonas maltophilia) on Study Day 20.
Subjects reporting more than one event are counted once using the highest severity.
¥ASTCT = American Society for Transplantation and Cellular Therapy; ICANS = immune effector cell-associated neurotoxicity syndrome.

> PSA50 Response in 50% of Patients

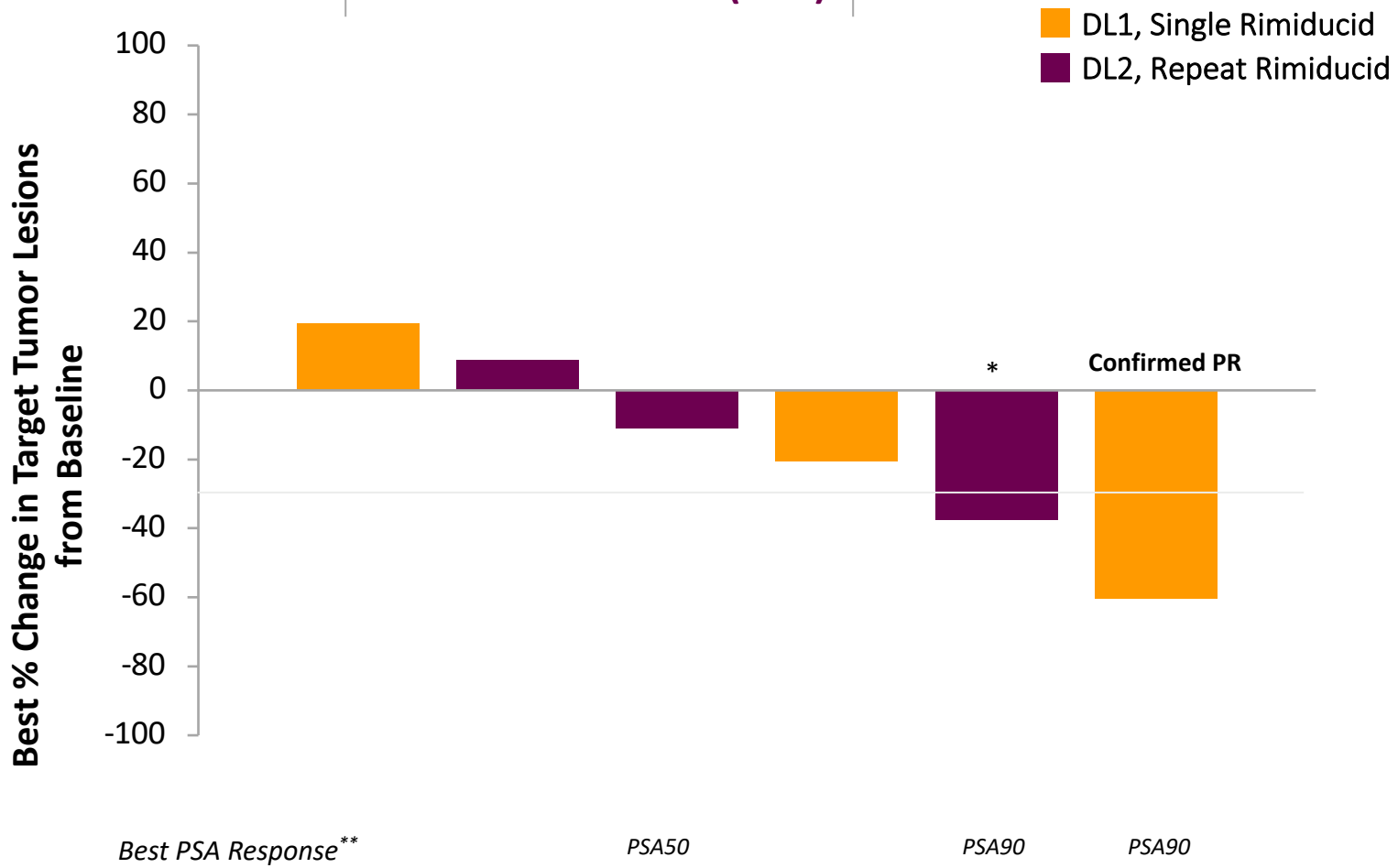
- PSA90 reductions in 3 patients within first 28 days following BPX-601 and rimiducid
- Marked decreases in PSA despite administration of dexamethasone



* Death day 20 due to sepsis; received 1 dose of rimiducid.

Radiographic Responses in Soft Tissue and Bone Only¥ Disease

Soft Tissue Disease (N=6)



Bone Only (N=2)

- 50% (1 of 2) patients with bone only disease and a PSA90 response at Day 28 demonstrated improvement on week 8 bone scan (3 of 4 lesions showed decreased enhancement)

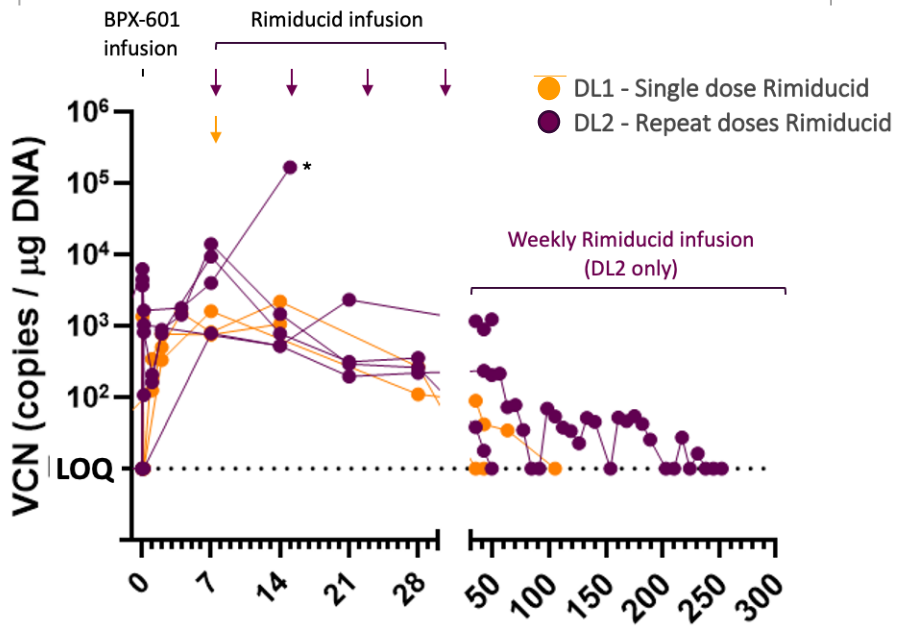
*Death day 20 due to sepsis. ** As defined in prior slide; best percent change from baseline in PSA.

¥ = Decreased enhancement on bone scan.

BPX-601 Expansion, Persistence and Cytokine Production

BPX-601 cells detectable >200 days in mCRPC; consistent responsiveness to weekly rimiducid dosage

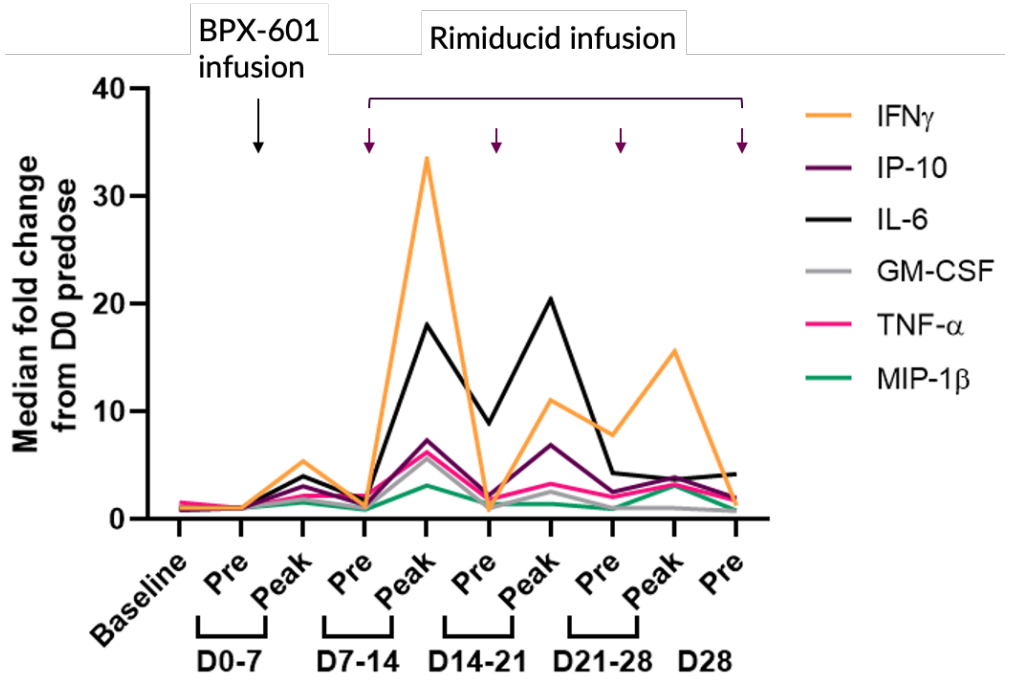
BPX-601 cell pharmacokinetics in blood



Data shown is pre-rimiducid VCN value for each rimiducid dose. LOQ = 10^1
VCN data obtained from whole blood (WB) or PBMCs; PBMC values normalized to WB.
* Death day 20 due to sepsis; received 1 dose of rimiducid; last VCN data on Day 15 shown

- Cell expansion generally consistent across patients
- Patient with GoCAR-T cells in peripheral blood > 200 days with stable disease by CT at 10 months

Cytokine production



- Median weekly pro-inflammatory T cell cytokine production pre and post rim in DL2 Cohort (n=5)
- Serum levels rise and fall with repeated rim dosage

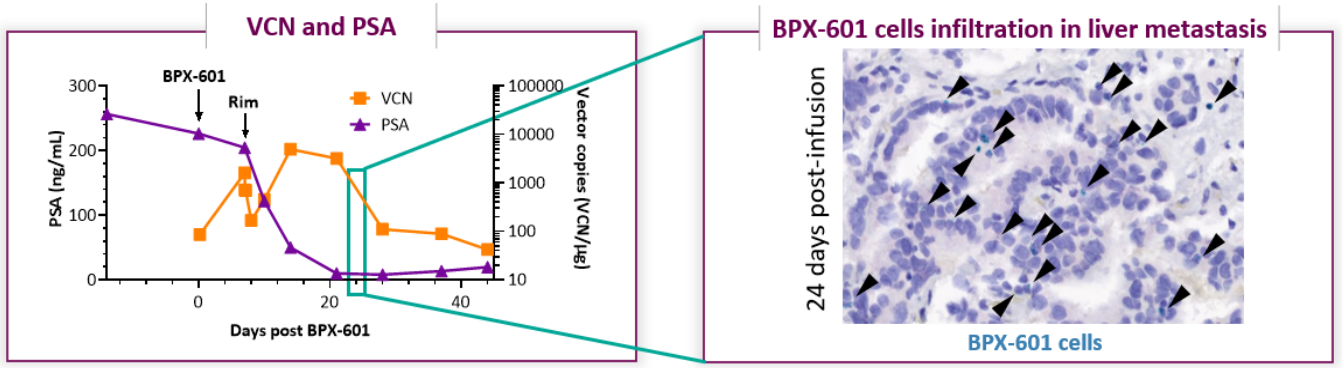
Bellicum

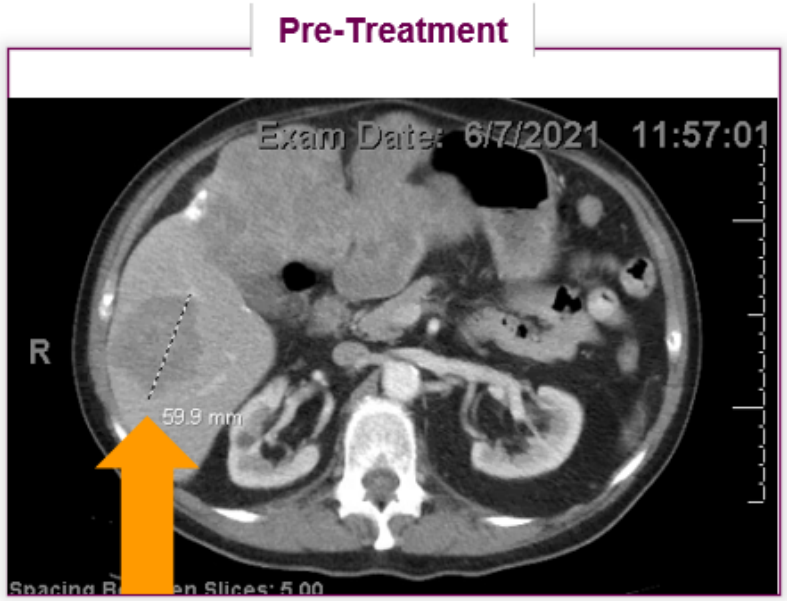
Case #1: Confirmed PR Observed in mCRPC Patient

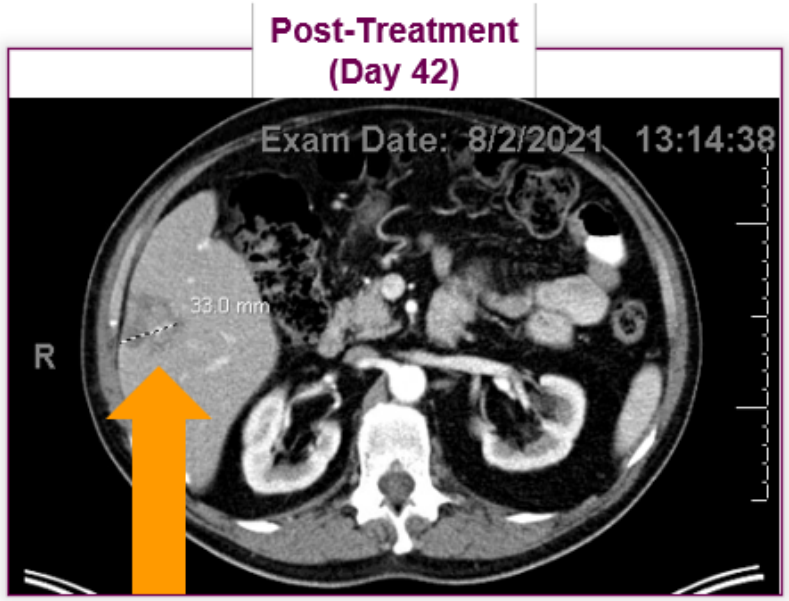
Rapid and deep PSA response correlated to administration of BPX-601 and a single-dose of rimiducid

68 y/o M with stage IV prostate adenocarcinoma diagnosed Aug 2019

- Prior therapies included: Lupron, docetaxel, abiraterone/prednisone with docetaxel; investigational PSMA-targeted therapy with progressive disease
- ~ 50% reduction in sum of longest diameters of target lesions (liver); confirmed Day 71 with 60% reduction







- Treatment-free interval following BPX-601 and a single-dose of rimiducid was 4.5 months
- Patient was subsequently enrolled in a clinical trial with a PD-1/CTLA-4 bispecific + chemotherapy and continues on study

Case #2: PSA90 Response Ongoing in Bone Only mCPRC

Decreased enhancement in 3 of 4 Lesions on Week 8 Bone Scan

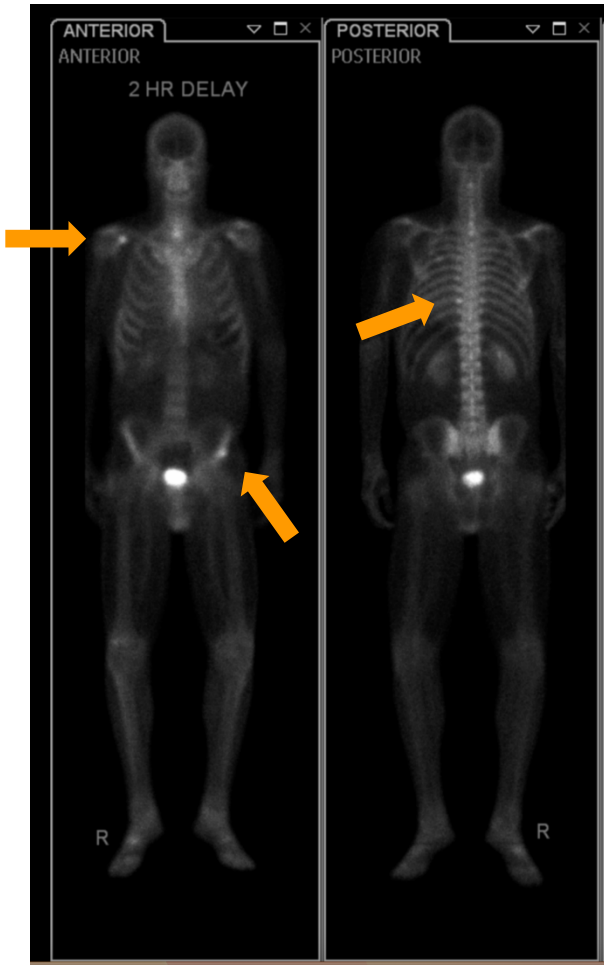
59 y/o M with bone only mCPRC diagnosed Feb 2022

- Refractory to 6 prior lines of therapy, including multiple ADTs; prior to enrollment received cabazitaxel x 6 cycles

Study Timepoint	PSA ng/mL
Baseline	29.4
Day 28	1.1
Day 58	1.0
Day 86	1.2

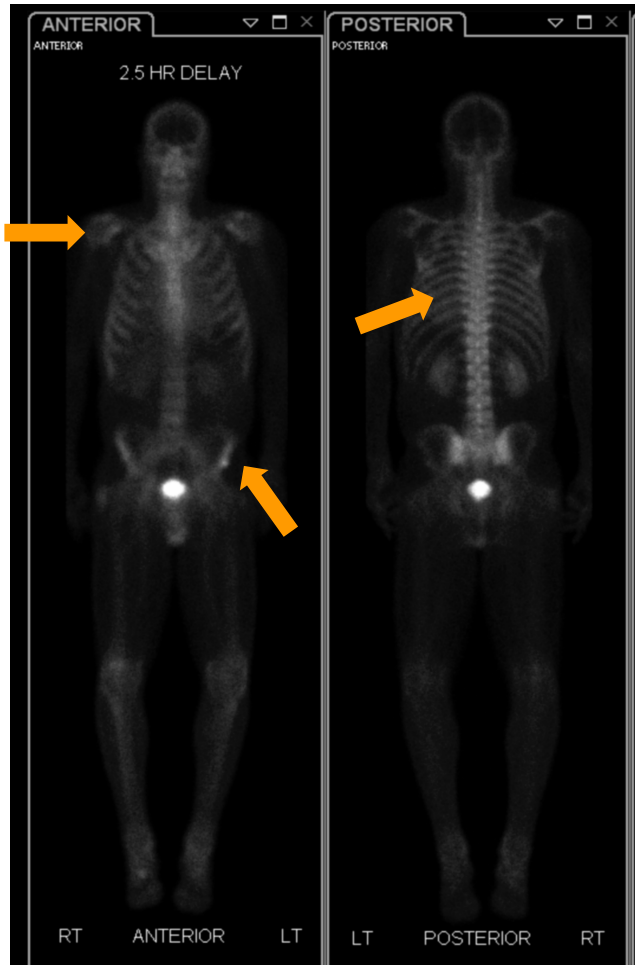
- Patient continues weekly rimiducid with PSA90 response ongoing as of 15 Nov 22 (Day 86)

Pre-Treatment



Additional lesion in L4th rib not easily noted here

Post-Treatment (Week 8)



Lesions R upper lateral scapula, posterior L 9th transverse and additional L4th rib no longer evident per radiology report

Bellicum

BPX-601 mCRPC Conclusions

This interim update demonstrates encouraging preliminary efficacy of BPX-601 PSCA-directed GoCAR-T-cell product in combination with rimiducid in mCRPC

- BPX-601 with rimiducid induced biochemical and radiographic responses in heavily pretreated patients
  - Rapid declines in PSA (50% PSA50, 38% PSA90, n=8)
  - 33% RECIST response rate (n=6) and 50% of patients with bone-only disease (n=2) show improvement on bone scan
- Most common grade 3+ adverse events were myelosuppression due to lymphodepleting chemotherapy; grade 3+ CRS and ICANs were experienced by 2 (25%) and 1 (12.5%) patients respectively, which improved with standard of care treatment
- Consistent BPX-601 cell expansion observed in peripheral blood, with persistence over 200 days
- Pro-inflammatory T cell cytokine production in response to weekly rimiducid administration
- Evidence of BPX-601 cell infiltration in PSCA-positive tumor
- Dose escalation continues, with weekly rimiducid doses to ->0.8->1.6mg/kg and subsequently cell doses to ->7.5->10m cells/kg

Comparative CAR-T Outcomes in mCPRC

	BPX-601 PSCA GoCAR-T[1] N=8		City of Hope PSCA CAR-T[2] (MB-105) N=12		P-PSMA-101[3] N=14	
Baseline Demographics Age (years) Previous Regimens	Median (Min, Max) 67 (56, 75) 6 (5, 9)		Median (Min, Max) 69 (42, 73) NR (≥1 Androgen Tx)		Mean (Min, Max) 70 (57, 79) 7 (3, 15)	
PSA PSA50 Response PSA90 Response	 4 (50%) 3 (38%)		 NR NR		 5 (36%) 1 (7%)*	
RECIST Objective Response¥	2/6 (33%)		0 (0%)		NR	
Bone Only PSA Response	1/2 (50%)		NR		NR[å]	
TEAE CRS Neurotoxicity/ICANS	All Grades 8 (100%) 2 (25%)	Grade 3+ 2 (25%) 1 (13%)	All Grades 4 (33%) 0 (0%)	Grade 3+ 0 (0%) 0 (0%)	All Grades 8 (57%) 2 (14%)	Grade 3+ 2 (14%) 1 (7%)
DLT	1 (Death due to sepsis)		2 (Cystitis)		1 (Death due to CRS/MAS)	

¥ Objective response rate is defined as the proportion of subjects with a best overall response of PR or CR according to RECIST v1.1; includes 1 confirmed and 1 unconfirmed PR. *Not reported; derived from waterfall.
[å] Improvement in PSA and bone disease reported in one patient with both visceral and bone mets

FOR ILLUSTRATIVE PURPOSES ONLY: no head-to-head clinical trial has been conducted. Differences exist between trial designs and subject characteristics, and caution should be exercised when comparing data across studies.

1. Data on file. 2. J Clin Oncol 40, 2022 (suppl 6; abstr 91) and poster. 3. J Clin Oncol 40, 2022 (suppl 6; abstr 98) and poster. 4. J Clin Oncol 40, 2022 (40:6_suppl, 94-94); Endpoint News (Jun 3, 2021)

Note[4]: Tmunity CART-PSMA-TGFβRDN program reported 1/13 (8%) PSA50 and PSA90 response, no Objective Response per RECIST; program terminated after two Grade 5 immune adverse events

BPX-603
HER-2 Dual-Switch GoCAR-T

BPX-603 Dual Switch GoCAR-T Targeting HER2

Product Summary

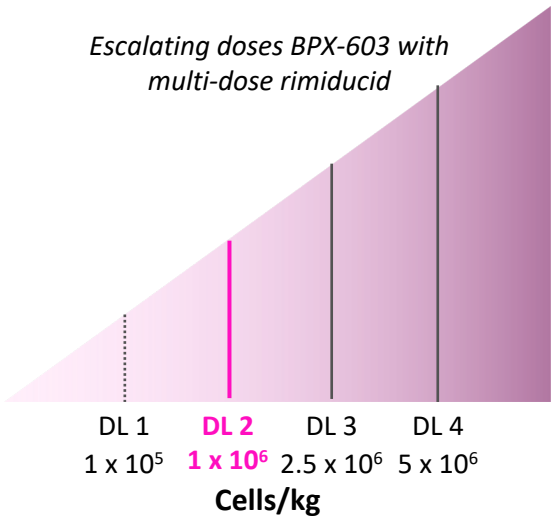
- HER2 is a validated tumor antigen expressed on numerous solid tumors with high unmet need
- BPX-603 designed to potentially address limitations of previous CAR-T efforts targeting HER2
  - Moderate affinity scFv to enhance target engagement and activity
  - MC signaling to increase cell proliferation & persistence, modulate the TME, and enhance host immunity
  - Bellicum switch technology designed to time and manage CAR-T activation and enable mitigation of acute toxicities

Program Update

- Dose Level 1 cleared with no dose-limiting toxicity
- Cell dose escalation ongoing at DL 2

Phase I: 3+3 Dose Escalation

Locally advanced or metastatic HER2+ solid tumors* where standard treatment is no longer effective, does not exist, or subject is ineligible†



- Sequential patient enrollment
  - ≥28 days for DL 1; ≥14 days thereafter
- First subject in each dose level receives cells only without rimiducid

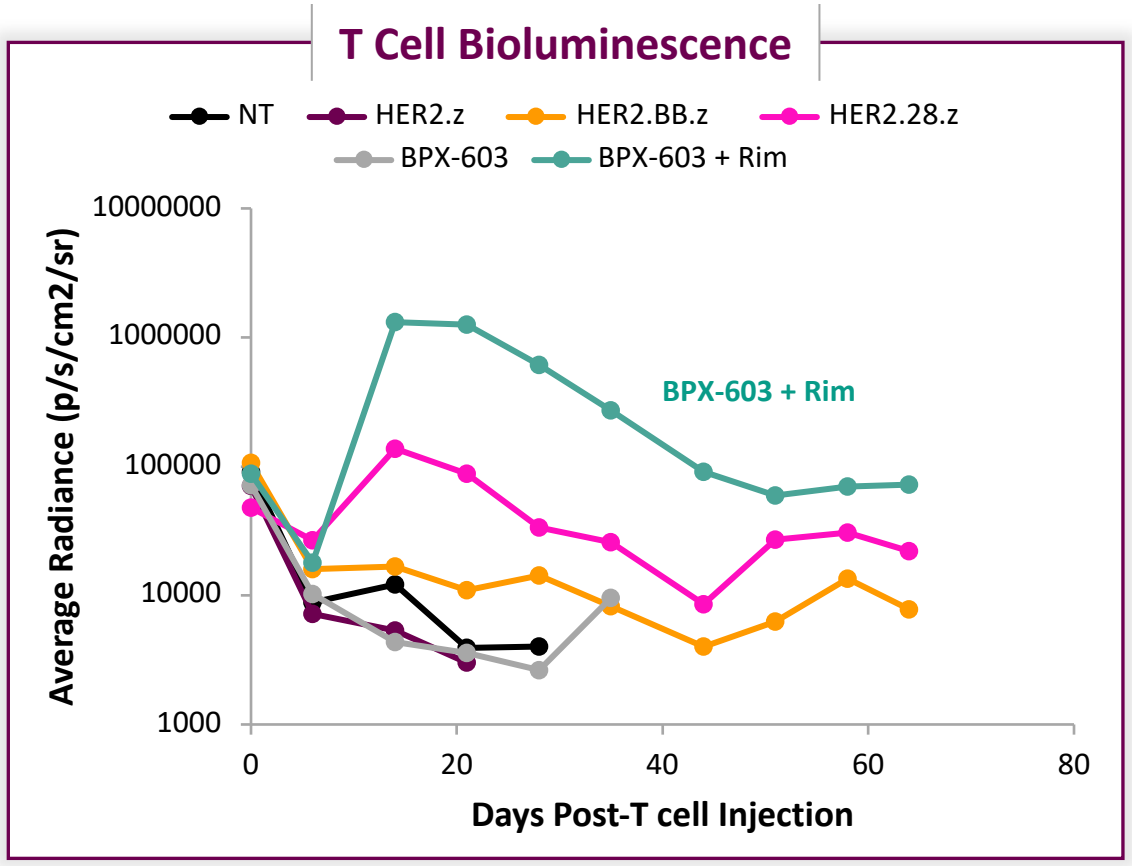
*GBM excluded from Phase 1

Historical HER2 CAR-T Studies: Modest Clinical Outcomes

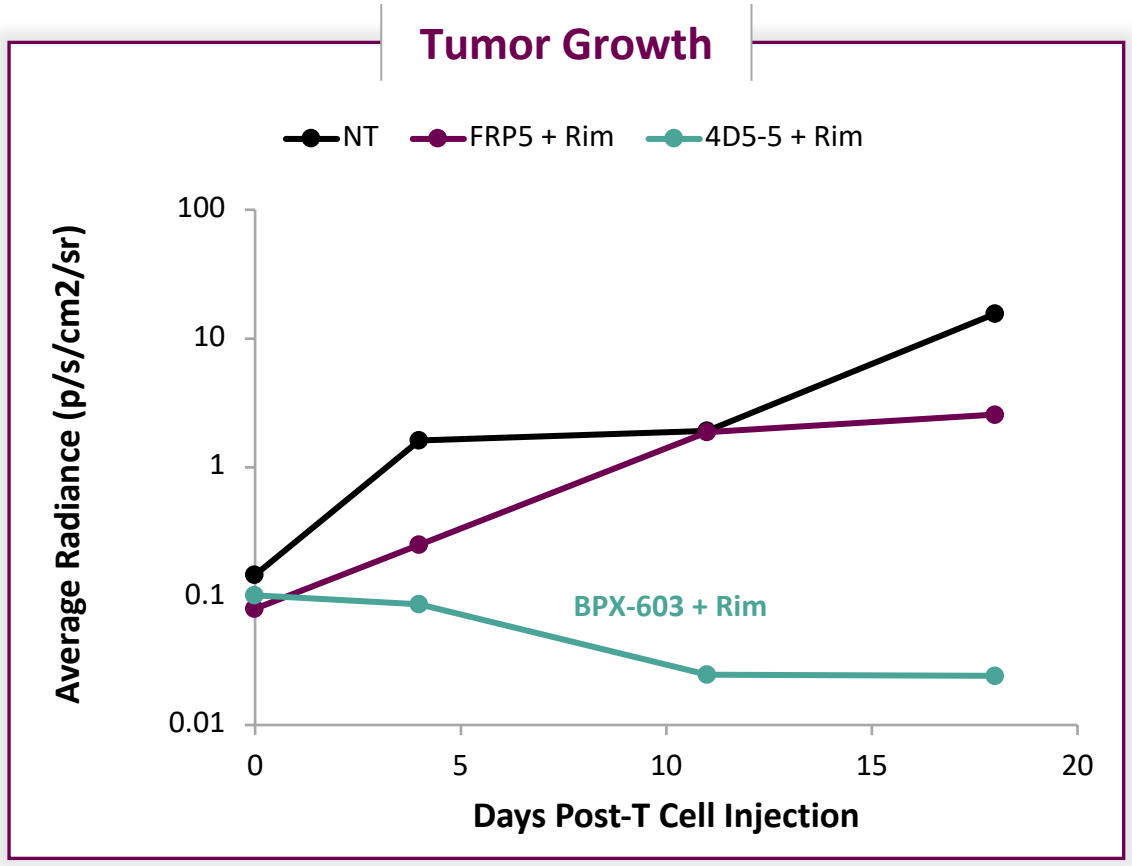
Study Properties	Morgan, 2010	Ahmed, 2015	Feng, 2017	Ahmed, 2017	Hegde, 2019
Construct	4D5-28-BB-z	FRP5-28-z	Her2-BB-z	FRP5-28-z	FRP5-28-z
Indication(s)	Metastatic colon	Sarcomas	CCA and PCa	GBM	Sarcomas
Patient number	1	19	11	17	10
HER2 expression	≥2+ (IHC)	≥1+ (IHC)	>50% positive	≥1+ (IHC)	≥1+ (IHC)
CAR-T dose	10^{10}	10^{4} - 10^{8}	10^{6}	10^{6} - 10^{8}	10^{8}
CAR-T expansion	NE	Negligible	>1,000 copies	Negligible	>10,000 copies
Toxicity	Lung reactivity	No DLTs	Mild AEs	Mild AEs	Mild AEs
Outcome	Grade 5 toxicity	1 PR	1 PR	1 PR	2 CR
Total Responses: 2 CR, 3 PR, 5/58 (8.6% ORR)					

BPX-603: Compelling Preclinical Evidence

iMC Co-Activation Enhances Cell Proliferation Relative to Current CAR-T Standards



Moderate Affinity scFv Enhances Anti-tumor Effect Relative to Low Affinity FRP5



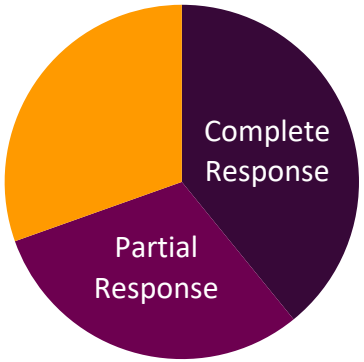
Expanding the Use of CaspaCIDe Through Licensing

Clinical Experience with CaspaCIDe (iC9)

Experience from Rivo-cel Program[1]

24 pediatric haplo-HSCT patients experienced advanced or steroid-refractory GvHD from iC9-containing allogeneic T cells and received rimiducid to trigger iC9

70% Overall Response Rate* (n=24)



Four additional patients achieved CR by Day 30

*Evaluated at Day 7 post-rimiducid administration.

Median Time to Response

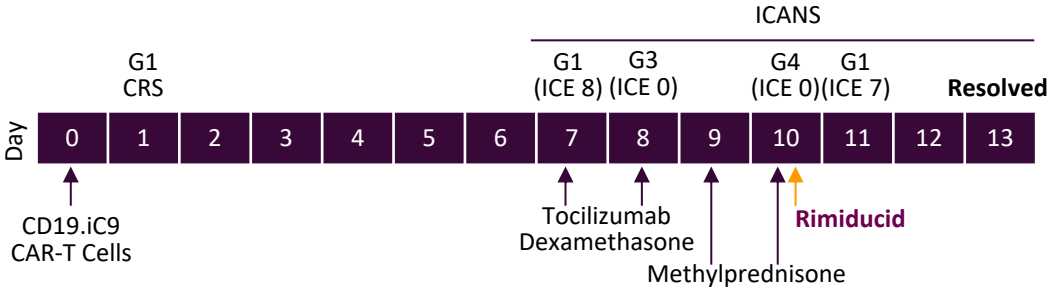
1 Day (Range 1–4 Days)

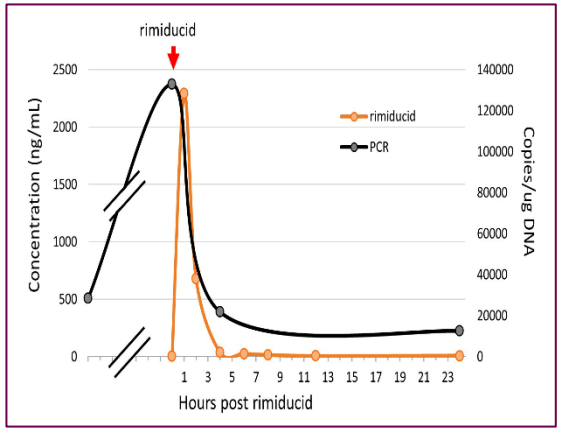
Immunological Response

- All evaluable patients receiving rimiducid had reduction in circulating rivo-cel cells
- Majority of reduction observed within 4 hours

CAR-T Case Report from University of North Carolina[2]

26-year-old female with relapsed B-ALL received CD19.iC9 CAR-T; received rimiducid to treat refractory ICANS





Rapid Results After Rimiducid Administration

- >80% reduction in CAR-T transgene copies within 4 hours
- ICANs improvement to Grade 1 within 12 hours

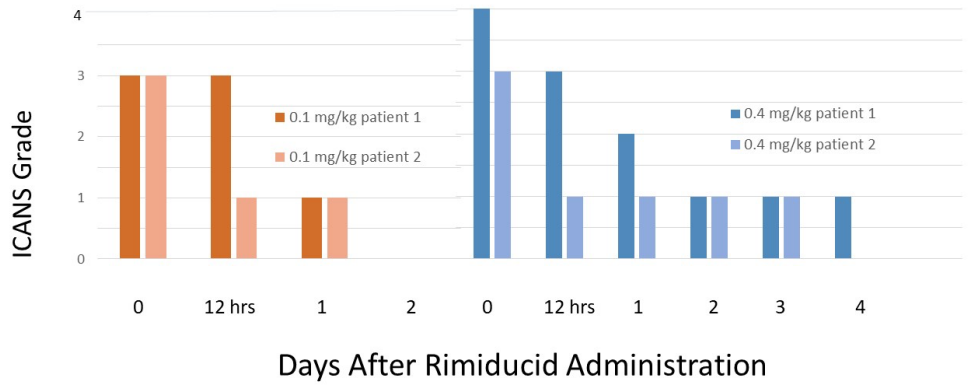
1. Elkeky, et al. *Blood*. (2018) 132 (Supplement 1): 2207.
2. Matthew C. Foster, et al, Utility of a safety switch to abrogate CD19. CAR T-cell–associated neurotoxicity. *Blood*. 2021; 137 (23): 3306–3309.

CaspaCIDe May Mitigate Severe CAR-T-Mediated Adverse Events

Updated results from iC9 CAR.19 study presented at ASH 2022

- Rimiducid use for management of severe, prolonged corticosteroid-refractory ICANS in patients with B-lymphoblastic leukemia (B-ALL) evaluated in an ongoing phase I/II study of iC9 CAR.19 cells IST at UNC-CH
- Clinical and pharmacodynamic courses of ICANS reported for four patients treated with rimiducid at two doses

Figure 1: Clinical ICANS Grade after RIM dosing



- Grade 3-4 ICANS improved ≥1 grade within 24 hours and resolved within 2-5 days after administration of either 0.4mg/kg or 0.1mg/kg of rimiducid
- ddPCR for ΔNGFR showed reduction in transcripts by >80% in all patients at 4 hours after end of RIM infusion

- Rimiducid administration to these four patients with ICANS was associated with abrupt reduction of circulating iC9 CAR.19 cells and ICANS grade
- Doses of rimiducid as low as 0.01mg/kg are being explored to determine if toxicity may be mitigated without diminishing the therapeutic benefit of iC9 CAR.19 cells

Bellicum

Investigator sponsored trial at the University of North Carolina Lineberger Comprehensive Cancer Center of a CD19 CAR-T containing CaspaCIDe; NCT03016377 .
Foster MC et al. ASH 2022, abstract 3312.

Expanding the Use of CaspaCIDe Through Licensing

Summary

- CaspaCIDe is the most clinically-validated safety switch, offering the potential to improve the benefit/risk of cell therapies
- Bellicum has established option/license agreements with leading institutions for use of CaspaCIDe and rimiducid in cell therapies
  - Agreements currently cover nine CAR-T and CAR-NK programs with potential to add more over time
- Under these agreements, Bellicum is entitled to:
  - Sub-license execution fees upon out-license of program
  - % share of milestones and certain other sub-licensing revenue
  - Single digit % royalty on product net sales
- Agreements have generated over $13m in revenue to date

Current Agreements

- The University of Texas MD Anderson Cancer Center
- University of North Carolina Lineberger Comprehensive Cancer Center
- Massachusetts General Hospital Cancer Center
- Takeda Pharmaceutical*

* Rimiducid supply agreement for TAK-007, licensed CD19 CAR-NKfrom MDACC

Summary

Anticipated Key Program Goals & Milestones

Product Candidate	Goals & Milestones	Planned Timing
BPX-601 PSCA GoCAR-T in mCRPC	• Initial Phase 1 interim presentation • Phase 1 data update	✔ 1Q'2024
BPX-603 HER2 GoCAR-T (Dual-Switch)	• Program update • Initial Phase 1 interim presentation	Mid-2023 1H'2024

Investment Summary

Building a next generation cell therapy pipeline around the GoCAR platform

GoCAR Platform

Differentiated co-activation domain (MyD88/CD40) and switch technology drive greater proliferation, persistence, power, and performance

BPX-601

- Autologous GoCAR-T targeting PSCA
- Enrolling mCRPC patients in Phase 1/2 trial
- Biochemical and radiographic responses observed early in dose escalation
- Data update planned 1Q'2024

BPX-603

- Autologous Dual-Switch GoCAR-T targeting HER2
- Enrolling HER2+ solid tumor patients in Phase 1/2 trial
- No DLTs observed in dose level 1
- Program update planned mid-2023; initial Phase 1 interim data presentation planned 1H'2024

CaspaCIDe Licensing

- Nine licensed programs to date
- Potential to expand use of switch technology

Cash runway to mid-2023

- Cash balance of $28.8M as of Sep 30, 2022