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ASX:IMU

MIMOTOPE INDUCED B-CELL ANTIBODIES FOR IMMUNO-ONCOLOGY

Leslie Chong | Chief Executive Officer

2H/2017

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WHAT DOES IMUGENE DO?

Imugene's technology
can induce a patient's body
to make its own specific
antibodies that target cancer.

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EXECUTIVE SUMMARY

- Two novel oncology platforms: B cell mimotope vaccines and small molecule arginine modulator
- Lead mimotope: HER-Vaxx Phase 1b/2 mimotope study in Her-2+ gastric cancer about to commence
  - POC demonstrated in Phase 1 Her-2+ breast cancer study – safety & immunogenecity established
- Mimotope candidate to be identified
- Arginine modulators in pre-clinical development
- Robust IP portfolios
- Outstanding scientific provenance from leading medical institutions & extensively published in peer journals
- Numerous milestone announcements & valuation inflection points over next 12-24 months
- Attractively priced against ASX and international peers
- Experienced management & board

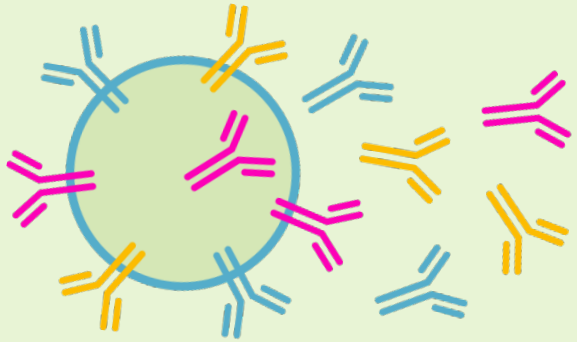
A BETTER WAY TO MAKE ANTIBODIES TO TREAT CANCER?

IN A FACILITY

For example, Roche's Herceptin

VS

USING B CELLS IN YOUR OWN BODY



Teaching B cells to make antibodies using peptide mimotopes

B Cells are cells in the human body that naturally produce millions of antibodies

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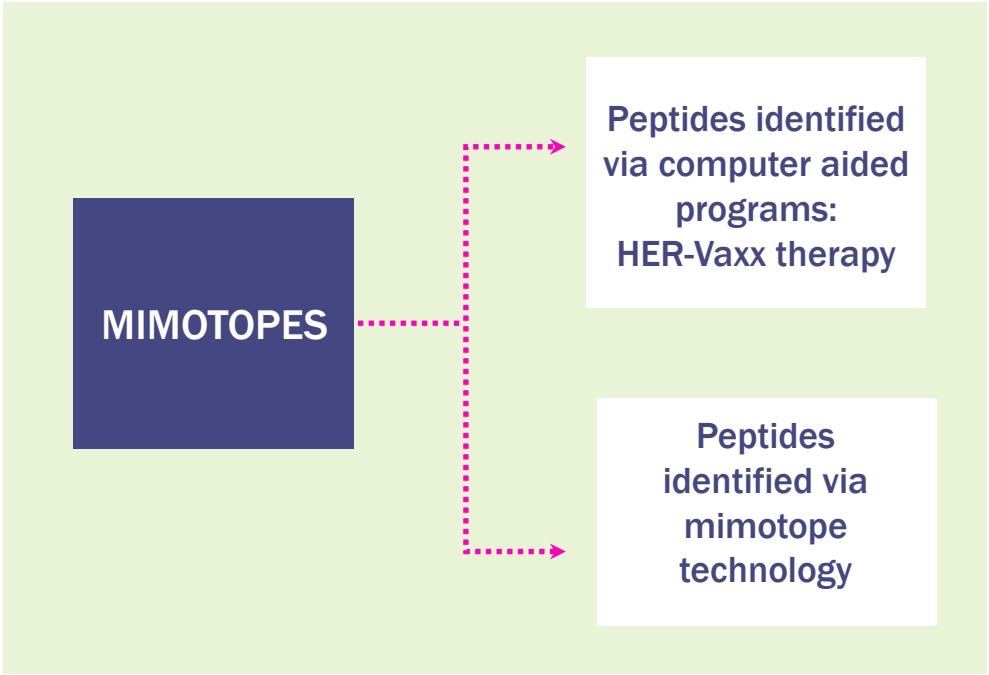
TWO MIMOTOPE PEPTIDE PROGRAMS AND COMMERCIAL OPPORTUNITIES

- A mimotope is a small molecule, often a peptide, which mirrors the structure of an epitope, the specific target an antibody binds to.
- Because of this property, the mimotope induces an antibody response similar to the one elicited by the epitope.
- A mimotope causes your B cells to produce an antibody copy of the antibody you want to “mimic”
- Potential tool for selecting novel vaccine candidates against a variety of tumors
- Technology can be used to copy any approved antibody on the market today



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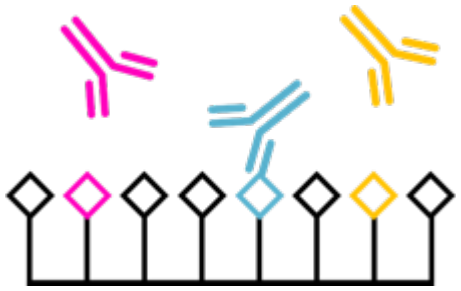
MIMOTOPE: PLATFORM TECHNOLOGY

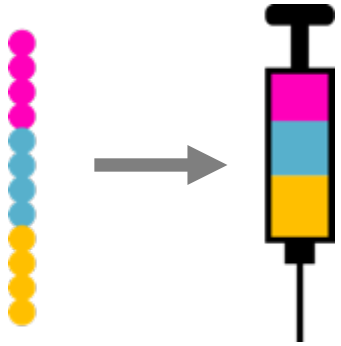
SELECTION OF MIMOTOPES

A library of mimotopes can be interrogated with any monoclonal antibody to identify the mimotopes to which it binds



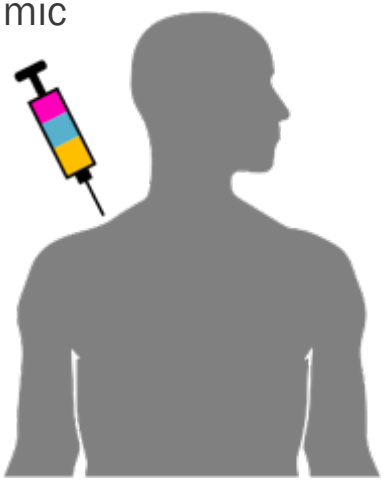
CREATION OF A VACCINE

The selected mimotope or mimotopes can be used in isolation or combination to create a B-cell peptide therapy with the appropriate carrier system and adjuvant.



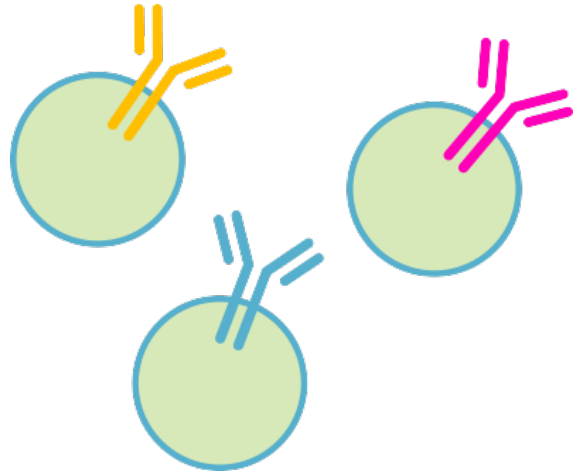
IMMUNIZATION

Immunization with the peptide will lead to the patients B-cells producing copies of the Ab you want to mimic



ENDOGENOUS AB PRODUCTION

Successful delivery will result in endogenous Ab production with associated immune memory



The mimotope platform has the potential to be part of the next wave of immuno-oncology products. It makes multi-level therapies against a combination of targets achievable.

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ADVANTAGES OF MIMOTOPE INDUCED B-CELL BASED ANTIBODIES V. SYNTHETIC ANTIBODIES

Issue	Natural B Cell Derived Antibodies	Monoclonal Antibodies
Safety	Stimulates the immune system to produce natural Abs, potentially safer, as demonstrated by HER-Vaxx	Synthetic Ab, with side effects (including ventricular dysfunction, CHF, anaphylaxis, immune mediation)
Efficacy	Polyclonal Ab response reduces risk of resistance and potentially increases efficacy	Monoclonal Ab - single shot
Durability	Antibodies continuously produced a lasting immune response to inhibit tumor recurrence	Half life up to 12 days sometimes less
Usability	Potentially low numbers of vaccinations required per year	Requires regular infusion
Cost	Low cost of production enables greater pricing flexibility facilitating combinations and opening up additional markets	Expensive course of treatment >USD100K per year in the US

B-Cell Vaccines offer a unique opportunity to intervene at multiple points in the immune system and create immune memory which enhances durability of response.

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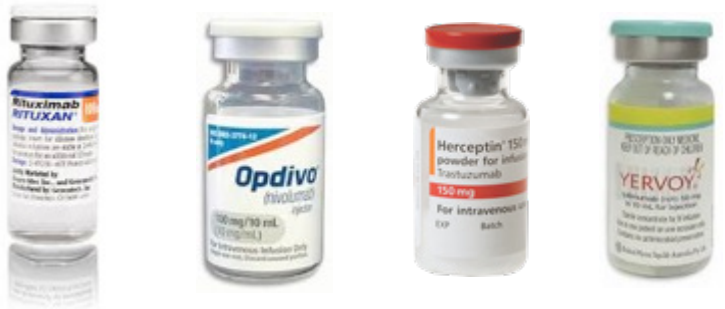
THE MONOCLONAL ANTIBODY (mAb) MARKET

- Multiple antibody therapies are approved to treat cancer, for example:

Sales in 2016

- **Herceptin:** >US$6.7 billion
- **Perjeta:** >US$1.8 billion
- **Rituxan:** >US$7.3 billion
- **YERVOY®:** >US$1.0 billion
- **OPDIVO®:** >US$3.7 billion
- **KEYTRUDA:** >US$1.4 billion



Total monoclonal antibody market is currently at US$60 billion

- <u>All of these antibodies are manufactured in a factory.</u>

- Instead of infusing patients with antibodies synthesized in a factory, what if we can induce the patient's own B-cells to make similar cancer-fighting antibodies using Imugene's mimotope technology?

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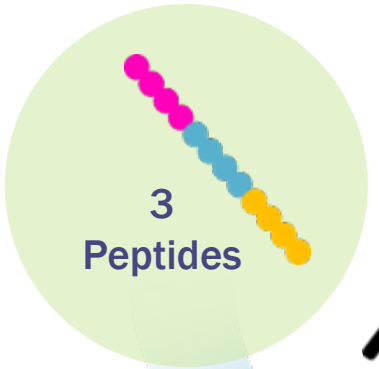
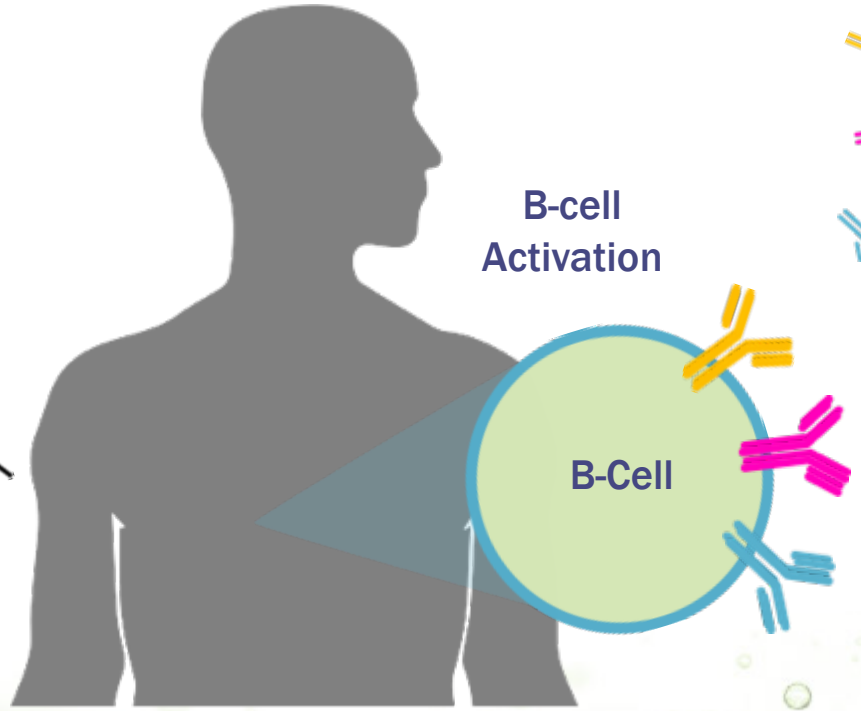
HER-Vaxx MIMOTOPE: MECHANISM OF ACTION

Peptides
"mimic" the epitope



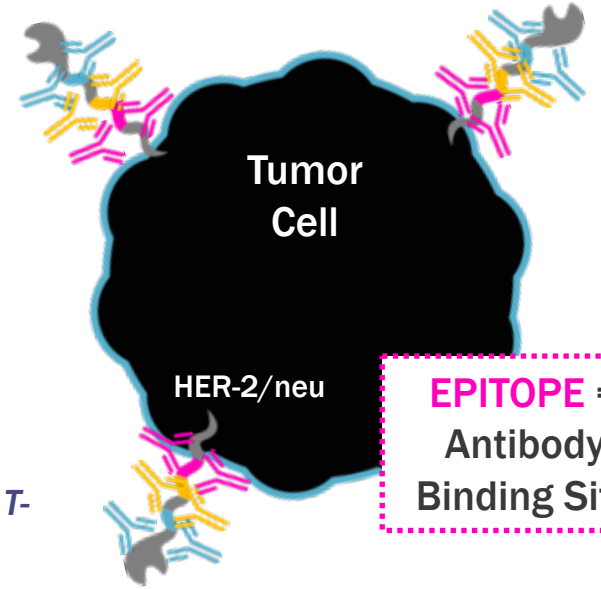
HER-Vaxx Immunotherapy



B-cell Activation

HER-Vaxx Antibody Secretion

Via helper T-cells



EPITOPE = Antibody Binding Site

HER-Vaxx attacks the same target as the the world's largest selling breast cancer drug Herceptin

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HER-VAXX IS A Phase 1b/2 STAGE MIMOTOPE PEPTIDE THERAPY BEING DEVELOPED FOR HER2+ GASTRIC CANCER

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PHASE 1 IN BREAST CANCER, COMPLETED AT MEDICAL UNIVERSITY OF VIENNA- SINGLE AGENT, NO CHEMO

DESIGN

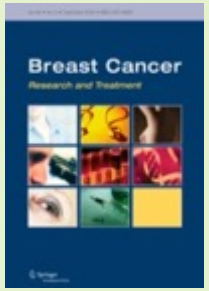
- 10 patients
- All late stage breast cancer patients
- HER-2 +/++
- Life expectancy > 4 months
- Conducted at Medical University of Vienna

RESULTS

- Patients developed anti-HER-2 antibodies
- Induction of cytokines (Th1 biased; IFNγ)
- Induction of memory T & B cells post vaccination
- Reduction in T reg cells post vaccination, indicating strong vaccine response
- Antibodies induced displayed potent anti-tumor activity
- Promising results - Patients were end stage and not primary target group
- Reviewed in peer publication

CLINICAL ENDPOINTS

1. **Safety and Tolerability**
2. **Immunogenicity: antibodies and cellular responses**



* Wiedermann et. al., Breast Cancer Res Treat. 2010 Feb;119(3):673-83.

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HER-VAXX HAS BEEN OPTIMISED SINCE PHASE 1A BREAST CANCER STUDY

1st Generation

- Three separate B Cell epitopes delivered in virosomes (used in Phase 1a).

2nd Generation

- Incorporated the three B Cell epitopes into a single 49-mer peptide
- > 2x increase in antibody response in vivo compared to three single epitopes (extended patent life to 2030)

Ph1b/2 Formulation

3rd Generation

- Changed the delivery system from virosomes to CRM197 (which gave CD4 T-Helper response), and added a montanide adjuvant
- >20x increase in antibody response in vivo (potentially extends patent life to 2036)

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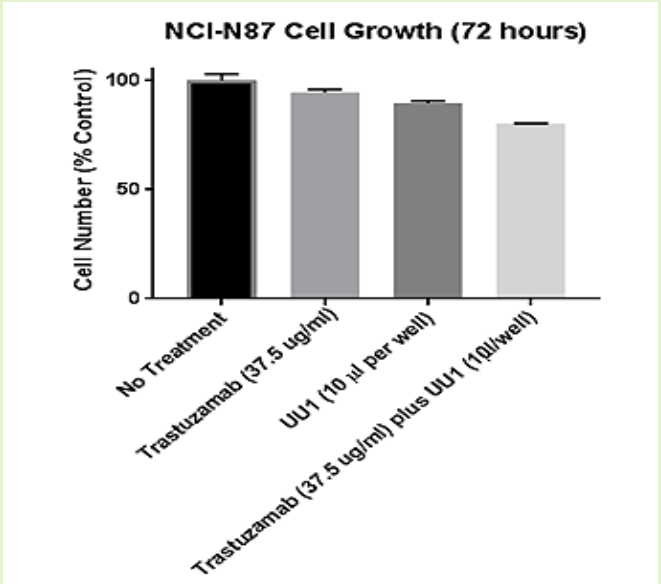
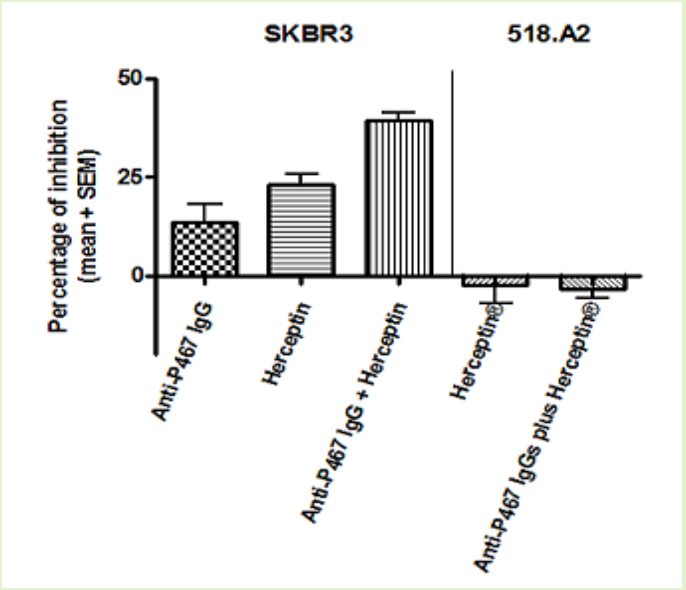
HER-VAXX INHIBITS HER-2 EXPRESSING CELLS

- HER-Vaxx antibodies demonstrate anti-tumour effect by inhibiting HER-2+ gastric and breast cancer cell lines
- Combination with Herceptin shows significantly higher inhibition than Herceptin alone.



HER-2+ gastric cancer cells*



HER-2+ breast cancer cells

*BMC Cancer2017, Wiedermann Feb. 2017

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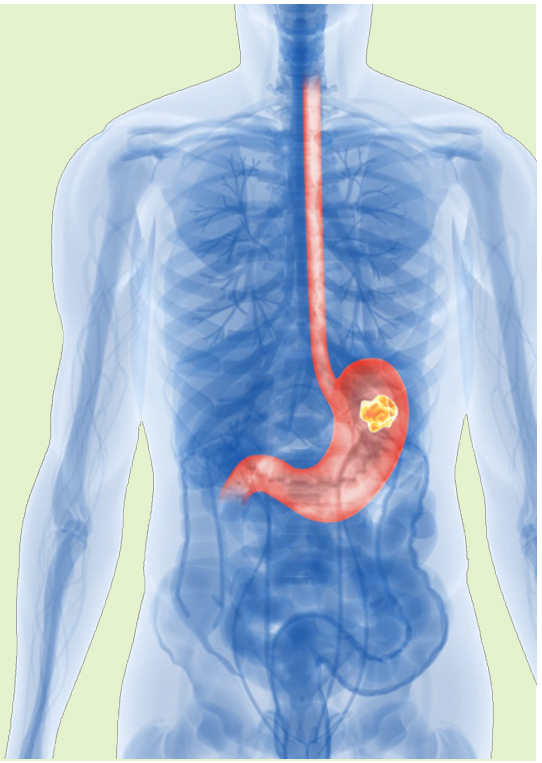
PHASE 1B/2, IN GASTRIC CANCER

Phase 1b lead-in

- Open label
- ~Up to 18 patients in 3 cohorts of up to 6 pts per cohort
- Combination with chemo/cisplatin
- Endpoints:
  - Recommended Phase 2 Dose of HER-Vaxx
  - Safety: any HER-Vaxx toxicity
  - Immunogenicity (anti-HER-2 antibody titres)

Phase 2

- Open label
- ~68 patients from sites in Asia
- Combination with chemo
- Randomized
- Primary Endpoints:
  - Overall Survival
  - Progression-Free Survival
- Secondary endpoint:
  - Immune response



2H, 2017 : Patients Enrolled

2H, 2017: Early Patient Data Available

2H, 2017: Interim Ph1b Patient Data Available

1H, 2018: Final Ph1b Patient Data Available

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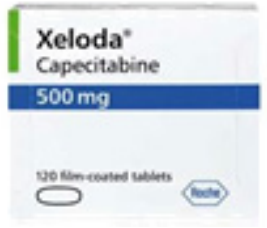
GASTRIC MARKET OPPORTUNITY

- Asia is the largest market for gastric cancer globally
- Gastric cancer is the second leading cause of cancer mortality in the world & its management, especially in advanced stages, has evolved relatively little
- ~20% patients with metastatic gastric cancer are HER-2 positive
- Surgery, chemotherapy, radiation & Herceptin are the key treatments
- In many countries, particularly Asia, chemotherapy such as capecitibine and 5-FU, is the standard of care, not Herceptin



Chemotherapy

Monoclonal antibody

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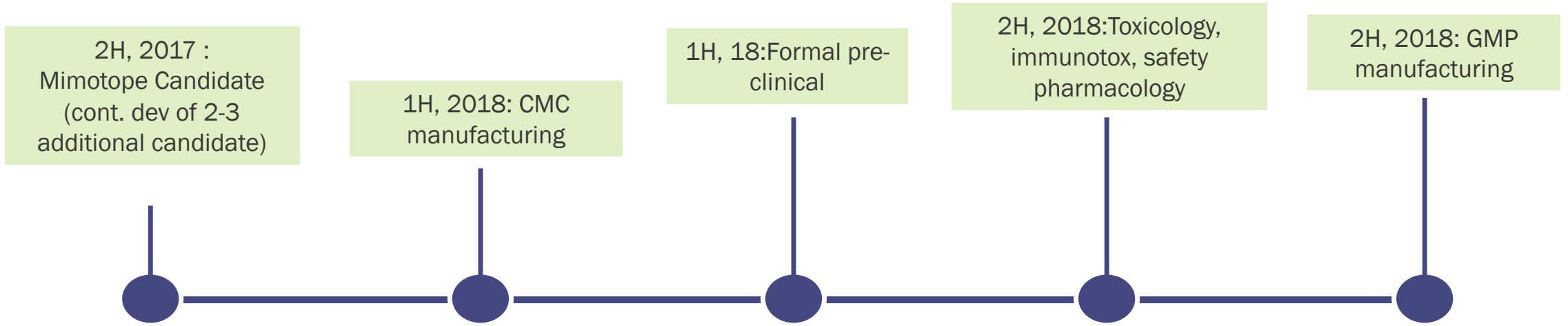
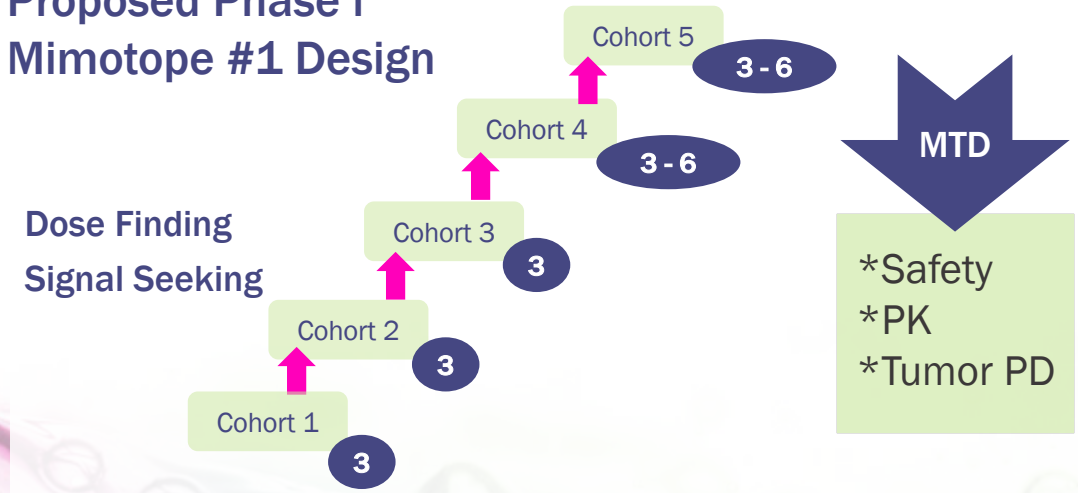
MIMOTOPE B-CELL PEPTIDE THERAPY

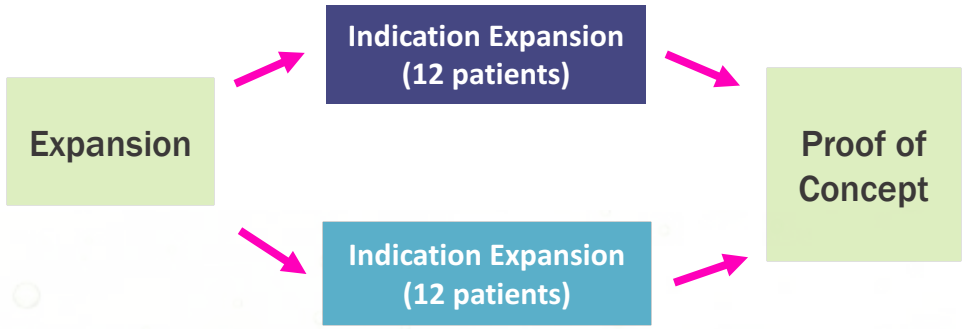
MIMOTOPE PROPOSED DEVELOPMENT PATH 2017-2018



Proposed Phase I Mimotope #1 Design



Expansions Assumption



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ARGININE MODULATORS

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SECONDARY TECHNOLOGY PLATFORM
FIRST-IN-CLASS SMALL MOLECULE ARGININE MODULATORS – A12

- Arginine is a critical amino acid for the health of cancer fighting T-cells and depletion of it limits the effectiveness of T-cells to fight tumors
- IMU's A12 molecule increase the availability of arginine in the cellular environment
- Proof of concept for A12 could be established as early as 2H 2017.
- New patent filed in the field of cancer and I-O, including combination with checkpoint inhibitors
- Commercially validated by Incyte's I-O deal with Calithera's Phase 1 arginine inhibitor CB-1158

Incyte

CALITHERA BIOSCIENCES

DEAL TERMS

- Worldwide rights for heme & oncology
- $45m up-front & $8m equity investment
- $420 million
- Co-fund development of CB-1158

ARGININE PROPOSED DEVELOPMENT PATH 2017-2018

Given that Arginine is a critical amino acid for the health of cancer fighting T-cells:

2017

- In vitro effect of lead compound on human PBMC's will readout T-cell cytokine changes
- Flow cytometry – ex-vivo analysis of CD4+T cell proliferation and INF-γ. Will help elucidate key MOA
- Anti-tumour activity in 12 syngeneic mouse models
- Non-GLP PK and ADME assays

2018

- Formal preclinical Tox/safety pharmacology
- GMP manufacture – CMC
- IND application

Syngeneic mouse models

Cell line	Cancer Type
H22	Liver
MC38	Colon
EMT-6	Breast
Pan02	Pancreatic
CT26	Colon
B16F10	Melanoma
A20	Lymphoma
LL/2	Lung
B16BL6	Melanoma
RM-1	Prostate
Renca	kidney
MBT2	Bladder

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A TEAM WITH TRACK RECORD IN DRUG DEVELOPMENT

Leslie Chong

Chief Executive Officer

- Over 19 years of oncology experience in Phase I - III of clinical program development
- Leadership role involvement in 2 marketed oncology products
- Previously Senior Clinical Program Lead at Genentech, Inc., in San Francisco

Dr Axel Hoos

Non-Executive Director

- Currently Vice President Oncology R&D at GlaxoSmithKline
- Previously Clinical Lead on Ipilumimab at Bristol-Myers Squibb
- Co-Director of the think-tank Cancer Immunotherapy Consortium

Paul Hopper

Executive Chairman

- International & ASX biotech capital markets experience particularly in immuno-oncology & vaccines
- Chairman of Viralytics, Founder & Director of Prescient, Founder of Imugene & Polynoma LLC, former Director pSivida, Somnomed & Fibrocell Science

Prof Ursula Wiedermann

Chief Scientific Officer

- Co-inventor of Her-Vaxx;
- Professor of Vaccinology at Medical University of Vienna

Dr Nick Ede

Chief Technology Officer

- Over 25 years peptide vaccine and drug development
- Former CEO Adistem, CEO Mimotopes
- VP Chemistry Chiron (now Novartis), Research Fellow CRC Vaccine Technology

Dr Anthony Good

Clinical Program Manager

- Over 15 years oncology & immunology experience. Active in the development of Viagra, Revatio, Lipitor, Selzentry and Somavert.
- Ex Pfizer Global Research and Development

BUSINESS STRATEGY AND PARTNERING OPPORTUNITIES

2018

Phase 1b
Gastric Study

2018-2019

Phase 1b
Mimotope +
others

2018-2020

Big Pharma
and/or biotech?

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FINANCIAL SUMMARY

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Market Cap (14/Jul/17)	$33.1M AUD, $25.7M USD
Ordinary Shares	2.365 billion
12 month price range	0.7 cents – 2.1 cents AUD
Avg daily volume	2M shares (April-June 2017)
Investment to Date	~$15.2 m (public) ~$ 5.5 m (VC)
Cash & Equivalents	$5.7M as of April 2017

Top 5 shareholders (as at May. 2017)

	No. of Shares	% Capital
Platinum Asset Management	240,227,753	10.16%
National Nominees Limited	95,548,708	4.04%
Webinvest Pty Ltd	90,000,000	3.81%
Paul Hopper Executive Chairman	66,424,732	2.81%
Tisia Nominees	65,899,999	2.79%

Options on issue (as at May. 2017)

	No of options	Exercise Price	Expires
Unlisted	49,000,000	$0.015*	Various dates (Nov 2017 to Sep 2020)

* Average

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36 MONTH TARGETS AND INVESTOR DELIVERABLES

HER-VAXX

Definitive clinical data package from a Phase 1b and Phase 2 trial in gastric cancer

+

MIMOTOPES

3-4 mimotope candidates. Move at least two mimotope candidates from pre-clinical to IND enabled and to complete one mimotope in a Phase 1 clinical trial

+

ARGININE MODULATORS

Candidate selection Develop at least one to pre-clinical proof of concept

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IMUGENE PIPELINE

PROGRAM	MIMOTOPE IDENTIFICATION	IMMUNE CHARACTERIZATION	ID OF CANDIDATE	PRE-IND WORK	CLINICAL DEVELOPMENT
HER-Vaxx					
HER-Vaxx /Her2 Combo					
*Mimotope #2					
*Mimotope #3					
Her2 / *Mimotope Combo					
Combo #3?	TBD				

	DISCOVERY	ID OF CANDIDATE	PRE-IND WORK
Arginine Modulator			

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- Mimotope candidate to be identified
- Arginine modulators in pre-clinical development
- Robust IP portfolios
- Outstanding scientific provenance from leading medical institutions & extensively published in peer journals
- Numerous milestone announcements & valuation inflection points over next 12-24 months
- Attractively priced against ASX and international peers
- Experienced management & board

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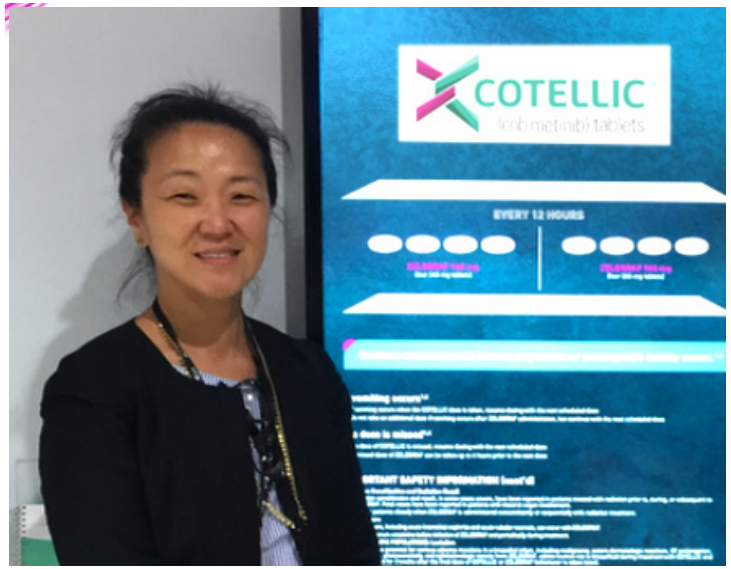
APPENDIX

SR. TEAM MEMBER ON MARKETED ONCOLOGY DRUGS



ZELBORAF® (vemurafenib) tablets

CABOMETYX™ (cabozantinib) tablets
60 mg | 40 mg | 20 mg

TECENTRIQ® atezolizumab INJECTION FOR INTRAVENOUS USE 1200 mg

HERCEPTIN ® (TRASTUZUMAB) MILD TREATMENT RELATED SIDE EFFECTS

- Diarrhea
- Redness or irritation at injection (IV) site
- Muscle/joint/back pain
- Stomach or abdominal pain
- Headache
- Sleep problems (insomnia)
- Nausea and vomiting (may be severe)
- Weight loss

HERCEPTIN ® (TRASTUZUMAB)

SERIOUS TREATMENT RELATED SIDE EFFECTS – BLACK BOX WARNING1

- CARDIOMYOPATHY: Herceptin can result in sub-clinical and clinical cardiac failure manifesting as CHF (congestive heart failure), and decreased LVEF (left ventricular ejection fraction).
- INFUSION REACTIONS: PULMONARY TOXICITY: Herceptin administration can result in serious and fatal infusion reactions and pulmonary toxicity.
- Anaphylaxis, angioedema, interstitial pneumonitis, or acute respiratory distress syndrome.

1. Herceptin Product Label – full prescribing information

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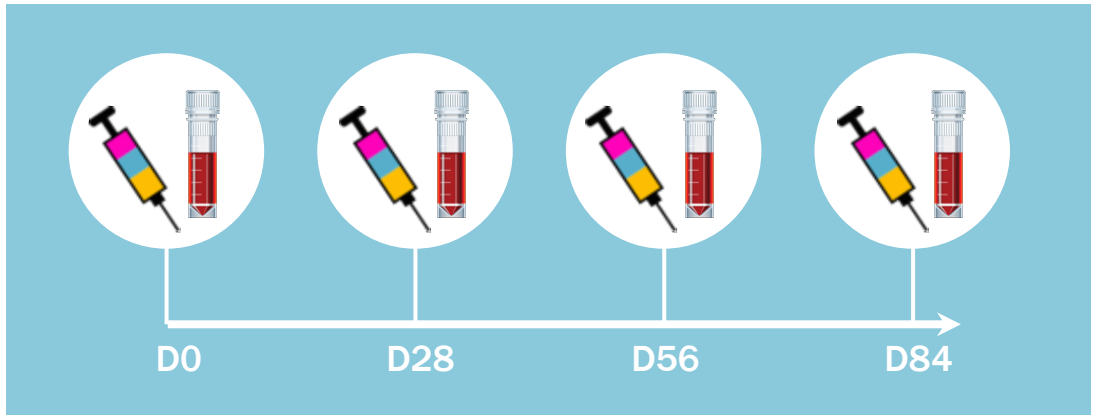
PHASE IA STUDY DESIGN*

ADMINISTRATION & READOUT SCHEDULE



Vaccination with 10µg of each peptide antigen

Blood draw

Patient inclusion criteria

- Metastatic breast cancer
- HER2 +, ++
- ER/PR pos.
- Life expectance > 4 mo

Primary endpoint

- Safety & Tolerability

Secondary endpoint

- Immunogenicity
  - Specific antibodies
  - Cellular responses

* Breast Cancer Res Treat. 2010 Feb;119(3):673-83.

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PATIENT CHARACTERISTICS – AGES 55-84 *

Patient ID	Age	Metastatic disease since	Prior chemotherapy	Current antihormonal therapy
1	55	Oct. 2006	no	Anastrozol
2	66	May 2004	yes (1 adj)	Fulvestrant
3	84	Mar. 1999	no	Anastrozol
4	79	Sept. 2003	no	Anastrozol
5	67	Apr. 2004	no	Fulvestrant
6	69	Sept. 2004	no	Anastrozol
7	60	Aug. 2002	yes (3 met)	Fulvestrant
8	76	Apr. 1999	no	Fulvestrant
9	63	Jun. 2006	yes (1 met)	Exemestan
10	70	Apr. 2008	No	Anastrozol

* Breast Cancer Res Treat. 2010 Feb;119(3):673-83.

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SAFETY AND TOLERABILITY – FEW GRADE 1 LOCAL REACTIONS, NONE SYSTEMIC*

Patient ID	Local vaccination reaction grade	Systemic grade 3/4 toxicity
1	1	no
2	0	no
3	0	no
4	1	no
5	1	no
6	0	no
7	0	no
8	0	no
9	1	no
10	0	no

* Breast Cancer Res Treat. 2010 Feb;119(3):673-83.

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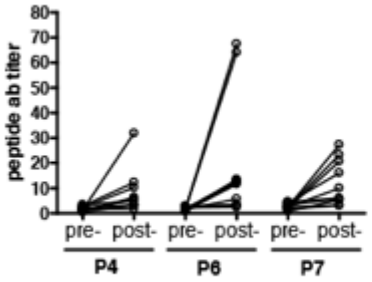
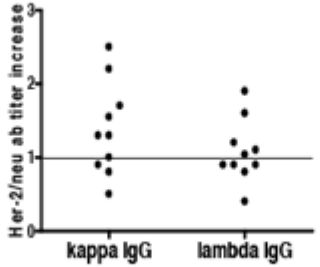
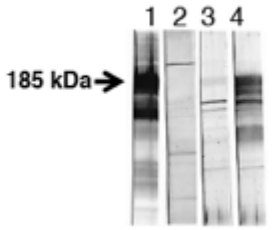
PHASE 1 SECONDARY ENDPOINT – IMMUNOLOGIC RESPONSES

ANTIBODY RESPONSES

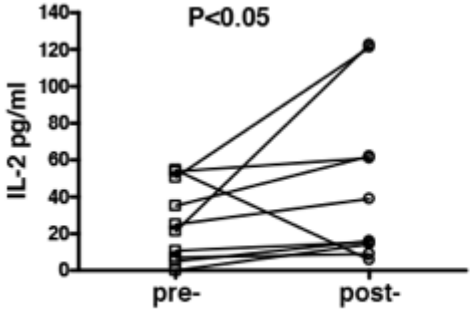


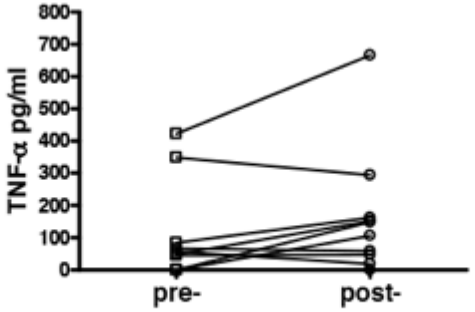


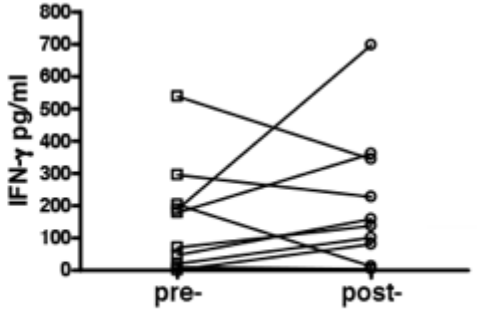


Western blot analysis demonstrating increase of Her-2/neu-specific IgG post- vaccination in patient:
(lane 1) Polyclonal rabbit anti Her-2/neu antibody was used as positive control
(lane 2) serum of a healthy volunteer as negative control
(lane 3) Serum prior
(lane 4) after completed vaccinations

CELLULAR RESPONSES SHOW TH1 PROFILE







* Breast Cancer Res Treat. 2010 Feb;119(3):673-83.

- 8/10 developed significant anti-peptide antibody levels
- In all but one the antibodies were also directed against Her-2/neu
- The majority also showed a 4-fold increase in influenza titres (HI)

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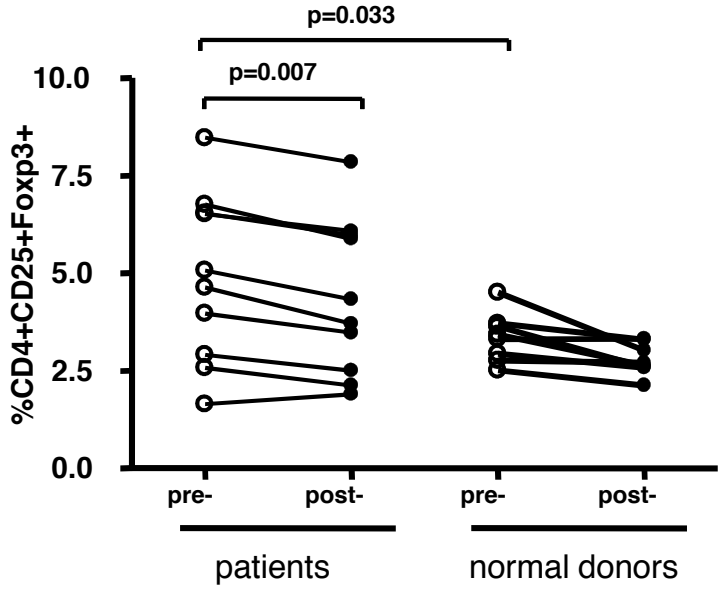
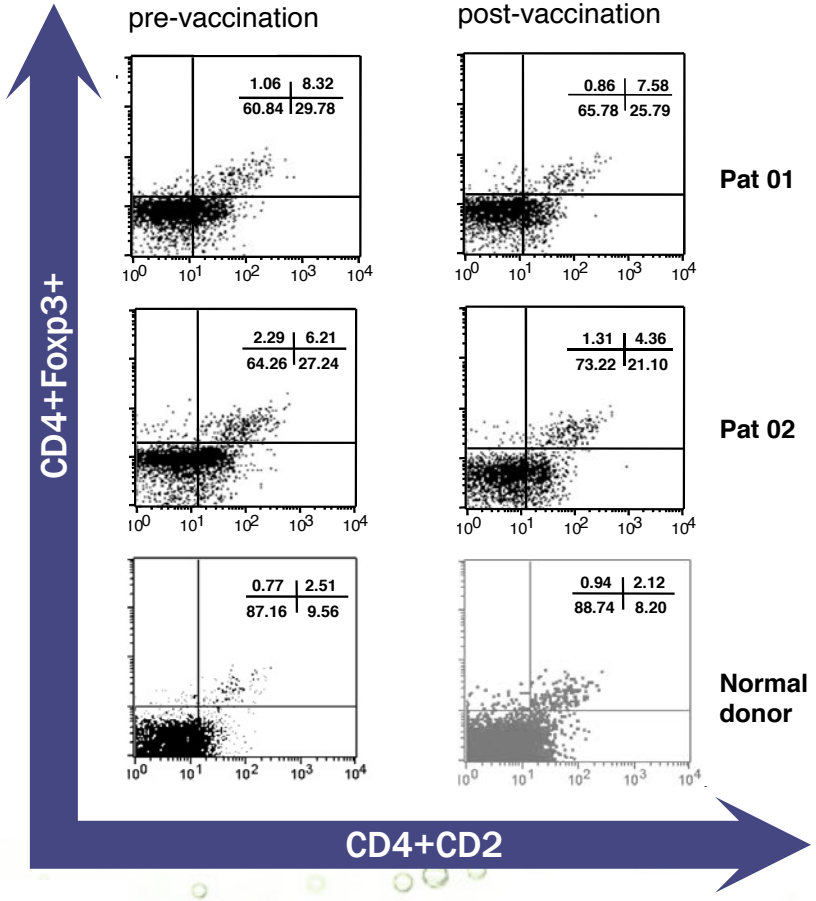
REDUCTION IN REGULATORY T CELLS*





- Significantly higher number of CD4+Foxp3+ regulatory T cells in tumour patients than healthy controls
- Vaccination significantly reduced T reg cells in both groups

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ENCOURAGING IMMUNOGENICITY, EVEN AT LOW DOSE, AND IN PATIENTS AGES UP TO 84 YEARS, WITH NO CARDIOTOXICITY

Antibody and cellular responses in human

Pat. #	Peptide-specific ab P4, P6, P7	HER2- specific ab	Infl. HIT	IL-2, IFNγ, TNF	T reg
1	↑ ↑ ↑	↑	-	- - -	↓
2	↑ ↑ ↑	↑	↑	↑ ↑ ↑	↓
3	↑ ↑ ↑	↑ (+/-)	-	↑ - -	↓
4	↑ ↑ ↑	↑	↑	- ↑ ↑	↓
5	↑ ↑ ↑	↑	↑	↑ ↑ ↑	↓
6	- - -	-	-	↓ ↓ ↓	↓
7	↑ ↑ ↑	↑	↑	- - -	↓
8	↑ ↑ ↑	↑ (+/-)	↑	↑ ↑ -	↑
9	↑ +/- +/-	↑	↑	↑ ↑ ↑	↓
10	- - -	-	-	+/- ↓ +/-	↓

HER-Vaxx breast cancer vaccine – Phase 1 trial 10 µg group

- Immunogenicity in 8/10 patients in Phase 1 study with 10 µg of peptide antigen
- Good correlation with cellular responses (cytokines)
- Safe and well tolerated, in particular no cardiotoxicity
- Protective efficacy of peptides demonstrated in preclinical tumor model in mice showing delay of onset and reduced tumor growth

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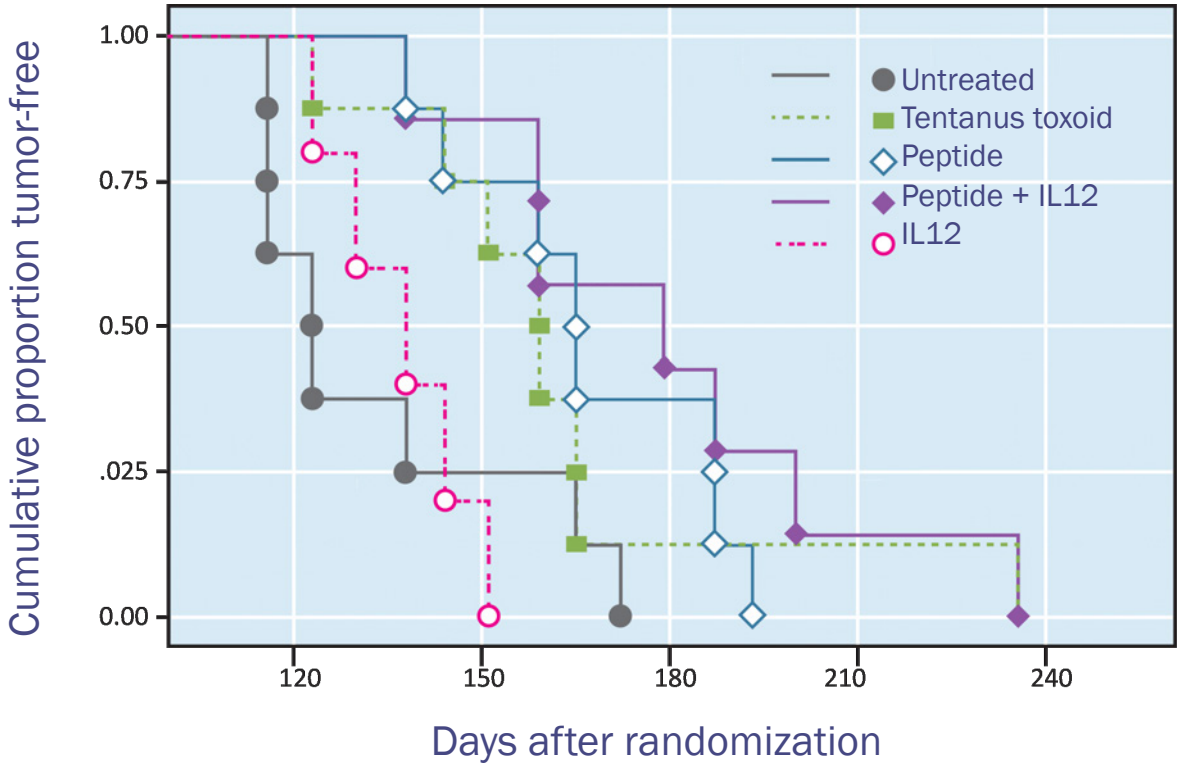
TUMOR GROWTH INHIBITION IN VIVO*

Time to disease progression



- Prolonged time to disease progression
- Immunization of c-neu transgenic mice (recognized HER2 cancer model) with tetanus toxoid-conjugated peptides P4, P6 and P7
- Vaccinated animals show significant delay in tumor onset and reduced growth kinetics
- Co-administration of IL-12 further improves the vaccine performance

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Preclinical study with tetanus toxoid–conjugated peptide antigens

d 170 ⟷ d 65 ⟷ d 235

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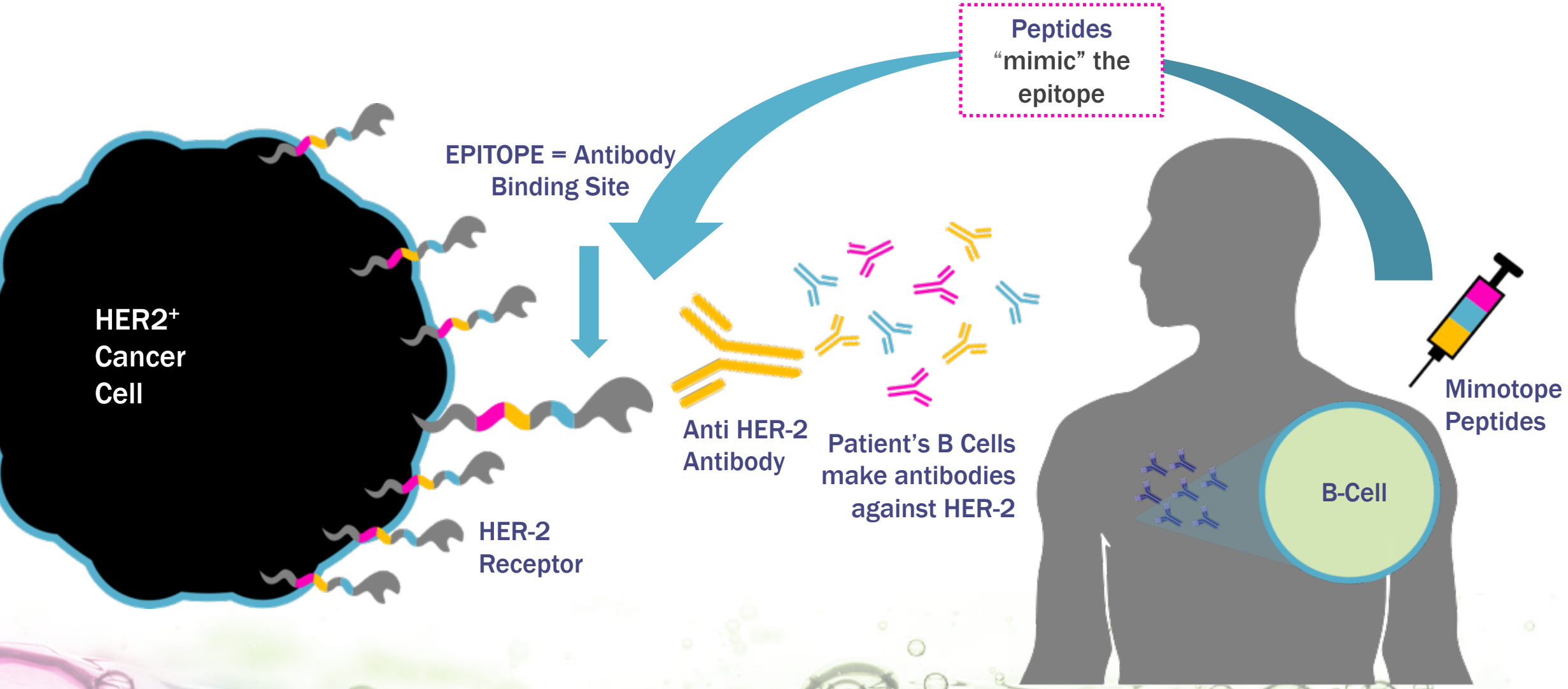
MIMOTOPE



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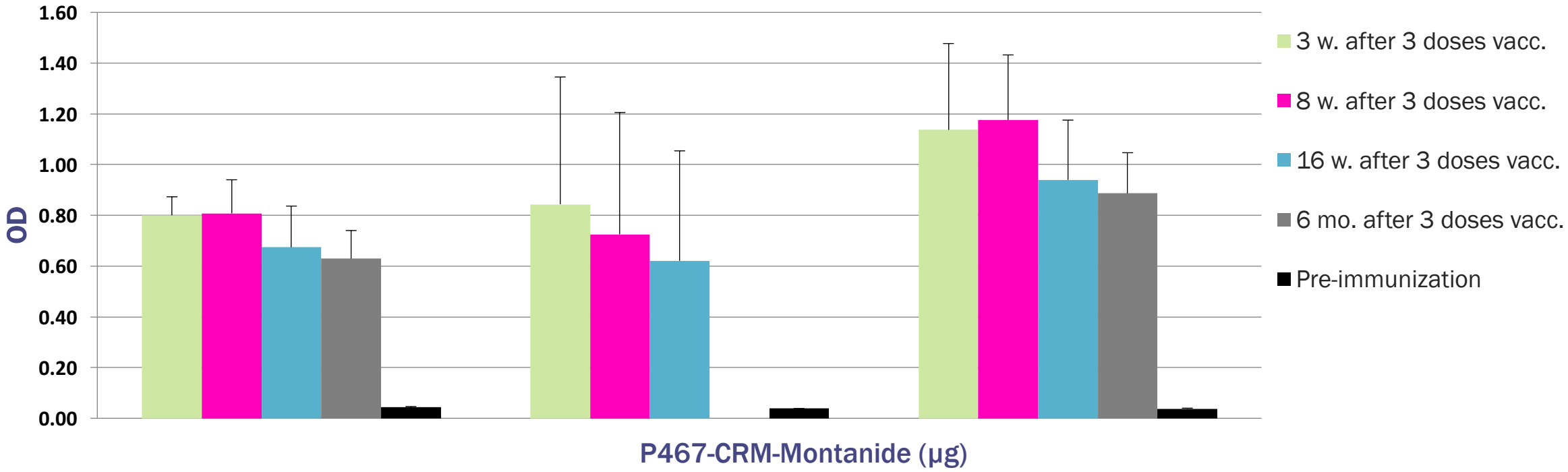
PHASE 1B/2 ENHANCED GASTRIC FORMULATION

Her-2/neu specific IgG kinetic, after last immunization



In the mouse model the new formulation sees circulating antibodies maintained for 6 months which equates to many years in humans.

Leslie Chong

Chief Executive Officer

leslie.chong@imugene.com

+61 458 040 433