Investor Presentation

Striving to deliver cures through controllable cell therapy

March 2019

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 CaspaCIDe® (“iC9”), GoCAR-T® (incorporating “iMC”) and related technologies; our product candidates including rivo-cel™ (previously BPX-501), BPX-601, BPX-603, BPX-802, and rimiducid; the effectiveness of our CaspaCIDe and GoCAR-T programs and their possible range of application and potential curative effects and safety in the treatment of diseases, including as compared to other treatment options and competitive therapies; the success of our collaborations with academic and commercial partners; the timing, progress of enrollment and success of our clinical trials; and the timing of potential European marketing authorization applications for rivo-cel and rimiducid. Our estimates, projections and other forward-looking statements are based on our 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, 2018.

Investment Summary

Rivo-cel

Allogeneic polyclonal T-cells for hematologic malignancies and inherited blood disorders (+HSCT)

European pediatric opportunity clinically de-risked

- 249 patients enrolled in Phase 1 / 2 study
- Late interim results presented at ASH in Dec. 2018 trend toward meeting primary endpoint
- Expect topline data in 1H 2019; MAA filings in 2H 2019
- European HQ and leadership team in place for commercialization prep

Global trial underway to broaden label

- Enrolling Phase 2/3 THRIVE study in AML and MDS in patients 12+ years old

GoCAR-T Pipeline

Controllable CAR-T cells designed to optimize efficacy and safety

BPX-601 GoCAR-T promising early clinical data

- Phase 1 / 2 study enrolling in pancreatic, gastric and prostate cancers
- Initial safety data on 12 pancreatic patients presented at ESMO-IO in Dec. 2018 indicate attractive safety profile and early clinical activity
- Trial amendments to lymphodepletion regimen and activation molecule administration to enhance potential clinical response

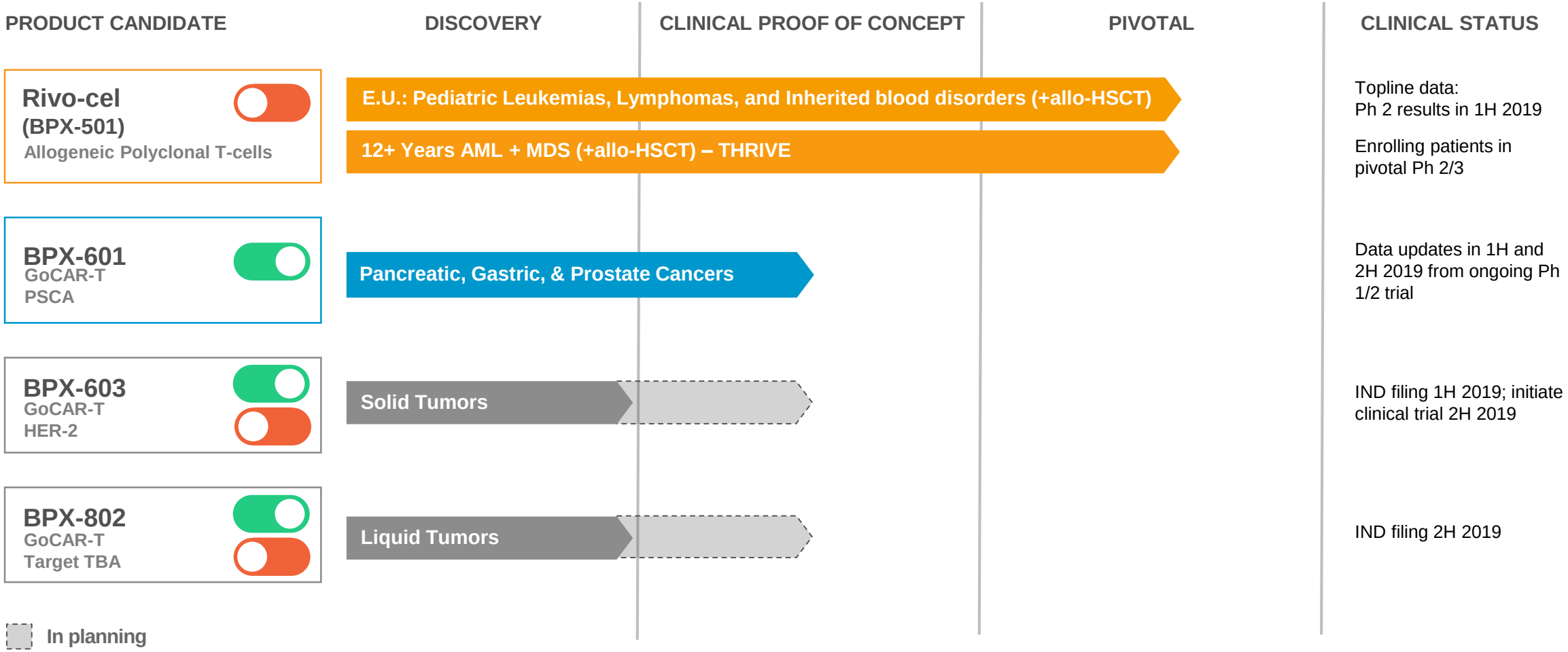
Two dual-switch GoCAR-T candidates to IND in 2019

- BPX-603 targeting HER2 antigen in solid tumors
- BPX-802 targeting liquid tumors, target antigen TBA

Cash of $98.0MM as of December 31, 2018; Cash Runway Through 2019

Development Pipeline: Rivo-cel and GoCAR-T

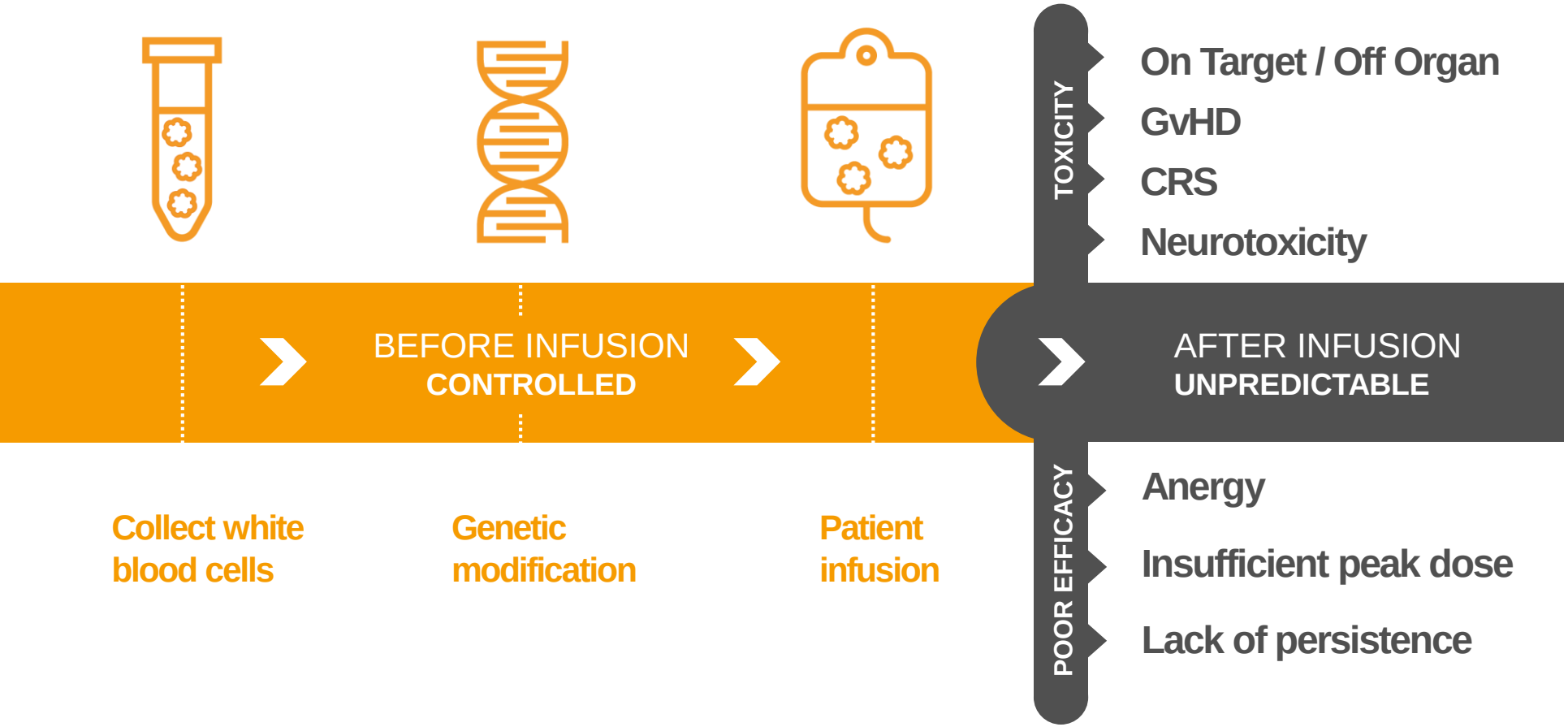
Controllable cell therapies that may represent major advances in liquid and solid tumors



Technology Overview

Most Cell Therapies Only Controlled Before Infusion

Limited ability to expand a narrow therapeutic window



Bellicum Platform Enables Control After Infusion

Provides physicians ability to expand the therapeutic window in each patient

BEFORE INFUSION
CONTROLLED

Collect white blood cells

Genetic modification

Patient infusion

iMC ACTIVATION switch
to activate immune cells and modulate the tumor micro-environment

AFTER INFUSION
CONTROLLED

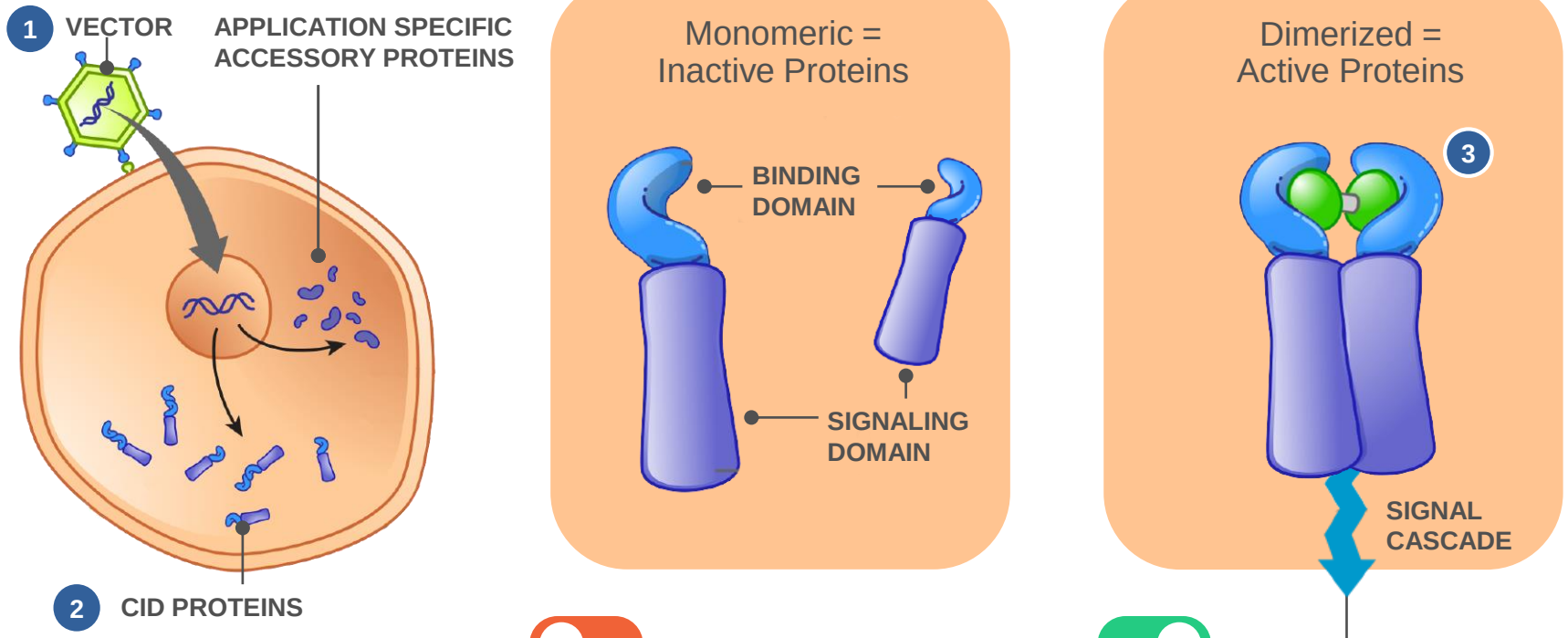
CaspaCIDe SAFETY switch
to eliminate toxic cells

Potential for Improved Benefit / Risk

Chemical Induction of Dimerization ("CID") Molecular Switch Platform

Rimiducid infusion activates signaling pathways to control T-cell function

1. Viral transduction transfers the DNA from a **vector** into the target cell nucleus.
2. Vector-derived DNA directs expression of **CID** and **accessory proteins.**
3. **Rimiducid** dimerizes the CID proteins, thus turning on the signal cascade.



Signal	Caspase-9 ("iC9")	MyD88 and CD40 ("iMC")
Result	Apoptosis (cell death)	T-cell activation, proliferation & survival

GoCAR-T Pipeline

GoCAR-T: Differentiated Approach to Cell Therapy

Current Challenges in Cell Therapy

Limited efficacy in solid tumors

- Inadequate cell proliferation and persistence to sustain efficacy
- Inability to overcome immune suppressive factors in tumor microenvironment (TME)

Potential safety issues with more potent approaches

GoCAR-T Benefits

Potential for enhanced efficacy in solid tumors via iMC signaling

- MyD88 and CD40 are superior co-stimulatory molecules with potential for greater cell expansion and persistence
- Modulates the tumor microenvironment, overriding common inhibitory pathways (PD-1, PGE2, TGF-β)
- Enhances host immune activity by inducing pro-inflammatory cytokines and chemokines

Potential for enhanced eafety

- iMC provides control over timing and frequency of co-activation
- CaspaCIDe rapidly eliminates a majority of CAR-T cells to manage acute toxicities

BPX-601 GoCAR-T Targeting Prostate Stem Cell Antigen

Product Summary

- Attractive first-in-class solid tumor CAR-T opportunity
- First-in-human experience with iMC
- Initial Phase 1 results presented in Dec 2018 demonstrate:
  - Safety
  - iMC-driven T cell activation
  - Biologic activity
- Phase 1 enrollment ongoing

Unmet Need

High unmet need in solid tumors expressing Prostate Stem Cell Antigen (PSCA)

	Incidence (US)	Annual Deaths (US)	% Expressing PSCA
Pancreatic	55k	44k	~60%
Prostate	165k	29k	75-90%
Gastric	26k	11k	76-89%

Incidence and annual deaths: Noone AM, Howlader N, Krapcho M, Miller D, Brest A, Yu M, Ruhl J, Tatalovich Z, Mariotto A, Lewis DR, Chen HS, Feuer EJ, Cronin KA (eds). SEER Cancer Statistics Review, 1975-2015, National Cancer Institute. Bethesda, MD, https://seer.cancer.gov/csr/1975_2015/, based on November 2017 SEER data submission, posted to the SEER web site, April 2018.
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 Trial Progression

BP-012 trial in relapsed/refractory pancreatic, gastric, and prostate cancers

	Cohort 0 (Lead-in)	Cohort 3	Cohort 4	Cohort 5a	Cohort 5b	Next Cohort
Patient Population	3L+ Pancreatic			2L Pancreatic 2L Gastric HR-Refractory Prostate		2L Pancreatic 2L Gastric HR-Refractory Prostate
BPX-601 Dose ***x10^6 cells/kg @ Day 0***	1.25	1.25	2.5	5.0		5.0
Rimiducid Dose ***mg/kg @ Day 7***	None	Single Dose	Single Dose	Single Dose		Scheduled Repeat Dosing
Conditioning	Cytoxan 1g/m^2 @ Day -3			Cytoxan 1g/m^2 @ Day -3	Cytoxan 0.5g/m^2 Fludarabine 30mg/m^2 @ Days -5, -4, -3	Cytoxan 0.5g/m^2 Fludarabine 30mg/m^2 @ Days -5, -4, -3
Status	Enrolled			Active		Pending

ClinicalTrials.gov Identifier: NCT02744287

BPX-601: No Dose Limiting Toxicities Observed

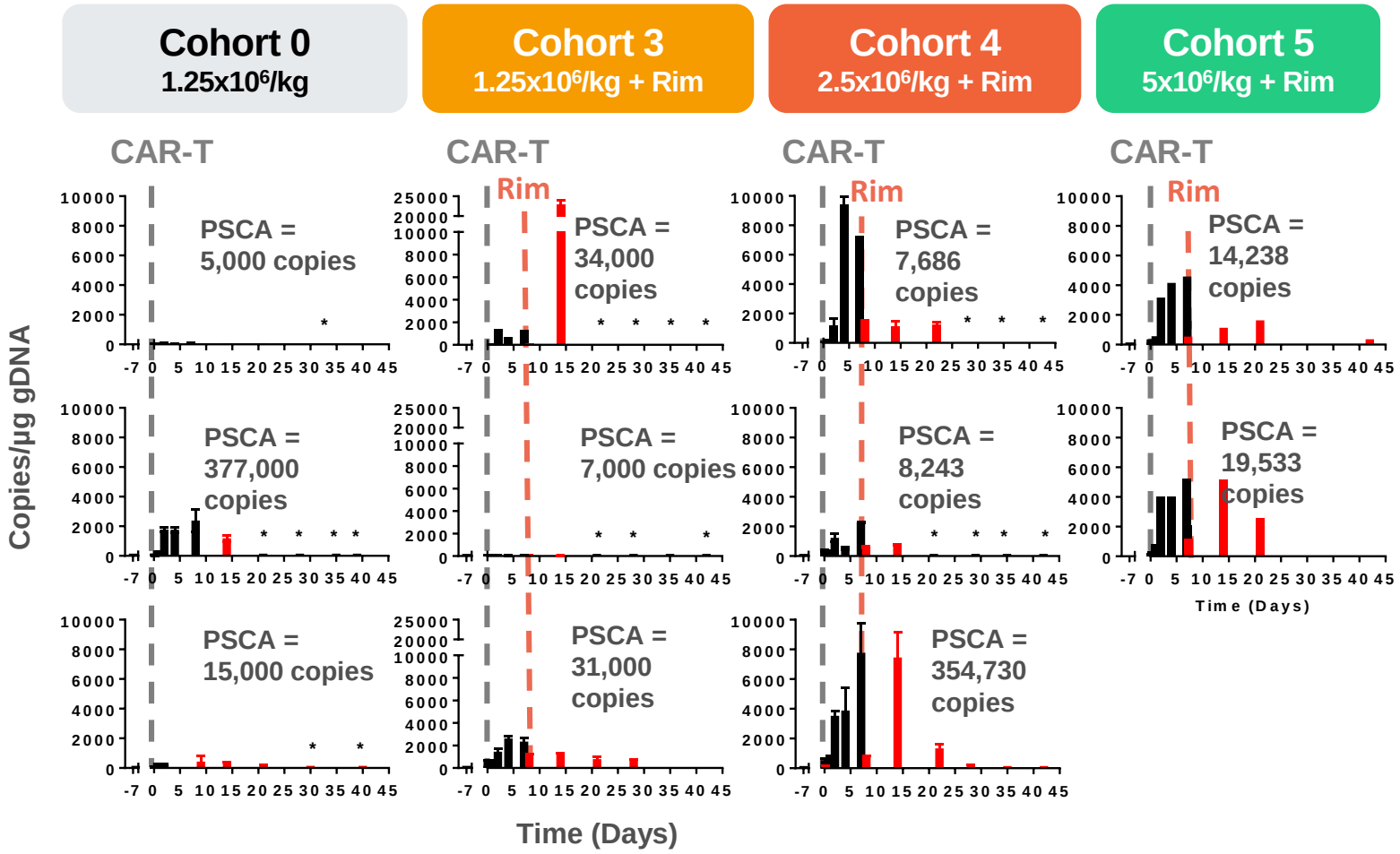
Data presented at ESMO Immuno-Oncology Congress 2018 – clinical cut-off October 29, 2018

Most common AEs reported by > 1 patient	Total (N=12)
Any Event, n (%)	12 (100)
Fatigue	4 (33)
Abdominal pain upper	3 (25)
Hypotension	3 (25)
Abdominal pain	2 (17)
Back pain	2 (17)
Diarrhea	2 (17)
Flatulence	2 (17)
Nausea	2 (17)
Pyrexia	2 (17)

- **No dose limiting toxicities were observed**
- **Pyrexia was the only treatment-related AE reported by >1 patient (n=2)**
  - Grade 1–2 on Day 0 following BPX-601 infusion
  - Both events resolved within 24–36 hours with supportive care

AE, adverse event

BPX-601: iMC-Driven T Cell Expansion & Persistence



- **Limited evidence of LD with CTX-only regimen (79% ± 25% of cells remained)**
- **Rapid cell expansion by Day 4, but no persistence without Rim**
- **With single-dose Rim:**
  - Cell expansion of 3 to 20-fold within 7 days in 4 patients
  - Cell persistence of >3 weeks in 3 patients

* Vector copy number < limit of quantification.
CTX, cyclophosphamide; LD, lymphodepletion; PSCA, prostate stem cell antigen; Rim, rimiducid.

BPX-601: Evidence of Anti-Tumor Activity

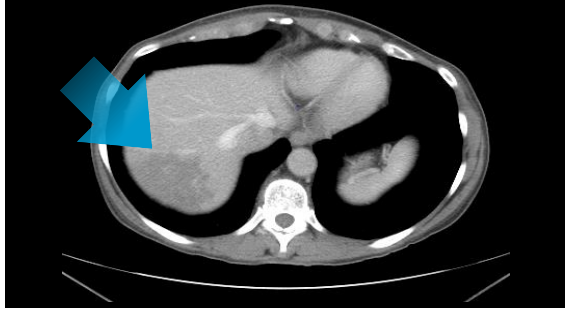
Cohort	Best Response (RECIST)			
	CR	PR	SD	PD
0	0	0	1	2
3	0	0	2	1
4	0	0	2	1

Two patients with SD had tumor shrinkage >20%

Disease control without new therapies: 16 and >18 weeks in 1 and 3 patients, respectively

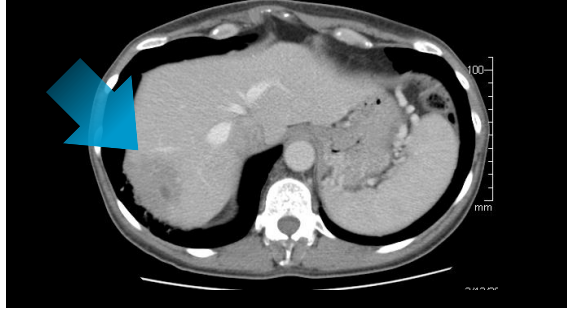
Patient 3A | 2 prior therapies; PSCA = 34,000 copies

Baseline



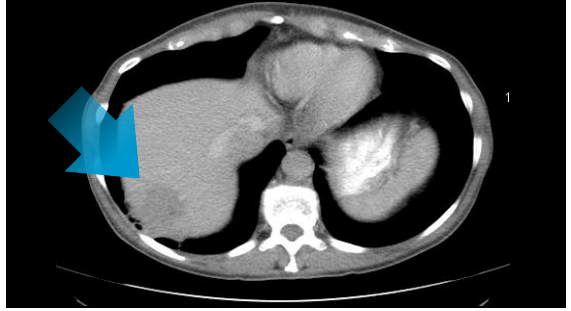
- Lesion longest diameter: 70 mm
- **CA19-9: 294**

Month 1



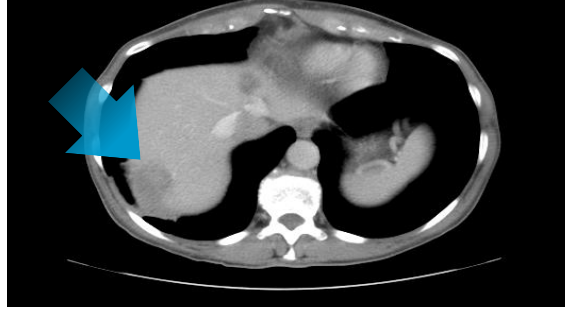
- Lesion longest diameter: 57 mm
- **CA19-9: 152.6**
- Overall response: SD (−15%)

Month 2



- Lesion longest diameter: 49 mm
- **CA19-9: 207.2**
- Possible new lesion
- Overall response: SD (−25%)

Month 4



- Lesion longest diameter: 40 mm
- **CA19-9: 641.4**
- New lesion confirmed
- Overall response: PD

CA19-9, cancer antigen 19-9; CR, complete response; PD, progressive disease; PR, partial response; PSCA, prostate stem cell antigen; SD, stable disease.

BPX-603 Dual Switch GoCAR-T Targeting HER2

Product Summary

- HER2 is a validated tumor antigen and is expressed on numerous solid tumors with high unmet need
- Historical HER2 CAR-T studies have shown modest overall activity and off-tumor / on-target toxicity
- BPX-603 may address these limitations
  - iMC may increase cell proliferation & persistence, modulate the TME, and enhance host immunity
  - CaspaCIDe may mitigate treatment emergent toxicities

Unmet Need

Indication	Incidence[1]	HER2+	5-year OS (Stage IV)[1]
Gastric	28,000	10-30%[3]	<20%
Colorectal	145,000	10%[4]	<15%
Ovarian	22,000	20-30%[5]	<30%
Uterine/ Endometrial	61,000	50-80%[6]	14-69%
Glioblastoma	12,000	20-30%[2]	<20%

[1]National Cancer Database, American Cancer Society, https://www.cancer.org, accessed 21 December 2018; [2]Lui et al., Cancer Res 2004; [3]Gravolos et al., Annals Oncol 2008; [4]Tu et al., Exp Ther Med 2018; [5]Berchuck et al., Cancer Res 1990, Bartlett et al., Brit J Cancer 1996; [6]Grushko et al., Gynecologic Oncol 2008

Historical HER2 Studies: Modest Clinical Outcomes

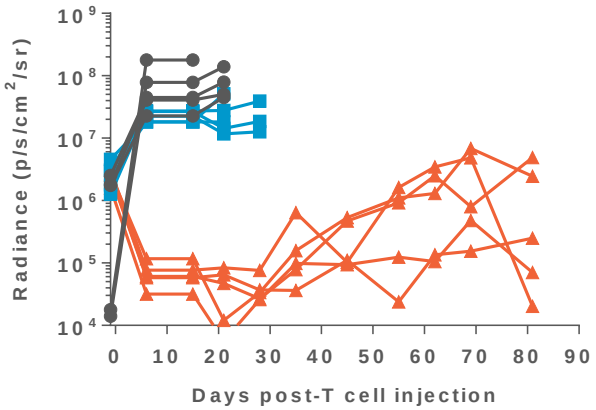
Study Properties	Morgan, 2010	Ahmed, 2015	Hegde, 2017	Feng, 2017	Ahmed, 2017
Construct	4D5-28-BB-z	FRP5-28-z	FRP5-28-z	Her2-BB-z	FRP5-28-z
Indication(s)	Metastatic colon	Sarcomas	Sarcomas	CCA and PCa	GBM
Patient number	1	19	6	11	17
HER2 expression	≥2+ (IHC)	≥1+ (IHC)	≥1+ (IHC)	>50% positive	≥1+ (IHC)
CAR-T dose	10^{10}	10^{4} - 10^{8}	10^{8}	10^{6}	10^{6} - 10^{8}
CAR-T expansion	NE	Negligible	>10,000 copies	>1,000 copies	Negligible
Toxicity	Lung reactivity	No DLTs	Mild AEs	Mild AEs	Mild AEs
Outcome	Grade 5 toxicity	1 PR, 3 SD,13 PD	2 CR, 2 SD	1 PR, 5 SD	1 PR, 7 PD
Total Responses	2 CR, 3 PR, 5/54 (9.3% ORR)				

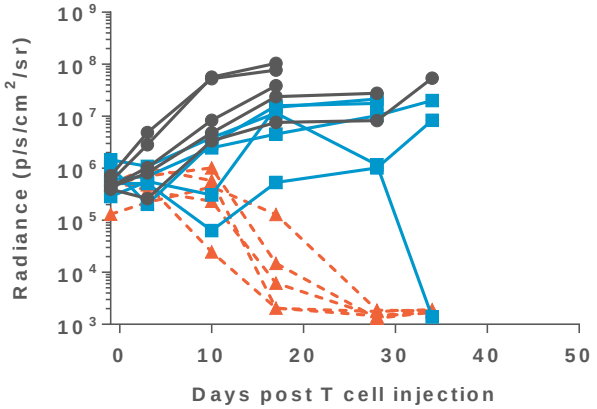
BPX-603 Pre-Clinical Studies Demonstrate Potential Clinical Benefits

HER2+ A549
Lung Carcinoma
(1x10⁴ T cells)

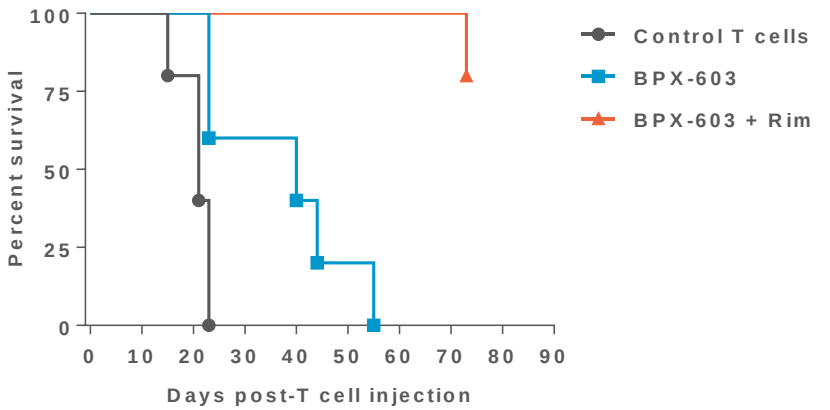
HER2+ OE19
Esophageal Carcinoma
(5x10⁶ T cells)

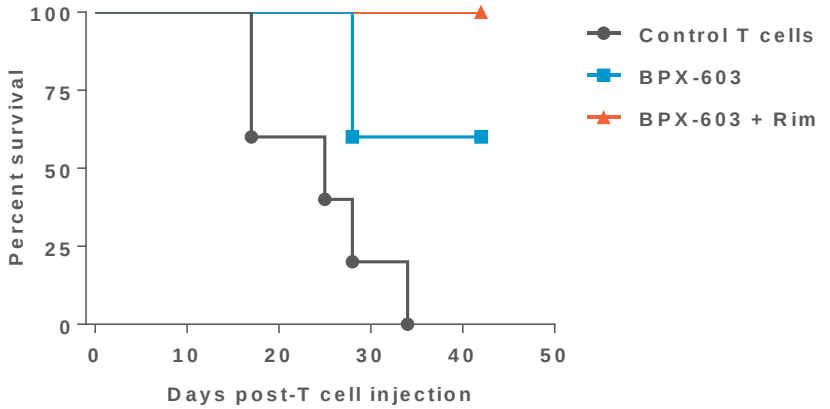
Tumor growth





Survival



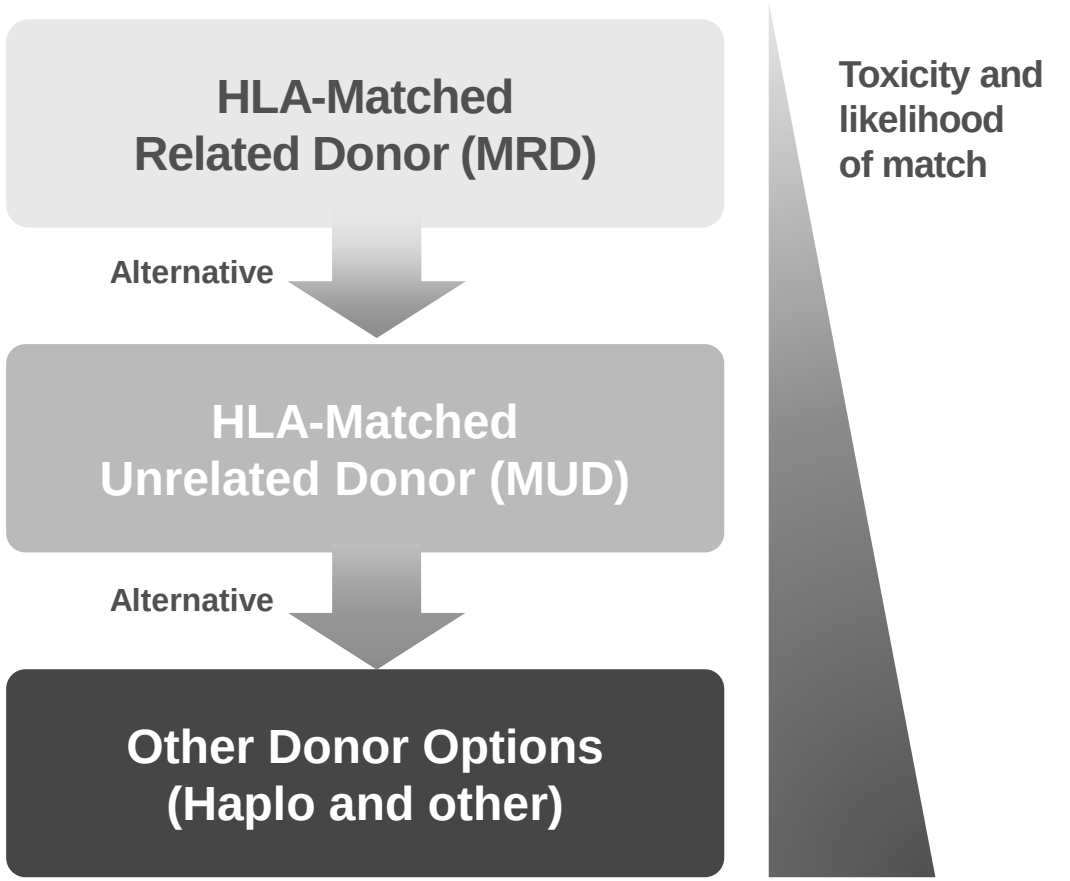


Bellicum PHARMACEUTICALS

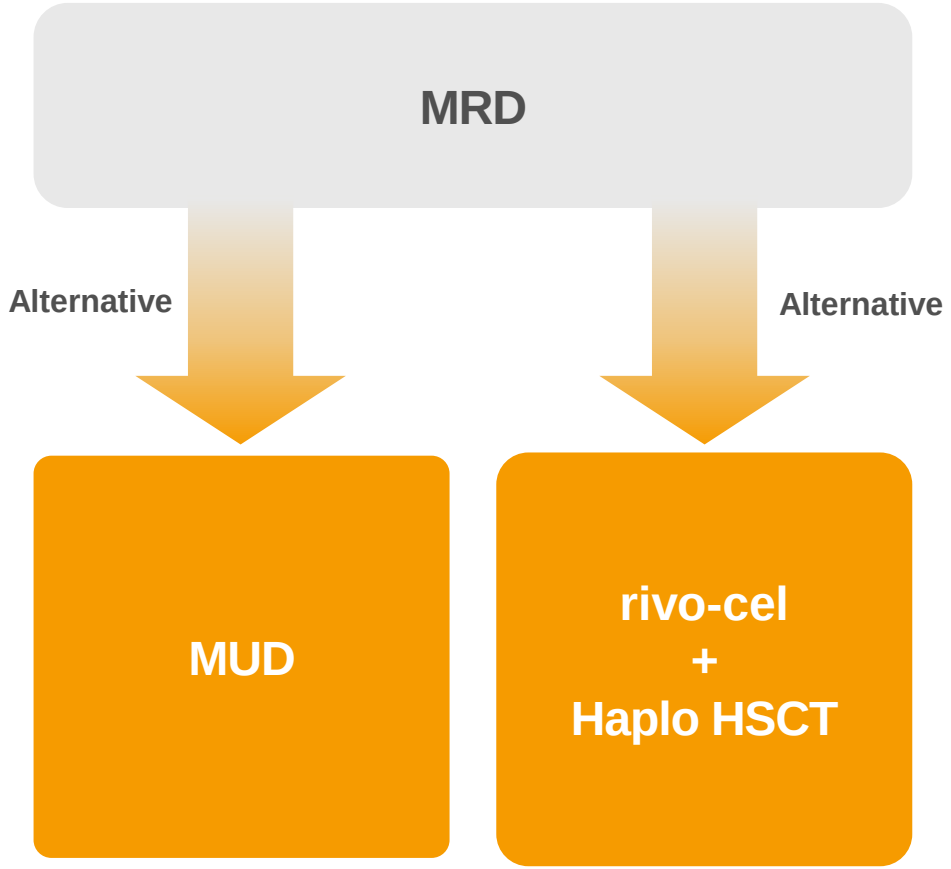
RIVO-CEL

Rivo-cel: Opportunity To Transform Treatment Paradigm

Current HCST Treatment paradigm



Potential Future HSCT Treatment Paradigm



[1]Other includes HLA mismatched and umbilical cord blood.

BP-004 Study: Basis for European Pediatric Approval

Phase 1/2 study of rivo-cel in pediatric patients following TCR αβ depleted allo-HSCT

High risk pediatric malignancies and non-malignant disorders → αβ T-cell and B-cell depleted haplo-HSCT without GvHD Prophylaxis → **Rivo-cel** → Rimiducid for patients who develop visceral GvHD or are refractory to SOC treatment

Enrolled Populations

N = 249	
Malignant (N = 117)	**Non-Malignant (N = 132)**
Diagnosis	**Diagnosis**
Acute lymphocytic leukemia (ALL)	Primary Immune Deficiencies
Acute myeloid leukemia (AML)	β Thalassemia Major
Other	Other Erythroid Disorders
	Bone Marrow Failure Disorders

Outcomes

Rivo-cel:

- Event-free survival at 180 days (regulatory endpoint)
  - TRM/NRM, severe GvHD, and life-threatening infections
- Progression-free survival
- Disease status

Rimiducid:

- GvHD response

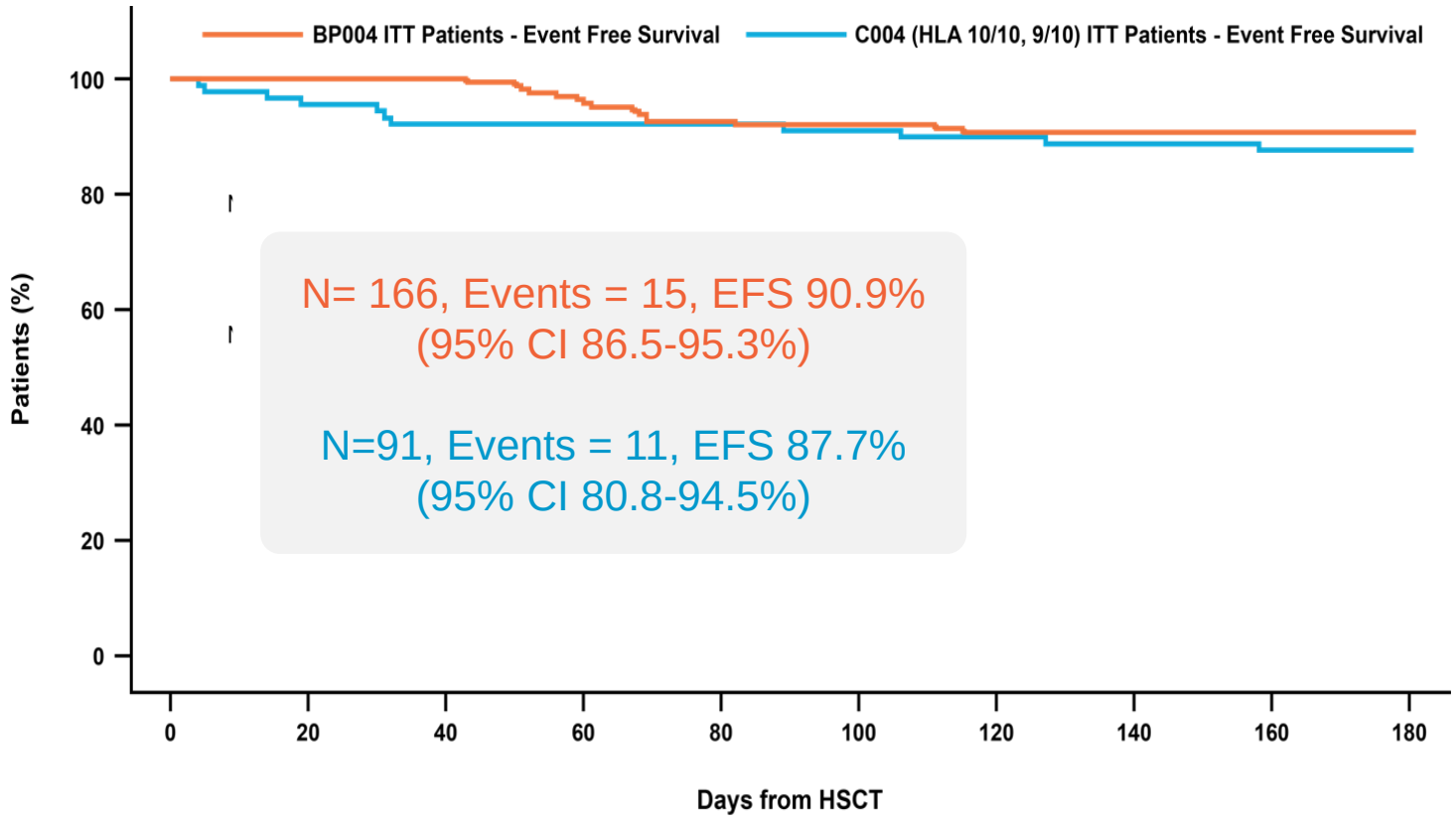
TRM, transplant-related mortality; NRM, non-relapse mortality; GvHD, graft versus host disease; SOC, standard of care; HSCT, hematopoietic stem cell transplantation. ClinicalTrials.gov Identifiers: NCT01744223, NCT02065869.

Rivo-cel Interim Results Trend Towards Meeting Primary Endpoint

Interim six-month event-free survival comparable to MUD HSCT

- C-004 is an observational trial of pediatric patients with malignant (67%) or non-malignant (33%) disease who underwent a MUD HSCT
- Non-inferiority of rivo-cel EFS at 180 days to MUD HSCT is required for EMA approval
- Full analysis with statistical comparisons of patients who received rivo-cel or a MUD HSCT planned for 2019

Event Free Survival at 180 days



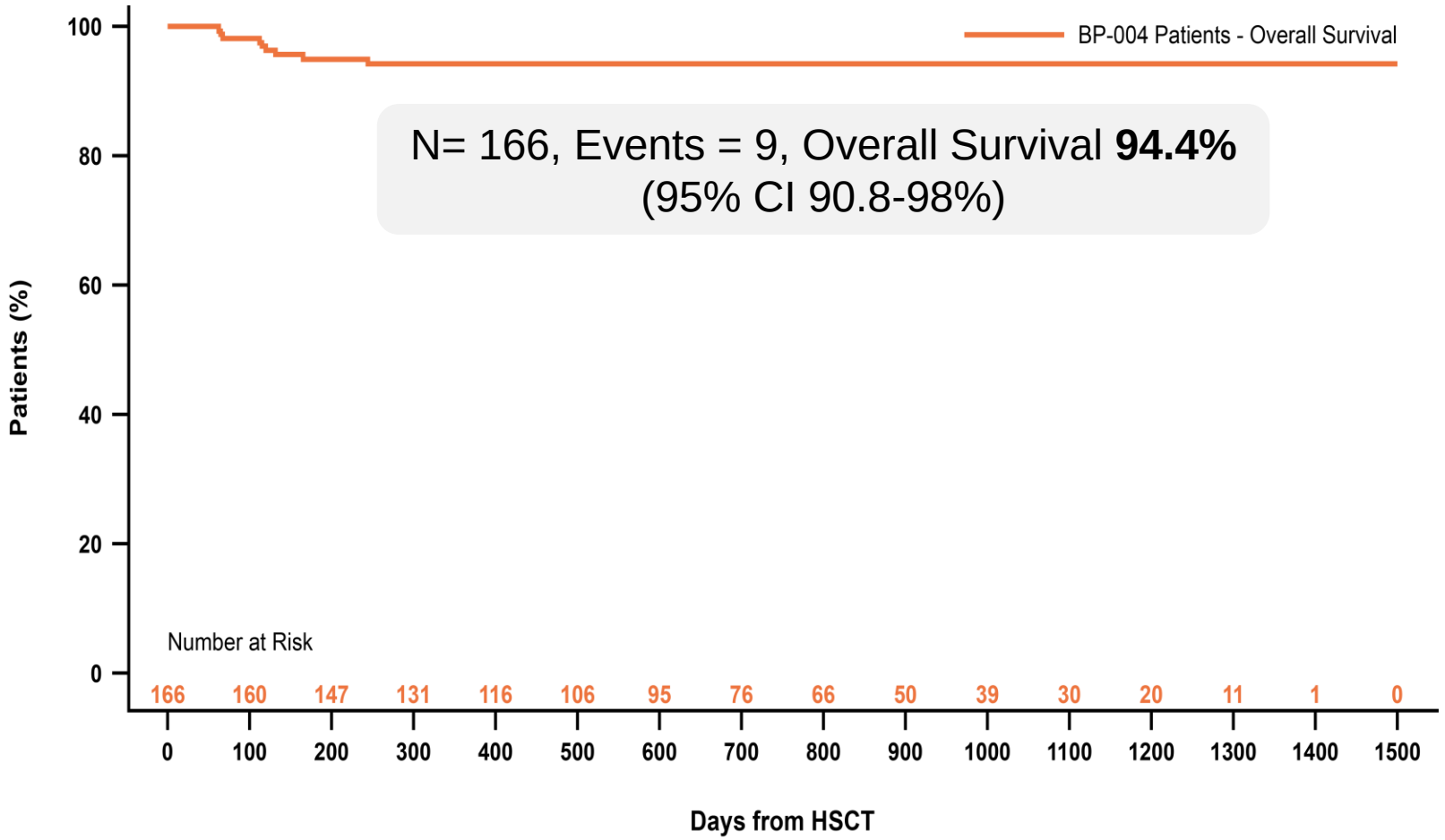
EFS, event free survival; MUD, matched unrelated donor; HSCT, Hematopoietic Stem Cell Transplantation
Data presented at 60th ASH Annual Meeting – December, 2018

Rivo-cel: High Rates of Disease-Free and Overall Survival

Interim survival results

With median 20.3 months (0.5 – 47.4 months):

- Relapse-free survival **82.9%** in malignant patients
- Disease-free survival **95.2%** in non-malignant patients



Rivo-cel: High Rates of GvHD Response to Rimiducid

Interim results of response in patients refractory to standard of care treatment

Methods & Evaluable Population

Patients who developed visceral GvHD or were refractory to SOC treatment were eligible to receive ≥1 dose (up to 3 at 48 hour intervals) of rimiducid (0.4 mg/kg)

Of 238 GvHD-evaluable patients:

- 35.7% (85/238) experienced any grade acute or chronic GvHD
- 28.2% (24/85) of patients with GvHD received rimiducid

Efficacy Results

Best overall response of 70%
7 days post-rimiducid

- 9 CR and 7 PR
- Median time to response of 1 day (1 - 4 days)

Four patients in PR or not evaluable at day 7 achieved CR within 30 days post-rimiducid

Translational Results

Reduction in rivo-cel serum levels observed in all patients receiving rimiducid[1]

Rimiducid eliminates the most highly activated rivo-cel T cells which express the highest level of iC9[2], leaving remaining cells to re-expand

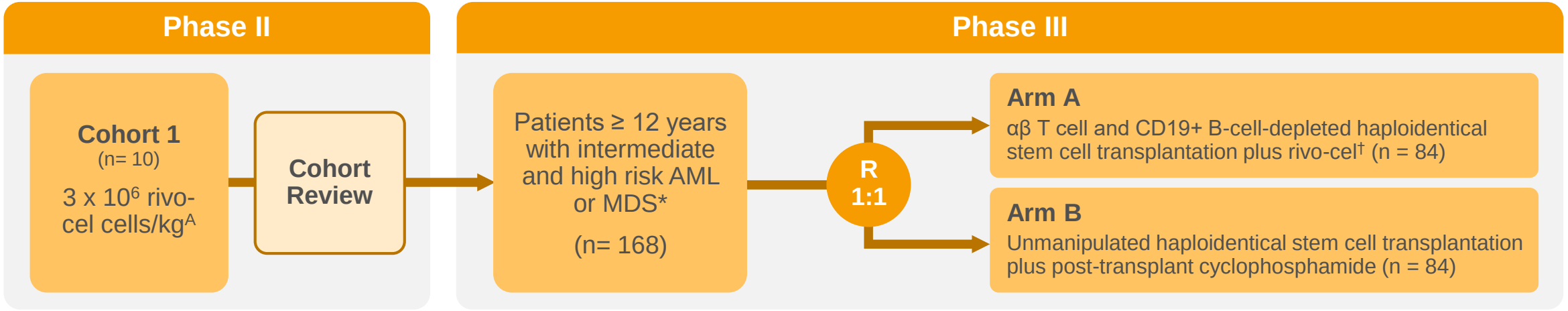
- 79% (11/14) malignant patients receiving rimiducid remain relapse free

Bellicum PHARMACEUTICALS

GvHD: acute graft versus host disease; SOC, Standard of Care; PR, Partial Response; CR, Complete Response
1. N = 10 with translational data at time of interim. 2. Zhou et al. ASH 2018, a3496

THRIVE: Registrational Trial in Adults & Adolescents

Phase 2/3 study of rivo-cel in intermediate and high risk AML & MDS in patients 12+ years old



Primary Outcome

Overall Survival

Secondary Outcomes

- Graft-versus host disease and relapse-free survival (GRFS) at time from randomization until Grade 3-4 acute GvHD, chronic GvHD requiring systemic immunosuppression, disease relapse or death, whichever comes first
- Relapse free survival (RFS)
- Non-relapse mortality (NRM)
- Time to resolution of GvHD after administration of rimiducid

A If dose level 1 exceeds the MTD, alternative dose levels (dose level -1: 1 x 106 BPX-501 cells/kg) will be explored
† No GvHD prophylaxis will be given. Rimiducid will be administered to inactivate rivogenlecleucel (rivo-cel) in the event of GVHD not responsive to standard of care treatment
Updated 8 Nov 2018. Clinicaltrials.gov identifier: NCT03699475

Bellicum PHARMACEUTICALS

Rivo-cel Addresses Key Shortcomings

Rivo-cel addresses shortcomings of stem cell transplants to treat hematological malignancies and inherited blood disorders

Rivo-cel Target Market

	Matched Related Donor (MRD)	Matched Unrelated Donor (MUD)	Haplo and Other	Rivo-cel +HSCT
% of Current Market	25-30%	~50%	~20-25%	
Leading Causes of Mortality and Morbidity: Disease Relapse	●	●	●	✓ ●
Leading Causes of Mortality and Morbidity: Infection	●	●	●	✓ ●
Leading Causes of Mortality and Morbidity: GvHD	●	●	●	✓ ●
Likelihood to Find Donor	Low	Low-Medium	High	✓ High
Time to Identify Donor	Short	Long	Short	✓ Short

Rivo-cel: Significant Market Opportunity

Potential List Price

Cost Effectiveness Analysis

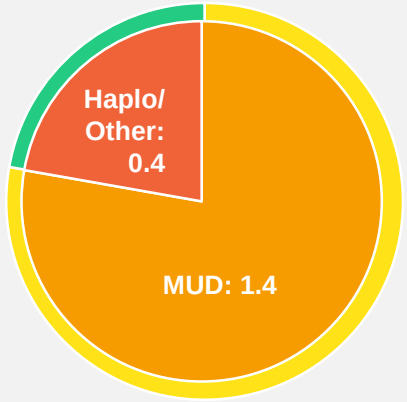
Market Research

Pricing Benchmarks

Patient Population

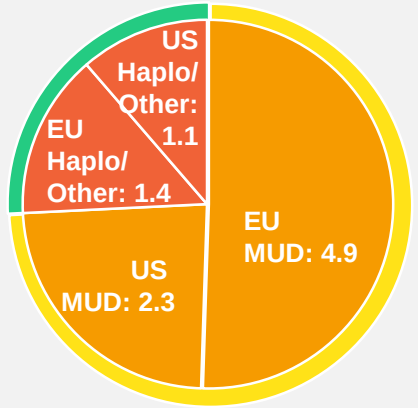
Initial market: EU Pediatric*
(in thousands)

TOTAL: 1.8



Next market: Adult & Adolescent AML/MDS*
(in thousands)

TOTAL: 9.7



Market Opportunity

European Pediatric

$0.5-0.7 billion

Adult & Adolescent AML/MDS

$3-4 billion

Additional Opportunities

- **Geographic expansion**
  - U.S. Pediatric
  - Asia
- **Patient population growth**
- **Expansion of HSCT eligibility**
- **Development in other malignancies**

*As of 2016. EBMT Transplant Activity Survey; CIBMTR Current Uses & Outcomes of HCT; internal company analysis
Market share expectations represented by green (strong) and yellow (moderate)

Rivo-cel: Significant Opportunity for EU Pediatric Launch

Demand

- Encouraging early KOL feedback
- Compelling clinical value proposition
- Broad and rapid haplo donor availability

Pricing & Reimbursement

- Early payer market research encouraging at target pricing
- Outstanding clinical profile and strong health economics

Manufacturing & Supply Chain

- Robust manufacturing process developed
- Commercially experienced cell therapy CMO
- High touch supply chain & customer service solution being co-developed

Team

- Efficient: ~75 transplant centers represent ~80% of opportunity
- Experienced: outstanding team in place with relevant track record

Execution of Key Objectives

Bellicum Leadership Team

Rick Fair
President & CEO

Genentech
A Member of the Roche Group
Johnson & Johnson

William Grossman
Chief Medical Officer

abbvie
Genentech
A Member of the Roche Group
MERCK

Atabak Mokari
Chief Financial Officer

Credit Suisse
UBS
IRIDEX
Wells Fargo

Gregory Naeve
Chief Business Officer

The Column Group
Pfizer

Aaron Foster
Senior Vice President
Head of Research

BCM Baylor College of Medicine
Texas Children's Hospital

Alan Smith
Exec. Vice President
Tech Operations

Baxter
LifeNet Health
Cognate BioServices, Inc.
Osiris Therapeutics, Inc.

Shane Ward
General Counsel &
Corporate Secretary

DYNAVAX
INNOVATING IMMUNOLOGY
HUMAN GENOME SCIENCES
GILEAD
SIDLEY

Thierry Darcis
General Manager, Europe

gsk GlaxoSmithKline
NPS Pharma
NOVARTIS
ViroPharma

Substantial Progress Achieved in 2018

Delivered on commitments and strengthened the organization

	2018 To-Do List	
BPX-601	Complete enrollment in cell dose escalation portion of BP-012 Phase 1/2 study	✓
	Present initial clinical data at medical meeting	✓
Rivo-cel	Complete enrollment & present IA on BP-004 and C/CP-004 comparator studies	✓
	Initiate Phase 2/3 study in adult & adolescent AML & MDS	✓
	Confirm pediatric approval pathway in US	✓✗
	Initiate commercial launch preparation in Europe	✓
BPX-701	Present initial clinical data at medical meeting	✗
PIPELINE	Complete dual-switch constructs for two new GoCAR-T candidates	✓
ORG	Complete build-out of Houston cell & viral vector manufacturing facility	✓
	Establish site in San Francisco Bay Area and European HQ	✓
	Strengthen the leadership team	✓

Anticipated 2019 and 2020 Key Program Milestones

	1H'19	2H'19	2020
BPX-601	Presentations of updated Phase 1 results (Cy/flu regimen) Amend BP-012 to allow for scheduled dosing of rimiducid to reactivate iMC	Presentation of updated Phase 1 results (repeat rimiducid dosing)	Updated Phase 1 and Phase 2 results
CAR-T PIPELINE	IND submission for BPX-603	First patient treated in BPX-603 Phase 1 trial IND submission for BPX-802	BPX-603 Phase 1 data BPX-802 Phase 1 data
Rivo-cel	Final analyses of BP-004 and C/CP-004 trials	MAA submissions for rivo-cel and rimiducid for pediatric patients	MAA Approval THRIVE Phase 2 interim data

Investment Summary

Rivo-cel

Allogeneic polyclonal T-cells for hematologic malignancies and inherited blood disorders (+HSCT)

European pediatric opportunity clinically de-risked

- 249 patients enrolled in Phase 1 / 2 study
- Late interim results presented at ASH in Dec. 2018 trend toward meeting primary endpoint
- Expect topline data in 1H 2019; MAA filings in 2H 2019
- European HQ and leadership team in place for commercialization prep

Global trial underway to broaden label

- Enrolling Phase 2/3 THRIVE study in AML and MDS in patients 12+ years old

GoCAR-T Pipeline

Controllable CAR-T cells designed to optimize efficacy and safety

BPX-601 GoCAR-T promising early clinical data

- Phase 1 / 2 study enrolling in pancreatic, gastric and prostate cancers
- Initial safety data on 12 pancreatic patients presented at ESMO-IO in Dec. 2018 indicate attractive safety profile and early clinical activity
- Trial amendments to lymphodepletion regimen and activation molecule administration to enhance potential clinical response

Two dual-switch GoCAR-T candidates to IND in 2019

- BPX-603 targeting HER2 antigen in solid tumors
- BPX-802 targeting liquid tumors, target antigen TBA

Cash of $98.0MM as of December 31, 2018; Cash Runway Through 2019