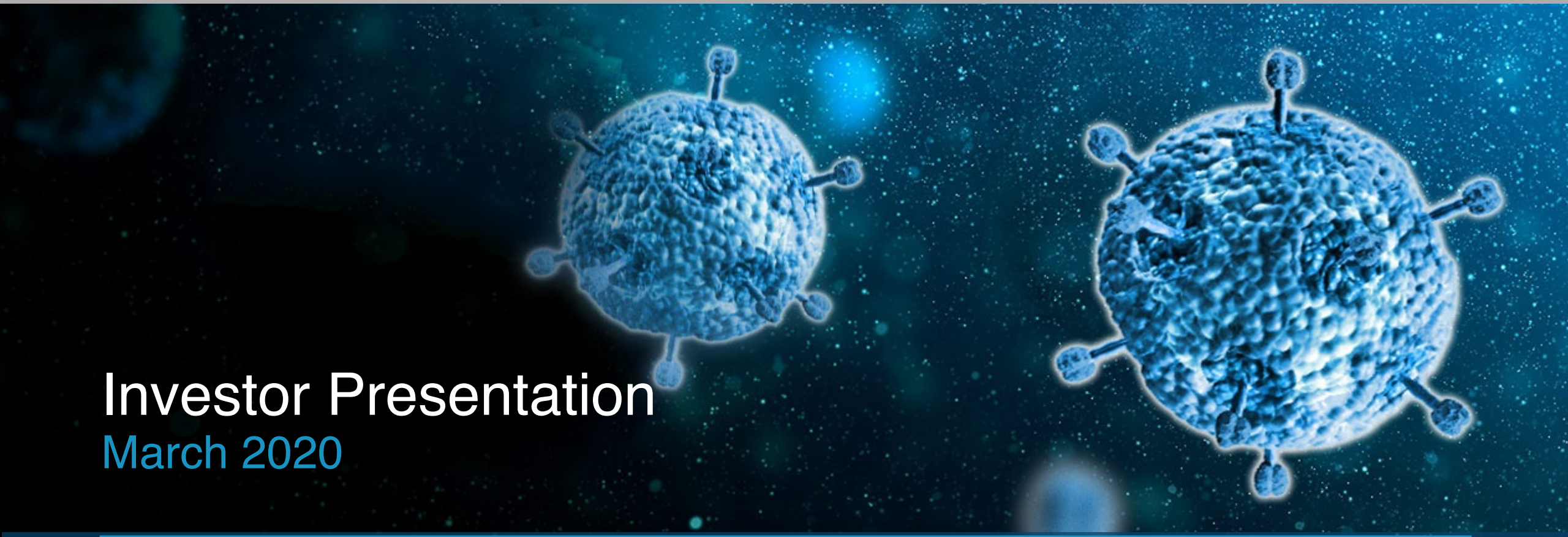
ONCOLYTICS BIOTECH INC.



Investor Presentation

March 2020

oncolyticsbiotech.com **Nasdaq** ONCY **TSX** ONC

Forward-Looking Statements

This presentation contains certain forward-looking statements relating to the company's business prospects and the development and commercialization of pelareorep, a first-in-class systemically administered immuno-oncology agent for solid tumors and heme malignancies. These statements are based on management's current expectations and beliefs and are subject to a number of factors which involve known and unknown risks, delays, uncertainties and other factors not under the company's control which may cause actual results, performance or achievements of the company to be materially different from the results, performance or other expectations implied by these forward looking statements.

In any forward-looking statement in which Oncolytics Biotech® Inc. expresses an expectation or belief as to future results, such expectations or beliefs are expressed in good faith and are believed to have a reasonable basis, but there can be no assurance that the statement or expectation or belief will be achieved. These factors include results of current or pending clinical trials, risks associated with intellectual property protection, financial projections, actions by the FDA/HPB/MHRA and those other factors detailed in the company's filings with SEDAR and the Securities and Exchange Commission. Oncolytics does not undertake an obligation to update the forward looking statements, except as required by applicable laws.

Oncolytics At-A-Glance

Clinical-stage biotechnology company developing **pelareorep**, a non-pathogenic proprietary isolate of the unarmed reovirus

- Selectively infects cancer cells following IV administration
- Promotes inflammation in the tumor through innate and adaptive immune responses
- Proven safety and efficacy
- Delivered intravenously - escapes neutralization
- First oncolytic virus to demonstrate overall survival benefit in a randomized study

San Diego, CA, USA

Calgary, AB, Canada

NASDAQ: ONCY

TSX: ONC

Clinical Development Plan: Confirm synergies with checkpoint inhibitors and advance into phase 3 registration study in metastatic breast cancer, while evaluating additional indications

Investment Highlights

Pelareorep

1st in class, safe and well-tolerated, intravenously delivered immuno-oncolytic virus (IOV) that selectively infects cancer cells creating inflammation in the tumor through innate and adaptive immune responses

Clinical Proof of Concept Demonstrated

Statistically significant increase in overall survival in phase 2 randomized metastatic breast cancer study

Identified Biomarker

Predictive and prognostic biomarkers derived from a simple blood draw

Established Cost-Effective Manufacturing

Margins in line with conventional vaccine production

Validating Relationships & Combination Studies

Partnership with **Adlai Nortye** to develop Chinese market and committed relationships and combination studies with:

- **Pfizer/EMD Serono:** BRACELET-1 study with Bavencio® in metastatic breast cancer
- **Roche:** AWARE-1 study with Tecentriq® in early stage breast cancer
- **Merck:** Pancreatic cancer study with Keytruda®
- **Bristol-Myers Squibb:** Multiple myeloma study with Opdivo®

Pelareorep & Competitive Advantages: dsRNA

Other OV's

Intratumoral Delivery

- Specialized delivery
- Variable dose
- Assured delivery to tumor

Armed/Modified Virus

- Customized handling
  (changes to standard of practice)
- Biosafety Level 3

Pelareorep

Intravenous Delivery

- Ease of delivery
- Standard dose
- Accesses both primary and metastatic disease

Unarmed/Unmodified Virus

- No change to standard practice
- Biosafety Level 2

Biomarkers

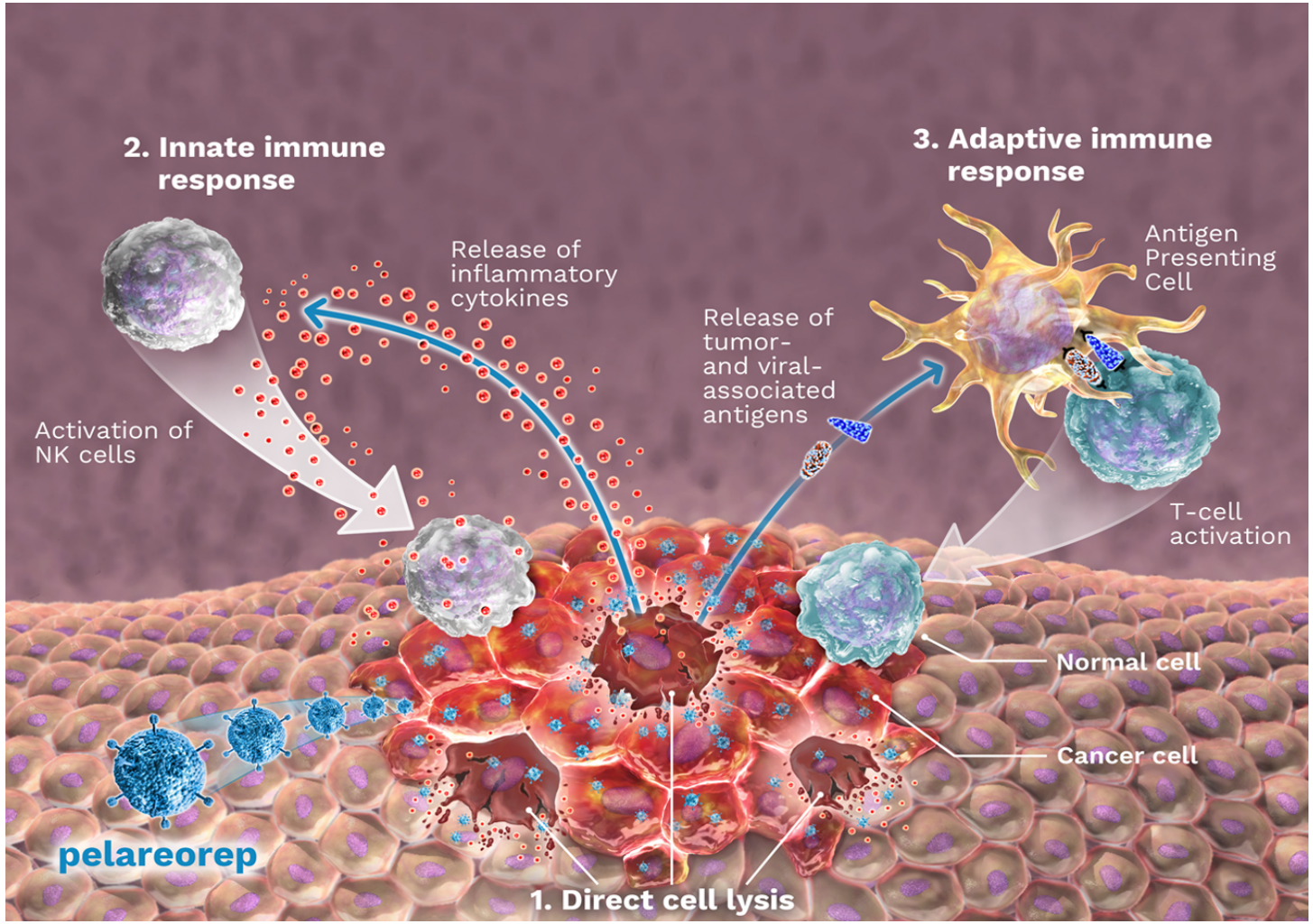
- T cell clonality *(measure by TCR Sequencing)*
- CEACAM6 *(measured by immunostaining)*
- Predictive and prognostic

Pelareorep Mechanism of Action

Synergy with chemotherapies & immunotherapies by promoting:

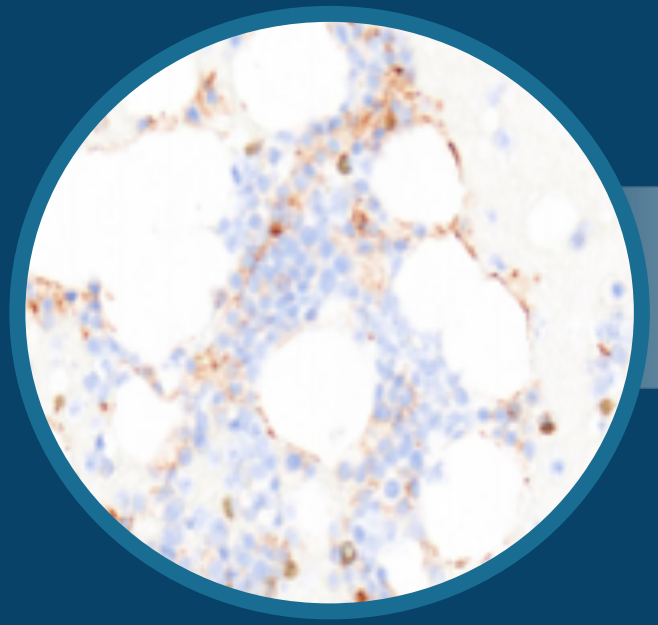
- Selective replication of the virus with accumulation of dsRNA
- Activating natural killer (NK) cells, dendritic cells and T cells
- Recruiting tumor infiltrating lymphocytes

MORE THAN 40
supporting publications



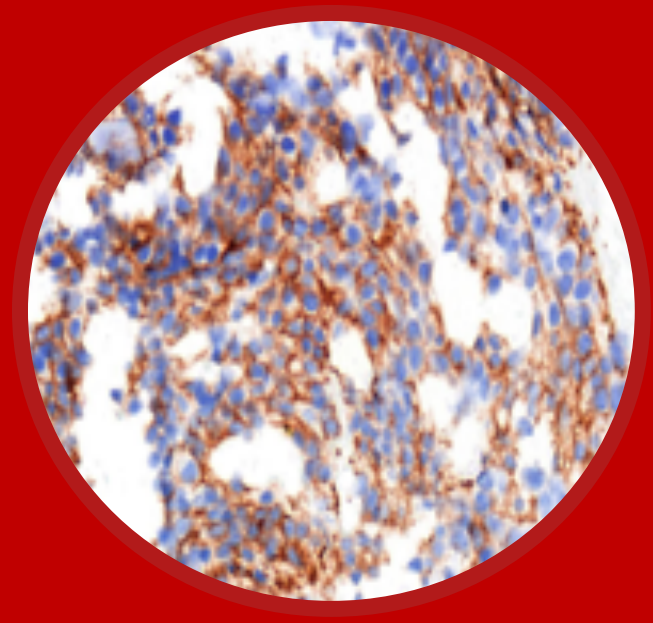
Pelareorep's Promotion of an Inflamed Tumor

Pre-treatment
Lack of PD-L1 staining



7-8 Days

One week after pelareorep + carfilzomib
>90% PD-L1 staining



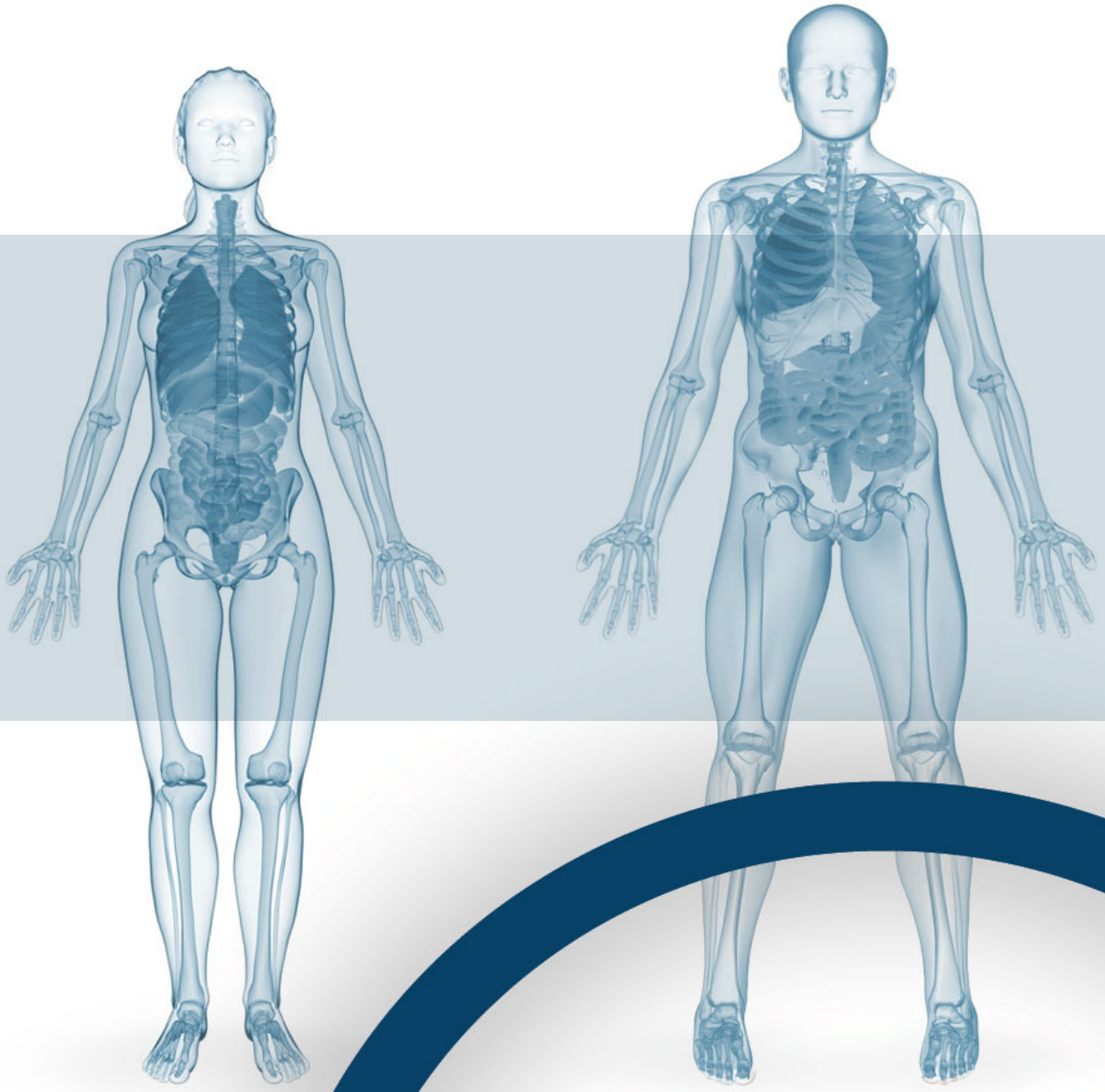
- Statistically significant increase in the number of cytotoxic CD8+ tumor infiltrating lymphocytes
- Decrease in regulatory T cells and an increase in CD8:Treg ratio in the infected tumor
- Robust antitumor immune response

Ongoing Pelareorep Clinical Studies

Programs	Combination	Indication	Preclinical	Phase 1	Phase 2	Phase 3
Breast Cancer						
BRACELET-1	BAVENCIO® avelumab Injection 20 mg/mL	mBC (HR+/HER2-)				
AWARE-1	TECENTRIQ® atezolizumab	Early stage BC	Window of opportunity study			
Gastro-Intestinal Cancer						
NU 18I01	KEYTRUDA® (pembrolizumab)	Pancreatic Cancer				
Multiple Myeloma						
NCI-9603	Kyprolis® (carfilzomib) for Injection	R/R Multiple Myeloma				
WINSHIP 4398-18	Kyprolis® (carfilzomib) for Injection + OPDIVO® (nivolumab)	R/R Multiple Myeloma				

Lead Indication

Breast Cancer



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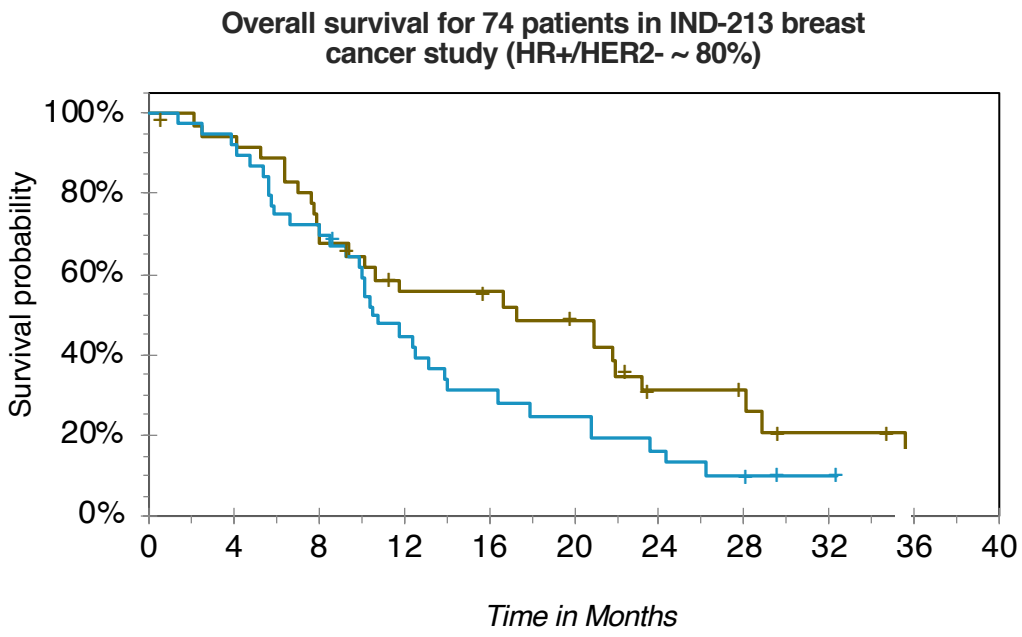
Breast Cancer: Metastatic Breast Cancer

Phase 2 Intent To Treat:
Statistically Significant Improvement in OS

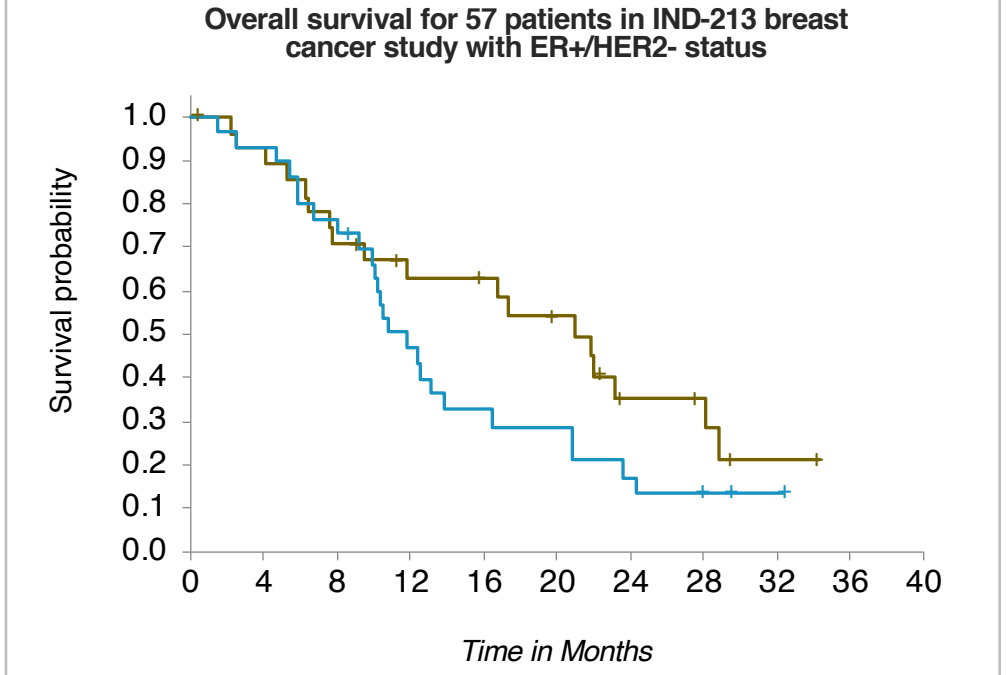


HR	= 0.65
p	0.1 (powered to 90%)
Median OS	= 10.35 vs. 17.35 mths
Test	n=36
Control	n=38

Test Arm
(paclitaxel/pelareorep)

Control Arm
(paclitaxel)

Phase 3 Patient Population:
Nearly doubled OS in HR+/HER2-



HR	= 0.60
p	= 0.1 (powered to 90%)
Median OS	= 10.8 mths vs 21.0 mths
Test	n= 28
Control	n= 29

CCTG: Canadian Cancer Trials Group

Breast Cancer: Metastatic Breast Cancer

Metastatic Breast Cancer (2nd, 3rd & 4th Line)

Statistically significant phase 2 OS data

Regulatory Feedback:

- Favorable FDA End-of-Phase 2 Meeting
- Favorable EMA Final Advice Letter
- Fast Track Designation
- Special Protocol Assessment Agreement

Creating a Successful Registration Strategy:

- **Can positive phase 2 results be enhanced by the addition of a checkpoint inhibitor?**
- **Would a biomarker increase the likelihood of success in phase 3?**

Breast Cancer: Biomarker – T Cell Clonality

Anti PD-L1 alone

T cell repertoire or clonality is a weak biomarker of response

Immune checkpoint inhibitors need existing clones to recognize tumor

Baseline T-cell repertoire

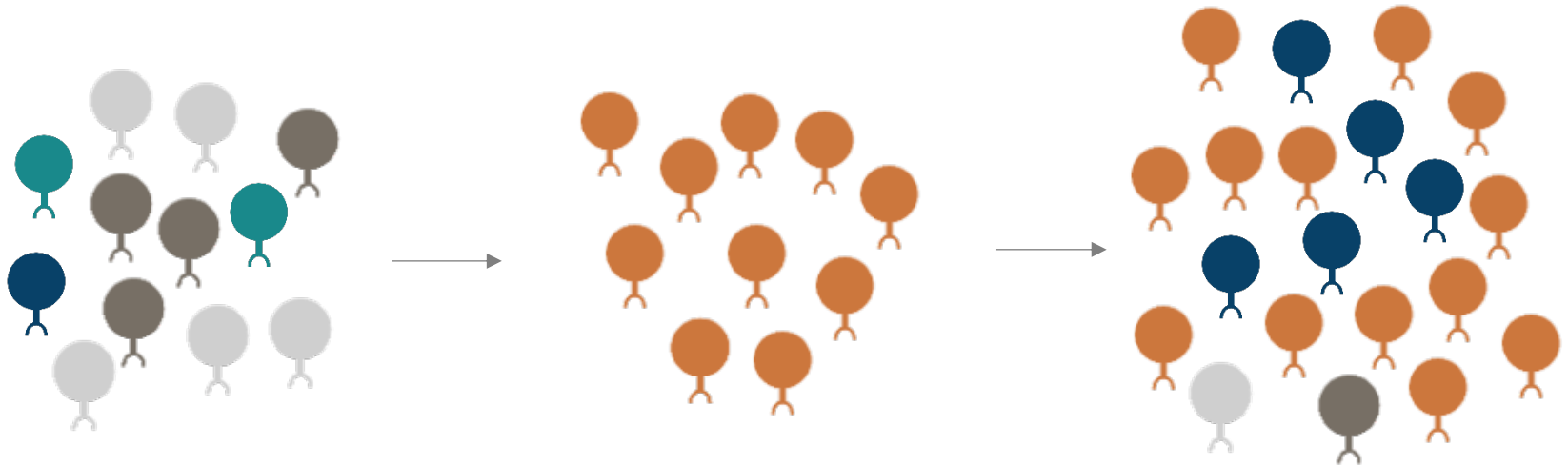
Cancer cell (Neoantigen) recognition and clonal expansion

Resulting T-cell repertoire

Pelareorep + Anti-PD-L1

T cell repertoire or clonality is a **robust** biomarker of response

Pelareorep expands existing clones and creates new reactive clones



Baseline T-cell repertoire

Creation of new viral or tumor neoantigen and clonal expansion

Resulting T-cell repertoire

Breast Cancer: AWARE-1 (early stage breast cancer)

TECENTRIQ® atezolizumab INJECTION FOR INTRAVENOUS USE 1200 mg

SOLTI INNOVATIVE BREAST CANCER RESEARCH

38 patient, randomized, open-label, five-arm, window-of-opportunity study in early stage breast cancer

- Combines with standard of care by breast cancer subtype, plus or minus
- Blood biopsy on day 1, day 3 and day of surgery (21 days)
- First use of clinical supply agreement with Roche

Cohort 1 (n=10) HR+ / HER2-	Pelareorep 4.5 x 10^{10} $TCID_{50}$ (D: 1,2,8,9) Letrozole (D:3)
Cohort 2 (n=10) HR+ / HER2-	Pelareorep 4.5 x 10^{10} $TCID_{50}$ (D: 1,2,8,9) Letrozole, Atezolizumab (D:3)
Cohort 3 (n=6) TNBC	Pelareorep 4.5 x 10^{10} $TCID_{50}$ (D: 1,2,8,9) Atezolizumab (D:3)
Cohort 4 (n=6) HR+ / HER2+	Pelareorep 4.5 x 10^{10} $TCID_{50}$ (D: 1,2,8,9) Trastuzumab, Atezolizumab (D:3)
Cohort 5 (n=6) HR- / HER2+	Pelareorep 4.5 x 10^{10} $TCID_{50}$ (D: 1,2,8,9) Trastuzumab, Atezolizumab (D:3)

Primary Endpoints:

- Overall CelTIL (cellularity and tumor-infiltrating lymphocytes)

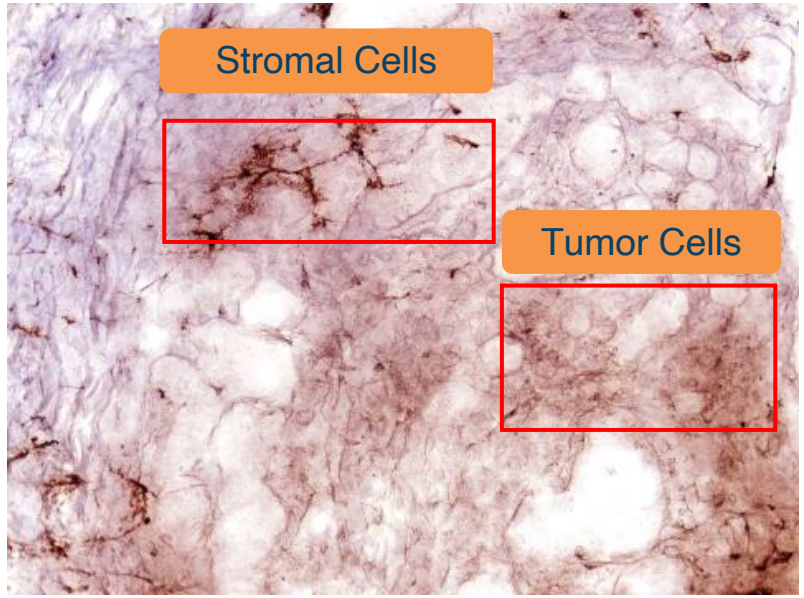
Secondary Endpoints:

- CelTIL by breast cancer subtype
- Safety
- Tumor and blood-based biomarkers

Breast Cancer: AWARE-1 Safety Run-in (single patient example)

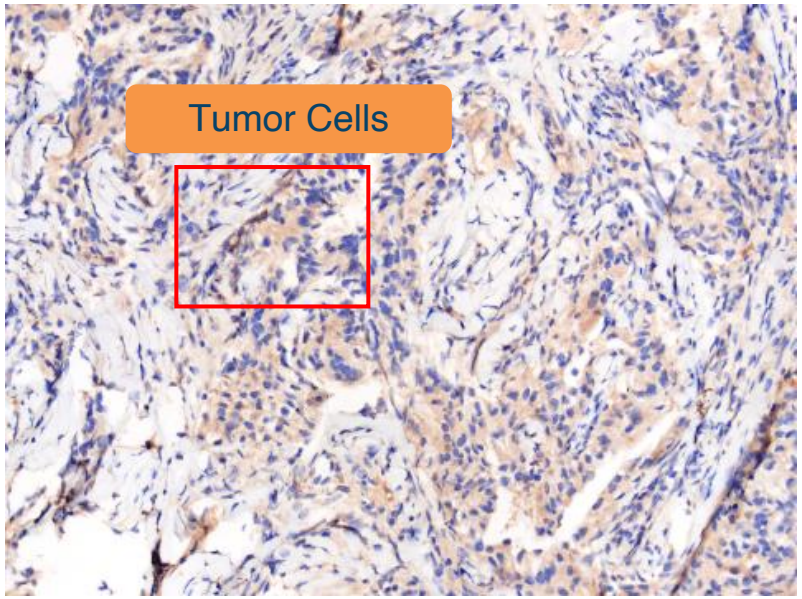
Timepoint	Reoviral RNA (% of tumor cells+)	Reoviral protein (% of tumor cells+)	CD8 (#+ cells/20X)	PD-L1 (#+ cells/20X)	Other
Screening	0	0	42.4 (11.3)	55.4 (13.4)	
Day 3	69.4 (13.1)	61.4 (9.1)	55.2 (8.3)	62.4 (7.9)	Expansion of new T cell clones
Surgery	72.3 (9.8)	64.9 (8.4)	66.7 (7.7)	72.0 (14.0)	Expansion of new T cell clones

Reoviral RNA



brown is +, blue counterstain

Reoviral Protein



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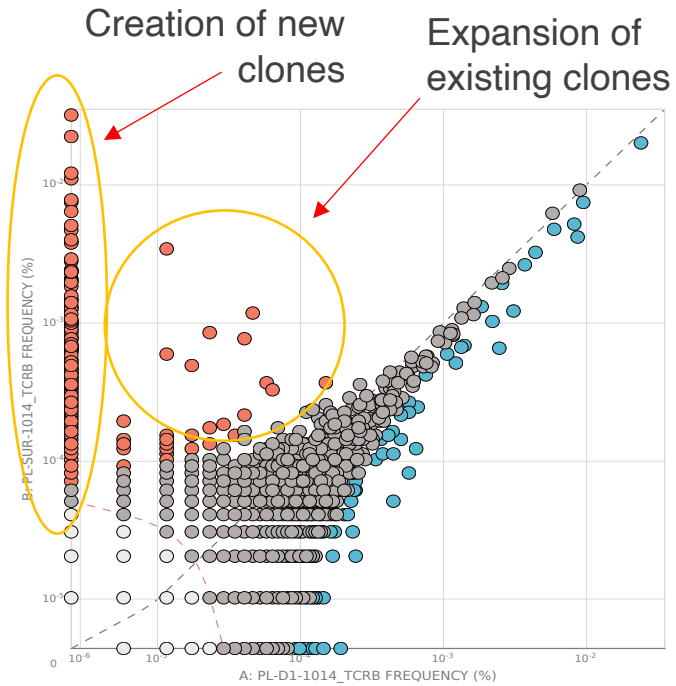
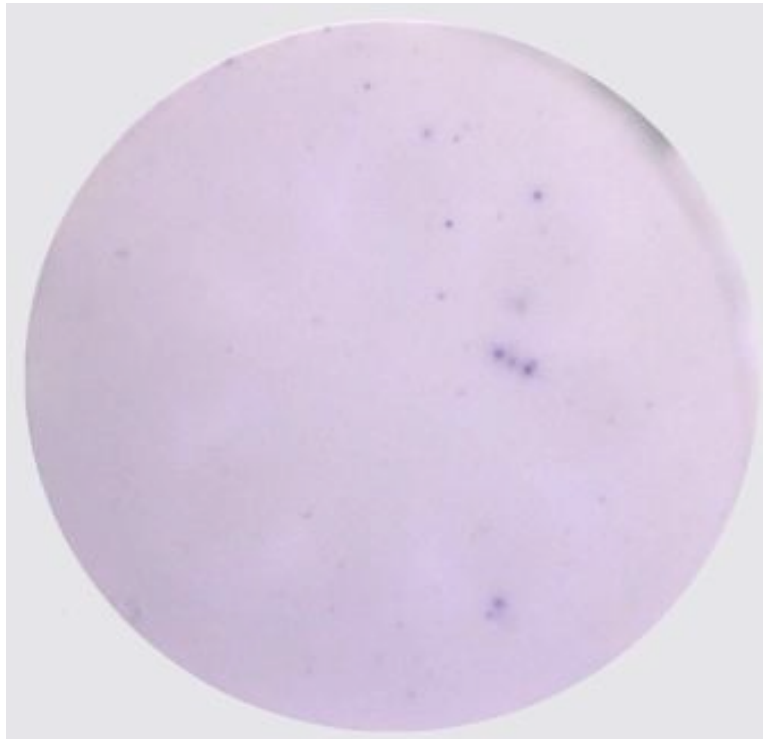


Breast Cancer: AWARE-1 Safety Run-in

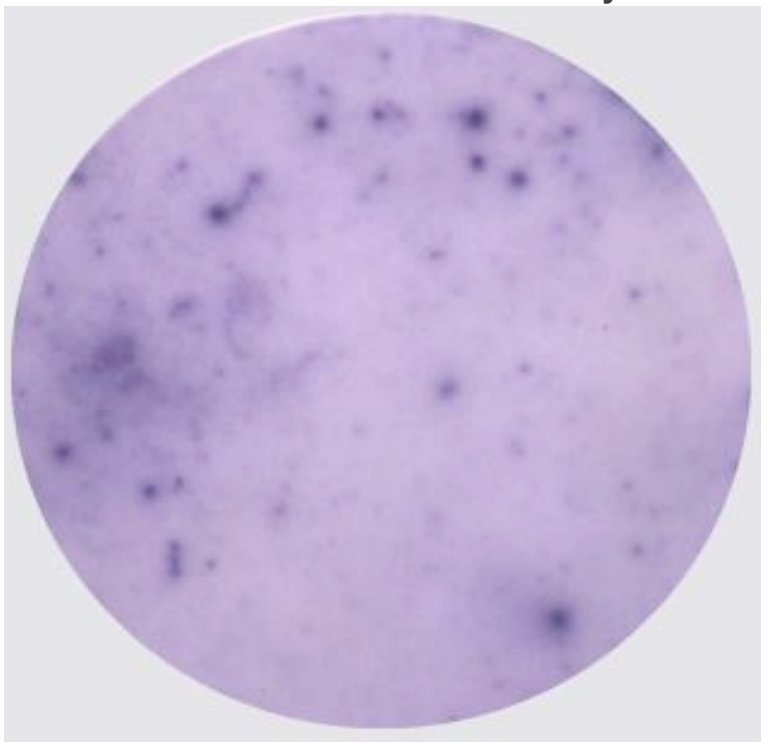
Expanded T cells become reactive toward tumor cells post-treatment

IFN-gamma elispot assay

Immune cells **Day 1** stimulated with tumor cells from Day 21



Immune cells **Day 21** stimulated with tumor cells from Day 21



Breast Cancer: BRACELET-1 (metastatic breast cancer)

48 patient randomized, open-label, three-arm phase 2 study (including 3 patient run-in)

HR+ / HER2-
N = 45

Cohort 1 (n = 15)
paclitaxel (PTX)

Cohort 2 (n = 15)
pelareorep + PTX

Cohort 3 (n = 15)
Bavencio + pelareorep + PTX

Exploratory Endpoints:
- Inflammatory phenotype
- Biomarker
- ORR at 16 weeks
- Safety

Enrollment beginning in Q1 2020

Breast Cancer: Defining the Path Forward

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☑

Final Advice From FDA following EOP2 meeting

- Granted Special Protocol Assessment (SPA)
- Recommended identification of biomarker before phase 3
- Confirmation of a single phase 3 study required for approval

☐

BRACELET-1 & AWARE-1

Confirm biomarker data for phase 3 registration study

Confirm pelareorep is acting as an immunotherapy

- Promotes tumor inflammation
- Increases PD-L1 expression on tumor targets
- Enhances the activity of checkpoint inhibitors

☐

Going Forward Options

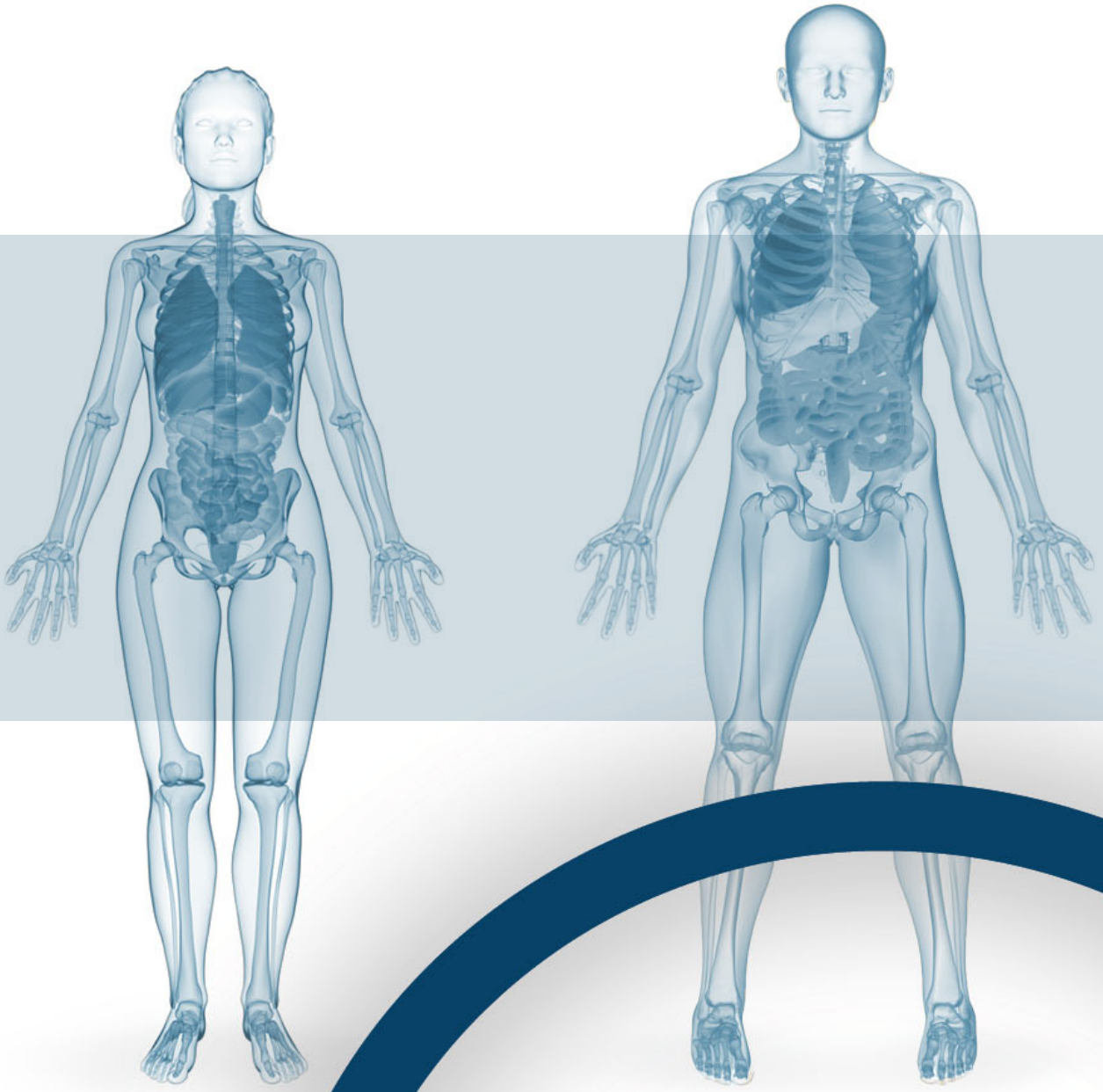
1) Add checkpoint inhibitor arm to existing phase 3 based on BRACELET-1 & AWARE-1 data

2) Advance phase 3 under existing SPA

** Biomarker could reduce phase 3 timelines by 9-12 months*

Further Leveraging Synergies with Established Immunotherapies

Establishing Pelareorep as a Backbone for Immune Directed Therapies



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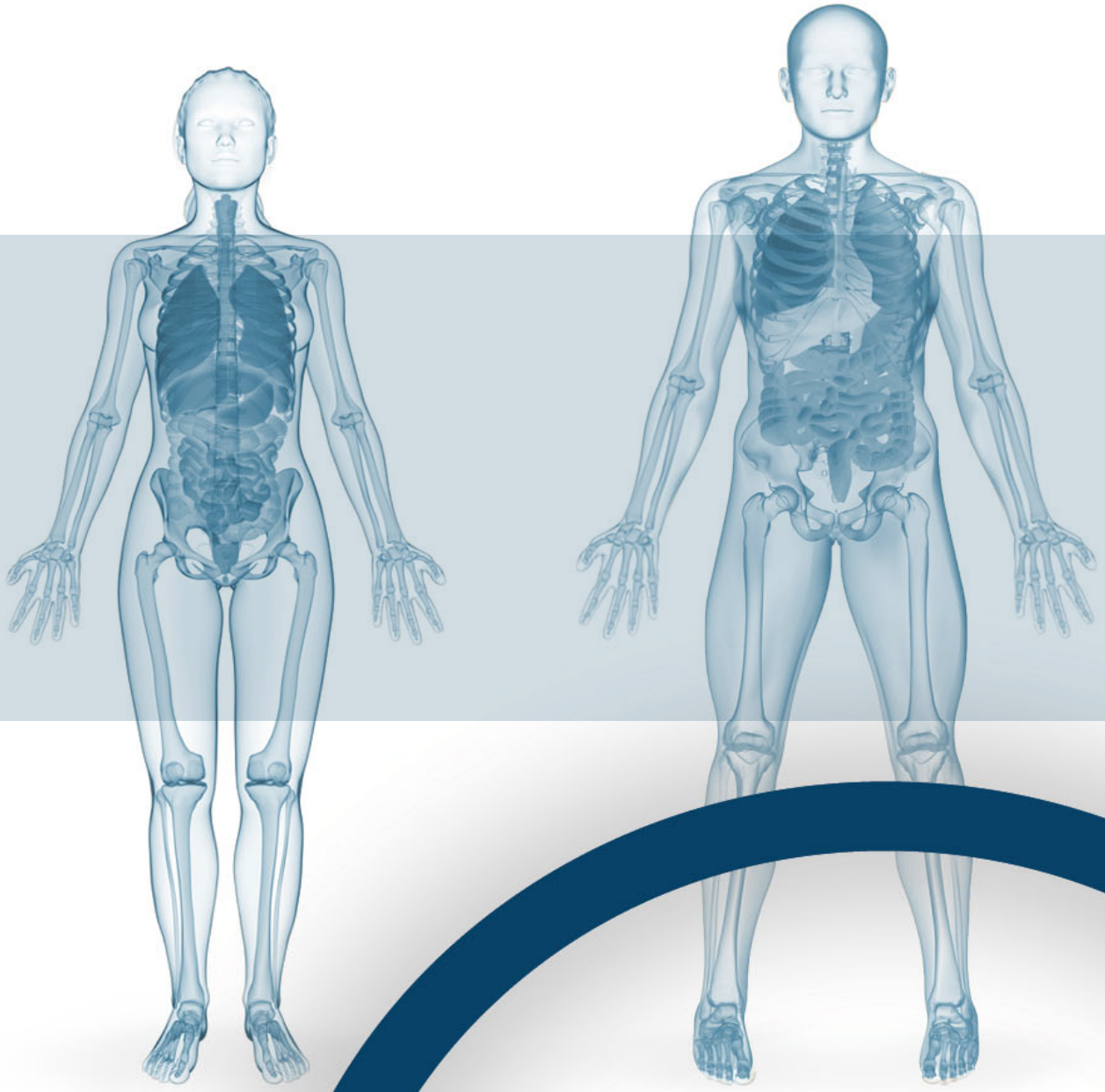
Checkpoint Combination Studies: Inflamed Tumor

	Metastatic Pancreatic Cancer
Collaborators	Northwestern Medicine® Feinberg School of Medicine; MERCK
Combination	pelareorep + KEYTRUDA® (pembrolizumab) Injection 100 mg
Study	Phase 2
Design	Up to 30 patients Primary Endpoint: ○ ORR by iRECIST Secondary Endpoints: ○ Confirmation of blood draw biomarker ○ PFS and mOS
Previous Pancreatic Study	**REO 024: Combination with Keytruda** (plus PI's choice of chemotherapy) • Two patients with SD: 126 and 277 day • One patient with PR lasting 504 days (35 cycles) • On treatment biopsy: infection in cancer cells and immune infiltrates Biomarker correlates with PFS at baseline *(HR=0.05, p=0.01)* Biomarker correlates with OS at baseline *(HR=0.12, p=0.01)* Biomarker correlates with OS after one cycle *(HR=0.08, p=0.01)*

Checkpoint Combination Studies: Inflamed Tumor

	Relapsing Remitting Multiple Myeloma
Collaborators	Bristol-Myers Squibb; EMORY UNIVERSITY
Combination	pelareorep + Kyprolis (carfilzomib) for Injection + OPDIVO (nivolumab)
Study	Phase 1
Design	40 to 50 patients Primary Endpoint: ○ Safety and dosing Secondary Endpoints: ○ Blood based immune biomarker ○ TTP, PFS & OS
Previous Multiple Myeloma Study	100% response rate at the top dose in combination with Kyprolis®

Safety, Manufacturing & Intellectual Property



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Pelareorep and Safety

- 1,100 patients treated, 900+ intravenously
- No maximum tolerated dose (MTD) reached to date

Monotherapy Toxicity Symptoms

- Toxicities have generally been mild (grade 1 or 2) and included chills, fever, headache, cough, myalgia, runny nose, sore throat, fatigue, lymphopenia or neutropenia
- Transient toxicities (grade 3 or 4) also included lymphopenia or neutropenia

Symptoms frequently observed from day 2 of treatment and usually lasted < 6 hours

Established Cost-Effective Contract Manufacturing

- Final formulation produced at 100 liter-scale under cGMP
- > 50,000 standard doses per production run
- Commercial scale manufacturing agreement with SAFC (part of Merck Millipore Sigma)
- When stored frozen, liquid formulation is stable for at least five years (stability testing ongoing)
- Biosafety Level 2 classification requiring no specialized handling requirements
- Cost of Goods (COGS) are in line with those of other products made via vaccine manufacturing process

** Some vials still have pelareorep's former branding: REOLYSIN*

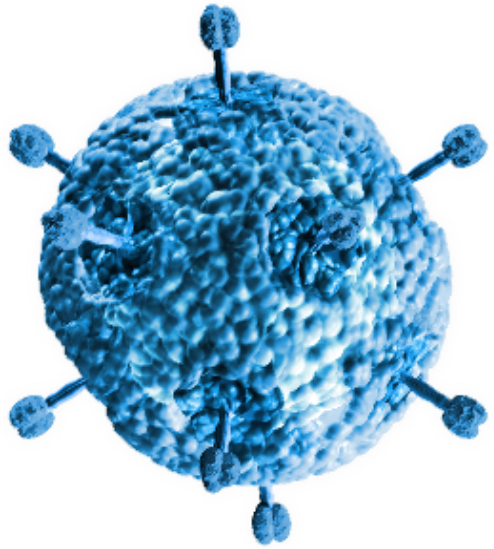
Strong Patent Portfolio

382 patents issued worldwide, including **48** US and **19** Canadian

Over **15** pending applications worldwide

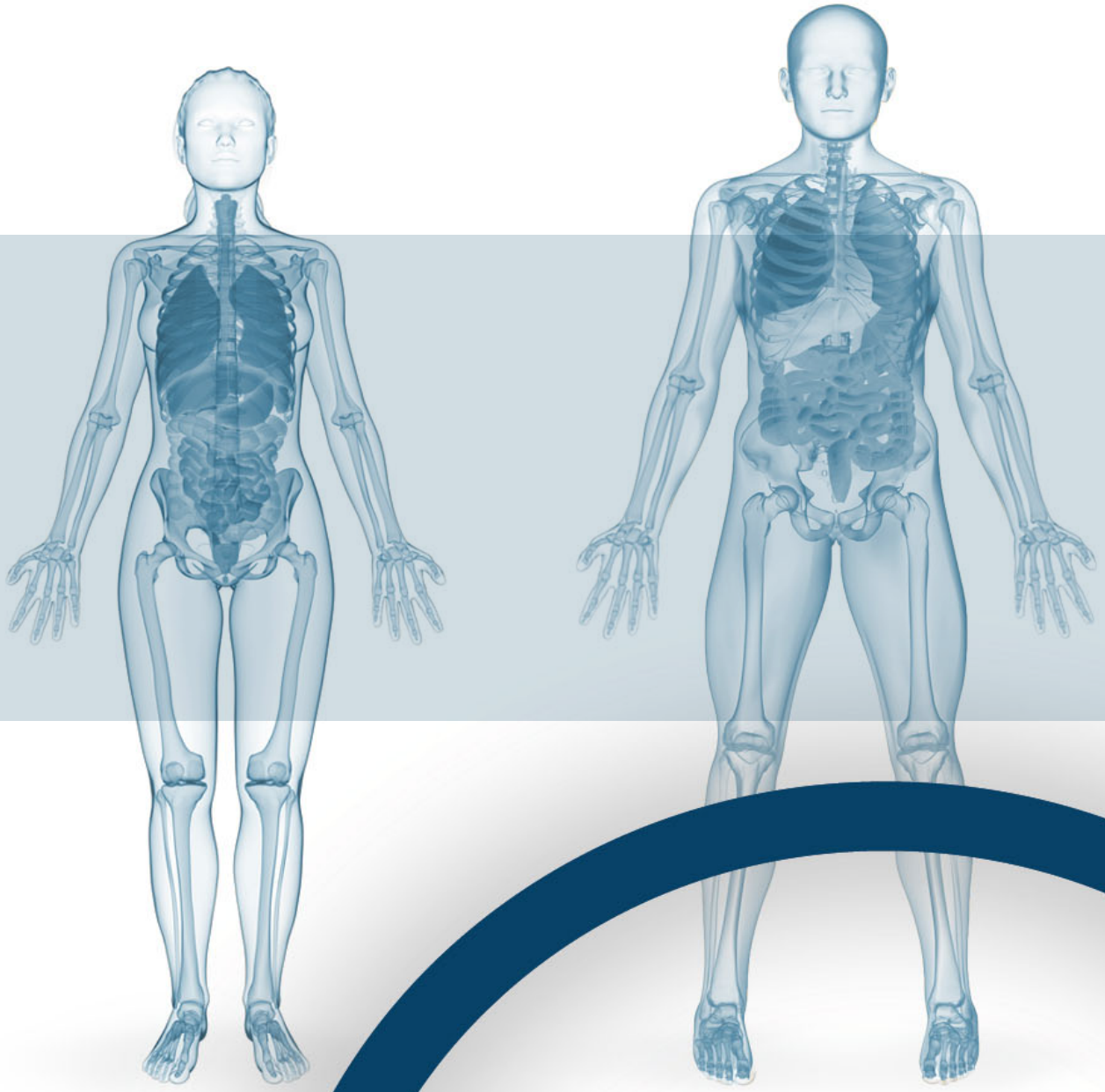
Reovirus issued patent claims cover:

- Compositions of matter comprising reovirus
  - Through 2028 and extendable to 2033
- Pharmaceutical use of reoviruses to treat neoplasia and cellular proliferative diseases
- Combination therapy with radiation, chemotherapy and/or immune-suppressants
- Methods for manufacturing reovirus and screening for susceptibility to reovirus
- Pharmaceutical use of reoviruses in transplantation procedures



As of March 4, 2020

Corporate



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Pharma's Growing Interest in Oncolytic Viruses

Pharma has realized the importance of oncolytic viruses with checkpoint blockade

Transaction	Lead asset	Transaction Value
Amgen acquired Biovex	HSV – phase 3	$425M upfront + up to $575M in milestone payments
Merck acquired Viralytics	Coxsackievirus – phase 1b	$394M
AbbVie partnered Turnstone Biologics	Rhabdovirus isolates – phase 1/2	not disclosed
Bristol-Myers Squibb partnered PsiOxus	Adenovirus – phase 1	$50M upfront + up to $886M in milestone payments + royalties
Merck KGgA partnered Vyriad	Measles phase 1/2	Not disclosed
Boehringer Ingelheim acquired ViraTherapeutics	VSV preclinical	$245M
Jansen acquired BeneVir	Undisclosed – preclinical	$140M upfront + up to $900M in milestone payments
Takeda partnered Turnstone Biologics	RIVAL-01 - preclinical	$120M upfront + up to $900M in milestone payments + royalties

Partnerships and acquisitions were frequently preceded by an active research collaboration between the parties

Business Development Strategy

Objective: Joint Development and Commercialization Partnership

- Support of breast cancer registration study as well as other potential registration opportunities
- Financial and clinical support for other company-sponsored and/or IST studies
- Expansion of indications
- Improved ability to meet timelines while lowering development and manufacturing costs
- Maintain rights in North America in part or in whole
- Out-license ROW rights

Co-Development Study

- Co-development agreement with **Pfizer/EMD Serono** to evaluate Bavencio in 2L mBC

Oncolytics or Investigator Sponsored Trials (IST's)

- 4 ongoing combination studies with **Merck, Roche & Bristol-Myers Squibb**

Monetize Certain Geographies

Successful partnership with Adlai Nortye

- China, Hong Kong, Macau, Singapore, South Korea and Taiwan
- Upfront and milestone payments of up to $86.6M
  - $21M in milestone payments largely under Oncolytics' control, with double-digit royalties
  - $65M tied to potential development expansion

Experienced Leadership

Extensive knowledge of oncology/immunotherapy I Public company experience Strong business development and commercialization expertise

MANAGEMENT

Matt Coffey, PhD, MBA
Co-founder, Director,
President & CEO

Rita Laeufle, MD, PhD
Chief Medical Officer
Genentech, Roche, Novartis

Kirk Look, CA
Chief Financial Officer
EY LLP

Andrew de Guttadauro
Global Head of Business Development
Amgen, Biogen, Takeda

Allison Hagerman, PEng, PMP
VP of Product Development
Visionary Biomedical

Michael Moore
VP of IR & Corporate Communications
Equicom, Atkins + Associates

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Former President, Sanofi Pasteur

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Hospital Clinic of Barcelona
SOLTI - Breast Cancer Research Group

Dr. Padmanee Sharma, MD, PhD
Professor, Department of
Genitourinary Medical Oncology
MD Anderson Cancer Center
KITE, Amgen & BMS IO Network

Market and Capital Data

Exchanges	Nasdaq: ONCY / TSX: ONC
Shares Outstanding (as of March 5, 2020)	37,375,025
Warrants (as of March 5, 2020)	2,269,832
June 2017 financing (CAD $9.025 strike price, expire June 1, 2022)	1,730,894
August 2019 financing (USD $0.90 strike price, expire August 16, 2024)	538,938
Options (as of March 5, 2020)	2,269,151
Restricted/performance share units (as of March 5, 2020)	205,340
Fully Diluted (as of March 5, 2020)	42,119,348
Cash & Cash Equivalents (March 5, 2020)	CDN $29.7 million (USD $22.2 million)*
Equity Research	Canaccord, Echelon, Ladenburg, RBC, Roth Capital

** Based on FX on March 5, 2020*

Catalysts & Milestones Through 2021

Catalyst / Event	Combination With	Timing
AWARE-1 breast cancer study: interim safety data	Roche / Tecentriq®	Q1 2020
Initiate phase 2 BRACELET-1 study in HR+ / HER2- mBC	Pfizer & Merck KGaA / Bavencio®	Q1 2020
AWARE-1 breast cancer study: interim biomarker data	Roche / Tecentriq®	Q2 2020
Phase 1 NCI-9603 multiple myeloma study: interim data (ASCO)*	Kyprolis®	Q2 2020
Phase 2 NU 18I01 second line pancreatic cancer study: interim data (ASCO)*	Merck / Keytruda®	Q2 2020
Phase 2 NU 18I01 second line pancreatic cancer study: final data*	Merck / Keytruda®	2H 2020
AWARE-1 breast cancer study: final biomarker data	Roche / Tecentriq®	2H 2020
Phase 1 WINSHIP 4398-18 multiple myeloma study: interim data (ASH)*	Bristol-Myers Squibb / Opdivo®	Q4 2020
Phase 2 BRACELET-1 metastatic breast cancer study: interim safety update	Pfizer & Merck KGaA / Bavencio®	Q4 2020
Complete enrollment in BRACELET-1 metastatic breast cancer study	Pfizer & Merck KGaA / Bavencio®	Q1 2021
Phase 2 BRACELET-1 metastatic breast cancer study: final data	Pfizer & Merck KGaA / Bavencio®	2H 2021

** Guidance provided by principal investigator*

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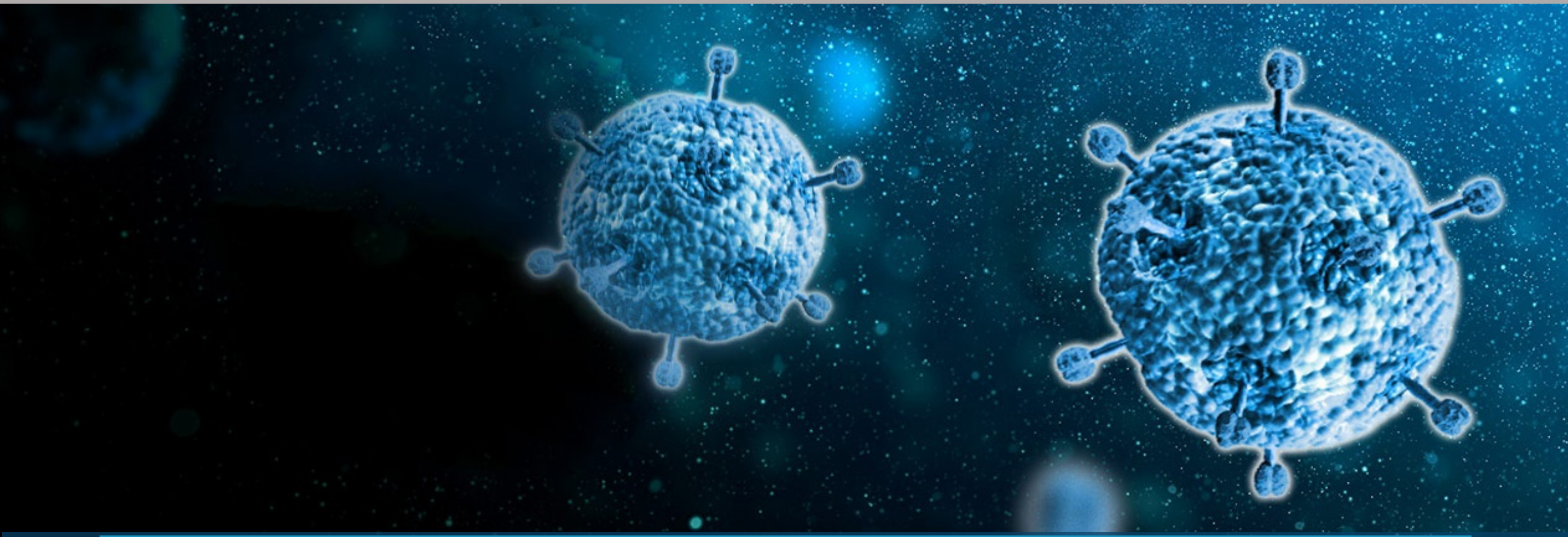

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